Resiliency of native mixed-grass rangelands and crested wheatgrass pasture lands to spring wildfire

Previous research has suggested that prescribed fire will become more necessary in the northern Great Plains of the United States as woody encroachment and invasive plant species cover increase. Prescribed fire will likely become a more frequent management strategy to mimic natural processes in grasslands-a combination of fire and...

Author(s): Katherine C. Kral-O'Brien, Kevin K. Sedivec, Benjamin A. Geaumont, Amanda L. Gearhart
Year Published: 2020
Type: Document
Book or Chapter or Journal Article

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

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

Can Mowing Substitute for Fire in Semiarid Grassland?

Accumulating data indicate the importance of fire in rangeland systems. Mowing is a common management technique sometimes considered a surrogate for fire. However, direct comparisons of fire and mowing effects are limited. Our objective was to determine whether mowing can substitute for fire in rangeland by comparing effects on...

Author(s): Lance T. Vermeire, Dustin J. Strong, Emily A. Gates, Clayton B. Marlow, Richard C. Waterman
Year Published: 2020
Type: Document
Book or Chapter or Journal Article

Resistance and Representation in a Wildland–Urban Interface Fuels Treatment Conflict: The Case of the Forsythe II Project in the Arapaho-Roosevelt National Forest

Land treatments in wildland-urban interface (WUI) areas are highly visible and subject to public scrutiny and possible opposition. This study examines a contested vegetation treatment-Forsythe II-in a WUI area of the Arapaho-Roosevelt National Forest in Colorado. An initial phase of the research found vocal opposition to Forsythe II...

Author(s): Hannah Brenkert-Smith, Jody L. Jahn, Eric A. Vance, Juan Ahumada
Year Published: 2020
Type: Document
Book or Chapter or Journal Article

Lick Creek Demonstration-Research Forest: 25-Year Fire and Cutting Effects on Vegetation & Fuels - JFSP Final Report

Fuels reduction treatments are common in ponderosa pine ecosystems of the interior western United
States, but the long-term effects on many key ecosystem attributes remain poorly understood, including: tree growth and mortality; forest fuel loads; understory vegetation diversity and composition; production and distribution of...

Author(s): Christopher R. Keyes, Sharon M. Hood, Anna Sala, Duncan C. Lutes
Year Published: 2019
Type: Document
Technical Report or White Paper

Peatland vegetation change and establishment of re-introduced Sphagnum moss after prescribed burning
www.nrfirescience.org/resource/19377
Fire, including prescribed burning, is common on peatlands globally and can affect vegetation, including peat-forming Sphagnum mosses, and affect ecosystem services. We monitored vegetation in different burn-age categories at three UK peatland sites over a 19-month period. Half of the plots had Sphagnum fragments added and their...

Author(s): Alice Noble, Sheila M. Palmer, David J. Glaves, Alistair Crowle, Joseph Holden
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

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

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

Resilience of a ponderosa pine plantation to a backfiring operation during a mid-summer wildfire
www.nrfirescience.org/resource/20544
The Mill Fire, which burned in north-western California during the summer of 2012, provided a unique research opportunity when firefighters implemented a backfiring operation to limit wildfire growth. This backfire was ignited and burned through research plots from a long-term study designed to determine the effects of tree density...

Author(s): Jainwei Zhang, Kaelyn A. Finley, Eric E. Knapp
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Determining burnability: Predicting completion rates and coverage of prescribed burns for fuel management
www.nrfirescience.org/resource/19013
Prescribed burning is a widely used strategy in forested landscapes to reduce the risk from wildfires to human lives and valued assets. The ability for managers to undertake prescribed burns is contingent on fuel, weather and operational constraints. In practice, not all areas nominated to be burnt get completed, and within burns...
A Double Whammy: Climate Change and Stand-Replacing Wildfires
www.nrfirescience.org/resource/20493
In the Intermountain region of the Western United States, most forested landscapes are fire prone and adapted to a semiarid climate. With the severity of wildfires increasing as a result of excessive fuels, land managers are concerned about forest converting to non-forest types such as shrubland or grassland. “And then when you... Author(s): Rocky Mountain Research Station Year Published: 2019 Type: Document Research Brief or Fact Sheet

Accessing the life in smoke: a new application of unmanned aircraft systems (UAS) to sample wildland fire bioaerosol emissions and their environment
www.nrfirescience.org/resource/20412
Wildland fire is a major producer of aerosols from combustion of vegetation and soils, but little is known about the abundance and composition of smoke’s biological content. Bioaerosols, or aerosols derived from biological sources, may be a significant component of the aerosol load vectored in wildland fire smoke. If bioaerosols... Author(s): Leda N. Kobziar, Melissa R.A. Pingree, Adam C. Watts, Kellen N. Nelson, Tyler J. Dreaden, Mary Ridout Year Published: 2019 Type: Document Book or Chapter or Journal Article

Western Rx Fire Science Research Burn: Extending southeastern prescribed fire lessons and science to the West
www.nrfirescience.org/resource/19856
Often a prescribed burn requires time sensitive, logistical, and safety precautions that would make it challenging for a non-fire qualified person to observe and ask questions while it is taking place. The Lubrecht field trip, though requiring the same precautions listed above, was unique in that it was set up for the purpose of... Author(s): Monique D. Wynecoop Year Published: 2019 Type: Document Research Brief or Fact Sheet

Modeling long-term effects of fuel treatments on fuel loads and fire regimes in the Great Basin - Final Report to the Joint Fire Science Program
www.nrfirescience.org/resource/20381
The principal motivation for this study is that sagebrush-steppe ecosystems are undergoing significant state changes, and land managers are challenged with optimizing their resources for both short- and long-term use. Yet, limited knowledge is available regarding how the sagebrush-steppe will respond to environmental changes related... Author(s): Nancy F. Glenn, Alejandro N. Flores, Douglas J. Shinneman, David S. Pilliod Year Published: 2019 Type: Document
We’re Not Doing Enough Prescribed Fire in the Western United States to Mitigate Wildfire Risk
www.nrfirescience.org/resource/19761
Prescribed fire is one of the most widely advocated management practices for reducing wildfire hazard and has a long and rich tradition rooted in indigenous and local ecological knowledge. The scientific literature has repeatedly reported that prescribed fire is often the most effective means of achieving such goals by reducing...
Author(s): Crystal A. Kolden
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Lick Creek Demonstration-Research Forest: 25-Year Fire and Cutting Effects on Vegetation and Fuels - Final Report to JFSP
www.nrfirescience.org/resource/20248
Fuels reduction treatments are common in ponderosa pine ecosystems of the interior western United States, but the long-term effects on many key ecosystem attributes remain poorly understood, including: tree growth and mortality; forest fuel loads; understory vegetation diversity and composition; production and distribution of...
Author(s): Christopher R. Keyes, Sharon M. Hood, Anna Sala, Duncan C. Lutes
Year Published: 2019
Type: Document
Technical Report or White Paper

The consequences of soil heating for prescribed fire use and fire restoration in the South - Final Report to the Joint Fire Science Program
www.nrfirescience.org/resource/19729
Soil heating resulting from prescribed burning in the southern US has potential immediate and long-term impacts. Where fire is being restored to long-unburned sites, the duration and depth of soil heating may be substantial, affecting seed banks, soil carbon cycling, and root and rhizosphere systems with often severe repercussions...
Author(s): Leda N. Kobziar, J. Morgan Varner, Jesse K. Kreye, Michael G. Andreu, David R. Godwin
Year Published: 2019
Type: Document
Technical Report or White Paper

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

Prescribed Summer Fire and Seeding Applied to Restore Juniper-Encroached and Exotic
Annual Grass-Invaded Sagebrush Steppe

Western juniper (Juniperus occidentalis Hook.) encroachment and exotic annual grass (medusahead [Taeniatherum caput-medusae L. Nevski] and cheatgrass [Bromus tectorum L.]) invasion of sagebrush (Artemisia L.) communities decrease ecosystem services and degrade ecosystem function. Traditionally, these compositional changes were...

Author(s): Kirk W. Davies, A.E. Dean
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Pile age and burn season influence fuelbed properties, combustion dynamics, fuel consumption, and charcoal formation when burning hand piles

Piling and burning is widely used to dispose of unmerchantable debris resulting from thinning in forests throughout the western United States. Quite often more piles are created than are burned in a given year, however, causing piles to persist, accumulate, and age on the landscape. The effects of burning piles of increasing age has...

Author(s): Clinton S. Wright, Alexander M. Evans, Sara Grove, Karen A. Haubensak
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Fighting flames and forging firelines: wildfire suppression effectiveness at the fire edge

Purpose of Review: The effectiveness of wildfire suppression is difficult to define as it can be assessed against different objectives and at a range of scales. The influence of multiple variables make it a challenge to research. This two-part series presents a synthesis of the current understanding of the effectiveness of wildfire...

Author(s): Matt P. Plucinski
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

From Farms to Forests: Landscape Carbon Balance after 50 Years of Afforestation, Harvesting, and Prescribed Fire

Establishing reliable carbon baselines for landowners desiring to sustain carbon sequestration and identify opportunities to mitigate land management impacts on carbon balance is important; however, national and regional assessments are not designed to support individual landowners. Such baselines become increasingly valuable when...

Author(s): Doug P. Aubrey, John I. Blake, Stanley J. Zarnoch
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

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
Effects of fire rotation interval and overstory type on ambient soil temperatures in ponderosa pine forests in Arizona

www.nrfirescience.org/resource/20116
Ambient soil temperatures were measured every four weeks from May 1986 to November 1986 at three depths under the organic forest floor in ponderosa pine (Pinus ponderosa Lawson & C. Lawson) forests in three stand types subjected to periodic prescribed burning. Temperatures at the organic layer – soil surface interface in...
Author(s): David R. Weise, Stephen S. Sackett, Sally M. Haase, Nels Johnson
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Calculation of critical water flow rates for wildfire suppression

www.nrfirescience.org/resource/19381
Predicting water suppression requirements and its impacts on firefighting strategies and logistics within the urban environment has been the subject of many previous studies, however the same level of research has yet to be applied in the realm of wildfire suppression. To work towards addressing this knowledge gap, this paper...
Author(s): Greg Penney, Daryoush Habibi, Marcus Cattani, Murray Carter
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

How big is enough? Vegetation structure impacts effective fuel treatment width and forest resiliency

www.nrfirescience.org/resource/19052
Fuel treatments are designed with multiple management goals, including improving suppression capacity and restoring the historical structure of dry forests. Fuelbreaks are a class of fuel treatment that remove fuels within a wide strip of land, with an overarching objective to reduce fire behavior and provide safe access for...
Author(s): Maureen C. Kennedy, Morris C. Johnson, Kendra Fallon, Deborah Mayer
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Effects of variable density thinning and burning treatments - JFSP Final Report

www.nrfirescience.org/resource/20111
Over recent decades, increases in substantial tree mortality events have coincided with severe drought and bark beetle outbreak. This has prompted forest managers to find treatments that enhance resistance to disturbances. Variable density thinning is an alternative management method intended to increase spatial heterogeneity, with...
Author(s): Jeffrey M. Kane, Alexis Bernal
Year Published: 2019
Type: Document
Improving long-term fuel treatment effectiveness in the National Forest System through quantitative prioritization

Predicting the efficacy of fuel treatments aimed at reducing high severity fire in dry-mixed conifer forests in the western US is a challenging problem that has been addressed in a variety of ways using both field observations and wildfire simulation models. One way to describe the efficacy of fuel treatments is to quantify how...

Author(s): Ana M. G. Barros, Alan A. Ager, Michelle A. Day, Palaiologos Palaiologou
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Drying rates of saturated masticated fuelbeds from Rocky Mountain mixed-conifer stands

Mastication is becoming a popular wildland fuel treatment in the United States but little is known about how masticated fuels dry over time, especially as these atypical fuelbeds age. This report summarises measured drying rates of different-aged masticated fuelbeds built from material collected from sites that were treated using...

Author(s): Robert E. Keane, Lisa M. Holsinger, Helen Y. Smith, Pamela G. Sikkink
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

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

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

Author(s): Bianca Dunker, C. Michael Bull, David A. Keith, Don A. Driscoll
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Characterizing fire effects on conifers at tree level from airborne laser scanning and high-resolution, multispectral satellite data

Post-fire assessment is made after a wildfire incident to provide details about damage level and its distribution over burned areas. Such assessments inform restoration plans and future monitoring of ecosystem recovery. Due to the high cost and time to conduct fieldwork, remote sensing is an appealing alternative to assess post-fire...

Author(s): Carine Klauberg, Andrew T. Hudak, C. A. Silva, Sarah A. Lewis, Peter R. Robichaud, Theresa B. Jain
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Evaluating ecological resilience across wildfire suppression levels under climate and fuel
treatment scenarios using landscape simulation modelling
www.nrfirescience.org/resource/19870
Continued suppression of wildfires may allow more biomass to accumulate to foster even more intense fires. Enlightened fire management involves explicitly determining concurrent levels of suppression, wildland fire use (allowing some fires to burn) and fuel treatments to manage landscapes for ecological resilience. This study used...
Author(s): Robert E. Keane, Kathy L. Gray, Brett Davis, Lisa M. Holsinger, Rachel A. Loehman
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Fire and Forest Management in Montane Forests of the Northwestern States and California, USA
www.nrfirescience.org/resource/19298
We reviewed forest management in the mountainous regions of several northwestern states and California in the United States and how it has impacted current issues facing these forests. We focused on the large-scale activities like fire suppression and logging which resulted in landscape level changes. We divided the region into two...
Author(s): Iris Allen, Sophan Chhin, Jainwei Zhang
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

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

Fuel Characteristic Classification System (FCCS) field sampling and fuelbed development guide
www.nrfirescience.org/resource/19832
The Fuel Characteristic Classification System (FCCS) was designed to store and archive wildland fuel characteristics within fuelbeds, defined as the inherent physical characteristics of fuels that contribute to fire behavior and effects. The FCCS represents fuel characteristics in six strata including canopy, shrubs, herbaceous...
Author(s): Susan J. Prichard, Anne Andreu, Roger D. Ottmar, Ellen Eberhardt
Year Published: 2019
Type: Document
Technical Report or White Paper

Vegetation succession in an old-growth ponderosa pine forest following structural restoration with fire: implications for retreatment and maintenance - JFSP Final Report
www.nrfirescience.org/resource/19272
Stand changes brought on by fire exclusion have contributed to reduced resilience to wildfire in ponderosa pine forests throughout the western US. Growing recognition of how structural attributes influence resilience has led to interest in restoring more heterogeneous conditions once common in these forests, but key information...
Aboveground forest carbon shows different responses to fire frequency in harvested and unharvested forests
www.nrfirescience.org/resource/18801
Sequestration of carbon in forest ecosystems has been identified as an effective strategy to help mitigate the effects of global climate change. Prescribed burning and timber harvesting are two common, co-occurring, forest management practices that may alter forest carbon pools. Prescribed burning for forest management, such as...
Author(s): Luke Collins, Ross A. Bradstock, Fabiano de Aquino Ximenes, Bronwyn Horsey, Robert Sawyer, Trent D. Penman
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Short- and long-term effects of ponderosa pine fuel treatments intersected by the Egley Fire Complex, Oregon, USA
www.nrfirescience.org/resource/20359
Background Fuel treatments are widely used to alter fuels in forested ecosystems to mitigate wildfire behavior and effects. However, few studies have examined long-term ecological effects of interacting fuel treatments (commercial harvests, pre-commercial thinnings, pile and burning, and prescribed fire) and wildfire. Using annually...
Author(s): Jessie M. Dodge, Eva K. Strand, Andrew T. Hudak, Benjamin C. Bright, Darcy H. Hammond, Beth A. Newingham
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

www.nrfirescience.org/resource/19760
Poor air quality arising from prescribed and wildfire smoke emissions poses threats to human health and therefore must be taken into account for the planning and implementation of prescribed burns for reducing contemporary fuel loading and other management goals. To better understand how smoke properties vary as a function of fuel...
Author(s): Kellen N. Nelson, Jayne M. Boehmler, Andrey Y. Khlystov, Hans Moosmuller, Vera Samburova, Chiranjivi Bhattarai, Eric M. Wilcox, Adam C. Watts
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Determinants of perceived risk and liability concerns associated with prescribed burning in the United States
www.nrfirescience.org/resource/19212
While prescribed burning is a proven tool in the management of forests and grasslands, its use has been limited due, in part, to potential risks that may result in legal liability, property damage, and personal injury. The purpose of this study is to understand the factors that shape landowners' and fire professionals' perceptions...
Effects of variable density thinning and burning treatments on the spatial patterns of drought-related tree mortality - Final Report to JFSP

www.nrfirescience.org/resource/20247

Over recent decades, increases in substantial tree mortality events have coincided with severe drought and bark beetle outbreak. This has prompted forest managers to find treatments that enhance resistance to disturbances. Variable density thinning is an alternative management method intended to increase spatial heterogeneity, with...

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

www.nrfirescience.org/resource/19637

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

Pixel-level statistical analyses of prescribed fire spread

www.nrfirescience.org/resource/19200

Wildland fire dynamics are a complex three-dimensional turbulent process. Cellular automata (CA) is an efficient tool to predict fire dynamics, but the main parameters of the method are challenging to estimate. To overcome this challenge, we compute statistical distributions of the key parameters of a CA model using infrared images...

Forest soil disturbance: implications of factors contributing to the wildland fire nexus

www.nrfirescience.org/resource/20175

Wildfires and prescribed fires cause a range of impacts on forest soils depending on the interactions of a nexus of fire severity, scale of fire, slope, infiltration rates, and post-fire rainfall. These factors determine the degree of impact on forest soils and subsequently the need for post-fire soil management. Fire is a useful...
Factors influencing fire suppression success in the province of Quebec (Canada)
www.nrfirescience.org/resource/19631
In the managed forest of Canada, forest fires are actively suppressed through efficient initial attack capability; however, the impact of different factors on the suppression success remains to be understood. The aim of this paper was to analyze the influence of operational suppression objectives (fire detection, initial attack, and...)
Author(s): Adrián Cardil, Miren Lorente, Dominique Boucher, Jonathan Boucher, Sylvie Gauthier
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Contain and control: wildfire suppression effectiveness at incidents and across landscapes
www.nrfirescience.org/resource/19168
Purpose of Review: Containing and controlling wildfire incidents is one of the main functions of fire management. Understanding how this can be done effectively and efficiently informs many of the preparatory activities undertaken by fire management agencies to limit the impact of wildfires. This second article within a two-part...
Author(s): Matt P. Plucinski
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Understory vascular plant responses to retention harvesting with and without prescribed fire
www.nrfirescience.org/resource/20122
Wildfire is the predominant natural disturbance in the boreal forests of western Canada. Natural disturbance-based forest management involves the use of retention harvesting to retain stand structural diversity post-harvest; however, this partial harvesting technique does not cause combustion of the forest floor as does fire....
Author(s): Caroline Mary Adrianne Franklin, Scott E. Nielsen, S. Ellen Macdonald
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Future fire scenarios: predicting the effect of fire management strategies on the trajectory of high-quality habitat for threatened species
www.nrfirescience.org/resource/19421
Prescribed (or 'planned') burning is used by land managers to reduce fuel-loads in order to mitigate the spread of wildfire, thereby protecting life and property, and to promote environmental heterogeneity to enhance biodiversity. Globally, many fire management agencies focus on increasing extent and frequency of prescribed burning...
Author(s): Jemima Connell, Simon J. Watson, Rick S. Taylor, Sarah C. Avitabile, Natasha Schedvin, Kathryn Schneider, Michael F. Clarke
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

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

Modeling thinning effects on fire behavior with STANDFIRE
www.nrfirescience.org/resource/18335
Key message: We describe a modeling system that enables detailed, 3D fire simulations in forest fuels. Using data from three sites, we analyze thinning fuel treatments on fire behavior and fire effects and compare outputs with a more commonly used model. Context: Thinning is considered useful in altering fire behavior, reducing fire...
Author(s): Russell A. Parsons, F. Pimont, Lucas Wells, Greg M. Cohn, William Matt Jolly, Francois P. deColigny, Eric Rigolot, Jean-Luc Dupuy, William E. Mell, Rodman Linn
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Wildland fuel treatments
www.nrfirescience.org/resource/18313
The purposeful use of any silvicultural method, including mechanical methods, managed wildfire, prescribed fire, or a combination of approaches, to intentionally alter the fuel complex in such a way as to modify fire behavior and thereby minimize the potential negative impacts of future wildfires on ecosystem goods and services,...
Author(s): Chad M. Hoffman, Brandon M. Collins, Michael A. Battaglia
Year Published: 2018
Type: Document
Research Brief or Fact Sheet

Fire regimes approaching historic norms reduce wildfire?facilitated conversion from forest to non?forest
www.nrfirescience.org/resource/19957
Extensive high?severity wildfires have driven major losses of ponderosa pine and mixed?conifer forests in the southwestern United States, in some settings catalyzing enduring conversions to non?forested vegetation types. Management interventions to reduce the probability of stand?replacing wildfire have included mechanical...
Author(s): Ryan B. Walker, Jonathan D. Coop, Sean A. Parks, Laura Trader
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Dormant-Season Fire Inhibits Sixweeks Fescue and Enhances Forage Production in Shortgrass Steppe
www.nrfirescience.org/resource/17672
Semiarid rangelands experience substantial interannual variability in precipitation, which can determine the relative abundance of species in any given year and influence the way that fire affects plant community composition and productivity. Long-term studies are needed to examine potential interactions between fluctuating...
Author(s): N. A. Dufek, David J. Augustine, Dana M. Blumenthal, Julie A. Kray, Justin D. Derner
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
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

Can Air Quality Management Drive Sustainable Fuels Management at the Temperate Wildland–Urban Interface?
www.nrfirescience.org/resource/18137
Sustainable fire management has eluded all industrial societies. Given the growing number and magnitude of wildfire events, prescribed fire is being increasingly promoted as the key to reducing wildfire risk. However, smoke from prescribed fires can adversely affect public health. We propose that the application of air quality...
Author(s): David M. J. S. Bowman, Lori D. Daniels, Fay H. Johnston, Grant J. Williamson, William Matt Jolly, Sheryl Magzamen, Ana G. Rappold, Michael Brauer, Sarah B. Henderson
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Prescribed fire regimes subtly alter ponderosa pine forest plant community structure
www.nrfirescience.org/resource/18802
Prescribed fire is an active management tool used to address wildfire hazard and ecological concerns associated with fire exclusion and suppression over the past century. Despite widespread application in the United States, there is considerable inconsistency and lack of information regarding the extent to which specific outcomes...
Author(s): Becky K. Kerns, Michelle A. Day
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Preface: Special issue on wildland fires
www.nrfirescience.org/resource/17795
Wildland fires are a critical Earth-system process that impacts human populations in each settled continent [1,2]. Wildland fires have often been stated as being essential to human life and civilization through the impacts on land clearance, agriculture, and hunting, with fire as a phenomenon serving a key role in the development of...
Author(s): Alistair M. S. Smith, James A. Lutz, Chad M. Hoffman, Grant J. Williamson, Andrew T. Hudak
Year Published: 2018
Type: Document
Book or Chapter or Journal Article
The National Association of State Foresters (NASF) and the Coalition of Prescribed Fire Councils (CPFC) worked collaboratively to produce the 2018 National Prescribed Fire Use Survey Report. Since 2012, this report has been compiled every three years, and is unique among fire surveys. Numerous surveys have been conducted that...

Author(s): Mark A. Melvin
Year Published: 2018
Type: Document
Technical Report or White Paper

A conservation paradox in the Great Basin-altering sagebrush landscapes with fuel breaks to reduce habitat loss from wildfire

Interactions between fire and nonnative, annual plant species (that is, 'the grass/fire cycle') represent one of the greatest threats to sagebrush (Artemisia spp.) ecosystems and associated wildlife, including the greater sage-grouse (Centrocercus urophasianus). In 2015, U.S. Department of the Interior called for a 'science-based...

Author(s): Douglas J. Shinneman, Cameron L. Aldridge, Peter S. Coates, Matthew J. Germino, David S. Pilliod, Nicole M. Vaillant
Year Published: 2018
Type: Document
Technical Report or White Paper

How does forest recovery following moderate-severity fire influence effects of subsequent wildfire in mixed-conifer forests?

Given regional increases in fire activity in western North American forests, understanding how fire influences the extent and effects of subsequent fires is particularly relevant. Remotely sensed estimates of fire effects have allowed for spatial portioning into different severity categories based on the degree of fire-caused...

Author(s): Brandon M. Collins, Jamie M. Lydersen, Richard G. Everett, Scott L. Stephens
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Fuel mass and stand structure 13 years after logging of a severely burned ponderosa pine forest in northeastern Oregon, U.S.A

Stand structure and fuel mass were measured in 2011, 13 years after logging of a seasonally dry, ponderosa pine-dominated forest that had burned severely in the 1996 Summit Wildfire, Malheur National Forest, northeastern Oregon, U.S.A. Data are compared to those taken one year after post-fire logging (1999), and analyzed in the...

Author(s): James D. McIver, Roger D. Ottmar
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Fuel treatment planning: fragmenting high fuel load areas while maintaining availability and connectivity of faunal habitat
Reducing the fuel load in fire-prone landscapes is aimed at mitigating the risk of catastrophic wildfires but there are ecological consequences. Maintaining habitat for fauna of both sufficient extent and connectivity while fragmenting areas of high fuel loads presents land managers with seemingly contrasting objectives. Faced with...

Author(s): Ramya Rachmawati, Melih Ozlen, John W. Hearne, Karin J. Reinke
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

**Fire behavior and ecological effects of burning masticated forest fuels**

Managers masticate fuels to redistribute fuels within a forest. They use machines to chip and shred whole trees, shrubs, and herbaceous vegetation to reduce the fuels in the canopy and move them to the forest floor. Fires burning in the dense, compact fuelbeds resulting from mastication often burn with lower intensity and shorter...

Author(s): Penelope Morgan, Alistair M. S. Smith, Aaron M. Sparks, Camille Stevens-Rumann, Pamela G. Sikkink, Zachary D. Lyon, Robert F. Keefe
Year Published: 2018
Type: Document
Research Brief or Fact Sheet

**Negligible impacts of biomass removal on Douglas-fir growth 29 years after outplanting in the northern Rocky Mountains**

To investigate the long-term impacts of biomass harvesting on site productivity, we remeasured trees in the 1974 Forest Residues Utilization Research and Development Program at Coram Experimental Forest in western Montana. Three levels (high, medium, and low) of biomass removal intensity combined with broadcast burning treatment...

Author(s): Woongsoon Jang, Christopher R. Keyes, Deborah S. Page-Dumroese
Year Published: 2018
Type: Document
Book or Chapter or Journal Article


Globally, wildfire size and frequency has increased in the last thirty years across numerous ecosystems. Models predict that trend to continue with increases in temperature and shifts in seasonal precipitation caused by climate change. In the western United States, these trends are exacerbated by invasive annual grasses that create...

Author(s): Eva K. Strand, Beth A. Newingham, Chris Bowman-Prideaux
Year Published: 2018
Type: Document
Technical Report or White Paper

**The nature of the beast: examining climate adaptation options in forests with stand-replacing fire regimes**

Building resilience to natural disturbances is a key to managing forests for adaptation to climate change. To date, most climate adaptation guidance has focused on recommendations for frequent...
forests, leaving few published guidelines for forests that naturally experience infrequent, stand-replacing wildfires. Because most... 

Author(s): Joshua S. Halofsky, Daniel C. Donato, Jerry F. Franklin, Jessica E. Halofsky, David L. Peterson, Brian J. Harvey
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Weak interspecific interactions in a sagebrush steppe? Conflicting evidence from observations and experiments
www.nrfirescience.org/resource/17939
Stable coexistence requires intraspecific limitations to be stronger than interspecific limitations. The greater the difference between intra- and interspecific limitations, the more stable the coexistence, and the weaker the competitive release any species should experience following removal of competitors. We conducted a removal...

Author(s): Peter B. Adler, Andrew R. Kleinhesselink, Giles Hooker, Joshua B. Taylor, Brittany Teller, Stephan P. Ellner
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Human influences superseded climate to disrupt the 20th century fire regime in Jasper National Park, Canada
www.nrfirescience.org/resource/18402
To enhance understanding of how climate and humans influenced historical fire occurrence in the montane forests of Jasper National Park, we crossdated fire-scar and tree age samples from 172 plots. We tested effects of drought and climatic variation driven by the El Niño-Southern Oscillation (ENSO) and Pacific North American (PNA)...

Author(s): Raphael D. Chavardes, Lori D. Daniels, Ze’ev Gedalof, David W. Andison
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Long-term effects of restoration fire and thinning on soil fungi, fine root biomass, and duff levels - Final report to the Joint Fire Science Program
www.nrfirescience.org/resource/17150
The proposed research will help managers understand how early soil ecosystem responses to fuel reduction treatments with prescribed fire may or may not be indicative of longer term responses. This research is necessary for better establishing, in forest management plans and decision documents, the ecosystem costs and benefits of...

Author(s): Jane E. Smith, Daniel L. Luoma, Robyn L. Darbyshire, James D. McIver, Andrew P. Youngblood
Year Published: 2018
Type: Document
Technical Report or White Paper

Characterizing fire behavior from laboratory burns of multi-aged, mixed-conifer masticated fuels in the western United States
www.nrfirescience.org/resource/17916
Mastication is the process of chipping or shredding components of the tree canopy or above-ground vegetation to reduce the canopy, alter fire spread rates, and reduce crown fire potential. Mastication as
a fuel treatment, either alone or in combination with prescribed fire, has been the subject of much research. This research has...

Author(s): Faith A. Heinsch, Pamela G. Sikkink, Helen Y. Smith, Molly L. Retzlaff
Year Published: 2018
Type: Document
Technical Report or White Paper

Resilience and resistance in sagebrush ecosystems are associated with seasonal soil temperature and water availability
www.nrfirescience.org/resource/18350
Invasion and dominance of exotic grasses and increased fire frequency threaten native ecosystems worldwide. In the Great Basin region of the western United States, woody and herbaceous fuel treatments are implemented to decrease the effects of wildfire and increase sagebrush (Artemisia spp.) ecosystem resilience to disturbance and...
Author(s): Bruce A. Roundy, Jeanne C. Chambers, David A. Pyke, Richard F. Miller, Robin J. Tausch, Eugene Schupp, Ben Rau, Trevor Gruell
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Wildfire fuel management: network-based models and optimization of prescribed burning
www.nrfirescience.org/resource/17866
Wildfires are a common phenomenon on most continents. They have occurred for an estimated 60 million years and are part of a regular climatic cycle. Nevertheless, wildfires represent a real and continuing problem that can have a major impact on people, wildlife and the environment. The intensity and severity of wildfires can be...
Author(s): Dmytro Matsypura, Oleg A. Prokopyev, Aizat Zahar
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Can air quality management drive sustainable fuels management at the temperate wildland-urban interface?
www.nrfirescience.org/resource/18327
Sustainable fire management has eluded all industrial societies. Given the growing number and magnitude of wildfire events, prescribed fire is being increasingly promoted as the key to reducing wildfire risk. However, smoke from prescribed fires can adversely affect public health. We propose that the application of air quality...
Author(s): David M. J. S. Bowman, Lori D. Daniels, Fay H. Johnston, Grant J. Williamson, William Matt Jolly, Sheryl Magzamen, Ana G. Rappold, Michael Brauer, Sarah B. Henderson
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Monitoring Effectiveness of Forest Restoration Treatments: The Importance of Time and Space - Final Report to the Joint Fire Science Program
www.nrfirescience.org/resource/16991
Fuel-reduction treatments have been used effectively in dry, fire-adapted forests to reduce risk of high-severity crown fire, but it is less certain if they achieve their ecosystem restoration objectives. To date, there has not been a comprehensive assessment of how the spatial and temporal dimensions of ecological assessments may...
Long-Term Effect of Prescribed Burning Regimes and Logging on Coarse Woody Debris in South-Eastern Australia

Coarse woody debris (CWD) is vital within forest ecosystems for an array of fauna. Forest management practices, such as prescribed burning and logging, influence the creation or loss of CWD. We examined the effect of long-term prescribed burning and logging on (i) the abundance of hollow-bearing CWD, (ii) the volume of CWD in...

A Statement of Common Ground Regarding the Role of Wildfire in Forested Landscapes of the Western United States

For millennia, wildfires have markedly influenced forests and non-forested landscapes of the western United States (US), and they are increasingly seen as having substantial impacts on society and nature. There is growing concern over what kinds and amounts of fire will achieve desirable outcomes and limit harmful effects on people...

Prescribed fire policy barriers and opportunities: a diversity of challenges and strategies across the west

We are conducting a project investigating policies that limit managers' ability to conduct prescribed fire on US Forest Service and Bureau of Land Management (BLM) lands in the 11 Western states. The goals for this phase of our work were to understand the extent to which various policies are limiting prescribed fire programs,...

Long-term effects of restoration fire and thinning on soil fungi, fine root biomass, and litter depth - Final Report to the Joint Fire Science Program

To increase ecosystem resiliency, and achieve the desired future condition of stands with large tree retention and low fuel loads, federal agencies have actively implemented a large number of fuel reduction and forest restoration projects in low-elevation dry conifer forests throughout the western United States. A noteworthy example...
**Why do prescribed burning?**

www.nrfirescience.org/resource/17801

Fire has always been a natural disturbance process that is essential to healthy ecological systems across the landscape in the western United States. In the early 1900s, land management agencies sought to suppress all fires in an effort to preserve the timber supply and other natural resources. Fire suppression policy was effective...

**Fire regimes approaching historic norms reduce wildfire-facilitated conversion from forest to non-forest**

www.nrfirescience.org/resource/17545

Extensive high-severity wildfires have driven major losses of ponderosa pine and mixed-conifer forests in the southwestern United States, in some settings catalyzing enduring conversions to non-forested vegetation types. Management interventions to reduce the probability of stand-replacing wildfire have included mechanical...

**Fuel bed response to vegetation treatments in juniper-invaded sagebrush steppe**

www.nrfirescience.org/resource/18119

Expansion of juniper (Juniperus spp. L.) and pinyon (Pinus spp. L.) into sagebrush steppe habitats has been occurring for over a century across western United States. Vegetation and fuel treatments, with the goal of increasing landscape diversity and herbaceous productivity, and reducing woody fuels are commonly implemented to...

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

www.nrfirescience.org/resource/17730

The treatment of the contribution of woody debris (WD, such as branches or small logs >6–50 mm diameter) to the rate of forward spread of a fire in current operational forest fire spread models is inconsistent. Some models do not take into account this fuel at all (i.e. only consider the combustion of fine fuels ( < 6 mm...
Multiobjective prioritization of preselected fuel treatment strategies for public forestland: a case study in Flathead County, Montana
www.nrfirescience.org/resource/17346
Preferred fuel treatment strategies (FTSs) were determined for two public forests in Flathead County, Montana, for the period 2010–59 using a multiple-objective evaluation method that accounts for future residential development in the WUI and climate change. Three fuel management objectives were used to evaluate and rank FTSs.:
Author(s): Tony Prato, Travis B. Paveglio
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Stand dynamics 11 years after retention harvest in a lodgepole pine forest
www.nrfirescience.org/resource/17959
Structurally diverse forests provide resilience to an array of disturbances and are a mainstay of multiple-resource management. Silviculture based on natural disturbance can increase structural heterogeneity while providing other ecological and economic benefits. One useful silvicultural tool for promoting structural heterogeneity:
Author(s): Justin S. Crotteau, Christopher R. Keyes, Sharon M. Hood, Andrew J. Larson, Elaine Kennedy Sutherland, David K. Wright, Joel M. Egan
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Masticated Fuels and Fire Behavior in Forests of the Interior West - JFSP Final Report
www.nrfirescience.org/resource/17722
Managers masticate fuels to reduce extreme fire hazards, but the impact on fire behavior within the resulting compact fuelbeds is poorly understood. We burned 54 laboratory-based fuelbeds one and two growing seasons after mastication and 75 masticated fuelbeds in prescribed fires one growing season after treatment in three replicate:
Author(s): Penelope Morgan, Alistair M. S. Smith, Robert F. Keefe
Year Published: 2018
Type: Document
Technical Report or White Paper

Fire behaviour in masticated forest fuels: lab and prescribed fire experiments
www.nrfirescience.org/resource/17949
Managers masticate fuels to reduce extreme fire hazards, but the effect on fire behaviour within the resulting compact fuelbeds is poorly understood. We burned 54 masticated fuelbeds in laboratory experiments one and two growing seasons after mastication and 75 masticated fuelbeds in prescribed fire experiments one growing season:
Author(s): Zachary D. Lyon, Penelope Morgan, Camille Stevens-Rumann, Aaron M. Sparks, Robert F. Keefe, Alistair M. S. Smith
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Physical and chemical characteristics of surface fuels in masticated mixed-conifer stands of the U.S. Rocky Mountains
www.nrfirescience.org/resource/16749
Mastication is a wildland fuel treatment technique that is rapidly becoming the preferred method for many fire hazard reduction projects, especially in areas where reducing fuels with prescribed fire is particularly challenging. Mastication is the process of mechanically modifying the live and dead surface and canopy biomass by...

Author(s): Robert E. Keane, Pamela G. Sikkink, Theresa B. Jain
Year Published: 2018
Type: Document
Technical Report or White Paper

Interactions between large high-severity fires and salvage logging on a short return interval reduce the regrowth of fire-prone serotinous forests

www.nrfirescience.org/resource/17175
New fire disturbance regimes under accelerating global environmental change can have unprecedented consequences for ecosystem resilience, lessening ecosystem natural regeneration. In the Mediterranean Basin, fire-dependent obligate seeder forests that are prone to increasingly frequent stand-replacing fires and then salvaged logged...

Author(s): Angela Taboada, Víctor Fernández-García, Elena Marcos, Leonor Calvo
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Growth response of whitebark pine (Pinus albicaulis Engelm) regeneration to thinning and prescribed burn treatments

www.nrfirescience.org/resource/17921
Whitebark pine (Pinus albicaulis Engelm.) forests play a prominent role throughout high-elevation ecosystems in the northern Rocky Mountains, however, they are vanishing from the high mountain landscape due to three factors: exotic white pine blister rust (Cronartium ribicola Fischer) invasions, mountain pine beetle (Dendroctonus...)

Author(s): Molly L. Retzlaff, Robert E. Keane, David L.R. Affleck, Sharon M. Hood
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Thermocouple probe orientation affects prescribed fire behavior estimation

www.nrfirescience.org/resource/18357
Understanding the relationship between fire intensity and fuel mass is essential information for scientists and forest managers seeking to manage forests using prescribed fires. Peak burning temperature, duration of heating, and area under the temperature profile are fire behavior metrics obtained from thermocouple-datalogger...

Author(s): Thomas Adam Coates, Alex T. Chow, Donald L. Hagan, Thomas A. Waldrop, G. Geoff Wang, William C. Bridges, Mary-Frances Rogers, James H. Dozier
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

A review of community smoke exposure from wildfire compared to prescribed fire in the United States

www.nrfirescience.org/resource/17896
Prescribed fire, intentionally ignited low-intensity fires, and managed wildfires—wildfires that are allowed to burn for land management benefit—could be used as a land management tool to create forests that are resilient to wildland fire. This could lead to fewer large catastrophic wildfires in the future. However,
Effects of conifer treatments on soil nutrient availability and plant composition in sagebrush steppe

**www.nrfirescience.org/resource/16691**

Pinyon-juniper woodlands of the western United States have expanded 2 to 10-fold since the late 1800’s. Tree control measures using chainsaws, heavy equipment and prescribed fire have been used to reduce woodlands and restore big sagebrush steppe and decrease woody fuel loading. We evaluated nutrient availability and herbaceous...

Author(s): Jonathan D. Bates, Kirk W. Davies  
Year Published: 2017  
Type: Document  
Book or Chapter or Journal Article

Wildland fire risk reduction: a Government Accountability Office report

**www.nrfirescience.org/resource/15283**

This report examines federal officials' and stakeholders' views on (1) factors that affect federal-nonfederal collaboration aimed at reducing wildland fire risk to communities and (2) actions that could improve their ability to reduce risk to communities.

Author(s): U.S. Government Accountability Office  
Year Published: 2017  
Type: Document  
Technical Report or White Paper

Do Fuel Treatments Restore Ecosystem Function? Water Use Efficiency Before and After Fire Suppression and Fuels Treatments in Fire-Prone Pine Forests in the Western United States - Final Report to the Joint Fire Science Program

**www.nrfirescience.org/resource/17013**

This project had three objectives. The first objective was to identify variation in discrimination of $\Delta^{13}C$ and intrinsic water use efficiency (iWUE) in Ponderosa pine (Pinus ponderosa) tree rings from 1800 to 2012 at two Fire and Fire Surrogate study sites (Arizona, Washington). The sites are both dominated by ponderosa pine but...

Author(s): Alan H. Taylor, Soumaya Belmecheri, Lucas B. Harris  
Year Published: 2017  
Type: Document  
Technical Report or White Paper

Review of Pathways for Building Fire Spread in the Wildland Urban Interface Part I: Exposure Conditions

**www.nrfirescience.org/resource/17814**

While the wildland–urban interface (WUI) is not a new concept, fires in WUI communities have rapidly expanded in frequency and severity over the past few decades. The number of structures lost per year has increased significantly, due in part to increased development in rural areas, fuel management policies, and climate change,...

Author(s): Sara E. Caton, Raquel S. P. Hakes, Daniel J. Gorham, Aixi Zhou, Michael J. Gollner  
Year Published: 2017  
Type: Document
Forest succession along a productivity gradient following fire exclusion
www.nrfirescience.org/resource/16658
Numerous studies have documented significant change in conifer forests of the American West following the cessation of recurrent fire at the end of the 19th century. But the successional dynamics that characterize different forested settings in the absence of fire remain poorly understood. This study reconstructs structural and...
Author(s): James D. Johnston
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Prescribed burning in ponderosa pine: fuel reductions and redistributing fuels near boles to prevent injury
www.nrfirescience.org/resource/15214
Fire suppression and other factors have resulted in high wildfire risk in the western US, and prescribed burning can be an effective tool for thinning forests and reducing fuels to lessen wildfire risks. However, prescribed burning sometimes fails to substantially reduce fuels and sometimes damages and kills valuable, large trees....
Author(s): Robert Progar, Kathryn H. Hrinkevich, Edward S. Clark, Matthew J. Rinella
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
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

Effect of particle aging on chemical characteristics, smoldering, and fire behavior in mixed-conifer masticated fuel
www.nrfirescience.org/resource/15782
Mastication is a silvicultural technique that grinds, shreds, or chops trees or shrubs into pieces and redistributes the biomass onto the forest floor to form a layer of woody debris. Unlike other fuel treatments that remove this biomass, masticated biomass often remains on site, which increases total fuel loading and causes concern...
Author(s): Pamela G. Sikkink, Theresa B. Jain, James J. Reardon, Faith A. Heinsch, Robert E. Keane, Bret W. Butler, Scott L. Baggett
Year Published: 2017
Type: Document
Book or Chapter or Journal Article
Mortality predictions of fire-injured large Douglas-fir and ponderosa

Wild and prescribed fire-induced injury to forest trees can produce immediate or delayed tree mortality but fire-injured trees can also survive. Land managers use logistic regression models that incorporate tree-injury variables to discriminate between fatally injured trees and those that will survive. We used data from 4024...

Author(s): Lisa Ganio, Robert A. Progar
Year Published: 2017
Type: Document

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

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

Year Published: 2017
Type: Document

Smoke in a new era of fire

Smoke from fire can sharply reduce air quality by releasing particulate matter, one of the most dangerous types of air pollution for human health. A third of U.S. households have someone sensitive to smoke. Minimizing the amount and impact of smoke is a high priority for land managers and regulators. One tool for achieving that goal...

Author(s): Rachel White, Paul F. Hessburg, Narasimhan K. Larkin, J. Morgan Varner
Year Published: 2017
Type: Document

Methods to reduce forest residue volume after timber harvesting and produce black carbon

Forest restoration often includes thinning to reduce tree density and improve ecosystem processes and function while also reducing the risk of wildfire or insect and disease outbreaks. However, one drawback of these restoration treatments is that slash is often burned in piles that may damage the soil and require further restoration...

Author(s): Deborah S. Page-Dumroese, Matt Busse, Jim Archuleta, Darren McAvoy, Eric Roussel
Year Published: 2017
Type: Document

Unplanned Wildfire in Areas With Slash Piles

Each year, fuel treatments reduce the likelihood of uncharacteristically severe wildland fire in
overstocked stands across millions of acres in the United States. Typically, these treatments target small-diameter trees for removal, producing large amounts of unmerchantable material and increasing surface fuels. Currently, few...

Author(s): Alexander M. Evans, Clinton S. Wright
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

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

www.nrfirescience.org/resource/15044

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

Author(s): J. Ziegler, Chad M. Hoffman, Michael A. Battaglia, William E. Mell
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Long-term effects of fuel treatments on aboveground biomass accumulation in ponderosa pine forests of the northern Rocky Mountains

www.nrfirescience.org/resource/15543

Fuel treatments in ponderosa pine forests of the northern Rocky Mountains are commonly used to modify fire behavior, but it is unclear how different fuel treatments impact the subsequent production and distribution of aboveground biomass, especially in the long term. This research evaluated aboveground biomass responses 23 years...

Author(s): Kate A. Clyatt, Christopher R. Keyes, Sharon M. Hood
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Production rates for United States Forest Service brush disposal planning in the northern Rocky Mountains

www.nrfirescience.org/resource/16536

Timber harvesting operations generate brush and other vegetative debris, which often has no marketable value. In many western U.S. forests, these materials represent a fire hazard and a potential threat to forest health and must be removed or burned for disposal. Currently, there is no established, consistent method to estimate...

Author(s): Dan R. Loeffler, Stu Hoyt, Nathaniel Anderson
Year Published: 2017
Type: Document
Technical Report or White Paper

Fuel-related fire-behaviour relationships for mixed live and dead fuels burned in the laboratory

www.nrfirescience.org/resource/16452

A laboratory experimental program addressing fire spread in fuel beds composed of dead foliage litter and vertically placed quasi-live branches, representative of many natural fuel complexes, was carried out for either still-air or wind conditions. Fuel-bed characteristics, fire spread rate, flame geometry, and fuel consumption were...

Author(s): Carlos G. Rossa, Paulo M. Fernandes
Towards enhanced risk management: planning, decision making and monitoring of US wildfire response
www.nrfirescience.org/resource/15485
This paper is the preface to a special issue focused on US wildfire response. The nine papers included build from a 2016 conference special session on monitoring, modelling and accountability of fire management policies and practices. Here we provide the unifying theme for these papers, summarise each from this perspective, and...
Author(s): Christopher J. Dunn, David E. Calkin, Matthew P. Thompson
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Impacts of Mastication Fuel Treatments on California, USA, Chaparral Vegetation Structure and Composition
www.nrfirescience.org/resource/16334
Mechanical fuel treatments are a primary pre-fire strategy for potentially mitigating the threat of wildland fire, yet there is limited information on how they impact shrubland ecosystems. Our goal was to assess the impact of mechanical mastication fuel treatments on chaparral vegetation and to determine the extent to which they...
Author(s): Teresa J. Brennan, Jon E. Keeley
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Predicting Post-Fire Tree Mortality for 12 Western US Conifers Using the First Order Fire Effects Model (FOFEM)
www.nrfirescience.org/resource/16738
Accurate prediction of fire-caused tree mortality is critical for making sound land management decisions such as developing burning prescriptions and post-fire management guidelines. To improve efforts to predict post-fire tree mortality, we developed 3-year post-fire mortality models for 12 Western conifer species-white fir (Abies... Author(s): Sharon M. Hood, Duncan C. Lutes
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
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: Synthesis
Mapping tree canopy cover in support of proactive prairie grouse conservation in western North America

www.nrfirescience.org/resource/14922

Invasive woody plant expansion is a primary threat driving fragmentation and loss of sagebrush (Artemisia spp.) and prairie habitats across the central and western United States. Expansion of native woody plants, including conifer (primarily Juniperus spp.) and mesquite (Prosopis spp.), over the past century is...

Author(s): Michael J. Falkowski, Jeffrey S. Evans, David E. Naugle, Christian A. Hagen, Scott A. Carleton, Jeremy D. Maestas, Azad Henareh Khalyani, Aaron J. Poznanovic, Andrew J. Lawrence

Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Productivity and sustainability of hybrid aspen (Populus tremula L. P. Tremuloides Michx.) root sucker stands with varying management strategies

www.nrfirescience.org/resource/16694

Hybrid aspen (Populus tremula L. P. tremuloides Michx.) has recently been introduced commercially in the Nordic and Baltic forestry. The hybrid is suitable for biomass production under high latitude conditions and the productivity is promising. Regeneration may be based on vigorous root sucker sprouting. Management strategies for...

Author(s): Lars Rytter, Rose-Marie Rytter

Year Published: 2017
Type: Document
Book or Chapter or Journal Article

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

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

The effects of thinning and burning on understory vegetation in North America: A meta-analysis

www.nrfirescience.org/resource/16668

Management in fire-prone ecosystems relies widely upon application of prescribed fire and/or firesurrogate (e.g., forest thinning) treatments to maintain biodiversity and ecosystem function. The literature suggests fire and mechanical treatments proved more variable in their effects on understory vegetation as compared to their...

Author(s): Joshua Willms, Anne Bartuszevige, Dylan W. Schwilk, Patricia L. Kennedy

Year Published: 2017
Type: Document
Book or Chapter or Journal Article
The effect of salvage logging on surface fuel loads and fuel moisture in beetle-infested lodgepole pine forests
www.nrfirescience.org/resource/15246
Widespread tree mortality from mountain pine beetle (MPB; Dendroctonus ponderosae Hopkins) outbreaks has prompted forest management activities to reduce crown fire hazard in the Rocky Mountain region. However, little is known about how beetle-related salvage logging and biomass utilization options affect woody surface fuel loads and...
Author(s): Paul R. Hood, Kellen N. Nelson, Charles C. Rhoades, Daniel B. Tinker
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
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

Uneven-aged silviculture can reduce negative effects of forest management on beetles
www.nrfirescience.org/resource/16656
Decline in biodiversity have increased the interest in alternative forest management approaches. Unevenaged silviculture has been proposed as a mean to maintain continuity of forest canopy cover, mimic small-scale disturbances and provide a stratified forest structure similar to that of old-growth forests and therefore better...
Author(s): Klara Joelsson, Joakim Hjältén, Timothy Work, Heloise Gibb, Jean-Michel Roberge, Therese Löfroth
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Landscape-scale quantification of fire-induced change in canopy cover following mountain pine beetle outbreak and timber harvest
www.nrfirescience.org/resource/15137
Across the western United States, the three primary drivers of tree mortality and carbon balance are bark beetles, timber harvest, and wildfire. While these agents of forest change frequently overlap, uncertainty remains regarding their interactions and influence on specific subsequent fire effects such as change in canopy cover....
Author(s): T. Ryan McCarley, Crystal A. Kolden, Nicole M. Vaillant, Andrew T. Hudak, Alistair M. S. Smith, Jason Kreitler
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Early forest thinning changes aboveground carbon distribution among pools, but not total amount
Mounting concerns about global climate change have increased interest in the potential to use common forest management practices, such as forest density management with thinning, in climate change mitigation and adaptation efforts. Long-term effects of forest density management on total aboveground C are not well understood.

Author(s): Michael S. Schaedel, Andrew J. Larson, David L.R. Affleck, R. Travis Belote, John M. Goodburn, Deborah S. Page-Dumroese
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Adapting fuel treatments in a changing climate - Prescribed fire, mechanical treatments, wildfire, and restoration

The Available Science Assessment Project (ASAP) leads, EcoAdapt and Oregon State University’s Institute for Natural Resources, hosted a workshop during the International Association of Wildland Fire’s 5th Fire Behavior and Fuels Conference, in cooperation with the Northwest Fire Science Consortium and the Northern Rockies...

Author(s): Corey L. Gucker
Year Published: 2017
Type: Document
Research Brief or Fact Sheet

Surface fuel characteristics, temporal dynamics, and fire behavior of masticated mixed-conifer fuelbeds of the U.S. Southeast and Rocky Mountains

Mastication is a wildland fuel treatment technique that is rapidly becoming popular with fire managers for fire hazard reduction projects, especially in areas where reducing fuels with prescribed fire is particularly challenging. Mastication is the process of mechanically modifying the live and dead surface and canopy biomass by...

Author(s): Robert E. Keane, Pamela G. Sikkink, Theresa B. Jain, James J. Reardon
Year Published: 2017
Type: Document
Technical Report or White Paper

Radial and stand-level thinning treatments: 15-year growth response of legacy ponderosa and Jeffrey pine trees

Restoration efforts to improve vigor of large, old trees and decrease risk to high-intensity wildland fire and drought-mediated insect mortality often include reductions in stand density. We examined 15-year growth response of old ponderosa pine (Pinus ponderosa) and Jeffrey pine (Pinus jeffreyi) trees in northeastern California, U....

Author(s): Sharon M. Hood, Danny R. Cluck, Bobette E. Jones, Sean Pinnell
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

An evaluation of the Forest Service Hazardous Fuels Treatment Program—Are we treating enough to promote resiliency or reduce hazard?

The National Cohesive Wildland Fire Management Strategy recognizes that wildfire is a necessary
natural process in many ecosystems and strives to reduce conflicts between fire-prone landscapes and people. In an effort to mitigate potential negative wildfire impacts proactively, the Forest Service fuels program reduces wildland fuels...  
Author(s): Nicole M. Vaillant, Elizabeth D. Reinhardt  
Year Published: 2017  
Type: Document  
Book or Chapter or Journal Article

Importance of fuel treatment for limiting moderate-to-high intensity fire: Findings from comparative fire modeling  
www.nrfirescience.org/resource/16502  
Wildland fire intensity influences natural communities, soil properties, erosion, and sequestered carbon. Measuring effectiveness of fuel treatment for reducing area of higher intensity unplanned fire is argued to be more meaningful than determining effect on total unplanned area burned. Objectives To contrast the relative...  
Author(s): Geoffrey J. Cary, Ian D. Davies, Ross A. Bradstock, Robert E. Keane, Michael D. Flannigan  
Year Published: 2017  
Type: Document  
Book or Chapter or Journal Article

Whither the paradigm shift? Large wildland fires and the wildfire paradox offer opportunities for a new paradigm of ecological fire management  
www.nrfirescience.org/resource/15487  
The growing frequency of large wildland fires has raised awareness of the ‘wildfire paradox’ and the ‘firefighting trap’ that are both rooted in the fire exclusion paradigm. However, a paradigm shift has been unfolding in the wildland fire community that seeks to restore fire ecology processes across broad landscapes. This...  
Author(s): Timothy Ingalsbee  
Year Published: 2017  
Type: Document  
Book or Chapter or Journal Article

Evidence of fuels management and fire weather influencing fire severity in an extreme fire event  
www.nrfirescience.org/resource/17228  
Following changes in vegetation structure and pattern, along with a changing climate, large wildfire incidence has increased in forests throughout the western United States. Given this increase, there is great interest in whether fuels treatments and previous wildfire can alter fire severity patterns in large wildfires. We assessed...  
Author(s): Jamie M. Lydersen, Brandon M. Collins, Matthew L. Brooks, John R. Matchett, Kristen L. Shive, Nicholas A. Povak, Van R. Kane, Douglas F. Smith  
Year Published: 2017  
Type: Document  
Book or Chapter or Journal Article

Long-term precommercial thinning effects on *Larix occidentalis* (western larch) tree and stand characteristics  
www.nrfirescience.org/resource/16449  
Precommercial thinning (PCT) is used to increase tree size and shorten harvest rotation time. Short-term results from PCT studies often show a trade-off between individual-tree growth and net stand yield, while longer-term effects of PCT on tree growth and stand yield are less well documented. We used a 54-year-old PCT study to test...
Short-term ecological consequences of collaborative restoration treatments in ponderosa pine forests of Colorado
www.nrfirescience.org/resource/15484
Ecological restoration treatments are being implemented at an increasing rate in ponderosa pine and other dry conifer forests across the western United States, via the USDA Forest Service’s Collaborative Forest Landscape Restoration (CFLR) program. In this program, collaborative stakeholder groups work with National Forests (NFs)...
Author(s): Jennifer S. Briggs, Paula J. Fornwalt, Jonas A. Feinstein
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Targeted woodland removal to recover at-risk grouse and their sagebrush-steppe and prairie ecosystems
www.nrfirescience.org/resource/14924
In this paper, we summarize key findings from a special issue of the journal Rangeland Ecology & Management examining socioecological aspects of woodland expansion and management actions to address this threat in sagebrush and prairie ecosystems. We highlight species and ecosystem outcomes that may result from recent...
Author(s): Richard F. Miller, David E. Naugle, Jeremy D. Maestas, Christian A. Hagen, Galon Hall
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Long-term effects of burn season and frequency on ponderosa pine forest fuels and seedlings
www.nrfirescience.org/resource/16327
Prescribed fire is widely applied in western US forests to limit future fire severity by reducing tree density, fuels, and excessive seedlings. Repeated prescribed burning attempts to simulate historical fire regimes in frequent-fire forests, yet there is limited long-term information regarding optimal burn season and frequency. In...
Author(s): Douglas J. Westlind, Becky K. Kerns
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Predicting forest floor and woody fuel consumption from prescribed burns in southern and western pine ecosystems of the United States
www.nrfirescience.org/resource/16699
Reliable estimates of pre-burn biomass and fuel consumption are important to estimate wildland fire emissions and assist in prescribed burn planning. We present empirical models for predicting fuel consumption in natural fuels from 60 prescribed fires in ponderosa pine-dominated forests in the western US and 60 prescribed fires in...
Author(s): Susan J. Prichard, Maureen C. Kennedy, Clinton S. Wright, J.B. Cronan, Roger D. Ottmar
Year Published: 2017
Type: Document
Mulching fuels treatments promote understory plant communities in three Colorado, USA, coniferous forest types
www.nrfirescience.org/resource/14906
Mulching fuels treatments have been increasingly implemented by forest managers in the western USA to reduce crown fire hazard. These treatments use heavy machinery to masticate or chip unwanted shrubs and small-diameter trees and broadcast the mulched material on the ground. Because mulching treatments are relatively novel and have...
Author(s): Paula J. Fornwalt, Monique E. Rocca, Michael A. Battaglia, Charles C. Rhoades, Michael G. Ryan
Year Published: 2017
Type: Document

Management impacts on carbon dynamics in a Sierra Nevada mixed conifer forest
www.nrfirescience.org/resource/14230
Forest ecosystems can act as sinks of carbon and thus mitigate anthropogenic carbon emissions. When forests are actively managed, treatments can alter forests carbon dynamics, reducing their sink strength and switching them from sinks to sources of carbon. These effects are generally characterized by fast temporal dynamics. Hence...
Author(s): Sabina Dore, Danny L. Fry, Brandon M. Collins, Rodrigo Vargas, Robert A. York, Scott L. Stephens
Year Published: 2016
Type: Document

Short-term impacts of fire-mediated habitat alterations on an isolated bighorn sheep population
www.nrfirescience.org/resource/14889
Habitat alterations may improve and expand wildlife habitats, and bolster waning wildlife populations. We used global positioning system (GPS) locations to monitor 38 bighorn sheep (Ovis canadensis Shaw) that were translocated to the Seminoe Mountains, Wyoming, USA, in 2009 and 2010, and 24 bighorns captured in 2011 to investigate...
Author(s): Justin G. Clapp, Jeffrey L. Beck
Year Published: 2016
Type: Document

Incorporating resource protection constraints in an analysis of landscape fuel-treatment effectiveness in the northern Sierra Nevada, CA, USA
www.nrfirescience.org/resource/14012
Finding novel ways to plan and implement landscape-level forest treatments that protect sensitive wildlife and other key ecosystem components, while also reducing the risk of large-scale, high-severity fires, can prove to be difficult. We examined alternative approaches to landscape-scale fuel-treatment design for the same landscape...
Author(s): Christopher B. Dow, Brandon M. Collins, Scott L. Stephens
Year Published: 2016
Type: Document
Emissions from prescribed burning of timber slash piles in Oregon
www.nrfirescience.org/resource/14886
Emissions from burning piles of post-harvest timber slash (Douglas-fir) in Grande Ronde, Oregon were sampled using an instrument platform lofted into the plume using a tether-controlled aerostat or balloon. Emissions of carbon monoxide, carbon dioxide, methane, particulate matter (PM2.5), black carbon, ultraviolet absorbing PM,...
Author(s): Johanna Aurell, Brian K. Gullett, Dennis Tabor, Nick Yonker
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

STANDFIRE: an IFT-DSS module for spatially explicit, 3D fuel treatment analysis - Final Report to the Joint Fire Science Program
www.nrfirescience.org/resource/15584
Managers are increasingly called upon to implement fuel treatments to alter potential fire behavior, in order to mitigate threats to firefighters and communities, or to maintain or restore healthy ecosystems. While some case studies have shown positive results, many questions remain about how effective certain kinds of fuel...
Author(s): Russell A. Parsons, Lucas Wells, F. Pimont, William Matt Jolly, Rodman Linn, William E. Mell
Year Published: 2016
Type: Document
Technical Report or White Paper

Effects of prescribed fire on wildlife and wildlife habitat in selected ecosystems of North America
www.nrfirescience.org/resource/14715
Prescribed fire is applied widely as a management tool in North America to meet various objectives such as reducing fuel loads and fuel continuity, returning fire to an ecosystem, enhancing wildlife habitats, improving forage, preparing seedbeds, improving watershed conditions, enhancing nutrient cycling, ...
Author(s): William M. Block, L. Mike Conner, Paul A. Brewer, Paulette Ford, Jonathan Haupler, Andrea Litt, Ronald E. Masters, Laura R. Mitchell, Jane Park
Year Published: 2016
Type: Document
Technical Report or White Paper

Beyond fuel treatment effectiveness: characterizing interactions between fire and treatments in the US
www.nrfirescience.org/resource/14662
In the United States, fuel reduction treatments are a standard land management tool to restore the structure and composition of forests that have been degraded by past management. Although treatments can have multiple purposes, their principal objective is to create landscape conditions where wildland fire can be safely managed to...
Author(s): Kevin M. Barnett, Sean A. Parks, Carol Miller, Helen T. Naughton
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Fuel size impacts on carbon residuals and combustion dynamics in masticated woody debris
www.nrfirescience.org/resource/14488
Mastication of standing trees to reduce crown fuel loading is an increasingly popular method of
reducing wildfire hazard in the wildland-urban interface of Canada. Previous research has shown that masticated fuel beds can leave considerable pyrogenic and black carbon residuals after burning, though the impact of fuel particle size...

**Author(s):** Dan K. Thompson, Tom J. Schiks, B. Mike Wotton  
**Year Published:** 2016  
**Type:** Document  
**Book or Chapter or Journal Article**

**Tamm Review: Are fuel treatments effective at achieving ecological and social objectives? A systematic review**  
[www.nrfirescience.org/resource/14425](www.nrfirescience.org/resource/14425)  
The prevailing paradigm in the western U.S. is that the increase in stand-replacing wildfires in historically frequent-fire dry forests is due to unnatural fuel loads that have resulted from management activities including fire suppression, logging, and grazing, combined with more severe drought conditions and increasing...

**Author(s):** Elizabeth L. Kalies, Larissa L. Yocom Kent  
**Year Published:** 2016  
**Type:** Document  
**Book or Chapter or Journal Article, Synthesis**

**Forest fuels and potential fire behaviour 12 years after variable-retention harvest in lodgepole pine**  
[www.nrfirescience.org/resource/14346](www.nrfirescience.org/resource/14346)  
Variable-retention harvesting in lodgepole pine offers an alternative to conventional, even-aged management. This harvesting technique promotes structural complexity and age-class diversity in residual stands and promotes resilience to disturbance. We examined fuel loads and potential fire behaviour 12 years after two modes of...

**Author(s):** Justin S. Crotteau, Christopher R. Keyes, Elaine Kennedy Sutherland, David K. Wright, Joel M. Egan  
**Year Published:** 2016  
**Type:** Document  
**Book or Chapter or Journal Article**

**Wildland fire limits subsequent fire occurrence**  
[www.nrfirescience.org/resource/15303](www.nrfirescience.org/resource/15303)  
Several aspects of wildland fire are moderated by site- and landscape-level vegetation changes caused by previous fire, thereby creating a dynamic where one fire exerts a regulatory control on subsequent fire. For example, wildland fire has been shown to regulate the size and severity of subsequent fire. However, wildland fire has...

**Author(s):** Sean A. Parks, Carol Miller, Lisa M. Holsinger, Scott L. Baggett, Benjamin J. Bird  
**Year Published:** 2016  
**Type:** Document  
**Book or Chapter or Journal Article**

**Does prescribed fire promote resistance to drought in low elevation forests of the Sierra Nevada, California, USA?**  
[www.nrfirescience.org/resource/14244](www.nrfirescience.org/resource/14244)  
Prescribed fire is a primary tool used to restore western forests following more than a century of fire exclusion, reducing fire hazard by removing dead and live fuels (small trees and shrubs). It is commonly assumed that the reduced forest density following prescribed fire also reduces competition for resources among the...
Social preferences toward energy generation with woody biomass from public forests in Montana, USA
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...

A guide to fuels management in riparian areas of the Interior West
www.nrfirescience.org/resource/12632
Fuel treatments in riparian areas pose distinct challenges. Riparian areas are protected by administrative regulations, many of which are largely custodial and restrict active management. However, riparian areas have also been affected by fire suppression, land use, and disturbance and manipulative treatments of fuels...

Longevity and Effectiveness of Mechanical Mastication Treatments - Final Report to the Joint Fire Science Program
www.nrfirescience.org/resource/17032
This report summarizes research funded by the Joint Fire Science Program (JFSP Project Number 12-1-03-31) addressing needs for information regarding the effectiveness and longevity of fuels treatments. We investigated the longevity of effects associated with mastication treatments on variables including fuels, vegetation, and fire...

Wildland fire: nature's fuel treatment
www.nrfirescience.org/resource/14887
Every year wildland fires affect much more acreage in the United States compared to controlled burns. Like controlled burns, wildland fire can help promote biological diversity and healthy ecosystems. But despite these facts, wildland fire is not often considered as a fuel treatment in the United States. Scientists working with the...
Fortifying the forest: thinning and burning increase resistance to a bark beetle outbreak and promote forest resilience
www.nrfirescience.org/resource/14810
Fire frequency in low-elevation coniferous forests in western North America has greatly declined since the late 1800s. In many areas, this has increased tree density and the proportion of shade-tolerant species, reduced resource availability, and increased forest susceptibility to forest insect pests and high-severity wildfire. In...
Author(s): Sharon M. Hood, Stephen P. Baker, Anna Sala
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Resolving future fire management conflicts using multicriteria decision making
www.nrfirescience.org/resource/13893
Management strategies to reduce the risks to human life and property from wildfire commonly involve burning native vegetation. However, planned burning can conflict with other societal objectives such as human health and biodiversity conservation. These conflicts are likely to intensify as fire regimes change under future climates...
Author(s): Don A. Driscoll, Michael Bode, Ross A. Bradstock, David A. Keith, Trent D. Penman, Owen F. Price
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Riparian fuel treatments in the western USA: challenges and considerations
www.nrfirescience.org/resource/14663
Fuel reduction treatments are being conducted throughout watersheds of the western United States to reduce hazardous fuels in efforts to decrease the risk of high-severity fire. The number of fuel reduction projects that include near-stream environments is increasing, bringing new challenges to riparian management. Riparian areas...
Author(s): Kathleen A. Dwire, Kristen E. Meyer, Gregg M. Riegel, Timothy A. Burton
Year Published: 2016
Type: Document
Technical Report or White Paper

Effectiveness and longevity of wildland fire as a fuel treatment
www.nrfirescience.org/resource/14440
Wildland fires, especially wildfires, are not commonly thought of as fuel treatments; however, because fires consume fuels and alter vegetation structure, they can serve as fuel treatments similar to more traditional means (e.g., mechanical or prescribed fire). To consider previously burned areas when managing subsequent fires,...
Author(s): Sean A. Parks, Corey L. Gucker
Year Published: 2016
Type: Document
Research Brief or Fact Sheet

Examining alternative fuel management strategies and the relative contribution of National Forest System land to wildfire risk to adjacent homes - a pilot assessment on the Sierra National Forest, California, USA
Determining the degree of risk that wildfires pose to homes, where across the landscape the risk originates, and who can best mitigate risk are integral elements of effective co-management of wildfire risk. Developing assessments and tools to help provide this information is a high priority for federal land management agencies such...

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

The Interagency Fuels Treatment Decision Support System: functionality for fuels treatment planning

The Interagency Fuels Treatment Decision Support System (IFTDSS) is a web-based software and data integration framework that organizes fire and fuels software applications into a single online application. IFTDSS is designed to make fuels treatment planning and analysis more efficient and...

Author(s): Stacy Drury, H. Michael Rauscher, Erin M. Banwell, Shih Ming Huang, Tami L. Lavezzo
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Evaluation and optimization of fuel treatment effectiveness with an integrated experimental/modeling approach - Final Report to the Joint Fire Science Program

The effectiveness of a hazardous fuel reduction treatment must take into account both the physical change on fuel loading and structure and the effect that this change may have on wildland fire behavior. We first took a remote sensing and field measurement approach to quantify the effects of an aggressive fuel treatment program on...

Author(s): Nick Skowronski, Albert Simeoni, Kenneth L. Clark, William E. Mell, Rory Hadden
Year Published: 2016
Type: Document
Technical Report or White Paper

Characterizing large airtanker use in United States fire management

The appropriate role of large airtankers (LATs) in federal fire suppression in the United States has been the source of much debate and discussion in recent years as the U.S. Forest Service (USFS) has faced impending decisions about how best to address an aging fleet of contracted aircraft. Questions of fleet efficiency are...

Author(s): Crystal S. Stonesifer, Matthew P. Thompson, David E. Calkin, Charles W. McHugh
Year Published: 2015
Type: Document
Conference Proceedings

Empirical Support for the Use of Prescribed Burning

Prescribed burning as a fuel treatment seeks to moderate wildfire impacts and decreases the areal extent of wildfires by increasing the effectiveness of fire suppression. Assessment of prescribed burning effectiveness is frequently anecdotal or based on simulation. This paper examines recent observational evidence of prescribed fire...

Author(s): Paulo M. Fernandes
Fire, fuels, and streams: the effects and effectiveness of riparian treatments
www.nrfirescience.org/resource/13214
Fire is an important disturbance in riparian systems—consuming vegetation; increasing light; creating snags and debris flows; altering habitat structure; and affecting stream conditions, erosion, and hydrology. For many years, land managers have worked to keep fire out of riparian systems through the use of buffers...
Author(s): Josh McDaniel
Year Published: 2015
Type: Document
Research Brief or Fact Sheet

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

2015 National Prescribed Fire Use Survey Report
www.nrfirescience.org/resource/13795
Prescribed fire activity is complex and poorly understood when evaluated at a national scale. Most often fire complexity is defined by scale, frequency, season, and location in the context of local and state laws and local community acceptance. In an effort to gain better knowledge of prescribed fire use in the United...
Author(s): Mark A. Melvin
Year Published: 2015
Type: Document
Technical Report or White Paper

Quantifying and predicting fuels and the effects of reduction treatments along successional and invasion gradients in sagebrush habitats - JFSP final report
www.nrfirescience.org/resource/15504
Sagebrush shrubland ecosystems in the Great Basin are prime examples of how altered successional trajectories can create dynamic fuel conditions and, thus, increase uncertainty about fire risk and behavior. Although fire is a natural disturbance in sagebrush, post-fire environments are highly susceptible to conversion to an invasive...
Author(s): Douglas J. Shinneman, David S. Pilliod, Robert S. Arkle, Nancy F. Glenn
Year Published: 2015
Type: Document
Technical Report or White Paper

First approximations of prescribed fire risks relative to other management techniques used on
Fire is widely recognized as a critical ecological and evolutionary driver that needs to be at the forefront of land management actions if conservation targets are to be met. However, the prevailing view is that prescribed fire is riskier than other land management techniques. Perceived risks associated with the application of fire...

Author(s): Dirac Twidwell, Carissa L. Wonkka, Michael T. Sindelar, John R. Weir
Year Published: 2015
Type: Document
Book or Chapter or Journal Article

Severe wildfires create pulses of dead trees that influence future fuel loads, fire behavior, and fire effects as they decay and deposit surface woody fuels. Harvesting fire-killed trees may reduce future surface woody fuels and related fire hazards, but the magnitude and timing of post-fire logging effects on woody fuels have not...

Author(s): David W. Peterson, Erich K. Dodson, Richy J. Harrod
Year Published: 2015
Type: Document
Book or Chapter or Journal Article

Each year wildfires damage homes, businesses, communities, watersheds, and forests on millions of acres across the U.S. However there are effective ways to reduce the impact of wildfire. A new report, Evaluating the Effectiveness of Wildfire Mitigation Activities in the Wildland-Urban Interface, shares lessons learned from...

Author(s): Alexander M. Evans, Sarah Auerbach, Lara Wood Miller, Rachel Wood, Krys Nystrom, Jonathan Loevner, Amanda Aragon, Matthew Piccarello, Eytan Krasilovsky
Year Published: 2015
Type: Document
Technical Report or White Paper

Fuel treatments have been widely used as an effective fire management tool to mitigate catastrophic wildland fire risk in forested landscapes. Fire research efforts of the last two decades have significantly advanced fire behavior modeling and fuel treatment effects analysis, but integrated fuel treatment planning and optimization...

Author(s): Woodam Chung
Year Published: 2015
Type: Document
Book or Chapter or Journal Article

Fuel treatments have become an indispensable tool for managing fire in North American wildland ecosystems. Historical perspective and extant practices provide insights into current theory and areas of future emphasis. Managers have better understanding of treatment practices as researchers have provided clearer understanding of fire...
Effects of tree cutting and fire on understory vegetation in mixed conifer forests

www.nrfirescience.org/resource/12896

Mixed conifer forests of western North America are challenging for fire management, as historical fire regimes were highly variable in severity, timing, and spatial extent. Complex fire histories combined with site factors and other disturbances, such insect outbreaks, led to great variation in understory plant communities, and...

Author(s): Scott R. Abella, Judith D. Springer
Year Published: 2015
Type: Document
Book or Chapter or Journal Article

Measurements, datasets and preliminary results from the RxCADRE project - 2008, 2011 and 2012

www.nrfirescience.org/resource/13696

The lack of independent, quality-assured field data prevents scientists from effectively evaluating and advancing wildland fire models. To rectify this, scientists and technicians convened in the south-eastern United States in 2008, 2011 and 2012 to collect wildland fire data in six integrated core science disciplines defined by the...

Author(s): Roger D. Ottmar, J. Kevin Hiers, Bret W. Butler, Craig B. Clements, Matthew B. Dickinson, Andrew T. Hudak, Joseph J. O'Brien, Brian E. Potter, Eric Rowell, Tara Strand, Thomas J. Zajkowski
Year Published: 2015
Type: Document
Book or Chapter or Journal Article

Long-term effects on distribution of forest biomass following different harvesting levels in the Northern Rocky Mountains

www.nrfirescience.org/resource/13625

With increasing public demand for more intensive biomass utilization from forests, the concerns over adverse impacts on productivity by nutrient depletion are increasing. We remeasured the 1974 site of the Forest Residues Utilization Research and Development in northwestern Montana to investigate long-term impacts of intensive...

Author(s): Woongsoon Jang, Christopher R. Keyes, Deborah S. Page-Dumroese
Year Published: 2015
Type: Document
Book or Chapter or Journal Article

Initial results from a field experiment to support the assessment of fuel treatment effectiveness in reducing wildfire intensity and spread rate

www.nrfirescience.org/resource/16917

Hazardous fuel reduction treatments conducted both through prescribed fire and mechanical means are a critical part of the mitigation of wildland fire risk in the United States. The US Federal Government has spent an average of $500T million each year on fuel reduction, from 2002-2012 (Gorte 2011). At present, however, rigorous...

Collaborative fuels reduction and restoration - Experiences from the Southwestern Crown of the Continent
www.nrfirescience.org/resource/13064
Forests that historically burned in mixed-severity fire regimes prove difficult to manage, especially when they border homes and prized recreation areas. This management challenge was the focus of the Fuels Reduction and Restoration in Mixed-Conifer Forests of the Southwestern Crown of the Continent field trip, following the May...
Author(s): Corey L. Gucker
Year Published: 2015
Type: Document
Research Brief or Fact Sheet

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
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

A spatial stochastic programming model for timber and core area management under risk of fires
www.nrfirescience.org/resource/12386
Previous stochastic models in harvest scheduling seldom address explicit spatial management concerns under the influence of natural disturbances. We employ multistage stochastic programming models to explore the challenges and advantages of building spatial optimization models that account for the influences of random stand-...
Author(s): Yu Wei, Michael Bevers, Dung Tuan Nguyen, Erin J. Belval
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

A comprehensive guide to fuel management practices for dry mixed conifer forests in the northwestern United States: prescribed fire
www.nrfirescience.org/resource/12919
Fire has had a profound historical role in shaping dry mixed conifer forests in the western United States. However, the uncertainty and complexity of prescribed fires raises the question "Is fire always the best option for treating fuels?" The decision to use prescribed fire is dependent upon several factors.
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
Fuel treatment effectiveness in reducing fire intensity and spread rate -- an experimental overview

Fuel treatments represent a significant component of the wildfire mitigation strategy in the United States. However, the lack of research aimed at quantifying the explicit effectiveness of fuel treatments in reducing wildfire intensity and spread rate limits our ability to make educated decisions about the type and placement of...


Year Published: 2014
Type: Document
Conference Proceedings

One-hundred years of wildfire research: a legacy of the Priest River, Deception Creek, and Boise Basin Experimental Forests of Idaho

The 1910 fires, which burned more than 1.3 million ha of northern Rocky Mountain forests, provided a mission and management objectives for the newly created Forest Service. By 1911, the Priest River Experimental Station (Forest- PREF) was established in northern Idaho to help meet the needs of the Forest Service. Harry T. Gisborne,...

Author(s): Russell T. Graham, Theresa B. Jain, Kathy L. Graham, Robert Denner, Colin C. Hardy

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

Contrasting effects of wildfire and ecological restoration in old-growth western larch forests

The scientific basis for restoration of fire-excluded western larch/mixed-conifer forests is not as well developed as that for dry fire-frequent forests. We compared the effects of wildfire and restoration (combined thinning and prescribed fire) in fire-excluded western larch forests. In 2012, the wildfire site had more, taller, and...

Author(s): Taylor Hopkins, Andrew J. Larson, R. Travis Belote

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

Fire behavior in masticated fuels: a review

Mastication is an increasingly common fuels treatment that redistributes 'ladder' fuels to the forest floor to reduce vertical fuel continuity, crown fire potential, and fireline intensity, but fuel models do not exist for predicting fire behavior in these fuel types. Recent fires burning in masticated fuels have behaved in...

Author(s): Jesse K. Kreye, Nolan W. Brewer, Penelope Morgan, J. Morgan Varner, Alistair M. S. Smith, Chad M. Hoffman, Roger D. Ottmar

Year Published: 2014
Type: Document
Book or Chapter or Journal Article, Synthesis
Objective and perceived wildfire risk and its influence on private forest landowners fuel reduction activities in Oregon's (USA) ponderosa pine ecoregion

Policymakers seek ways to encourage fuel reduction among private forest landowners to augment similar efforts on federal and state lands. Motivating landowners to contribute to landscape-level wildfire protection requires an understanding of factors that underlie landowner behaviour regarding wildfire. We developed a conceptual...

Author(s): A. Paige Fischer, Jeffrey D. Kline, Alan A. Ager, Susan Charnley, Keith A. Olsen
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

Fuels treatments in ponderosa pine - Visits to the Boise National Forest and Boise Basin Exp. Forest

Terrie Jain, Research Forester with the USFS Rocky Mountain Research Station, together with foresters, and fire and wildlife managers from the Boise National Forest led a tour of fuels treatments in dry conifer forests around Idaho City, Idaho. Site visits provided a visual of high forest fuel conditions with potential to support...

Author(s): Corey L. Gucker
Year Published: 2014
Type: Document
Research Brief or Fact Sheet

A comprehensive guide to fuel management practices for dry mixed conifer forests in the northwestern United States: monitoring

Short- and medium-term evaluation of how fuel treatments are working is the only way to know if the hundreds of activities on the ground are adding up to the goals of more resilient landscapes and increased safety of people and property. Monitoring is a critical resource for decision makers who design fuels management programs,...

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

A comprehensive guide to fuel management practices for dry mixed conifer forests in the northwestern United States: mechanical, chemical, and biological fuel treatment methods

Several mechanical approaches to managing vegetation fuels hold promise when applied to the dry mixed conifer forests in the western United States. These are most useful to treat surface, ladder, and crown fuels. There are a variety of techniques to remove or alter all kinds of plant biomass (live, dead, or decomposed) that affect...

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
The role of wildfire, prescribed fire, and mountain pine beetle infestations on the population dynamics of black-backed woodpeckers in the Black Hills, South Dakota

Wildfire and mountain pine beetle infestations are naturally occurring disturbances in western North American forests. Black-backed woodpeckers (Picoides arcticus) are emblematic of the role these disturbances play in creating wildlife habitat, since they are strongly associated with recently-killed forests. However, management...

Author(s): Christopher T. Rota, Joshua J. Millsapugh, Mark A. Rumble, Chad P. Lehman, Dillon C. Kesler
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

Interagency prescribed fire planning and procedures guide

Fire is an essential ecological process in many fire-dependent ecosystems. In large areas of the country, fire exclusion from these ecosystems has led to unhealthy forest, woodland and rangeland conditions. These areas are at risk of intense, severe wildfires that threaten communities and cause significant damage to key ecological...

Author(s): U.S. Department of Agriculture, U.S. Department of Interior
Year Published: 2014
Type: Document
Management or Planning Document, Technical Report or White Paper

Reburns and their impact on carbon pools, site productivity, and recovery

Prior to fire suppression and exclusion, wildfires and other disturbances (e.g., insects, disease, and weather) sustained ecosystem processes in many landscapes of the Western United States. However, wildfires have been increasing in size, frequency, and intensity in recent years (Kellogg and others 2008). Recognizing the value of...

Author(s): Deborah S. Page-Dumroese, Theresa B. Jain, Jonathan Sandquist, Joanne M. Tirocke, John Errecart, Martin F. Jurgensen
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

Characterizing spatial reference conditions in southwestern warm/dry mixed-conifer forests

Reference conditions describe attributes of ecosystem structure, composition, and function and are used to inform ecological restoration efforts. Reference condition information on tree spatial patterns that occurred prior to wide-spread fire exclusion is limited for warm/dry mixed-conifer forests of the western U.S., particularly...

Author(s): Kyle Rodman, Andrew Sanchez Meador
Year Published: 2014
Type: Document
Research Brief or Fact Sheet

Restoration fuels treatments in old-growth- Visiting research plots in western larch and ponderosa pine forests

www.nrfirescience.org/resource/12674
Mick Harrington and Steve Arno, retired research foresters with the USFS Rocky Mountain Research Station, took participants of the May 2014 Large Wildland Fires Conference through a 300-year-old stand of ponderosa pine (Pinus ponderosa) and western larch (Larix occidentalis). While there, they discussed their research, which...

Author(s): Corey L. Gucker
Year Published: 2014
Type: Document
Research Brief or Fact Sheet

**Duff mound consumption and cambium injury for centuries-old western larch from prescribed burning in western Montana**

www.nrfirescience.org/resource/11974

Western larch is one of the most fire-adapted conifers in western North America. Its historical perpetuation depended upon regular fire disturbances, which creates open stand conditions and mineral seedbeds. A stand of 200- to 500-year-old larch in western Montana with deep duff mounds resulting from an unusually long 150-year fire-...

Author(s): Michael G. Harrington
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

**Silviculture research: the intersection of science and art across generations**

www.nrfirescience.org/resource/12912

A research silviculturist's work is firmly grounded in the scientific method to acquire knowledge on forest dynamics. They also integrate information from numerous sources to produce new knowledge not readily identified by single studies. Results and interpretation subsequently provide the scientific foundation for developing...

Author(s): Theresa B. Jain
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

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

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

www.nrfirescience.org/resource/12755

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

Author(s): Alan A. Ager, Michelle A. Day, Mark A. Finney, Ken W. Vance-Borland, Nicole M. Vaillant
Integrated fuel/restoration treatments - Field tour at the Priest River Experimental Forest
www.nrfirescience.org/resource/13694
Terrie Jain, Russell Graham, Andrew Hudak, and Bill Elliot with the United States Forest Service’s (USFS) Rocky Mountain Research Station, led a tour of fuels treatments in mostly moist mixed-conifer forests in the Priest River Experimental Forest (PREF) near Priest River, Idaho. Site visits and discussions highlighted how...
Author(s): Corey L. Gucker
Year Published: 2013
Type: Document
Research Brief or Fact Sheet

Fuel moisture influences on fire-altered carbon in masticated fuels: an experimental study
www.nrfirescience.org/resource/12021
Biomass burning is a significant contributor to atmospheric carbon emissions, but may also provide an avenue in which fire-affected ecosystems can accumulate carbon over time, through the generation of highly resistant fire-altered carbon. Identifying how fuel moisture, and subsequent changes in the fire behavior, relates to the...
Author(s): Nolan W. Brewer, Alistair M. S. Smith, Jeff A. Hatten, Philip E. Higuera, Andrew T. Hudak, Roger D. Ottmar, Wade T. Tinkham
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

The merits of prescribed fire outweigh potential carbon emission effects
www.nrfirescience.org/resource/12426
While North American ecosystems vary widely in their ecology and natural historical fire regimes, they are unified in benefitting from prescribed fire when judiciously applied with the goal of maintaining and restoring native ecosystem composition, structure, and function. On a modern landscape in which historical fire regimes...
Author(s): Association for Fire Ecology, International Association of Wildland Fire, Tall Timbers Research Station, The Nature Conservancy
Year Published: 2013
Type: Document
Technical Report or White Paper

Fuel treatments and fire severity: a meta-analysis
www.nrfirescience.org/resource/18721
We employed meta-analysis and information theory to synthesize findings reported in the literature on the effects of fuel treatments on subsequent fire intensity and severity. Data were compiled from 19 publications that reported observed fire responses from 62 treated versus untreated contrasts. Effect sizes varied widely and the...
Author(s): Erik J. Martinson, Philip N. Omi
Year Published: 2013
Type: Document
Technical Report or White Paper
Public perceptions of smoke from wildfire, prescribed fire, and fire use
www.nrfirescience.org/resource/13483
Managers and policy-makers across broad disciplines and organizations are calling for a better understanding of public opinion on natural resource issues. One such issue is that of fire and its role in the management of our forests and rangelands. Public perceptions of fuel reduction techniques, with a particular emphasis on using...
Author(s): Stacey S. Frederick
Year Published: 2013
Type: Document
Dissertation or Thesis

Wildfire and fuel treatment effects on forest carbon dynamics in the western United States
www.nrfirescience.org/resource/11981
Sequestration of carbon (C) in forests has the potential to mitigate the effects of climate change by offsetting future emissions of greenhouse gases. However, in dry temperate forests, wildfire is a natural disturbance agent with the potential to release large fluxes of C into the atmosphere. Climate-driven increases in wildfire...
Author(s): Joseph C. Restaino, David L. Peterson
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

Developing a computerized approach for optimizing individual tree removal to efficiently reduce crown fire potential
www.nrfirescience.org/resource/11889
Thinning is a common silvicultural treatment being widely used to restore different types of overstocked forest stands in western U.S. because of its effect on changing fire behavior. Typically, thinning is applied at the stand level using prescriptions derived from sample plots that ignore variability in tree sizes and location...
Author(s): Marco A. Contreras, Woodam Chung
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

Ignition devices for prescribed burning
www.nrfirescience.org/resource/12399
The prescribed burner has numerous tools at his/her disposal to start fire. Ground ignition devices continue to be developed and refined and include a wide range of options from kitchen matches to state-of-the-art hand-held 'ping-pong ball' launchers. This fact sheet describes many of these devices and includes a table to summarize...
Author(s): Dale D. Wade
Year Published: 2013
Type: Document
Research Brief or Fact Sheet

Hazardous fuel treatments, suppression cost impacts, and risk mitigation
www.nrfirescience.org/resource/16170
Land management agencies face uncertain tradeoffs regarding investments in preparedness and fuels management versus future suppression costs and impacts to valued resources and assets. Prospective evaluation of fuel treatments allows for comparison of alternative treatment strategies in terms of socioeconomic and ecological impacts...
Quantifying the potential impacts of fuel treatments on wildfire suppression costs
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

Restoring forest resilience: from reference spatial patterns to silvicultural prescriptions and monitoring
www.nrfirescience.org/resource/14006
Stand-level spatial pattern influences key aspects of resilience and ecosystem function such as disturbance behavior, regeneration, snow retention, and habitat quality in frequent-fire pine and mixed-conifer forests. Reference sites, from both pre-settlement era reconstructions and contemporary forests with active fire regimes,...
Author(s): Derek J. Churchill, Andrew J. Larson, Matthew C. Dahlgreen, Jerry F. Franklin, Paul F. Hessburg, James A. Lutz
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

Wildfire exposure and fuel management on western US national forests
www.nrfirescience.org/resource/12756
Substantial investments in fuel management activities on national forests in the western US are part of a national strategy to reduce human and ecological losses from catastrophic wildfire and create fire resilient landscapes. Prioritizing these investments within and among national forests remains a challenge, partly because a...
Author(s): Alan A. Ager, Michelle A. Day, Charles W. McHugh, Karen C. Short, Julie W. Gilbertson-Day, Mark A. Finney, David E. Calkin
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

Fire intensity and fire severity: how hot is your fire and why is that important?
www.nrfirescience.org/resource/12398
Achieving natural resource objectives typically requires the application of periodic fire because fire is truly THE ECOLOGICAL IMPERATIVE! But how does one measure success or failure? Determining how close a fire came to meeting your objective(s) is a difficult but crucial part of every burn evaluation and is not always immediately...
Author(s): Dale D. Wade
Year Published: 2013
Social and ecological factors influencing attitudes toward the application of high-intensity prescribed burns to restore fire adapted grassland ecosystems

Even though the ecology of restoring these fire prone systems back to grassland states is becoming clearer, a major hurdle to the reintroduction of historic fires at a landscape scale...

Author(s): David Toledo, Michael G. Sorice, Urs P. Kreuter
Year Published: 2013

Modeled forest inventory data suggest climate benefits from fuels management

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

The rising Great Plains fire campaign: citizens’ response to woody plant encroachment

Despite years of accumulating scientific evidence that fire is critical for maintaining the structure and function of grassland ecosystems in the US Great Plains, fire has not been restored as a fundamental grassland process across broad landscapes. The result has been widespread juniper encroachment and the degradation of the...

Author(s): Dirac Twidwell, William E. Rogers, Samuel D. Fuhlendorf, Carissa L. Wonkka, David M. Engle, John R. Weir, Urs P. Kreuter, Charles A. Taylor
Year Published: 2013

Fighting fire with fire: does a policy of broad-scale prescribed burning improve community safety?

Wildfires cause enormous damage worldwide, particularly in Victoria, Australia, with growing populations in fire-prone ecosystems. Broad-scale prescribed burning is an established, yet controversial, wildfire management policy in Victoria and Australia. But does broad-scale prescribed burning reduce fire damage? The answer depends...

Author(s): Danielle Clode, Mark A. Elgar
Year Published: 2013
Backfire technique for prescribed burning
www.nrfirescience.org/resource/12400
The term ‘backfire’ refers to a commonly used method for prescribed burning in which the igniter sets a line of fire that slowly backs into the wind. This technique should not be confused with the colloquial use of the term ‘backfire’ for ‘suppression fire,’ which refers to any fire set ahead of a wildfire in an attempt to stop it.
Author(s): Dale D. Wade
Year Published: 2013
Type: Document
Research Brief or Fact Sheet

Wildfire risk and optimal investments in watershed protection
www.nrfirescience.org/resource/16172
Following what was then one of the most destructive fire years on record, President Bush signed into law the Healthy Forests Restoration Act of 2003. The law requires no less than fifty percent of all funds allocated for hazardous fuels reductions to occur in the wildland-urban interface (WUI), with the aim of enhancing the...
Author(s): Travis Warziniack, Matthew P. Thompson
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

Management guide to ecosystem restoration treatments: two-aged lodgepole pine forests of central Montana, USA
www.nrfirescience.org/resource/11276
Lodgepole pine is one of the most widely distributed conifers in North America, with a mixed-severity rather than stand-replacement fire regime throughout much of its range. These lodgepole pine forests are patchy and often two-aged. Fire exclusion can reduce two-aged lodgepole pine heterogeneity. This management guide summarizes...
Author(s): Sharon M. Hood, Helen Y. Smith, David K. Wright, Lance S. Glasgow
Year Published: 2012
Type: Document
Synthesis, Technical Report or White Paper

Effect of suppression strategies on federal wildland fire expenditures
www.nrfirescience.org/resource/17807
Policymakers and decisionmakers alike have suggested that the use of less aggressive suppression strategies for wildland fires might help stem the tide of rising emergency wildland fire expenditures. However, the interplay of wildland fire management decisions and expenditures is not well understood. In this study, we assess the...
Author(s): Krista M. Gebert, Anne E. Black
Year Published: 2012
Type: Document
Book or Chapter or Journal Article

Effects of fuels reductions on plant communities and soils in a piñon-juniper woodland
www.nrfirescience.org/resource/8326
Over the past decade, a variety of fuels reduction strategies have been implemented across western US forests to lower the risk of high severity fires. In two separate studies, we evaluated the short-term effects of hand thinning and mechanical mastication on understory plant communities and soil resources in an upland Piñon-...
Effects of restoration thinning on spatial heterogeneity in mixed conifer forest

www.nrfirescience.org/resource/18202
Spatial pattern is an essential attribute of forest ecosystems and influences many ecological processes and functions. We hypothesized that restoration thinning conducted in fire-excluded ponderosa pine (Pinus ponderosa Douglas ex P. Lawson & C. Lawson) – western larch (Larix occidentalis Nutt.) – mixed-conifer forest would...

The effects of forest fuel-reduction treatments in the United States

www.nrfirescience.org/resource/12579
The current conditions of many seasonally dry forests in the western and southern United States, especially those that once experienced low- to moderate-intensity fire regimes, leave them uncharacteristically susceptible to high-severity wildfire. Both prescribed fire and its mechanical surrogates are generally successful in meeting...

Do thinning and/or burning treatments in western USA ponderosa or Jeffrey pine-dominated forests help restore natural fire behavior?

www.nrfirescience.org/resource/8318
We carried out a systematic review and meta-analysis of the effects of forest thinning and burning treatments on restoring fire behavior attributes in western USA pine forests. Ponderosa pine (Pinus ponderosa) and Jeffrey pine (Pinus jeffreyi), with co-occurring species, are adapted to a disturbance regime of frequent surface fires...

Using fire to increase the scale, benefits, and future maintenance of fuels treatments

www.nrfirescience.org/resource/11493
The USDA Forest Service is implementing a new planning rule and starting to revise forest plans for many of the 155 National Forests. In forests that historically had frequent fire regimes, the scale of current fuels reduction treatments has often been too limited to affect fire severity and the Forest Service has predominantly...
Modeling tree-level fuel connectivity to evaluate the effectiveness of thinning treatments for reducing crown fire potential

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

Author(s): Marco A. Contreras, Russell A. Parsons, Woodam Chung
Year Published: 2012
Type: Document
Book or Chapter or Journal Article

Roads impact the distribution of noxious weeds more than restoration treatments in a lodgepole pine forest in Montana, U.S.A.

A century of fire suppression has created unnaturally dense stands in many western North American forests, and silviculture treatments are being increasingly used to reduce fuels to mitigate wildfire hazards and manage insect infestations. Thinning prescriptions have the potential to restore forests to a more historically...

Author(s): Jennifer L. Birdsall, Ward W. McCaughey, Justin B. Runyon
Year Published: 2012
Type: Document
Book or Chapter or Journal Article

Understanding the effects of fire management practices on forest health: implications for weeds and vegetation structure

Current fire policy to restore ecosystem function and resiliency and reduce buildup of hazardous fuels implies a larger future role for fire (both natural and human ignitions) (USDA Forest Service and U.S. Department of the Interior 2000). Yet some fire management (such as building fire line, spike camps, or helispots) potentially...

Author(s): Anne E. Black, Peter Landres
Year Published: 2012
Type: Document
Technical Report or White Paper

Burning questions for managers: fuels management practices in riparian areas

Vegetation treatment projects for fuel reduction in riparian areas can pose distinct challenges to resource managers. Riparian areas are protected by administrative regulations, many of which are largely custodial and restrict active management. Like uplands, however, riparian areas have been affected by fire suppression, land use,...

Author(s): Kristen E. Meyer, Kathleen A. Dwire, Patricia A. Champ, Sandra E. Ryan, Gregg M. Riegel, Timothy A. Burton
Year Published: 2012
Type: Document
Book or Chapter or Journal Article

Fourmile Canyon Fire Findings

www.nrfirescience.org/resource/17701
The Fourmile Canyon Fire burned in the fall of 2010 in the Rocky Mountain Front Range adjacent to Boulder, Colorado. The fire occurred in steep, rugged terrain, primarily on privately owned mixed ponderosa pine and Douglas-fir forests. The fire started on September 6 when the humidity of the air was very dry (about <7%) and the...

Effects of ungulate herbivory on aspen, cottonwood, and willow development under forest fuels treatment regimes

Herbivory by domestic and wild ungulates can dramatically affect vegetation structure, composition and dynamics in nearly every terrestrial ecosystem of the world. These effects are of particular concern in forests of western North America, where intensive herbivory by native and domestic ungulates has the potential to substantially...

Principal short-term findings of the National Fire and Fire Surrogate study

Principal findings of the National Fire and Fire Surrogate (FFS) study are presented in an annotated bibliography and summarized in tabular form by site, discipline (ecosystem component), treatment type, and major theme. Composed of 12 sites, the FFS is a comprehensive multidisciplinary experiment designed to evaluate the costs and...

Tree spatial patterns in fire-frequent forests of western North America, including mechanisms of pattern formation and implications for designing fuel reduction and restoration treatments

Restoring characteristic fire regimes and forest structures are central objectives of many restoration and fuel reduction projects. Within-stand spatial pattern is a fundamental attribute of forest structure and influences many ecological processes and ecosystem functions. In this review we synthesize the available spatial reference...

A comprehensive guide to fuel management practices for dry mixed conifer forests in the northwestern United States

This guide describes the benefits, opportunities, and trade-offs concerning fuel treatments in the dry mixed conifer forests of northern California and the Klamath Mountains, Pacific Northwest Interior,
northern and central Rocky Mountains, and Utah. Multiple interacting disturbances and diverse physical settings have created a...

Author(s): Theresa B. Jain, Michael A. Battaglia, Han-Sup Han, Russell T. Graham, Christopher R. Keyes, Jeremy S. Fried, Jonathan Sandquist
Year Published: 2012
Type: Document
Synthesis, Technical Report or White Paper

National to local: a pre & post assessment of the Fuel Characteristic Classification System (FCCS) landscape variables for the Confederated Salish and Kootenai Tribes

www.nrfirescience.org/resource/13486
A modified Fuel Characteristic and Classification System (FCCS) fuelbed was created for the Confederated Salish & Kootenai Tribes (CSKT) of Montana. This crosswalk of data combined two principal sources of data: (1) locally the Bureau of Indian Affairs (BIA) Continuous Forest Inventory Data (CFI) and (2) nationally the US Forest...

Author(s): Laurel L. James
Year Published: 2012
Type: Document
Dissertation or Thesis

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

www.nrfirescience.org/resource/12728
The FLAME Act of 2009 requires the U.S. Department of Agriculture Forest Service and the U.S. Department of Interior to submit to Congress a Cohesive Wildfire Management Strategy. In this report, we explore the general science available for a risk-based approach to fire and fuels management and suggest analyses that may be applied...

Year Published: 2011
Type: Document
Technical Report or White Paper

Comprehensive fuels treatment practices guide for mixed conifer forests: California, central and southern Rockies, and the Southwest

www.nrfirescience.org/resource/12630
The goal of this guide is to provide a resource for managers of mixed conifer forests of the Southwestern plateaus and uplands, the Central and Southern Rocky Mountains, the Sierra Nevada, and the Transverse and Peninsular Ranges in Southern California. Mixed conifer forests have different species, structures, and spatial patterns...

Author(s): Alexander M. Evans, Rick G. Everett, Scott L. Stephens, James A. Youtz
Year Published: 2011
Type: Document
Synthesis, Technical Report or White Paper

What Is Limiting More Flexible Fire Management—Public or Agency Pressure?

www.nrfirescience.org/resource/17812
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
How fuel treatments saved homes from the 2011 Wallow fire
www.nrfirescience.org/resource/17699
This is a fuel treatment effectiveness assessment report from Region 3 about the success of fuel treatments in protecting several communities from the recent Wallow fire in Arizona and New Mexico. The report narrative and graphics point to the success of good forest management and good community assistance to protect life, property...
Author(s): Pam Bostwick, James P. Menakis, Tim Sexton
Year Published: 2011
Type: Document

Can fuel-reduction treatments really increase forest carbon storage in the western US by reducing future fire emissions?
www.nrfirescience.org/resource/8300
It has been suggested that thinning trees and other fuel-reduction practices aimed at reducing the probability of high-severity forest fire are consistent with efforts to keep carbon (C) sequestered in terrestrial pools, and that such practices should therefore be rewarded rather than penalized in C-accounting schemes. By evaluating...
Author(s): John L. Campbell, Mark E. Harmon, Stephen R. Mitchell
Year Published: 2011
Type: Document

Restoration of whitebark pine forests in the northern Rocky Mountains, USA
www.nrfirescience.org/resource/11900
Whitebark pine (Pinus albicaulis) has been declining across much of its range in North America because of the combined effects of mountain pine beetle epidemics, fire exclusion policies, and widespread exotic blister rust infections. Whitebark pine seed is dispersed by a bird, the Clark's nutcracker, which caches seed in open,...
Author(s): Robert E. Keane
Year Published: 2011
Type: Document

Advancing effects analysis for integrated, large-scale wildfire risk assessment
www.nrfirescience.org/resource/12729
In this article, we describe the design and development of a quantitative, geospatial risk assessment tool intended to facilitate monitoring trends in wildfire risk over time and to provide information useful in prioritizing fuels treatments and mitigation measures. The research effort is designed to develop, from a strategic view,...
Author(s): Matthew P. Thompson, David E. Calkin, Julie W. Gilbertson-Day, Alan A. Ager
Year Published: 2011
Type: Document

Review of fuel treatment effectiveness in forests and rangelands and a case study from the 2007 megafires in central, Idaho, USA
This report provides managers with the current state of knowledge regarding the effectiveness of fuel treatments for mitigating severe wildfire effects. A literature review examines the effectiveness of fuel treatments that had been previously applied and were subsequently burned through by wildfire in forests and rangelands. A case...

Author(s): Andrew T. Hudak, Ian Rickert, Penelope Morgan, Eva K. Strand, Sarah A. Lewis, Peter R. Robichaud, Chad M. Hoffman, Zachary A. Holden
Year Published: 2011
Type: Synthesis, Technical Report or White Paper

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

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

Author(s): Morris C. Johnson, Maureen C. Kennedy, David L. Peterson
Year Published: 2011
Type: Book or Chapter or Journal Article

A regional experiment to evaluate effects of fire and fire surrogate treatments in the sagebrush biome - Final Report to the Joint Fire Science Program

SageSTEP is a comprehensive regional experiment that provides critical information to managers faced with a sagebrush steppe ecosystem that is increasingly at risk from wildfire, invasive plants, and climate change. The experiment provides managers with information that can be used to restore ecological communities across the 100+...

Year Published: 2011
Type: Technical Report or White Paper

Thinning and burning in dry coniferous forests of the western United States: effectiveness in altering diameter distributions

Western United States land managers are conducting fuel reduction and forest restoration treatments in forests with altered structural conditions. As part of the National Fire and Fire Surrogate (FFS) study, thinning and burning treatments were evaluated for changing forest structure. Shifts between pretreatment and posttreatment...

Author(s): Andrew P. Youngblood
Year Published: 2010
Type: Book or Chapter or Journal Article

Large scale forest fuels projects and collaborative groups improvement study: analysis of a survey conducted for the Western Governors' Association's Forest Health Advisory Committee
The Western Governors' Association's Forest Health Advisory Committee (FHAC) sought answers to questions on how large scale forest treatment collaboratives are doing throughout the West. They were particularly interested in finding out where groups of different stakeholders were finding 'zones of agreement', what successes they are...

Author(s): Cheryl R. Renner
Year Published: 2010
Type: Document
Technical Report or White Paper

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

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

Author(s): Elizabeth D. Reinhardt, Lisa M. Holsinger, Robert E. Keane
Year Published: 2010
Type: Document
Book or Chapter or Journal Article

**Integrating fuel treatment into ecosystem management: a proposed project planning process**

Concern over increased wildland fire threats on public lands throughout the western United States makes fuel reduction activities the primary driver of many management projects. This single-issue focus recalls a management planning process practiced frequently in recent decades - a least-harm approach where the primary objective is...

Author(s): Keith Stockmann, Kevin D. Hyde, J. Greg Jones, Dan R. Loeffler, Robin P. Silverstein
Year Published: 2010
Type: Document
Book or Chapter or Journal Article, Management or Planning Document

**Interactive effects of historical logging and fire exclusion on ponderosa pine forest structure in the northern Rockies**

Increased forest density resulting from decades of fire exclusion is often perceived as the leading cause of historically aberrant, severe, contemporary wildfires and insect outbreaks documented in some fire-prone forests of the western United States. Based on this notion, current U.S. forest policy directs managers to reduce stand...

Author(s): Cameron Naficy, Anna Sala, Eric G. Keeling, Jon Graham, Thomas H. DeLuca
Year Published: 2010
Type: Document
Book or Chapter or Journal Article

**Evaluating wildland fire danger and prioritizing vegetation and fuels treatments**

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

Evaluation of forest management systems under risk of wildfire
www.nrfirescience.org/resource/8336
We evaluate the economic efficiency of even- and uneven-aged management systems under risk of wildfire. The management problems are formulated for a mixed-conifer stand and approximations of the optimal solutions are obtained using simulation optimization. The Northern Idaho variant of the Forest Vegetation Simulator and its Fire...
Author(s): Kari Hyytiainen, Robert G. Haight
Year Published: 2010
Type: Document
Book or Chapter or Journal Article

Biomass utilization for bioenergy in the western United States
www.nrfirescience.org/resource/8178
ANNOTATION: This study examines the use of woody residues, primarily from forest harvesting or wood products manufacturing operations (and to a limited degree from urban wood wastes), as a feedstock for direct-combustion bioenergy systems for electrical or thermal power applications. Opportunities for utilizing biomass for energy at...
Author(s): Deborah S. Page-Dumroese, Martin F. Jurgensen, Thomas A. Terry
Year Published: 2010
Type: Document
Book or Chapter or Journal Article, Synthesis

A comparison of landscape fuel treatment strategies to mitigate wildland fire risk in the urban interface and preserve old forest structure
www.nrfirescience.org/resource/12725
We simulated fuel reduction treatments on a 16,000 ha study area in Oregon, US, to examine tradeoffs between placing fuel treatments near residential structures within an urban interface, versus treating stands in the adjacent wildlands to meet forest health and ecological restoration goals. The treatment strategies were evaluated...
Author(s): Alan A. Ager, Nicole M. Vaillant, Mark A. Finney
Year Published: 2010
Type: Document
Book or Chapter or Journal Article

Prescribed fires as ecological surrogates for wildfires: a stream and riparian perspective
www.nrfirescience.org/resource/11444
Forest managers use prescribed fire to reduce wildfire risk and to provide resource benefits, yet little information is available on whether prescribed fires can function as ecological surrogates for wildfire in fire-prone landscapes. Information on impacts and benefits of this management tool on stream and riparian ecosystems is...
Author(s): Robert S. Arkle, David S. Pilliod
Year Published: 2010
Type: Document
Book or Chapter or Journal Article
Effects of fuel treatments on carbon-disturbance relationships in forests of the Northern Rocky Mountains

Fuel treatments alter conditions in forested stands at the time of the treatment and subsequently. Fuel treatments reduce on-site carbon and also change the fire potential and expected outcome of future wildfires, including their carbon emissions. We simulated effects of fuel treatments on 140 stands representing seven major habitat...

Author(s): Elizabeth D. Reinhardt, Lisa M. Holsinger
Year Published: 2010
Type: Document
Book or Chapter or Journal Article

Management guide to ecosystem restoration treatments: whitebark pine forests of the Northern Rocky Mountains, U.S.A.

Whitebark pine is declining across much of its range in North America because of the combined effects of mountain pine beetle epidemics, fire exclusion policies, and widespread exotic blister rust infections. This management guide summarizes the extensive data collected at whitebark pine treatment sites for three periods: (1) pre-...

Author(s): Robert E. Keane, Russell A. Parsons
Year Published: 2010
Type: Document
Technical Report or White Paper

Fuel reduction management practices in riparian areas of the Western USA

Two decades of uncharacteristically severe wildfires have caused government and private land managers to actively reduce hazardous fuels to lessen wildfire severity in western forests, including riparian areas. Because riparian fuel treatments are a fairly new management strategy, we set out to document their frequency and extent on...

Author(s): Katharine R. Stone, David S. Pilliod, Kathleen A. Dwire, Charles C. Rhoades, Sherry P. Wollrab, Michael K. Young
Year Published: 2010
Type: Document
Book or Chapter or Journal Article, Synthesis

Characterization of convective heating in full scale wildland fires

Data collected in the International Crown Fire modeling Experiment during 1999 are evaluated to characterize the magnitude and duration of convective energy heating in full scale crown fires. To accomplish this objective data on total and radiant incident heat flux, air temperature, and horizontal and vertical gas velocities were...

Author(s): Bret W. Butler
Year Published: 2010
Type: Document
Conference Proceedings

Wildfire risk and hazard: procedures for the first approximation

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

Author(s): David E. Calkin, Alan A. Ager, Julie W. Gilbertson-Day
Year Published: 2010
Type: Document
Technical Report or White Paper

Restoration treatment effects on stand structure, tree growth, and fire hazard in a ponderosa pine/Douglas-fir forest in Montana
www.nrfirescience.org/resource/8159
Crown fires that burned thousands of ha of ponderosa pine (Pinus ponderosa Dougl. ex Laws.) forests in recent years attest to the hazardous conditions extant on the western landscape. Managers have responded with broad-scale implementation of fuel reduction treatments; however, because threats to pine forests extend beyond fire, so...
Author(s): Carl E. Fiedler, Kerry L. Metlen, Erich K. Dodson
Year Published: 2010
Type: Document
Book or Chapter or Journal Article

Restoring whitebark pine forests of the northern Rocky Mountains, USA
www.nrfirescience.org/resource/8394
Whitebark pine (Pinus albicaulis) has been declining across much of its range in North America because of the combined effects of mountain pine beetle (Dendroctonus ponderosae) epidemics, fire exclusion policies, and widespread exotic blister rust infections. Whitebark pine seed is dispersed by a bird, the Clark's nutcracker (...
Author(s): Robert E. Keane, Russell A. Parsons
Year Published: 2010
Type: Document
Book or Chapter or Journal Article

Breakthrough at the Missouri River Breaks: a quick tool for comparing burned and unburned sites
www.nrfirescience.org/resource/11085
A quantitative understanding of how forests work, both before and after (prescribed and wild) fire, is essential to management. Yet acquiring the kind of broad yet detailed information needed for many management decisions can be costly, tedious, and time-consuming. After two sweeping wildfires in the Missouri River Breaks area of...
Author(s): Rachel Clark
Year Published: 2009
Type: Document
Research Brief or Fact Sheet

The national fire and fire surrogate study: effects of fuel reduction methods on forest vegetation structure and fuels
www.nrfirescience.org/resource/13351
Changes in vegetation and fuels were evaluated from measurements taken before and after fuel reduction treatments (prescribed fire, mechanical treatments, and the combination of the two) at 12 Fire and Fire Surrogate (FFS) sites located in forests with a surface fire regime across the conterminous United States. To test the relative...
Author(s): Dylan W. Schwilk, Jon E. Keeley, Eric E. Knapp, James D. McIver, John D. Bailey,
Implementation of National Fire Plan fuel treatments near the wildland-urban interface in the western United States

www.nrfirescience.org/resource/8225

Because of increasing concern about the effects of catastrophic wildland fires throughout the western United States, federal land managers have been engaged in efforts to restore historical fire behavior and mitigate wildfire risk. During the last 5 years (2004-2008), 44,000 fuels treatments were implemented across the western...

Author(s): Tania L. Schoennagel, Cara R. Nelson, David M. Theobald, Gunnar C. Carnwath, Teresa B. Chapman

Year Published: 2009
Type: Document
Book or Chapter or Journal Article

Fuel treatments, fire suppression, and their interaction with wildfire and its impact: the Warm Lake experience during the Cascade Complex of wildfires in central Idaho, 2007

www.nrfirescience.org/resource/17700

Wildfires during the summer of 2007 burned over 500,000 acres within central Idaho. These fires burned around and through over 8,000 acres of fuel treatments designed to offer protection from wildfire to over 70 summer homes and other buildings located near Warm Lake. This area east of Cascade, Idaho, exemplifies the difficulty of...

Author(s): Russell T. Graham, Theresa B. Jain, Mark Loseke

Year Published: 2009
Type: Document
Technical Report or White Paper

Ecological effects of prescribed fire season: a literature review and synthesis for managers

www.nrfirescience.org/resource/12616

This synthesis project on season of prescribed burning is to summarize results from studies to date in order to provide managers a resource for predicting fire effects and understanding what variables drive these fire effects in different areas of the country with varying fire regimes. A secondary objective will be to identify key...

Author(s): Eric E. Knapp, Becky L. Estes, Carl N. Skinner

Year Published: 2009
Type: Document
Synthesis, Technical Report or White Paper

Rx-CADRE (Prescribed Fire Combustion-Atmospheric Dynamics Research Experiments) collaborative research in the core fire sciences

www.nrfirescience.org/resource/16939

The Rx-CADRE project was the combination of local and national fire expertise in the field of core fire research. The project brought together approximately 30 fire scientists from six geographic regions and seven different agencies. The project objectives were to demonstrate the capacity for collaborative research by bringing...

Author(s): Daniel M. Jimenez, J. Kevin Hiers, Roger D. Ottmar, Matthew B. Dickinson, Robert L. Kremens, Joseph J. O’Brien, Andrew T. Hudak, C. Clements
Fire treatment effects on vegetation structure, fuels, and potential fire severity in western U.S. forests
www.nrfirescience.org/resource/13352
Forest structure and species composition in many western U.S. coniferous forests have been altered through fire exclusion, past and ongoing harvesting practices, and livestock grazing over the 20th century. The effects of these activities have been most pronounced in seasonally dry, low and mid-elevation coniferous forests that once...
Author(s): Scott L. Stephens, Jason J. Moghaddas, Carleton B. Edminster, Carl E. Fiedler, Sally M. Haase, Michael G. Harrington, Jon E. Keeley, Eric E. Knapp, James D. McIver, Kerry L. Metlen, Carl N. Skinner, Andrew P. Youngblood
Year Published: 2009
Type: Document
Book or Chapter or Journal Article

A multi-disciplinary approach to fire management strategy, suppression costs, community interaction and organizational performance
www.nrfirescience.org/resource/17806
Over the past several fire seasons, there has been increasing emphasis on strategies to achieve fire management objectives using less than full perimeter control, such as more prescribed burning and focused point and area protection. While the strategies and tactics themselves are not new, wider use by Federal agencies, particularly...
Author(s): Anne E. Black, Krista M. Gebert, Sarah M. McCaffrey, Toddi A. Steelman, Janie Canton-Thompson
Year Published: 2009
Type: Document
Book or Chapter or Journal Article

Fuel treatment guidebook: illustrating treatment effects on fire hazard
www.nrfirescience.org/resource/8155
The Guide to Fuel Treatments (Johnson and others 2007) analyzes potential fuel treatments and the potential effects of those treatments for dry forest lands in the Western United States. The guide examines low- to mid-elevation dry forest stands with high stem densities and heavy ladder fuels, which are currently common due to fire...
Author(s): Crystal L. Raymond
Year Published: 2009
Type: Document
Book or Chapter or Journal Article

Recovery of greater sage-grouse habitat features in Wyoming big sagebrush following prescribed fire
www.nrfirescience.org/resource/12127
The ability of prescribed fire to enhance habitat features for Greater Sage-Grouse (Centrocercus urophasianus) in Wyoming big sagebrush (Artemisia tridentata wyomingensis) in western North America is poorly understood. We evaluated recovery of habitat features important to wintering, nesting, and early brood-rearing Sage-Grouse in...
Author(s): Jeffrey L. Beck, John W. Connelly, Kerry P. Reese
Year Published: 2009
Bark beetle responses to vegetation management treatments
www.nrfirescience.org/resource/11070
Native tree-killing bark beetles (Coleoptera: Curculionidae, Scolytinae) are a natural component of forest ecosystems. Eradication is neither possible nor desirable and periodic outbreaks will occur as long as susceptible forests and favorable climatic conditions co-exist. Recent changes in forest structure and tree composition by...
Author(s): Joel D. McMillin, Christopher J. Fettig
Year Published: 2009
Type: Document
Conference Proceedings, Technical Report or White Paper

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
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

Assessing fuel treatment effectiveness using satellite imagery and spatial statistics
www.nrfirescience.org/resource/8227
Understanding the influences of forest management practices on wildfire severity is critical in fire-prone ecosystems of the western United States. Newly available geospatial data sets characterizing vegetation, fuels, topography, and burn severity offer new opportunities for studying fuel treatment effectiveness at regional to...
Author(s): Michael C. Wimberly, Mark A. Cochrane, Adam D. Baer, Kari Pabst
Year Published: 2009
Type: Document
Book or Chapter or Journal Article

Synthesis of knowledge from woody biomass removal case studies
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
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

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

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

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

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

The effects of hazardous fuel reduction treatments in the wildland urban interface on the activity of bark beetles infesting ponderosa pine
www.nrfirescience.org/resource/11479
Selective logging, fire suppression, forest succession, and climatic changes have resulted in high fire hazards over large areas of the western United States. Federal and state hazardous fuel reduction programs have increased accordingly to reduce the risk, extent and severity of these events, particularly in the wildland urban...

Author(s): Christopher J. Fettig, Joel D. McMillin, John A. Anhold, Shakeeb M. Hamud, Steven J. Seybold
Year Published: 2008
Type: Document
Conference Proceedings

Forest harvest can increase subsequent forest fire severity
www.nrfirescience.org/resource/11054
The USDA Forest Service is progressing from a land management strategy oriented around timber extraction towards one oriented around maintaining healthy forested lands. The healthy Forest Initiative promotes the idea of broadscale forest thinning and fuel treatments as an effective means for mitigating hazardous fuel conditions and...
Objectives and considerations for wildland fuel treatment in forested ecosystems of the interior western United States

www.nrfirescience.org/resource/8194

Many natural resource agencies and organizations recognize the importance of fuel treatments as tools for reducing fire hazards and restoring ecosystems. However, there continues to be confusion and misconception about fuel treatments and their implementation and effects in fire-prone landscapes across the United States. This paper...

Author(s): Elizabeth D. Reinhardt, Robert E. Keane, David E. Calkin, Jack D. Cohen
Year Published: 2008
Type: Document
Book or Chapter or Journal Article, Synthesis

Burn and they will come! The western regional birds and burns study examines bird responses to prescribed fire

www.nrfirescience.org/resource/11088

Although prescribed fire is increasingly being used in ponderosa pine forests as a management tool to reduce the risk of future high-severity wildfire, its effects on wildlife habitat have rarely been examined. The Birds and Burns Network was created to assist managers in planning prescribed fire projects that will reduce fuels and...

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

Reproductive output of ponderosa pine in response to thinning and prescribed burning in western Montana

www.nrfirescience.org/resource/8230

Thinning and thinning followed by prescribed fire are common management practices intended to restore historic conditions in low-elevation ponderosa pine (Pinus ponderosa Dougl. ex P....

Author(s): Gregory D. Peters, Anna Sala
Year Published: 2008
Type: Document
Book or Chapter or Journal Article

Estimating harvest costs for fuel treatments in the west

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. Cubbage, Karen L. Abt, Robert J. Huggett
Year Published: 2008
Type: Document
Book or Chapter or Journal Article
Contingent valuation of fuel hazard reduction treatments
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

The homeowner view of thinning methods for fire hazard reduction: more positive than many think
www.nrfirescience.org/resource/11486
With the focus of the National Fire Plan on decreasing fire risk in the wildland-urban interface, fire managers are increasingly tasked with reducing the fuel load in areas where mixed public and private ownership and a growing number of homes can make most fuel reduction methods problematic at best. In many of these intermix areas...
Author(s): Sarah M. McCaffrey
Year Published: 2008
Type: Document
Conference Proceedings, Technical Report or White Paper

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

Restoration of northern Rocky Mountain moist forests: integrating fuel treatments from the site to the landscape
www.nrfirescience.org/resource/11991
Restoration and fuel treatments in the moist forests of the northern Rocky Mountains are complex and far different from those applicable to the dry ponderosa pine forests. In the moist forests, clearcuts are the favored method to use for growing early-seral western white pine and western larch. Nevertheless, clearcuts and their...
Author(s): Theresa B. Jain, Russell T. Graham, Robert Denner, Jonathan Sandquist, Jeffrey S. Evans, Matthew Butler, Karen Brockus, David Cobb, Daniel Frigard, Han-Sup Han, Jeff Halbrook
Year Published: 2008
Type: Document
Conference Proceedings, Technical Report or White Paper

Maintaining soil productivity during forest or biomass-to-energy thinning harvests in the western United States
www.nrfirescience.org/resource/11018
ANNOTATION: Forest biomass thinnings can potentially impact soil resources by altering soil physical, chemical, and/or biological properties. This paper provides basic recommendations and findings derived from stand-removal studies to guide biomass thinnings for forest health, fuel reduction, or energy production. The focus of these...

Year Published: 2008
Type: Document
Conference Proceedings, Synthesis

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

Fire probability, fuel treatment effectiveness and ecological tradeoffs in Western U.S. public forests
www.nrfirescience.org/resource/12724
Fuel treatment effectiveness and non-treatment risks can be estimated from the probability of fire occurrence. Using extensive fire records for western US Forest Service lands, we estimate fuel treatments have a mean probability of 2.0-7.9% of encountering moderate- or high-severity fire during an assumed 20-year period of...

Author(s): Jonathan J. Rhodes, William L. Baker
Year Published: 2008
Type: Document
Book or Chapter or Journal Article

Spatial-endogenous fire risk and efficient fuel management and timber harvest
www.nrfirescience.org/resource/8277
This paper integrates a spatial fire-behavior model and a stochastic dynamic-optimization model to determine the optimal spatial pattern of fuel management and timber harvest. Each year's fire season causes the loss of forest values and lives in the western United States. We use a multi-plot analysis and incorporate uncertainty...

Author(s): Masashi Konoshima, Claire A. Montgomery, Heidi J. Albers, Jeffrey L. Arthur
Year Published: 2008
Type: Document
Book or Chapter or Journal Article

An assessment of fuel treatments on three large 2007 Pacific Northwest fires
www.nrfirescience.org/resource/17705
The Monument Fire burned across a landscape with extensive but relatively low intensity fuel treatments that reduced severe fire effects. The area that burned in the Egley Complex included both extensive underburns and intensive, strategically located fuel and other vegetation treatments that improved suppression effectiveness. The...

Author(s): Steve Harbert, Andrew T. Hudak, Laura Mayer, T. D. Rich, Sarah Robertson
Whitebark pine diameter growth response to removal of competition
www.nrfirescience.org/resource/19319
Silvicultural cutting treatments may be needed to restore whitebark pine (Pinus albicaulis) forests, but little is known of the response of this species to removal of competition through prescribed burning or silvicultural cuttings. We analyzed stem cross-sections from 48 whitebark pine trees in Montana around which most of the...
Author(s): Robert E. Keane, Kathy L. Gray, Laura J. Dickinson
Year Published: 2007
Type: Document
Technical Report or White Paper

Rapid assessment of postfire plant invasions in coniferous forests of the western United States
www.nrfirescience.org/resource/18957
Fire is a natural part of most forest ecosystems in the western United States, but its effects on nonnative plant invasion have only recently been studied. Also, forest managers are engaging in fuel reduction projects to lessen fire severity, often without considering potential negative ecological consequences such as nonnative...
Author(s): Jonathan P. Freeman, Thomas J. Stohlgren, Molly E. Hunter, Philip N. Omi, Erik J. Martinson, Geneva W. Chong, Cynthia S. Brown
Year Published: 2007
Type: Document
Book or Chapter or Journal Article

Science-based strategic planning for hazardous fuel treatment
www.nrfirescience.org/resource/15017
A scientific foundation coupled with technical support is needed to develop long-term strategic plans for fuel and vegetation treatments on public lands. These plans are developed at several spatial scales and are typically a component of fire management plans and other types of resource management plans. Such plans need to be...
Author(s): David L. Peterson, Morris C. Johnson
Year Published: 2007
Type: Document
Book or Chapter or Journal Article

Treatments that enhance the decomposition of forest fuels for use in partially harvested stands in the moist forests of the Northern Rocky Mountains - Final report to the Joint Fire Science Program
www.nrfirescience.org/resource/13115
The moist forests of the Rocky Mountains typically support late seral western hemlock, moist grand fir, or western redcedar forests. In addition to these species, Douglas-fir, western white pine, western larch, ponderosa pine, and lodgepole pine can occur creating a multitude of species compositions, structures, and successional...
Author(s): Russell T. Graham, Theresa B. Jain
Year Published: 2007
Type: Document
Technical Report or White Paper
Simulation of long-term landscape-level fuel treatment effects on large wildfires
www.nrfirescience.org/resource/8166
A simulation system was developed to explore how fuel treatments placed in topologically random and optimal spatial patterns affect the growth and behaviour of large fires when implemented at different rates over the course of five decades. The system consisted of a forest and fuel dynamics simulation module (Forest Vegetation...)
Author(s): Mark A. Finney, Robert C. Seli, Charles W. McHugh, Alan A. Ager, Bernhard Bahro, James K. Agee
Year Published: 2007
Type: Document
Book or Chapter or Journal Article

Testing the modeled effectiveness of an operational fuel reduction treatment in a small western Montana interface landscape using two spatial scales
www.nrfirescience.org/resource/8410
Much of the coniferous zones in the Western United States where fires were historically frequent have seen large increases in stand densities and associated forest fuels due to 20th century anthropogenic influences. This condition is partially responsible for contemporary large, uncharacteristically severe wildfires. Therefore,...
Author(s): Michael G. Harrington, Erin Noonan-Wright, Mitchell Doherty
Year Published: 2007
Type: Document
Conference Proceedings

Free selection: a silvicultural option
www.nrfirescience.org/resource/12133
Forest management objectives continue to evolve as the desires and needs of society change. The practice of silviculture has risen to the challenge by supplying silvicultural methods and systems to produce desired stand and forest structures and compositions to meet these changing objectives. For the most part, the practice of...
Author(s): Russell T. Graham, Theresa B. Jain, Jonathan Sandquist
Year Published: 2007
Type: Document
Conference Proceedings, Technical Report or White Paper

A report on conceptual advances in roll on/off technology in forestry
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/Urb...-
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

Understanding the influence of local and landscape conditions on the occurrence and abundance of Black-backed Woodpeckers in burned forest patches
www.nrfirescience.org/resource/15635
Wildfire is the predominant disturbance agent in the Northern Rockies. The nearly annual occurrence of wildfire at some point in a larger landscape has served as the environmental backdrop against which our native wildlife species have evolved. A number of native species have, in fact, become dependent on wildfires or wildfire...

Author(s): Richard L. Hutto, Deborah Austin, Sallie Hejl
Year Published: 2007
Type: Document
Technical Report or White Paper

Guide to fuel treatments in dry forests of the Western United States: assessing forest structure and fire hazard
www.nrfirescience.org/resource/11166
Guide to Fuel Treatments analyzes a range of fuel treatments for representative dry forest stands in the Western United States with overstories dominated by ponderosa pine (Pinus ponderosa), Douglas-fir (Pseudotsuga menziesii), and pinyon pine (Pinus edulis). Six silvicultural options (no thinning; thinning from below to 50 trees...)
Author(s): Morris C. Johnson, David L. Peterson, Crystal L. Raymond
Year Published: 2007
Type: Document
Technical Report or White Paper

Fuel consumption and flammability thresholds in shrub-dominated ecosystems - Final Report to the Joint Fire Science Program
www.nrfirescience.org/resource/11164
Research to quantify fuel consumption and flammability in shrub-dominated ecosystems has received little attention despite the widespread occurrence of fire-influenced, shrub-dominated landscapes across the arid lands of the western United States. While some research has addressed issues relating to fire behavior in some shrub-...
Author(s): Clinton S. Wright, Roger D. Ottmar, Sue A. Ferguson, Robert E. Vihnanek
Year Published: 2007
Type: Document
Technical Report or White Paper

Stand and fuel treatments for restoring old-growth ponderosa pine forests in the interior west (Boise Basin Experimental Forest) - Final report to the Joint Fire Science Program
www.nrfirescience.org/resource/13105
Fire exclusion, especially in the dry forests (i.e. those dominated or potentially dominated by ponderosa pine) has most often altered tree and shrub composition and structure and, though often overlooked in many locales, the forest floor from conditions that occurred historically (pre-1900). When fires are excluded...
Author(s): Russell T. Graham, Theresa B. Jain
Year Published: 2007
Type: Document
Technical Report or White Paper

Managing forest structure and fire hazard - A tool for planners
www.nrfirescience.org/resource/8404
Fire planners and other resource managers need to examine a range of potential fuel and vegetation treatments to select options that will lead to desired outcomes for fire hazard and natural resource conditions. A new approach to this issue integrates concepts and tools from silviculture and fuel science to quantify outcomes for a...
A fuel treatment reduces fire severity and increases suppression efficiency in a mixed conifer forest

Fuel treatments are being implemented on public and private lands across the western United States. Although scientists and managers have an understanding of how fuel treatments can modify potential fire behaviour under modelled conditions, there is limited information on how treatments perform under real wildfire conditions in...

Effects of alternative treatments on canopy fuel characteristics in five conifer stands

A detailed study of canopy fuel characteristics in five different forest types provided a unique dataset for simulating the effects of various stand manipulation treatments on canopy fuels. Low thinning, low thinning with commercial dbh limit, and crown thinning had similar effects on canopy bulk density (CBD) and canopy fuel load (...

Social science informing forest management — bringing new knowledge to fuels managers

To improve access, interpretability, and use of the full body of research, a pilot project was initiated by the USDA Forest Service to synthesize relevant scientific information and develop publications and decision support tools that managers can use to inform fuels treatment plans. This article provides an overview of the work of...

Birds and burns of the Interior West: descriptions, habitats, and management in western forests

This publication provides information about prescribed fire effects on habitats and populations of birds of the interior West and a synthesis of existing information on bird responses to fire across North America. Our literature synthesis indicated that aerial, ground, and bark insectivores favored recently burned habitats, whereas...
Science information for informing forest fuel management in dry forests of the western United States
www.nrfirescience.org/resource/7929
Land managers need timely and straightforward access to the best scientific information available for informing decisions on how to treat forest fuels in the dry forests of the western United States. However, although there is a tremendous amount of information available for informing fuels management decisions, often, it is in a...
Author(s): Sarah M. McCaffrey, Russell T. Graham
Year Published: 2007
Type: Document
Book or Chapter or Journal Article, Synthesis

Ten-year responses of ponderosa pine growth, vigor, and recruitment to restoration treatments in the Bitterroot Mountains, Montana, USA
www.nrfirescience.org/resource/13370
Little is known about ponderosa pine forest ecosystem responses to restoration practices in the Northern Rocky Mountains, USA. In this study, restoration treatments aimed at approximating historical forest structure and disturbances included modified single-tree selection cutting, with and without prescribed burning. We compared the...
Author(s): Alex Fajardo, Jon Graham, John M. Goodburn, Carl E. Fiedler
Year Published: 2007
Type: Document
Book or Chapter or Journal Article

Restoration treatment effects on the understory of ponderosa pine/Douglas-fir forests in western Montana, USA
www.nrfirescience.org/resource/7900
Fire exclusion and high-grade logging have altered the structure and function of ponderosa pine (Pinus ponderosa) forests across the American West. Restoration treatments are increasingly being used in these forests to move stand density, structure, and species composition toward more historically sustainable conditions. Yet little...
Author(s): Kerry L. Metlen, Carl E. Fiedler
Year Published: 2006
Type: Document
Book or Chapter or Journal Article

Changes in downed wood and forest structure after prescribed fire in ponderosa pine forests
www.nrfirescience.org/resource/11002
Most prescribed fire plans focus on reducing wildfire hazards with little consideration given to effects on wildlife populations and their habitats. To evaluate effectiveness of prescribed burning in reducing fuels and to assess effects of fuels reduction on wildlife, we began a large-scale study known as the Birds and Burns Network...
Author(s): Victoria A. Saab, Lisa Bate, John F. Lehmkuhl, Brett G. Dickson, Scott Story, Stephanie Jentsch, William M. Block
Year Published: 2006
Type: Document
Conference Proceedings

Paying for hazardous fuel treatments with revenue from removed biomass
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

Organizational characteristics that contribute to success in engaging the public to accomplish fuels management at the wilderness/non-wilderness interface
www.nrfirescience.org/resource/10984
In the fall of 2003, the Rocky Mountain Ranger District of the Lewis and Clark National Forest initiated a multi-year, large-scale prescribed burn in the Scapegoat Wilderness. The objectives of this burn were to make the non-wilderness side of the wilderness boundary more defensible from wildfire and to establish conditions that...
Author(s): Katie Knotek, Alan E. Watson
Year Published: 2006
Type: Document

Interactions among fire, insects, and pathogens in coniferous forests of the interior western United States and Canada
www.nrfirescience.org/resource/8120
Natural and recurring disturbances caused by fire, native forest insects and pathogens have interacted for millennia to create and maintain forests dominated by seral or pioneering species of conifers in the interior regions of the western United States and Canada. Changes in fire suppression and other factors in the last century...
Author(s): Thomas J. Parker, Karen M. Clancy, Robert L. Mathiasen
Year Published: 2006
Type: Document

Ponderosa pine ecosystems
www.nrfirescience.org/resource/11142
Ponderosa pine is one of the most widely distributed tree species in western North America. It is highly-valued as a source of lumber, but also is key to the health and social value western forests, whether growing in pure stands or in mixture with other conifer and hardwood species. In recent years, management objectives for...
Author(s): Russell T. Graham, Theresa B. Jain
Year Published: 2006
Type: Document

Estimating woody biomass supply from thinning treatments to reduce fire hazard in the US West
www.nrfirescience.org/resource/10995
This paper identifies timberland areas in 12 western states where thinning treatments (1) are judged to be needed to reduce fire hazard and (2) may 'pay for themselves' at a scale to make investment in forest product processing a realistic option. A web-based tool - Fuel Treatment Evaluator 3.0 - is used to select high-fire-hazard...
Author(s): Kenneth E. Skog, R. James Barbour
Wilderness fire management in a changing world
www.nrfirescience.org/resource/7963
Several strategies are available for reducing accumulated forest fuels and their associated risks, including naturally or accidentally ignited wildland fires, management ignited prescribed fires, and a variety of mechanical and chemical methods (Omi 1996). However, a combination of policy, law, philosophy, and logistics suggest...
Author(s): Carol Miller
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
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. Cubbage, Karen L. Abt
Year Published: 2006
Type: Document
Conference Proceedings

FTM-West: fuel treatment market model for US West
www.nrfirescience.org/resource/10974
This paper presents FTM-West, a partial market equilibrium model designed to project future wood market impacts of significantly expanded fuel treatment programs that could remove trees to reduce fire hazard on forestlands in the U.S. West. FTM-West was designed to account for structural complexities in marketing and utilization...
Author(s): Peter J. Ince, Andrew Kramp, Henry Spelter, Kenneth E. Skog, Dennis P. Dykstra
Year Published: 2006
Type: Document
Conference Proceedings

Intermountain region wood utilization and wood energy application program
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

FTM-West model results for selected fuel treatment scenarios
www.nrfirescience.org/resource/10985
This paper evaluated potential forest product market impacts in the U.S. West of increases in the supply of wood from thinnings to reduce fire hazard. Evaluations are done using the Fuel Treatment Market-West model for a set of hypothetical fuel treatment scenarios, which include stand-density-index (SDI) and thin-from-below (TFB)....

Author(s): Andrew Kramp, Peter J. Ince
Year Published: 2006
Type: Document
Conference Proceedings

Effects of fire exclusion on forest structure and composition in unlogged ponderosa pine/Douglas-fir forests
www.nrfirescience.org/resource/7928
Research to date on effects of fire exclusion in ponderosa pine (Pinus ponderosa) forests has been limited by narrow geographical focus, by confounding effects due to prior logging at research sites, and by uncertainty from using reconstructions of past conditions to infer changes. For the work presented here, reference stands in...

Author(s): Eric G. Keeling, Anna Sala, Thomas H. DeLuca
Year Published: 2006
Type: Document
Book or Chapter or Journal Article

Social science to improve fuels management: a synthesis of research relevant to communicating with homeowners about fuels management
www.nrfirescience.org/resource/15007
A series of syntheses were commissioned by the USDA Forest Service to aid in fuels mitigation project planning. This synthesis focuses on how managers can most effectively communicate with the public about fuels management efforts. It summarizes what is known about the techniques of persuasive communication programs and provides an...

Author(s): Martha C. Monroe, Lisa Pennisi, Sarah M. McCaffrey, Dennis Mileti
Year Published: 2006
Type: Document
Synthesis, Technical Report or White Paper

Prescribed fire: what influences public approval?
www.nrfirescience.org/resource/8440
Except in remote areas, most prescribed fires will have some effect on members of the public. It is therefore important for land managers to work with the public before, during, and after a prescribed burn. To do this effectively, managers need to have an accurate idea of what people do and do not think about prescribed fire and...

Author(s): Sarah M. McCaffrey
Year Published: 2006
Type: Document
Technical Report or White Paper

An analytical framework for quantifying wildland fire risk and fuel treatment benefit
www.nrfirescience.org/resource/12720
Federal wildland fire management programs have readily embraced the practice of fuel treatment. Wildland fire risk is quantified as expected annual loss ($ yr-1 or $ yr-1 ac-1). Fire risk at a point on the landscape is a function of the probability of burning at that point, the relative frequency of fire behaviors expected if the...

Author(s): Joe H. Scott
Timber markets and fuel treatments in the western U.S.
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

The use of silviculture and prescribed fire to manage stand structure and fuel profiles in a multi-aged lodgepole pine forest
www.nrfirescience.org/resource/10964
This paper presents several components of a multi-disciplinary project designed to evaluate the ecological and biological effects of two innovative silvicultural treatments coupled with prescribed fire in an attempt to both manage fuel profiles and create two-aged stand structures in lodgepole pine. Two shelterwood silvicultural...
Author(s): Colin C. Hardy, Helen Y. Smith, Ward W. McCaughey
Year Published: 2006
Type: Document
Conference Proceedings

Snag longevity in relation to wildfire and postfire salvage logging
www.nrfirescience.org/resource/8142
Snags create nesting, foraging, and roosting habitat for a variety of wildlife species. Removal of snags through postfire salvage logging reduces the densities and size classes of snags remaining after wildfire. We determined important variables associated with annual persistence rates (the probability a snag remains standing from 1...
Author(s): Robin E. Russell, Victoria A. Saab, Jonathan G. Dudley, Jay J. Rotella
Year Published: 2006
Type: Document
Book or Chapter or Journal Article

Broad-scale assessment of fuel treatment opportunities
www.nrfirescience.org/resource/10992
The Forest Inventory and Analysis (FIA) program has produced estimates of the extent and composition of the Nation's forests for several decades. FIA data have been used with a flexible silvicultural thinning option, a fire hazard model for preharvest and postharvest fire hazard assessment, a harvest economics model, and geospatial...
Author(s): Patrick D. Miles, Kenneth E. Skog, Wayne D. Shepperd, Elizabeth D. Reinhardt, Roger D. Fight
Year Published: 2006
Type: Document
Conference Proceedings, Technical Report or White Paper
Snow accumulation in thinned lodgepole pine stands, Montana, USA
www.nrfirescience.org/resource/8192
Alternative silvicultural treatments such as thinning can be used to restore forested watersheds and reduce wildfire hazards, but the hydrologic effects of these treatments are not well defined. We evaluated the effect of two shelterwood-with-reserve silvicultural prescriptions, one leaving residual trees evenly distributed (SE) and...
Author(s): Scott W. Woods, Robert S. Ahl, Jason Sappington, Ward W. McCaughey
Year Published: 2006
Type: Document
Book or Chapter or Journal Article

Mastication: a fuel reduction and site preparation alternative
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

Developing statistical wildlife habitat relationships for assessing cumulative effects of fuels treatments - Final Report to the Joint Fire Science Program
www.nrfirescience.org/resource/11160
The primary weakness in our current ability to evaluate future landscapes in terms of wildlife lies in the lack of quantitative models linking wildlife to forest stand conditions, including fuels treatments. This project focuses on 1) developing statistical wildlife habitat relationships models (WHR) utilizing Forest Inventory and...
Author(s): Samuel A. Cushman, Kevin S. McKelvey
Year Published: 2006
Type: Document
Technical Report or White Paper

Design and objectives of FTM-West model
www.nrfirescience.org/resource/10975
The FTM-West ('fuel treatment market' model for U.S. West) is a dynamic partial market equilibrium model of regional softwood timber and wood product markets, designed to project future market impacts of expanded fuel treatment programs that remove trees to reduce fire hazard on forestlands in the U.S. West. The model solves...
Author(s): Peter J. Ince, Henry Spelter
Year Published: 2006
Type: Document
Conference Proceedings

Evaluation of silvicultural treatments and biomass use for reducing fire hazard in western states
www.nrfirescience.org/resource/11189
Several analysis have shown that fire hazard is a concern for substantial areas of forestland, shrubland, grassland, and range in the western United States. In response, broadscale management strategies, such as the National Fire Plan, established actions to reduce the threat of undesirable fire. Available budgets are insufficient...
Integrating fuel treatments into comprehensive ecosystem management
www.nrfirescience.org/resource/10973
To plan fuel treatments in the context of comprehensive ecosystem management, forest managers must meet multiple-use and environmental objectives, address administrative and budget constraints, and reconcile performance measures from multiple policy directives. We demonstrate a multiple criteria approach to measuring success of fuel...

Effects of slash, machine passes, and soil moisture on penetration resistance in a cut-to-length harvesting
www.nrfirescience.org/resource/7936
Multiple entries into forest stands are often needed for fire hazard reduction and ecosystem restoration treatments in the Inland Northwest U.S.A. region. However, soil compaction occurring from mechanized harvesting operations often remains for many years and may contribute to a decline in long-term site productivity. A controlled...

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

Biomass utilization modeling on the Bitterroot National Forest
www.nrfirescience.org/resource/11008
ANNOTATION: The potential for biomass utilization to enhance the economics of treating hazardous forest fuels was examined on the Bitterroot National Forest and surrounding areas. Initial forest stand conditions were identified from Forest Inventory and Analysis (FIA) data and the Forest Vegetation Simulator (FVS) was used to...
Wildlife and invertebrate response to fuel reduction treatments in dry coniferous forests of the Western United States: a synthesis
www.nrfirescience.org/resource/11192
This paper synthesizes available information on the effects of hazardous fuel reduction treatments on terrestrial wildlife and invertebrates in dry coniferous forest types in the West. We focused on thinning and/or prescribed fire studies in ponderosa pine (Pinus ponderosa) and dry-type Douglas-fir (Pseudotsuga menziesii), lodgepole...
Author(s): David S. Pilliod, Evelyn L. Bull, Jane L. Hayes, Barbara C. Wales
Year Published: 2006
Type: Document
Synthesis, Technical Report or White Paper

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

Predicting cumulative watershed effects of fuel management with improved WEPP technology
www.nrfirescience.org/resource/8436
The increase in severe wildfires in recent years is due in part to an abundance of fuels in forests. In an effort to protect values at risk, and decrease the severity of wildfires, forest managers have embarked on a major program of fuel reduction. Past research has shown that such fuel reduction may have minimal impact at a...
Author(s): William J. Elliot, Joan Q. Wu
Year Published: 2005
Type: Document
Conference Proceedings

Cumulative effects of fuel management on landscape-scale fire behavior and effects - Final Report to the Joint Fire Science Program
www.nrfirescience.org/resource/11157
The project is concerned with modeling the long-term effects of landscape fuel treatment patterns on wildfire sizes and severity. The work was initiated based on theoretical fuel treatment patterns that appeared effective at changing fire growth across large landscapes, thus reducing the acreage burned and the chances that large...
Author(s): Mark A. Finney
Year Published: 2005
Type: Document
Technical Report or White Paper

Prescribed fire for fuel reduction in northern mixed-grass prairie: influence on habitat and population dynamics of indigenous wildlife - Final Report to the Joint Fire Science Program
www.nrfirescience.org/resource/11171
Prescribed fire is used increasingly to reduce accumulated fuels on National Wildlife Refuges (NWRs) and other reserves in the mixed-grass prairie region of the northern Great Plains. There is sparse documentation, however, on effects of prescribed fire on habitat and population dynamics of wildlife in the region. This multi-

Author(s): Robert K. Murphy, Todd A. Grant, Elizabeth M. Madden
Year Published: 2005
Type: Document
Technical Report or White Paper

Forest fuel treatments in western North America: merging silviculture and fire management
www.nrfirescience.org/resource/7948
In order to accomplish complex and multiple management objectives related to forest structure, fuels, and fire disturbance, these two disciplines must be effectively integrated in science and practice. The authors have linked scientific and management tools to develop an analytical approach that allows resource managers to quantify...
Author(s): Morris C. Johnson, David L. Peterson
Year Published: 2005
Type: Document
Book or Chapter or Journal Article

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

Social science to improve fuels management: a synthesis of research on assessing social acceptability of fuels treatments
www.nrfirescience.org/resource/15014
A series of syntheses were commissioned by the USDA Forest Service to aid in fuels mitigation project planning. This synthesis focuses on research for assessing the social acceptability of fuels treatments. The synthesis is structured around six important considerations for any social acceptability assessment: defining the fuels...
Author(s): Terry C. Daniel, Michael Valdiserri, Carrie R. Daniel, Susan C. Barro, Pamela J. Jakes
Year Published: 2005
Type: Document
Synthesis, Technical Report or White Paper

Changes in bird abundance after wildfire: importance of fire severity and time since fire
www.nrfirescience.org/resource/8256
Fire can cause profound changes in the composition and abundance of plant and animal species, but logistics, unpredictability of weather, and inherent danger make it nearly impossible to study high-severity fire effects experimentally. We took advantage of a unique opportunity to use a before-after/control-impact (BACI) approach to...
Author(s): Kristina M. Smucker, Richard L. Hutto, Brian M. Steele
Root diseases in coniferous forests of the Inland Northwest: potential implications of fuels treatments
www.nrfirescience.org/resource/11172
After nearly 100 years of fire exclusion, introduced pests, and selective harvesting, a change in forest composition has occurred in many Inland West forests of North America. This change in forest structure has frequently been accompanied by increases in root diseases and/or an unprecedented buildup of fuels. Consequently, many...
Author(s): Raini C. Rippy, Jane E. Stewart, Paul J. Zambino, Ned B. Klopfenstein, Joanne M. Tirocke, Mee-Sook Kim, Walter G. Thies
Year Published: 2005
Type: Document
Technical Report or White Paper

The role of fire in structuring sagebrush habitats and bird communities
www.nrfirescience.org/resource/15408
Fire is a dominant and highly visible disturbance in sagebrush (Artemisia spp.) ecosystems. In lower elevation, xeric sagebrush communities, the role of fire has changed in recent decades from an infrequent disturbance maintaining a landscape mosaic and facilitating community processes to frequent events that alter sagebrush...
Author(s): Steve Knick, Aaron L. Holmes, Richard F. Miller
Year Published: 2005
Type: Document
Book or Chapter or Journal Article

Forest fuel management: a spatial decision-support system developed by RMRS provides forest managers with the tools to effectively remove a build-up of fuels while adhering to principles of ecological multiple-use...
www.nrfirescience.org/resource/8240
Forest fuel management: a spatial decision-support system developed by Rocky Mountain Research Station provides forest managers with the tools to effectively remove a build-up of fuels while adhering to principles of ecological multiple-use forest management and responding to public interests. Twentieth-century forest management...
Author(s): Judy M. Troutwine
Year Published: 2005
Type: Document
Book or Chapter or Journal Article

Fire ecology of ponderosa pine and the rebuilding of fire-resilient ponderosa pine ecosystems
www.nrfirescience.org/resource/11074
The ponderosa pine ecosystems of the West have change dramatically since Euro-American settlement 140 years ago due to past land uses and the curtailment of natural fire. Today, ponderosa pine forests contain overabundance of fuel, and stand densities have increased from a range of 49-124 trees ha-1 (20-50 trees acre-1) to a range...
Author(s): Stephen A. Fitzgerald
Year Published: 2005
Type: Document
Conference Proceedings, Synthesis
Stand establishment and tending in the inland northwest
www.nrfirescience.org/resource/11141
The moist, cold, and dry forests of the Inland Northwest occupy approximately 144 million acres. Ponderosa pine, lodgepole pine, western white pine, western larch, and Douglas-fir are usually the preferred commercial species of the area. These early-seral species are relatively resistant to endemic levels of insects and diseases....
Author(s): Russell T. Graham, Theresa B. Jain, Phil Cannon
Year Published: 2005
Type: Document
Technical Report or White Paper

Distribution of bark beetle attacks after whitebark pine restoration treatments: a case study
www.nrfirescience.org/resource/8366
Whitebark pine (Pinus albicaulis Engelm.), an important component of high elevation ecosystems in the western United States and Canada, is declining due to fire exclusion, white pine blister rust (Cronartium ribicola J.C. Fisch.), and mountain pine beetle (Dendroctonus ponderosae Hopkins). This study was conducted to evaluate the...
Author(s): Kristen M. Waring, Diana L. Six
Year Published: 2005
Type: Document
Book or Chapter or Journal Article

Effect of alternative silvicultural treatments on snow accumulation in lodgepole pine stands, Montana, U.S.A.
www.nrfirescience.org/resource/8413
Alternative silvicultural treatments such as thinning can restore the productivity and diversity of forested watersheds and reduce wildfire hazards, but the hydrologic effects of these treatments are not well defined. We evaluated the effect of even thinning (SE) and group-retention thinning (SG), both with ~ 60 % basal area removal...
Author(s): Scott W. Woods, Ward W. McCaughey, Robert S. Ahl, Jason Sappington
Year Published: 2005
Type: Document
Conference Proceedings

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

A strategic assessment of forest biomass and fuel reduction treatments in Western States
www.nrfirescience.org/resource/11197
This assessment characterizes, at a regional scale, forest biomass that can potentially be removed to
implement the fuel reduction and ecosystem restoration objectives of the National Fire Plan for the Western United States. The assessment area covers forests on both public and private ownerships in the region and describes all...

Year Published: 2005
Type: Document
Technical Report or White Paper

Basic principles of forest fuel reduction treatments
www.nrfirescience.org/resource/18976
Successful fire exclusion in the 20th century has created severe fire problems across the West. Not every forest is at risk of uncharacteristically severe wildfire, but drier forests are in need of active management to mitigate fire hazard. We summarize a set of simple principles important to address in fuel reduction treatments:....
Author(s): James K. Agee, Carl N. Skinner
Year Published: 2005
Type: Document
Book or Chapter or Journal Article

When to prescribe
www.nrfirescience.org/resource/11500
Prescribed fire can be the most practical and affordable way to reduce dangerous accumulations of combustible fuels. At the same time, prescribed fire can help restore the ecological process of fire to fire-adapted ecosystems through its influence on soil nutrients, growth and mortality of plants, seedling establishment and...
Author(s): Carol Miller
Year Published: 2005
Type: Document
Book or Chapter or Journal Article

Acceptability of smoke from prescribed forest burning in the northern inland west: a focus group approach
www.nrfirescience.org/resource/8393
Focus groups were used to gauge tolerance of smoke from broadcast prescribed forest burning in the wildland-urban interface of the northern Inland West. Focus group participants worked through issues surrounding prescribed burning as a management tool to determine if the origin of smoke made a difference in the acceptance of that...
Author(s): Brad R. Weisshaupt, Matthew S. Carroll, Keith A. Blatner, William D. Robinson, Pamela J. Jakes
Year Published: 2005
Type: Document
Book or Chapter or Journal Article

Forest structure and fire hazard in dry forests of the Western United States
www.nrfirescience.org/resource/11163
ANNOTATION: This document synthesizes the relevant scientific knowledge that can assist fuel-treatment projects on national forests and other public lands and contribute to National Environmental Policy Act (NEPA) analyses and other assessments. It is intended to support science-based decision
Social science to improve fuels management: a synthesis of research on collaboration
www.nrfirescience.org/resource/15016
A series of syntheses were commissioned by the USDA Forest Service to aid in fuels mitigation project planning. This synthesis focuses on collaboration research, and offers knowledge and tools to improve collaboration in the planning and implementation of wildland fire and fuels management projects. It covers a variety of topics...
Author(s): Victoria Sturtevant, Margaret Ann Moote, Pamela J. Jakes, Anthony S. Cheng
Year Published: 2005
Type: Document
Synthesis, Technical Report or White Paper

Application of free selection in mixed forests of the inland northwestern United States
www.nrfirescience.org/resource/7933
Forest management objectives continue to evolve as the desires and needs of society change. The practice of silviculture has risen to the challenge by supplying silvicultural methods and systems to produce desired stand and forest structures and compositions to meet these changing objectives. For the most part, the practice of...
Author(s): Russell T. Graham, Theresa B. Jain
Year Published: 2005
Type: Document
Book or Chapter or Journal Article

Social science to improve fuels management: a synthesis of research on aesthetics and fuels management
www.nrfirescience.org/resource/15009
A series of syntheses were commissioned by the USDA Forest Service to aid in fuels mitigation project planning. This synthesis focuses on research addressing aesthetic considerations of fuels management. A general finding is that fuels management activities can contribute to the visual quality of a landscape. Topics covered in the...
Author(s): Robert L. Ryan
Year Published: 2005
Type: Document
Synthesis, Technical Report or White Paper

Prescribed fire strategies to restore wildlife habitat in ponderosa pine forests of the intermountain west (birds and burns network) - Final Report to the Joint Fire Science Program
www.nrfirescience.org/resource/11400
The goal of this project was to help evaluate the effectiveness of prescribed fire in reducing fuels, and to assess the effects of fuel reduction on habitats and populations of birds in ponderosa pine forests throughout the Interior West. Known as the Birds and Burns Network, we have study areas located on National Forest and The...
Author(s): Victoria A. Saab, William M. Block
Year Published: 2005
Type: Document
The amount of science applicable to the management of wildfire hazards is increasing daily. In addition, the attitudes of landowners and policymakers about fire and fuels management are changing. This fact sheet discusses three critical keys to communicating about wildfire hazards.

Author(s): Dennis Mileti
Year Published: 2004
Type: Document
Research Brief or Fact Sheet

Estimates of crown fire hazard are presented for existing forest conditions in Montana by density class, structural class, forest type, and landownership. Three hazard reduction treatments were evaluated for their effectiveness in treating historically fire-adapted forests (ponderosa pine (Pinus ponderosa Dougl. ex Laws.), Douglas-...)

Author(s): Carl E. Fiedler, Charles E. Keegan, Christopher W. Woodall, Todd A. Morgan
Year Published: 2004
Type: Document
Technical Report or White Paper

Fuels management responsibilities may include providing local property owners with the information for taking responsibility for reducing fuels on their land. This fact sheet discusses three different types of information that may be useful in programs to engage property owners in fuel reduction activities.

Author(s): Martha C. Monroe, Lisa Pennisi
Year Published: 2004
Type: Document
Research Brief or Fact Sheet

FOFEM 5.2 is a simple, yet versatile computer program that predicts first order fire effects using text and graphic outputs. It can be used in a variety of situations including: determining acceptable upper and lower fuel moistures for conducting prescribed burns, determining the number of acres that may be burned on a given day...

Author(s): Steve Sutherland
Year Published: 2004
Type: Document
Research Brief or Fact Sheet
Weed infestations cause an economic loss of $13 billion per year even though $9.5 billion per year is spent on weed control measures. In addition to these economic costs, weeds are replacing native species, altering native plant and animal communities, affecting ecosystem health and function, threatening biodiversity and Threatened...

Author(s): Steve Sutherland
Year Published: 2004
Type: Document
Research Brief or Fact Sheet

While our understanding of the causes for variation in postfire effects is increasing, burn prescriptions may not always include parameters that control the long-term heat pulse from fire. This paper discusses (1) fuel consumption and fire effects, (2) prescription design considerations, and (3) planning a prescribed fire.

Author(s): Melanie Miller
Year Published: 2004
Type: Document
Research Brief or Fact Sheet

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

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

This is a government publication outlining the steps to wildfire preparedness in Red Lodge, MT. The key features include homeowners' associations, which lead in fuel reduction around properties; USFS
recreation residences, which conduct fuel reduction projects; evacuation plans and fuel breaks; regulations; and relationships, which...

Author(s): Victoria Sturtevant, Linda E. Kruger
Year Published: 2004
Type: Document
Research Brief or Fact Sheet

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

Fuels planning: science synthesis and integration; economic uses fact sheet 1: mastication treatments and costs
www.nrfirescience.org/resource/14937
Mastication, or mulching, is a mechanical fuel treatment that changes the structure and size of fuels in the stand. This fact sheet describes the kinds of equipment available, where mastication should be used, and treatment factors affecting cost.
Author(s): Robert B. Rummer
Year Published: 2004
Type: Document
Research Brief or Fact Sheet

Restoring vigor and reducing hazard in an old growth western larch stand (Montana)
www.nrfirescience.org/resource/7926
Description not entered
Author(s): Carl E. Fiedler, Michael G. Harrington
Year Published: 2004
Type: Document
Book or Chapter or Journal Article

Fuels planning: science synthesis and integration; forest structure and fire hazard fact sheet 5: fuel treatment principles for complex landscapes
www.nrfirescience.org/resource/14956
Appropriate types of thinning and surface fuel treatments are clearly useful in reducing surface and crown fire hazards under a wide range of fuels and topographic situations. This paper provides well-established scientific principles and simulation tools that can be used to adjust fuel treatments to attain specific risk levels.
Author(s): David L. Peterson, Sarah M. McCaffrey
Year Published: 2004
Type: Document
Research Brief or Fact Sheet
Fuels planning: science synthesis and integration; forest structure and fire hazard fact sheet 1: forest structure and fire hazard overview
www.nrfirescience.org/resource/14953
Many managers and policy makers guided by the National Environmental Policy Act process want to understand the scientific principles on which they can base fuel treatments for reducing the size and severity of wildfires. These Forest Structure and Fire Hazard fact sheets discuss how to estimate fire hazard, how to visualize fuel...
Author(s): Kelly O'Brien
Year Published: 2004
Type: Document
Research Brief or Fact Sheet

Fuels planning: science synthesis and integration; social issues fact sheet 3: developing personal responsibility for fuels reduction: more ways to catch and hold people’s attention
www.nrfirescience.org/resource/14950
Other fact sheets discuss the different types of information that are useful in explaining to property owners the importance of taking personal responsibility for fuels management on their land. However, for some property owners, new information is not enough—they may need more information in order to understand that change is...
Author(s): Martha C. Monroe, Lisa Pennisi
Year Published: 2004
Type: Document
Research Brief or Fact Sheet

Effectiveness of thinning and prescribed fire in reducing wildfire severity
www.nrfirescience.org/resource/11072
The severity of recent fire seasons in the US has provided dramatic evidence for the increasing complexity of wildfire problems. A wide variety of indicators suggest worsening dilemmas: area burned, funds expended, homes destroyed or evacuated, ecosystems at risk, and human fatalities/injuries all seem to be on the increase or have...
Author(s): Philip N. Omi, Erik J. Martinson
Year Published: 2004
Type: Document

Fuels planning: science synthesis and integration; environmental consequences fact sheet 8: evaluating sedimentation risks associated with fuel management
www.nrfirescience.org/resource/14946
This fact sheet describes the sources of sediment in upland forest watersheds in the context of fuel management activities. It presents the dominant forest soil erosion processes, and the principles behind the new sediment delivery interface developed to aid in erosion analysis of fuel management projects.
Author(s): William J. Elliot, Peter R. Robichaud
Year Published: 2004
Type: Document
Research Brief or Fact Sheet

Fuels planning: science synthesis and integration; environmental consequences fact sheet 6: wildland fire use: the 'other' treatment option
www.nrfirescience.org/resource/14944
Fire suppression has reduced acres burned to an average of 2 million acres a year. An unfortunate result of this has been the accumulation of even more above-normal fuel loads in many areas. This
paper discusses (1) the important ecological role of fire, (2) using fire as a fuels treatment, and (2) the benefits and risks of fire.
Author(s): Anne E. Black
Year Published: 2004
Type: Document
Research Brief or Fact Sheet

Science basis for changing forest structure to modify wildfire behavior and severity
www.nrfirescience.org/resource/15018
Fire, other disturbances, physical setting, weather, and climate shape the structure and function of forests throughout the Western United States. More than 80 years of fire research have shown that physical setting, fuels, and weather combine to determine wildfire intensity (the rate at which it consumes fuel) and severity (the...
Author(s): Russell T. Graham, Sarah M. McCaffrey, Theresa B. Jain
Year Published: 2004
Type: Document
Synthesis, Technical Report or White Paper

Fuels planning: science synthesis and integration; environmental consequences fact sheet 4: wildlife responses to fuels treatments: key considerations
www.nrfirescience.org/resource/14942
Managers face a difficult task in predicting the effects of fuels treatments on wildlife populations, mostly because information on how animals respond to fuels treatments is scarce or does not exist. This paper discusses key considerations-aspects of an animal's ecology and available information-that, despite the scarcity of...
Author(s): David S. Pilliod
Year Published: 2004
Type: Document
Research Brief or Fact Sheet

Fuels planning: science synthesis and integration; economic uses fact sheet 3: economic impacts of fuel treatments
www.nrfirescience.org/resource/14940
With increased interest in reducing hazardous fuels in dry inland forests of the American West, agencies and the public will want to know the economic impacts of fuel reduction treatments. This fact sheet discusses the economic impact tool, a component of My Fuel Treatment Planner, for evaluating economic impacts.
Author(s): Michael J. Niccolucci, Greg Alward
Year Published: 2004
Type: Document
Research Brief or Fact Sheet

Fuels planning: science synthesis and integration; forest structure and fire hazard fact sheet 4: role of silviculture in fuel treatments
www.nrfirescience.org/resource/14955
The principal goals of fuel treatments are to reduce fireline intensities, reduce the potential for crown fires, improve opportunities for successful fire suppression, and improve forest resilience to forest fires. This fact sheet discusses thinning, and surface fuel treatments, as well as challenges associated with those treatments...
Author(s): Morris C. Johnson
Year Published: 2004
A collaborative fire hazard reduction/ecosystem restoration stewardship project in a Montana mixed ponderosa pine/Douglas-fir/western larch wildland-urban interface

Forest Service managers and researchers designed and evaluated alternative disturbance-based fire hazard reduction/ecosystem restoration treatments in a greatly altered low-elevation ponderosa pine/Douglas-fir/western larch wildland urban interface. Collaboratively planned improvement cutting and prescribed fire treatment...

Author(s): Steve Slaughter, Laura Ward, Michael Hillis, Jimmie D. Chew, Becky McFarlan
Year Published: 2003
Type: Document
Conference Proceedings

Research on stand management options for reducing fuels and restoring two-aged lodgepole pine communities on the Tenderfoot Creek Experimental Forest

Fire-dependent lodgepole pine stands comprise significant acreages of mid and upper-elevation forests in the Northern Rockies, providing wood products, wildlife habitat, livestock forage, water, recreational opportunities, and expansive viewsheeds. Many lodgepole pine stands are in late-successional stages and at risk to pests and...

Author(s): Ward W. McCaughey
Year Published: 2003
Type: Document
Conference Proceedings

Comparing potential fuel treatment trade-off models: initial results

Understanding the trade-offs between short-term and long-term consequences of fire impacts on ecosystems is needed before a comprehensive fuels management program can be implemented nationally. We are evaluating 3 potential trade-off models at 8 locations in major U.S. fuel types, We present results of the initial testing of the 3...

Author(s): David R. Weise, Richard A. Kimberlin, Michael J. Arbaugh, Jimmie D. Chew, J. Greg Jones, James Merzenich, Marc R. Wiitala, Robert E. Keane, Mark D. Schaaf, Jan W. van Wagendonk
Year Published: 2003
Type: Document
Conference Proceedings

Establishment and growth of conifer regeneration following harvest and residue treatments in a western larch-Douglas-fir forest

Forest managers often choose prescriptions that promote natural regeneration of various species that differ in relative shade tolerance. Assessing the response of forest vegetation to alternative treatments in the Inland Northwest is challenging, given that the process takes decades to unfold. In this study, conifer regeneration was...

Author(s): Sarah Jane Pierce
Year Published: 2003
Type: Document
Dissertation or Thesis
Performance of fuel treatments subjected to wildfires
www.nrfirescience.org/resource/11038
Fire severity was evaluated in eight recent wildfires with standardized methods in adjacent treated and untreated stands. Sampled sites occurred in a variety of conifer forests throughout the Western United States. Treatments included reduction of surface fuels and crown fuels, both in isolation and in combination. Synthesis of our...
Author(s): Erik J. Martinson, Philip N. Omi
Year Published: 2003
Type: Document
Conference Proceedings

Combining simulation and optimization for evaluating the effectiveness of fuel treatments for four different fuel conditions at landscape scales
www.nrfirescience.org/resource/8431
The effectiveness of applying landscape level fuel treatments is analysed for four different landscape conditions by using both simulation and optimization. The four landscape conditions in the Bitterroot National Forest, Montana, represent a gradient of fuel conditions ranging from light, scattered, to heavy concentrated fuels....
Author(s): Jimmie D. Chew, J. Greg Jones, Christine Stalling, Janet Sullivan, Steve Slack
Year Published: 2003
Type: Document
Conference Proceedings

Use of fire and silvicultural techniques for whitebark pine restoration successes, caveats, and assessment techniques
www.nrfirescience.org/resource/10982
Whitebark pine (Pinus albicaulis) is a keystone species in upper subalpine forests of many parts of the northern Rocky Mountains and Cascades in the United States and Canada. These diverse ecosystems have been declining in parts of its range because of recent mountain pine beetle (Dentroctonous ponderosae) and blister rust (...)
Author(s): Robert E. Keane, Katherine Kendall, Robert Crabtree
Year Published: 2002
Type: Document
Conference Proceedings

Effect of thinning and prescribed burning on crown fire severity in ponderosa pine forests
www.nrfirescience.org/resource/8121
Fire exclusion policies have affected stand structure and wildfire hazard in north American ponderosa pine forests. Wildfires are becoming more severe in stands where trees are densely stocked with shade-tolerant understory trees. Although forest managers have been employing fuel treatment techniques to reduce wildfire hazard for...
Author(s): Jolie Pollet, Philip N. Omi
Year Published: 2002
Type: Document
Book or Chapter or Journal Article

Simulating fire hazard reduction, wood flows, and economics of fuel treatments with FVS, FEEMA, and FIA data
www.nrfirescience.org/resource/8432
This paper demonstrates protocols to analyze and illustrate trends in the long-term effects of repeated
The objectives of this analysis are to determine the effectiveness of two stand treatment options designed to immediately reduce and maintain lower wildfire hazards. Long...

Author(s): Glenn A. Christensen, Roger D. Fight, R. James Barbour
Year Published: 2002
Type: Document
Conference Proceedings

**Bird counts of burned versus unburned big sagebrush sites**
[www.nrfirescience.org/resource/11090](http://www.nrfirescience.org/resource/11090)
Burned-over big sagebrush sites dominated by perennial grasses supported fewer species of birds and fewer total number of birds than sites of unburned big sagebrush sites.

Author(s): Bruce L. Welch
Year Published: 2002
Type: Document
Research Brief or Fact Sheet

**Ponderosa pine ecosystems restoration and conservation: steps toward stewardship; April 25-27, 2000; Flagstaff, AZ**
[www.nrfirescience.org/resource/11888](http://www.nrfirescience.org/resource/11888)
This volume is divided into three sections: (1) Ecological, Biological, and Physical Science; (2) Social and Cultural; and (3) Economics and Utilization. Effective ecological restoration requires a combination of science and management. The authors of the first section exemplified this integration in the course of addressing a broad...

Author(s): Regina K. Vance, Carleton B. Edminster, W. Wallace Covington, Julie A. Blake
Year Published: 2001
Type: Document
Conference Proceedings

**Manipulations to regenerate aspen ecosystems**
[www.nrfirescience.org/resource/11882](http://www.nrfirescience.org/resource/11882)
Vegetative regeneration of aspen can be initiated through manipulations that provide hormonal stimulation, proper growth environment, and sucker protection - the three elements of the aspen regeneration triangle. The correct course of action depends upon a careful evaluation of the size, vigor, age, and successional status of the...

Author(s): Wayne D. Shepperd
Year Published: 2001
Type: Document
Conference Proceedings

**Can the fire-dependent whitebark pine be saved?**
[www.nrfirescience.org/resource/7927](http://www.nrfirescience.org/resource/7927)
In recent decades, whitebark pine has been declining due to epidemics and fire exclusion (Keane and Arno 1993; Kendall and Arno 1990). In the northern Rocky Mountains, a project is underway to explore the feasibility of using fire and silviculture to restore the tree's high-elevation habitat.

Author(s): Robert E. Keane
Year Published: 2001
Type: Document
Book or Chapter or Journal Article, Synthesis
Alternative ponderosa pine restoration treatments in the western United States
www.nrfirescience.org/resource/8409
Compared to presettlement times, many ponderosa pine forest of the United States are now more dense and have greater quantities of fuels. Widespread treatments are needed in these forests to restore ecological integrity and to reduce the risk of uncharacteristically severe fires. Among possible restorative treatments, however, the...
Author(s): James D. McIver, Charles P. Weatherspoon, Carleton B. Edminster
Year Published: 2001
Type: Document
Conference Proceedings

Mixed-severity fire regimes in the Northern Rocky Mountains: consequences of fire exclusion and options for the future
www.nrfirescience.org/resource/8426
Findings from fire history studies have increasingly indicated that many forest ecosystems in the northern Rocky Mountains were shaped by mixed-severity fire regimes, characterized by fires of variable severities at intervals averaging between about 30 and 100 years. Perhaps because mixed-severity fire regimes and their resulting...
Author(s): Stephen F. Arno, David J. Parsons, Robert E. Keane
Year Published: 2000
Type: Document
Conference Proceedings, Synthesis

The use of shaded fuelbreaks in landscape fire management
www.nrfirescience.org/resource/8372
Shaded fuelbreaks and larger landscape fuel treatments, such as prescribed fire, are receiving renewed interest as forest protection strategies in the western United States. The effectiveness of fuelbreaks remains a subject of debate because of differing fuelbreak objectives, prescriptions for creation and maintenance, and their...
Author(s): James K. Agee, Bernhard Bahro, Mark A. Finney, Philip N. Omi, David B. Sapsis, Carl N. Skinner, Jan W. van Wagendonk, Charles P. Weatherspoon
Year Published: 2000
Type: Document
Book or Chapter or Journal Article, Synthesis

The Fire and Fire Surrogates Study: providing guidelines for fire in future forest watershed management decisions
www.nrfirescience.org/resource/8434
As part of the 1998 Joint USDA/USDI Fire Science Program, the Fire and Fire Surrogates Study was proposed to establish and evaluate cross-comparisons of fuels treatment practices and techniques to reduce wildfire risk. This study evaluates prescribed fire, thinning, and various mechanical treatment methods for treating, removing, or...
Author(s): Carleton B. Edminster, Charles P. Weatherspoon, Daniel G. Neary
Year Published: 2000
Type: Document
Conference Proceedings

An overview of the fire and fuels extension to the forest vegetation simulator
www.nrfirescience.org/resource/11037
The Fire and Fuels Extension (FFE) to the Forest Vegetation Simulator (FVS) has been developed to assess the risk, behavior, and impact of fire in forest ecosystems. This extension to the widely-used
stand-dynamics model FVS simulates the dynamics of snags and surface fuels as they are affected by stand management (of trees or fuels).

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

**Year Published:** 2000

**Type:** Document

**Conference Proceedings**

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**Fire applications in ecosystem management**

[www.nrfirescience.org/resource/10965](http://www.nrfirescience.org/resource/10965)

Decades of fire absence from ponderosa pine/Douglas fir forests has resulted in overstocked, unhealthy, and severe fireprone stands requiring management attention. Prescribed fire can be used in three general situations during restoration management. First is when fuel loadings are excessive from either natural accumulation or...

**Author(s):** Michael G. Harrington

**Year Published:** 2000

**Type:** Document

**Conference Proceedings**

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**Ecosystem-based management in the whitebark pine zone**

[www.nrfirescience.org/resource/11892](http://www.nrfirescience.org/resource/11892)

Declining whitebark pine (Pinus albicaulis) forests have necessitated development of innovative methods to restore these ecologically valuable, high elevation ecosystems. We have begun an extensive restoration study using prescribed fire and silvicultural cuttings to return native ecological processes to degenerating whitebark pine...

**Author(s):** Robert E. Keane, Stephen F. Arno, Catherine A. Stewart

**Year Published:** 2000

**Type:** Document

**Conference Proceedings**

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**Synergy between ecological needs and economic aspects of ecosystem restoration**

[www.nrfirescience.org/resource/11050](http://www.nrfirescience.org/resource/11050)

The implementation of properly designed treatments to restore and sustain desired forest conditions in the Inland Northwest, besides moving forest stands more rapidly to an ecologically desirable and sustainable condition, can generate positive revenues from the timber to be removed. These treatments also have potential to increase...

**Author(s):** Charles E. Keegan, Carl E. Fiedler

**Year Published:** 2000

**Type:** Document

**Technical Report or White Paper**

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**Ecosystem-based management in the lodgepole pine zone**

[www.nrfirescience.org/resource/10963](http://www.nrfirescience.org/resource/10963)

The significant geographic extent of lodgepole pine (Pinus contorta) in the interior West and the large proportion within the mixed-severity fire regime has led to efforts for more ecologically based management of lodgepole pine. New research and demonstration activities are presented that may provide knowledge and techniques to...

**Author(s):** Colin C. Hardy, Robert E. Keane, Catherine A. Stewart

**Year Published:** 2000

**Type:** Document

**Conference Proceedings**
The varied topics presented in these symposium proceedings represent the diverse nature of the Bitterroot Ecosystem Management Research Project (BEMRP). Separated into six sections, the papers cover the different themes researched by BEMRP collaborators as well as brief overviews of five other ecosystem management projects. The...

Author(s): Helen Y. Smith
Year Published: 2000
Type: Document
Conference Proceedings

Ecosystem-based management at lower elevations
www.nrfirescience.org/resource/8423
Our experience testing ecosystem-based management (EM) treatments in ponderosa pine (Pinus ponderosa)/fir (Abies spp.) is summarized here. Topics covered include silvicultural treatments, fire application, soils and nutrient considerations, wildlife habitat considerations, associated riparian communities, and treatment of invasive...

Author(s): Stephen F. Arno
Year Published: 2000
Type: Document
Conference Proceedings

Associated riparian communities
www.nrfirescience.org/resource/10962
Some 100 years of fire exclusion in the Interior Northwest has resulted in riparian areas dominated by dense thickets of shade-tolerant trees. If former, more open conditions could be restored, these habitats could once more support a more diverse bird community. Efforts toward this at two study sites are described.

Author(s): Colin C. Hardy, Robert E. Keane, Michael G. Harrington
Year Published: 2000
Type: Document
Conference Proceedings

Effects of selection harvest and prescribed fire on the soil nitrogen status of ponderosa pine forests
www.nrfirescience.org/resource/8272
One hundred years of timber harvest and reduced fire frequency have resulted in the conversion of once open stands of ponderosa pine (Pinus ponderosa) forests to dense forests dominated by Douglas-fir (Pseudotsuga menziesii). Selection harvest and harvest with prescribed fire have been identified as possible tools to restore...

Author(s): Thomas H. DeLuca, Kristin L. Zouhar
Year Published: 2000
Type: Document
Book or Chapter or Journal Article

Silvicultural treatments
www.nrfirescience.org/resource/11891
Sustainable, ecologically-based management of pine/fir forests requires silviculturists to integrate several treatments that emulate historic disturbance processes. Restoration prescriptions typically
include cleaning or heavy understory thinning, improvement cutting to reduce the proportion of firs, and modified selection cutting...

Author(s): Carl E. Fiedler
Year Published: 2000
Type: Document
Conference Proceedings

Use of the helitorch to enhance diversity on riparian corridors in mature pinyon-juniper communities: a conceptual approach
www.nrfirescience.org/resource/12109
As pinyon-juniper have increased their dominance throughout the Great Basin, other perennial plants have declined in abundance. Riparian areas traditionally have the greatest biodiversity found in the region. The increase of pinyon-juniper can generally be attributed to a change in the disturbance regime. To increase the plant...

Author(s): G. Allen Rasmussen, Robin J. Tausch, Stephen C. Bunting
Year Published: 1999
Type: Document
Conference Proceedings

The effects of thinning and similar stand treatments on fire behavior in western forests
www.nrfirescience.org/resource/11183
In the West, thinning and partial cuttings are being considered for treating millions of forested acres that are overstocked and prone to wildfire. The objectives of these treatments include tree growth redistribution, tree species regulation, timber harvest, wildlife habitat improvement, and wildfire-hazard reduction. Depending on...

Author(s): Russell T. Graham, Alan E. Harvey, Theresa B. Jain, Jonalea R. Tonn
Year Published: 1999
Type: Document
Technical Report or White Paper

Applying simulation and optimization to plan fuel treatments at landscape scales
www.nrfirescience.org/resource/11067
Fuel treatment activities are analyzed at the landscape scale by using both simulation and optimization. Simulating vegetative patterns and processes at landscape scales (SIMPPLLE), a stochastic simulation modeling system, is initially applied to assess wildfire risks on the current landscape without management treatments but with...

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

Fire hazard and potential treatment effectiveness: a statewide assessment in Montana
www.nrfirescience.org/resource/8174
This assessment of Montana used data collected from Forest Inventory and Analysis (FIA) plots across Montana and summarized by forest type, density, and structure. The focus of the analysis was on ponderosa pine/Douglas fir/ dry mixed conifer forests that had historically seen low-intensity fires. Applying the Fire and Fuels...

Author(s): Carl E. Fiedler, Charles E. Keegan, Daniel P. Wichman, Stephen F. Arno
Year Published: 1999
Type: Document
Book or Chapter or Journal Article
Fuel reduction in residential and scenic forests: a comparison of three treatments in a western Montana ponderosa pine stand
www.nrfirescience.org/resource/11242
Three contrasting thinning treatments to reduce fire hazard were implemented in a 100-year-old ponderosa pine/Douglas-fir (Pinus ponderosa/Pseudotsuga menziesii) stand on the Lolo National Forest, MT. All treatments included a commercial thinning designed to reduce crown fuels and provide revenue to offset costs. The treatments are...
Author(s): Joe H. Scott
Year Published: 1998
Type: Document
Technical Report or White Paper

Environmental assessment: Tenderfoot Creek Experimental Forest - Vegetative treatment research project, Kings Hill Ranger District, Lewis and Clark National Forest, Meagher County, Montana
www.nrfirescience.org/resource/11513
Environmental assessment of the Tenderfoot Research Project. This research project proposes to harvest timber in two treatment subwatersheds, Spring Park Creek and Sun Creek. The silvicultural system proposed is a two-aged system termed 'shelterwood with reserves,' that uses even distribution of single or small groups and uneven...
Author(s): Gloria E. Flora, Ward W. McCaughey
Year Published: 1998
Type: Document
Management or Planning Document

Miller Creek Demonstration Forest - A forest born of fire: a field guide
www.nrfirescience.org/resource/11239
Miller Creek, on the Flathead National Forest in northwest Montana, is a demonstration forest, showing up to 30 years of forest change after clearcutting and a wide range of fire treatments in 1967 and 1968. Differences in tree regeneration and vegetation development are explained for units that were clearcut and prescribed burned....
Author(s): Penelope A. Latham, Raymond C. Shearer, Kevin L. O'Hara
Year Published: 1998
Type: Document
Technical Report or White Paper

Reduce fire hazards in ponderosa pine by thinning
www.nrfirescience.org/resource/8148
Forest stands of fire-dependent ponderosa pine cover about 40 million acres (16 million ha) in the Western United States. Ponderosa pine is commonly found in pure stands on dry sites, but in more moist conditions, it is associated with Douglas-fir, lodgepole pine, western larch, and others. Historically, these were often widely...
Author(s): Joe H. Scott
Year Published: 1998
Type: Document
Book or Chapter or Journal Article

Appendix A - Biological assessment, TCEF research project for Lewis and Clark National Forest
www.nrfirescience.org/resource/11505
An environmental analysis has been prepared which describes and evaluates the management alternatives for the timber harvest and burning within the Tenderfoot Creek Experimental Forest (TCEF) project area. The project area lies within the headwaters of the Tenderfoot drainage of the Lewis and Clark National Forest. The purpose of...

**Author(s): Donald Godtel**
**Year Published:** 1998
**Type:** Document
**Management or Planning Document**

**Effects of slash pile burning on the physical and chemical soil properties of Vassar soils**
[www.nrfirescience.org/resource/13125](www.nrfirescience.org/resource/13125)

To determine the initial effects of slash pile burning on chemical and physical properties in the Vassar soil series, mineral soil samples from two depths (2.5 cm and 12.5 cm) were collected before and after burning slash piles of four fuel loadings (0.5 m, 1 m, 2 m and 3 m) over wet and dry soils, as well as from burned and...

**Author(s): Brian P. Oswald, Douglas Davenport, Leon F. Neuenschwander**
**Year Published:** 1998
**Type: Document**
**Book or Chapter or Journal Article**

**Modeling effects of prescribed fire on wildlife habitat: stand structure, snag recruitment and coarse woody debris**
[www.nrfirescience.org/resource/11027](www.nrfirescience.org/resource/11027)

Tenderfoot Creek Experimental Forest is used as a case study to model the effects of prescribed fire and silvicultural treatments on stand structure, snag recruitment, and coarse woody debris. The Forest Vegetation Simulator (FVS) and the Fire and Fuels Extension simulate the effects of the following treatment prescriptions:...

**Author(s): Colin C. Hardy, Elizabeth D. Reinhardt**
**Year Published:** 1998
**Type: Document**
**Conference Proceedings**

**Managerial and institutional factors affect prescribed burning costs**
[www.nrfirescience.org/resource/7931](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**

**Restoring fire in lodgepole pine forests of the Intermountain West**
[www.nrfirescience.org/resource/8347](www.nrfirescience.org/resource/8347)

We are developing new management treatments for regenerating and sustaining lodgepole pine (Pinus contorta) forests through emulation of natural disturbance processes. Lodgepole pine is the principal forest cover on over 26 million hectares in western North America. While infrequent, stand replacing fires following mountain pine...

**Author(s): Colin C. Hardy, Ward W. McCaughey**
**Year Published:** 1997
Harvesting cost model for small trees in natural stands in the interior northwest

Data from numerous published studies were combined to estimate the costs of harvesting small trees in natural stands in the Interior Northwest of North America. This article discusses cost estimates for harvesting small trees in natural stands in the Interior Northwest of North America. The cost relationships for six harvesting...

Author(s): Colin C. Hardy
Year Published: 1996
Type: Document
Technical Report or White Paper

Prescribed fire applications: restoring ecological structure and process in ponderosa pine forests

The decision to include the fire process as part of a restoration treatment for a particular forest site is most logically made in conjunction with the decision for a silvicultural treatment. In other words, forest managers do not typically wait to visually or quantitatively evaluate the post harvest site before deciding whether or...

Author(s): Michael G. Harrington
Year Published: 1996
Type: Document
Technical Report or White Paper

The role of fire in Research Natural Areas in the Northern Rockies and Pacific Northwest

Forest Service Research Natural Areas are established to preserve examples of all significant natural ecosystems for comparison with those influenced and/or managed by humans, to provide educational and research areas for ecological and environmental studies, and to preserve gene pools for typical and rare and endangered species....

Author(s): Sarah E. Greene, Angela Evenden
Year Published: 1996
Type: Document
Technical Report or White Paper

Silvicultural applications: restoring ecological structure and process in ponderosa pine forests

A primary goal of restoration treatments in ponderosa pine (Pinus ponderosa)/fir forests is to create more open stand structures, thereby improving tree vigor and reducing vulnerability to insects, disease, and severe fire. An additional goal in some stands is to manipulate existing species composition and site conditions to favor...

Author(s): Carl E. Fiedler
Year Published: 1996
Type: Document
Technical Report or White Paper

Wildfire and salvage logging: recommendations for ecologically sound post-fire salvage logging and other post-fire treatments on federal lands in the West
From the text: ‘This paper offers a scientific framework of principles and practices that are provided to guide development of federal policy concerning wildfire and salvage logging and other post-fire treatments. A common thread throughout the recommendations is that most native species are adapted to natural patterns and...

Author(s): R.L. Beschta, Christopher A. Frissell, R. Gresswell, R. Hauer, James R. Karr, G. Wayne Minshall, David A. Perry, Jonathan J. Rhodes
Year Published: 1995
Type: Document
Technical Report or White Paper

Prescribed burning considerations in sagebrush annual grassland communities

Prescribed burning can be an effective tool to manage sagebrush grasslands. However, burning prescriptions for sagebrush grasslands vary depending on the management objectives, species composition of the community, and location. To develop successful fire prescriptions in these communities, consideration must first be given to the...

Author(s): G. Allen Rasmussen
Year Published: 1994
Type: Document
Conference Proceedings, Technical Report or White Paper

Natural revegetation of burned and unburned clearcuts in western larch forests of northwest Montana

In 1967 and 1968, seven south- and east-facing units, averaging 4-ha each, in a western larch forest of northwest Montana were (1) clearcut and burned by prescribed fire or wildfire, (2) clearcut and unburned, or (3) uncut and burned by wildfire. More than 20 years of forest succession data from permanent transects show that fire...

Author(s): Raymond C. Shearer, Peter F. Stickney
Year Published: 1991
Type: Document
Technical Report or White Paper

Woody fuel and duff consumption by prescribed fire in northern Idaho mixed conifer logging slash

Describes results of prescribed burning 36 plots in northern Idaho mixed conifer logging slash. Fuel characteristics and methods for predicting duff and woody fuel consumption are reported. Guidelines are included for developing fire prescriptions.

Author(s): Elizabeth D. Reinhardt
Year Published: 1991
Type: Document
Technical Report or White Paper

Twenty-year natural regeneration following five silvicultural prescriptions in spruce-fir forests of the intermountain west

No single combination of five cutting-site preparation treatments resulted in superior natural regeneration in spruce-fir stands in Wyoming, Utah, and Idaho. Best results were generally obtained by partial cutting, with minimal disturbance of litter and organic matter, especially on harsh, high-elevation
User’s guide to version 2 of the Regeneration Establishment Model: part of the Prognosis Model
www.nrfirescience.org/resource/11148
Version 2 of the Regeneration Establishment Model is part of version 6 of the Prognosis Model for Stand Development. The regeneration model predicts results of regeneration harvests for most site and stand conditions found in the Northern Rocky Mountains. The model is based on analysis of 12,128 1/300-acre plots sampled in forests...

Silvicultural management alternatives for whitebark pine
www.nrfirescience.org/resource/19287
Whitebark pine (Pinus albicaulis) has received little management emphasis except in the past 10 years. Silvicultural treatment of whitebark pine is starting to draw increased interest as attention is focused on the species and its potential management. The objective of this paper is to summarize what is currently known about the...

Streamflow and water quality responses to preharvest prescribed burning in an undisturbed ponderosa pine watershed
www.nrfirescience.org/resource/18551
[from the text] Forest history studies (Arno 1980, Dieterich 1983) indicate that before fire suppression was initiated at the start of this century, most forest fires were surface fires. These fires reduced fire hazards and improved stand conditions by preparing seedbeds, thinning advance regeneration, and retarding the invasion of...

Vegetation response to helicopter logging and broadcast burning in Douglas-fir habitat types at Silver Creek, central Idaho
www.nrfirescience.org/resource/11963
Shrub frequency, cover, and height, and herb frequency and cover were measured on plots from two Douglas-fir habitat types in three cutting units. The plots were measured prior to helicopter yarding and broadcast burning and then 1, 2, 5, and 10 years later. The broadcast burning was more severe on one cutting unit than the other...
**Effects of fire in the northern Great Plains**  
[www.nrfirescience.org/resource/11184](http://www.nrfirescience.org/resource/11184)  
Fire has been used inconsistently to manage native and tame grasslands in the Northern Great Plains (NGP) of the north-central U.S. and south-central Canada, particularly the grasslands found in prairies, plains, agricultural land retirement programs, and moist soil sites. This has happened for three primary reasons: (1) the...  
Author(s): Kenneth F. Higgins, Arnold D. Kruse, James L. Piehl  
Year Published: 1989  
Type: Document  
Synthesis, Technical Report or White Paper

**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

**Guidelines for prescribed burning sagebrush-grass rangelands in the northern Great Basin**  
[www.nrfirescience.org/resource/11256](http://www.nrfirescience.org/resource/11256)  
Summarizes recent literature on the effects of fire on sagebrush-grass vegetation. Also outlines procedures and considerations for planning and conducting prescribed fires and monitoring effects. Includes a comprehensive annotated bibliography of the fire-sagebrush-grass literature published since 1980.  
Author(s): Stephen C. Bunting, Bruce M. Kilgore, Charles L. Bushey  
Year Published: 1987  
Type: Document  
Technical Report or White Paper

**Guide to understory burning in ponderosa pine-larch-fir forests in the Intermountain West**  
[www.nrfirescience.org/resource/11255](http://www.nrfirescience.org/resource/11255)  
Summarizes the objectives, prescriptions, and techniques used in prescribed burning beneath the canopy of ponderosa pine stands, and stands of ponderosa pine mixed with western larch, Douglas-fir, and grand fir. Information was derived from 12 districts in two USDA Forest Service Regions and seven National Forests in Montana and...  
Author(s): Bruce M. Kilgore, George A. Curtis  
Year Published: 1987  
Type: Document  
Technical Report or White Paper

**Use of prescribed burning in juniper and pinyon-juniper woodlands**  
[www.nrfirescience.org/resource/12118](http://www.nrfirescience.org/resource/12118)  
Postfire succession in juniper and pinyon-juniper is primarily dependent upon the potential of the site, the preburn plant community and the characteristics of the fire. The successful use of prescribed burning is dependent upon the appropriate selection of treatment sites. As juniper and pinyon become
Using prescribed fire to reduce the risk of large wildfires: a break-even analysis

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.

Prescribed fire opportunities in grasslands invaded by Douglas-fir: state-of-the-art guidelines

Provides information on use of prescribed fire to enhance productivity of bunchgrass ranges that have been invaded by Douglas-fir. Six vegetative "situations" representative of treatment opportunities most commonly encountered in Montana are discussed. Included are fire prescription considerations and identification of the resource.

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

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

Site treatments influence development of a young mixed-species western larch stand

More intensive management could be applied to many young stands in conifer forests of the Northern Rockies. Vast areas are stocked with stands that contain a mixture of conifer species. An important mixed species cover type in this region is the western larch type (formerly called the larch-Douglas-fir type).
Fire, logging, and white-tailed deer interrelationships in the Swan Valley, northwestern Montana

www.nrfirescience.org/resource/11056

The historical importance of fire was investigated on the upper Swan Valley winter white-tailed deer range in northwestern Montana. The relatively recent impacts of logging on winter range quality were also included in these studies. Fire exclusion has led to successional development of once open-canopied mature seral forests, and...

Author(s): June D. Freedman, James R. Habeck
Year Published: 1985
Type: Document
Conference Proceedings, Technical Report or White Paper

A summary of ponderosa pine (Pinus ponderosa) management activities in the Lick Creek Drainage of the Bitterroot National Forest

www.nrfirescience.org/resource/13371

The objective of this thesis was to summarize 80 years of changes associated with several cutting regimes in the Lick Creek Drainage. The Lick Creek Drainage was first selectively cut in 1906, followed by several commercial and precommercial thinnings occurring in the late 1950's through the early 1980's. Permanent...

Author(s): James P. Menakis
Year Published: 1985
Type: Document
Dissertation or Thesis

Intensive utilization with conventional harvesting systems

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

Damage from logging and prescribed burning in partially cut Douglas-fir stands

www.nrfirescience.org/resource/11928

Damage from tractor logging and slash burning in a Douglas-fir stand on gentle terrain was measured for three different types of timber harvesting. Logging damage was light in the selection-cut and understory-removal cutting units. In the overstory-removal unit, about 11 percent of the leave trees were killed by logging. Little...

Author(s): Robert E. Benson
Year Published: 1980
Type: Document
Research Brief or Fact Sheet

Influence of harvesting and residues on fuels and fire management

www.nrfirescience.org/resource/13134

Fuel and fire behavior potential in clearcut lodgepole pine and in Douglas-fir/larch under clearcutting, group selection, and shelterwood silvicultural systems were compared after logging to near-complete and conventional utilization standards. Fuels and fire behavior potentials were unaffected by silvicultural...
Postharvest residue burning under alternative silvicultural practices

Prescribed burning of logging slash was done in clearcut, overstory removal, and understory cutting units in a Douglas-fir stand on the Lubrecht Experimental Forest near Missoula, Mont. The burning prescriptions and actual burning conditions are described. Data on preharvest, post-harvest, and postburn conditions are reported.

Author(s): Robert W. Steele
Year Published: 1980
Type: Document
Research Brief or Fact Sheet

Fire ecology and prescribed burning in the Great Plains: a research review

Historical evidence indicates that fires were prevalent in grasslands. In the past, big prairie fires usually occurred during drought years that followed 1 to 3 years of above-average precipitation, which provided abundant and continuous fuel. Fire frequency probably varied from 5 to 10 years in level-to-rolling topography and from...

Author(s): Henry A. Wright, Arthur W. Bailey
Year Published: 1980
Type: Document
Technical Report or White Paper

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

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

A review of some interactions between harvesting, residue management, fire, and forest insects and diseases

Many species of insects and diseases create residues that predispose forests to fire. Conversely, natural factors such as fire, wind-throw, and other agents create forest residues that predispose forests to diseases and insects, including bark and cambium beetles, wood borers, and others. Man-made residues also predispose forests to...

Author(s): David G. Fellin
Year Published: 1979
Type: Document
Technical Report or White Paper
Elk-aspen relationships on a prescribed burn
www.nrfirescience.org/resource/11924
Elk use of aspen alones was deterred only one winter following prescribed fire. Numbers of aspen suckers on the nine burned clones increased 178 percent in 3 years, but the response varied greatly among clones. Elk browsing the third winter after burning averaged 44 percent of current annual growth, and eliminated incremental height...
Author(s): Joseph V. Basile
Year Published: 1979
Type: Document
Research Brief or Fact Sheet

The role and use of fire in sagebrush-grass and pinyon-juniper plant communities: a state-of-the-art review
www.nrfirescience.org/resource/11908
Fire frequencies averaged 32 to 70 years in sagebrush-grass communities. Early spring and late fall fires are the least harmful to perennial grasses, although small plants and those with coarse stems are more tolerant of fire than large plants and those with leafy stems. Cheatgrass can be suppressed by burning in early summer, but...
Author(s): Henry A. Wright, Leon F. Neuenschwander, Carlton M. Britton
Year Published: 1979
Type: Document
Synthesis, Technical Report or White Paper

Effects of burning moist fuels on seedbed preparation in cutover western larch forests
www.nrfirescience.org/resource/11955
In early September 1975, two clearcuts (14 and 17 acres; 5.7 and 6.9 ha), two sets of 4 small clearcuts (1.5 acres; 0.6 ha each), and one shelterwood cutting (22 acres; 8.9 ha) were broadcast burned principally for seedbed preparation and fuel reduction on the Coram Experimental Forest. The objective was to develop a model for...
Author(s): Donald K. Artley, Raymond C. Shearer, Robert W. Steele
Year Published: 1978
Type: Document
Technical Report or White Paper

Preliminary guidelines for prescribed burning under standing timber in western larch/Douglas-fir forests
www.nrfirescience.org/resource/11113
Guidelines are offered for safe, effective fire treatments in western larch/Douglas-fir forests. Describes procedures for estimating and limiting the scorching of tree crows. Provides a method for predicting percentage of the forest floor that will be burned down to mineral soil.
Author(s): Rodney A. Norum
Year Published: 1977
Type: Document
Research Brief or Fact Sheet

Intensive fiber utilization and prescribed fire: effects on the microbial ecology of forests
www.nrfirescience.org/resource/12150
Reviews current knowledge of the effects of intensive wood utilization, prescribed burning, or a combination of both treatments, on the microbial ecology of forest soils. Identifies additional research that must be done to fill voids in knowledge.
Author(s): Alan E. Harvey, Martin F. Jurgensen, Michael J. Larsen
Wildland fires and dwarf mistletoes: a literature review of ecology and prescribed burning
www.nrfirescience.org/resource/12412
Wildfires play a multiple role in the distribution of dwarf mistletoes - they may either inhibit or encourage these parasites depending primarily on the size and intensity of the burn. Many reports suggest that fire exclusion policies of the past half century have resulted in increased dwarf mistletoe levels as, well as increased...
Author(s): Martin E. Alexander, Frank G. Hawksworth
Year Published: 1975
Type: Document
Synthesis, Technical Report or White Paper

Clearcutting and burning slash alter quality of stream water in northern Idaho
www.nrfirescience.org/resource/11949
Three cutting units of varying size, soil, and aspect located along streams in the Priest River Experimental Forest in northern Idaho were chosen for evaluation of changes in water quality caused by clearcutting and subsequent burning of slash. Water sampling stations were established on each creek-upstream, downstream, and on the...
Author(s): Gordon G. Snyder, Harold F. Haupt, George H. Belt
Year Published: 1975
Type: Document
Technical Report or White Paper

Erosional effects of wildfire and logging in Idaho
www.nrfirescience.org/resource/18602
The effects of wildfire and logging on erosion from two small catchments of the Pine Creek drainage in Idaho, USA, were investigated. One catchment was clearfelled in 1972 and a wildfire burned in the study areas in 1973. The fire was more intense on the clear felled area (estimated fuels were 90 and 10 tons/acre on felled and...
Author(s): Walter F. Megahan, D. C. Molitor
Year Published: 1975
Type: Document
Conference Proceedings

Lodgepole pine logging residues: management alternatives
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

30 years of vegetation change following burning of sagebrush-grass range
www.nrfirescience.org/resource/15395
A sagebrush-grass range was burned according to plan in 1936. Long-term results show that sagebrush yields have increased while most other important shrub, grass, and forb yields have decreased. Evaluation by subspecies of sagebrush was helpful in interpreting sagebrush behavior. The return of sagebrush shows the need for planning...

Author(s): Roy O. Harniss, Robert B. Murray
Year Published: 1973
Type: Document
Book or Chapter or Journal Article

Prescribed fire planning in the Intermountain West
www.nrfirescience.org/resource/11936
Prescribed fire has been used in the forests of the Intermountain West since 1910. It is employed for site preparation for planting or seeding, hazard reduction, livestock range and wildlife habitat improvement, cover type conversion, and insect or disease control. The major advantage of fire for all these objectives is its low cost...

Author(s): William R. Beaufait
Year Published: 1966
Type: Document
Technical Report or White Paper

Fuel treatment for patch clear cuts on the Sloan-Venally timber sale
www.nrfirescience.org/resource/12797
The goal of this project is to ensure that post harvest 0-3 inch fuel loading, on the patch clear cuts within the Sloan-Kennally timber sale, will be in compliance with Forest Service Manual - 5100, Payette National Forest Supplement 5100-93-1, standards. In order to meet this goal the existing 0-3 inch fuel loading on the...

Author(s): Tyler Bentley
Type: Document
Management or Planning Document, Technical Report or White Paper