

## **Physical and chemical characteristics of surface fuels in masticated mixed-conifer stands of the U.S. Rocky Mountains**

[www.nrfirescience.org/resource/16749](http://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

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

[www.nrfirescience.org/resource/16753](http://www.nrfirescience.org/resource/16753)

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

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

[www.nrfirescience.org/resource/16563](http://www.nrfirescience.org/resource/16563)

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

## **Mulching fuels treatments promote understory plant communities in three Colorado, USA, coniferous forest types**

[www.nrfirescience.org/resource/14906](http://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

Book or Chapter or Journal Article

## **Wildland fire risk reduction: a Government Accountability Office report**

[www.nrfirescience.org/resource/15283](http://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

### **Importance of fuel treatment for limiting moderate-to-high intensity fire: Findings from comparative fire modeling**

[www.nrfirescience.org/resource/16502](http://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

### **Prescribed burning in ponderosa pine: fuel reductions and redistributing fuels near boles to prevent injury**

[www.nrfirescience.org/resource/15214](http://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

### **Decomposition rates of surface and buried forest-floor material**

[www.nrfirescience.org/resource/16459](http://www.nrfirescience.org/resource/16459)

Mechanical site preparation is assumed to reduce soil C stocks by increasing the rate at which the displaced organic material decomposes, but the evidence is equivocal. We measured rates of C loss of forest-floor material in mesh bags either placed on the surface or buried in the mineral soil at four sites in different regional...

Author(s): Cindy E. Prescott, Anya Reid, Shu Yao Wu, Marie-Charlotte Nilsson

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](http://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...

Author(s): Michael S. Schaedel, Andrew J. Larson, David L.R. Affleck, R. Travis Belote, John M.

Goodburn, David K. Wright, Elaine Kennedy Sutherland  
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](http://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

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

[www.nrfirescience.org/resource/15075](http://www.nrfirescience.org/resource/15075)

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

### **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](http://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  
Book or Chapter or Journal Article

### **Effects of conifer treatments on soil nutrient availability and plant composition in sagebrush steppe**

[www.nrfirescience.org/resource/16691](http://www.nrfirescience.org/resource/16691)

Piñon-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

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

[www.nrfirescience.org/resource/15522](http://www.nrfirescience.org/resource/15522)

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

**Mortality predictions of fire-injured large Douglas-fir and ponderosa**

[www.nrfirescience.org/resource/16642](http://www.nrfirescience.org/resource/16642)

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

Book or Chapter or Journal Article

**Short-term ecological consequences of collaborative restoration treatments in ponderosa pine forests of Colorado**

[www.nrfirescience.org/resource/15484](http://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

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

[www.nrfirescience.org/resource/16572](http://www.nrfirescience.org/resource/16572)

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

Book or Chapter or Journal Article

**Mapping tree canopy cover in support of proactive prairie grouse conservation in western North America**

[www.nrfirescience.org/resource/14922](http://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

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

[www.nrfirescience.org/resource/16536](http://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

### **The effect of salvage logging on surface fuel loads and fuel moisture in beetle-infested lodgepole pine forests**

[www.nrfirescience.org/resource/15246](http://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

### **Predicting post-fire tree mortality for 12 western US conifers using the First-Order Fire Effects Model (FOFEM)**

[www.nrfirescience.org/resource/16493](http://www.nrfirescience.org/resource/16493)

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 (...)

Author(s): Sharon M. Hood, Duncan C. Lutes

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

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

[www.nrfirescience.org/resource/15134](http://www.nrfirescience.org/resource/15134)

We use the simulation model Envision to analyze long-term wildfire dynamics and the effects of

different fuel management scenarios in central Oregon, USA. We simulated a 50-year future where fuel management activities were increased by doubling and tripling the current area treated while retaining existing treatment strategies in...

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

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

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

[www.nrfirescience.org/resource/16452](http://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

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](http://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

### **Long-term effects of burn season and frequency on ponderosa pine forest fuels and seedlings**

[www.nrfirescience.org/resource/16327](http://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

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

[www.nrfirescience.org/resource/15044](http://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

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

[www.nrfirescience.org/resource/16694](http://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

**Effects of accelerated wildfire on future fire regimes and implications for the United States federal fire policy**

[www.nrfirescience.org/resource/16267](http://www.nrfirescience.org/resource/16267)

Wildland fire suppression practices in the western United States are being widely scrutinized by policymakers and scientists as costs escalate and large fires increasingly affect social and ecological values. One potential solution is to change current fire suppression tactics to intentionally increase the area burned under...

Author(s): Alan A. Ager, Ana M. G. Barros, Haiganoush K. Preisler, Michelle A. Day, Thomas A. Spies, John D. Bailey, John P. Bolte

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](http://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

**Uneven-aged silviculture can reduce negative effects of forest management on beetles**

[www.nrfirescience.org/resource/16656](http://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

### **Early forest thinning changes aboveground carbon distribution among pools, but not total amount**

[www.nrfirescience.org/resource/16641](http://www.nrfirescience.org/resource/16641)

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

### **Targeted woodland removal to recover at-risk grouse and their sagebrush-steppe and prairie ecosystems**

[www.nrfirescience.org/resource/14924](http://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

### **Wildland fire: nature's fuel treatment**

[www.nrfirescience.org/resource/14887](http://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...

Author(s): Brian Cooke

Year Published: 2016

Type: Document

Research Brief or Fact Sheet

### **A guide to fuels management in riparian areas of the Interior West**

[www.nrfirescience.org/resource/12632](http://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...

Author(s): Kathleen A. Dwire, Kristen E. Meyer, Sandra E. Ryan, Gregg M. Riegel, Timothy A. Burton

Year Published: 2016

Type: Document

Synthesis, Technical Report or White Paper

### **Incorporating resource protection constraints in an analysis of landscape fuel-treatment**

### **effectiveness in the northern Sierra Nevada, CA, USA**

[www.nrfirescience.org/resource/14012](http://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

Book or Chapter or Journal Article

### **Resolving future fire management conflicts using multicriteria decision making**

[www.nrfirescience.org/resource/13893](http://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

### **Does prescribed fire promote resistance to drought in low elevation forests of the Sierra Nevada, California, USA?**

[www.nrfirescience.org/resource/14244](http://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...

Author(s): Phillip J. van Mantgem, Anthony C. Caprio, Nathan L. Stevenson, Adrian J. Das

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](http://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

### **STANDFIRE: an IFT-DSS module for spatially explicit, 3D fuel treatment analysis**

[www.nrfirescience.org/resource/15584](http://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

### **Effectiveness and longevity of wildland fire as a fuel treatment**

[www.nrfirescience.org/resource/14440](http://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

### **Forest fuels and potential fire behaviour 12 years after variable-retention harvest in lodgepole pine**

[www.nrfirescience.org/resource/14346](http://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](http://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

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

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

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

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

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

### **Emissions from prescribed burning of timber slash piles in Oregon**

[www.nrfirescience.org/resource/14886](http://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

### **Fortifying the forest: thinning and burning increase resistance to a bark beetle outbreak and promote forest resilience**

[www.nrfirescience.org/resource/14810](http://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

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

[www.nrfirescience.org/resource/14255](http://www.nrfirescience.org/resource/14255)

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

### **Effects of prescribed fire on wildlife and wildlife habitat in selected ecosystems of North America**

[www.nrfirescience.org/resource/14715](http://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 Haufler, 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](http://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](http://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](http://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

## **Collaborative fuels reduction and restoration - Experiences from the Southwestern Crown of the Continent**

[www.nrfirescience.org/resource/13064](http://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

## **2015 National Prescribed Fire Use Survey Report**

[www.nrfirescience.org/resource/13795](http://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

### **Post-fire logging reduces surface woody fuels up to four decades following wildfire**

[www.nrfirescience.org/resource/16307](http://www.nrfirescience.org/resource/16307)

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

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

[www.nrfirescience.org/resource/13696](http://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

### **First approximations of prescribed fire risks relative to other management techniques used on private lands**

[www.nrfirescience.org/resource/13593](http://www.nrfirescience.org/resource/13593)

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

### **Effects of tree cutting and fire on understory vegetation in mixed conifer forests**

[www.nrfirescience.org/resource/12896](http://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 as 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

### **Evaluating the effectiveness of wildfire mitigation activities in the wildland-urban interface**

[www.nrfirescience.org/resource/14047](http://www.nrfirescience.org/resource/14047)

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

### **Optimizing fuel treatments to reduce wildland fire risk**

[www.nrfirescience.org/resource/13273](http://www.nrfirescience.org/resource/13273)

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

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

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

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

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

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

### **Fire, fuels, and streams: the effects and effectiveness of riparian treatments**

[www.nrfirescience.org/resource/13214](http://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

### **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](http://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

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

[www.nrfirescience.org/resource/13625](http://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

### **Fire behavior in masticated fuels: a review**

[www.nrfirescience.org/resource/12387](http://www.nrfirescience.org/resource/12387)

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

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

[www.nrfirescience.org/resource/12951](http://www.nrfirescience.org/resource/12951)

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

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

[www.nrfirescience.org/resource/12928](http://www.nrfirescience.org/resource/12928)

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

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

[www.nrfirescience.org/resource/14531](http://www.nrfirescience.org/resource/14531)

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

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

[www.nrfirescience.org/resource/12920](http://www.nrfirescience.org/resource/12920)

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**

[www.nrfirescience.org/resource/12918](http://www.nrfirescience.org/resource/12918)

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

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

[www.nrfirescience.org/resource/12674](http://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

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

[www.nrfirescience.org/resource/13104](http://www.nrfirescience.org/resource/13104)

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

### **A spatial stochastic programming model for timber and core area management under risk of fires**

[www.nrfirescience.org/resource/12386](http://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

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

[www.nrfirescience.org/resource/13003](http://www.nrfirescience.org/resource/13003)

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

### **Interagency prescribed fire planning and procedures guide**

[www.nrfirescience.org/resource/12453](http://www.nrfirescience.org/resource/12453)

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

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

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

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

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

Year Published: 2014

Type: Document

Research Brief or Fact Sheet

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

[www.nrfirescience.org/resource/12919](http://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

Type: Document

Research Brief or Fact Sheet

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

[www.nrfirescience.org/resource/12912](http://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

**Backfire technique for prescribed burning**

[www.nrfirescience.org/resource/12400](http://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

**The relationship of post-fire white ash cover to surface fuel consumption**

[www.nrfirescience.org/resource/13119](http://www.nrfirescience.org/resource/13119)

White ash results from the complete combustion of surface fuels, making it a logically simple retrospective indicator of surface fuel consumption. However, the strength of this relationship has been neither tested nor adequately demonstrated with field measurements. We measured surface fuel loads and cover fractions of white ash and...

Author(s): Andrew T. Hudak, Roger D. Ottmar, Robert E. Vihnanek, Nolan W. Brewer, Alistair M. S. Smith, Penelope Morgan

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](http://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

Type: Document

Research Brief or Fact Sheet

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

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

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

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

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

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

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

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

Author(s): Jay O'Laughlin

Year Published: 2013

Type: Document

Technical Report or White Paper

### **Optimising fuel treatments over time and space**

[www.nrfirescience.org/resource/12039](http://www.nrfirescience.org/resource/12039)

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

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

Year Published: 2013  
Type: Document  
Book or Chapter or Journal Article

### **Impacts of disturbance on the terrestrial carbon budget of North America**

[www.nrfirescience.org/resource/12404](http://www.nrfirescience.org/resource/12404)

Because it is an important regulator of terrestrial carbon cycling in North America, extensive research on natural and human disturbances has been carried out as part of the North American Carbon Program and the CarboNA project. A synthesis of various components of this research was carried out, and the results are presented in the...

Author(s): Eric S. Kasischke, Brian D. Amiro, Nichole N. Barger, Nancy H. F. French, Scott J. Goetz, Guido Grosse, Mark E. Harmon, Jeffrey A. Hicke, Shuguang Liu, Jeffrey G. Masek

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

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

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

Land management agencies face uncertain tradeoffs regarding investments in preparedness and fuels management versus future suppression costs and impacts to valued resources and assets. Prospective evaluation of fuel treatments allows for comparison of alternative treatment strategies in terms of socioeconomic and ecological impacts...

Author(s): Matthew P. Thompson, Michael S. Hand, Julie W. Gilbertson-Day, Nicole M. Vaillant, Derek J. Nalle

Year Published: 2013

Type: Document

Conference Proceedings

### **The rising Great Plains fire campaign: citizens' response to woody plant encroachment**

[www.nrfirescience.org/resource/12011](http://www.nrfirescience.org/resource/12011)

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

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](http://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](http://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

### **Public perceptions of smoke from wildfire, prescribed fire, and fire use**

[www.nrfirescience.org/resource/13483](http://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

### **Fuel moisture and prescribed burning**

[www.nrfirescience.org/resource/12397](http://www.nrfirescience.org/resource/12397)

Moisture is the overriding factor governing fuel flammability. It determines whether ignition will take place and to what depth the forest floor will be consumed. If one uses enough torch mix, he/she can ignite the immediate area, but if fuel moisture is much above 22% in pine litter or 16% in hardwood litter, a headfire is...

Author(s): Dale D. Wade

Year Published: 2013

Type: Document

Research Brief or Fact Sheet

### **Restoring forest resilience: from reference spatial patterns to silvicultural prescriptions and monitoring**

[www.nrfirescience.org/resource/14006](http://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

### **Integrated fuel/restoration treatments - Field tour at the Priest River Experimental Forest**

[www.nrfirescience.org/resource/13694](http://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

### **Social and ecological factors influencing attitudes toward the application of high-intensity prescribed burns to restore fire adapted grassland ecosystems**

[www.nrfirescience.org/resource/12401](http://www.nrfirescience.org/resource/12401)

Fire suppression in grassland systems that are adapted to episodic fire has contributed to the recruitment of woody species in grasslands worldwide. 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

Type: Document

Book or Chapter or Journal Article

### **Wildfire risk and optimal investments in watershed protection**

[www.nrfirescience.org/resource/16172](http://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

### **Fuel moisture influences on fire-altered carbon in masticated fuels: an experimental study**

[www.nrfirescience.org/resource/12021](http://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

### **Wildfire exposure and fuel management on western US national forests**

[www.nrfirescience.org/resource/12756](http://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

### **The merits of prescribed fire outweigh potential carbon emission effects**

[www.nrfirescience.org/resource/12426](http://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

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

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

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

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

Year Published: 2013

Type: Document

Book or Chapter or Journal Article

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

[www.nrfirescience.org/resource/8346](http://www.nrfirescience.org/resource/8346)

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

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

[www.nrfirescience.org/resource/8337](http://www.nrfirescience.org/resource/8337)

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...

Author(s): Bryan A. Endress, Michael J. Wisdom, Martin Vavra, Catherine G. Parks, Brian L. Dick, Bridgett J. Naylor, Jennifer M. Boyd

Year Published: 2012

Type: Document

Book or Chapter or Journal Article

**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](http://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

**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](http://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...

Author(s): Peter Z. Fule, Joseph E. Crouse, John Paul Roccaforte, Elizabeth L. Kalies

Year Published: 2012

Type: Document

Book or Chapter or Journal Article, Synthesis

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

[www.nrfirescience.org/resource/11274](http://www.nrfirescience.org/resource/11274)

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

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

[www.nrfirescience.org/resource/12600](http://www.nrfirescience.org/resource/12600)

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...

Author(s): James D. McIver, Karen Erickson, Andrew P. Youngblood

Year Published: 2012

Type: Document

Synthesis, Technical Report or White Paper

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

[www.nrfirescience.org/resource/11493](http://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...

Author(s): Malcolm P. North, Brandon M. Collins, Scott L. Stephens

Year Published: 2012

Type: Document

Book or Chapter or Journal Article

### **Burning questions for managers: fuels management practices in riparian areas**

[www.nrfirescience.org/resource/8354](http://www.nrfirescience.org/resource/8354)

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

### **Effects of fuels reductions on plant communities and soils in a piñon-juniper woodland**

[www.nrfirescience.org/resource/8326](http://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-...

Author(s): Matthew R. Ross, S. C. Castle, Nichole N. Barger

Year Published: 2012

Type: Document

Book or Chapter or Journal Article

### **Influencing public perceptions of smoke management and prescribed burning programs: an analysis of opportunities existing in communication tactics, community-based partnerships and interagency decision making**

[www.nrfirescience.org/resource/13507](http://www.nrfirescience.org/resource/13507)

Historical fire suppression efforts have led to the alteration of forest structure and fuel conditions across the United States. Correspondingly, managers are now faced with higher fuel loads and denser vegetation as well as growing forest communities and wildland-urban interface. While managers recognize the ecological benefits of...

Author(s): Danielle K. Mazzotta

Year Published: 2012

Type: Document

Dissertation or Thesis

### **Bark beetles and fire: two forces of nature transforming western forests**

[www.nrfirescience.org/resource/11984](http://www.nrfirescience.org/resource/11984)

Bark beetles are chewing a wide swath through forests across North America. Over the past few years, infestations have become epidemic in lodgepole and spruce-fir forests of the Intermountain West. The

resulting extensive acreages of dead trees are alarming the public and raising concern about risk of severe fire. Researchers...

Author(s): Gail Wells

Year Published: 2012

Type: Document

Research Brief or Fact Sheet

### **Fuel treatment impacts on estimated wildfire carbon loss from forests in Montana, Oregon, California, and Arizona**

[www.nrfirescience.org/resource/8324](http://www.nrfirescience.org/resource/8324)

Using forests to sequester carbon in response to anthropogenically induced climate change is being considered across the globe. A recent U.S. executive order mandated that all federal agencies account for sequestration and emissions of greenhouse gases, highlighting the importance of understanding how forest carbon stocks are...

Author(s): Scott L. Stephens, Ralph E. Boerner, Jason J. Moghaddas, Emily E. Y. Moghaddas, Brandon M. Collins, Christopher B. Dow, Carleton B. Edminster, Carl E. Fiedler, Danny L. Fry, Bruce R. Hartsough, Jon E. Keeley, Eric E. Knapp, James D. McIver, Carl N. Skinner

Year Published: 2012

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](http://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

### **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**

[www.nrfirescience.org/resource/8316](http://www.nrfirescience.org/resource/8316)

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...

Author(s): Andrew J. Larson, Derek J. Churchill

Year Published: 2012

Type: Document

Book or Chapter or Journal Article, Synthesis

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

[www.nrfirescience.org/resource/12579](http://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...

Author(s): Scott L. Stephens, James D. McIver, Ralph E. Boerner, Christopher J. Fettig, Joseph B. Fontaine, Bruce R. Hartsough, Patricia L. Kennedy, Dylan W. Schwilk  
Year Published: 2012  
Type: Document  
Book or Chapter or Journal Article, Synthesis

**Human relationships to fire prone ecosystems: mapping values at risk on contested landscapes**

[www.nrfirescience.org/resource/13510](http://www.nrfirescience.org/resource/13510)

A key problem in developing a better understanding of different responses to landscape level management actions, such as fuel treatments, is being able to confidently record and accurately spatially delineate the meanings stakeholders ascribe to the landscape. To more accurately understand these relationships with the Bitterroot...

Author(s): Kari Gunderson, Stephen J. Carver, Brett Davis  
Year Published: 2011  
Type: Document  
Conference Proceedings

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

[www.nrfirescience.org/resource/12630](http://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

**Can fuel-reduction treatments really increase forest carbon storage in the western US by reducing future fire emissions?**

[www.nrfirescience.org/resource/8300](http://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  
Book or Chapter or Journal Article, Synthesis

**Plains prickly pear response to fire: effects of fuel load, heat, fire weather, and donor site soil**

[www.nrfirescience.org/resource/8283](http://www.nrfirescience.org/resource/8283)

Plains prickly pear (*Opuntia polyacantha* Haw.) is common throughout the Great Plains and often becomes detrimental to agricultural production on noncultivated lands. We examined direct fire effects on plains prickly pear and mechanisms of tissue damage to facilitate development of fire prescriptions. Cladodes from clones on three...

Author(s): Lance T. Vermeire, Aaron D. Roth  
Year Published: 2011  
Type: Document  
Book or Chapter or Journal Article

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

[www.nrfirescience.org/resource/8275](http://www.nrfirescience.org/resource/8275)

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

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

Year Published: 2011

Type: Document

Book or Chapter or Journal Article

### **Restoration relevance of recent National Fire Plan treatments in forests of the western United States**

[www.nrfirescience.org/resource/8226](http://www.nrfirescience.org/resource/8226)

The US National Fire Plan (NFP) is among the largest forest-restoration initiatives worldwide, removing wildland fuels on about 11 million hectares and costing over \$6 billion. We evaluated the extent to which areas treated under the NFP-from 2004 to 2008, in forest ecosystems outside the wildland-urban interface in 11 western...

Author(s): Tania L. Schoennagel, Cara R. Nelson

Year Published: 2011

Type: Document

Book or Chapter or Journal Article

### **Restoration of whitebark pine forests in the northern Rocky Mountains, USA**

[www.nrfirescience.org/resource/11900](http://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

Conference Proceedings

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

[www.nrfirescience.org/resource/11225](http://www.nrfirescience.org/resource/11225)

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+...

Author(s): James D. Mclver, Hugh Barrett, Mark W. Brunson, Stephen C. Bunting, Jeanne C. Chambers, Carla M. D'Antonio, Paul S. Doescher, Dale Johnson, Sherm Karl, Steve Knick, Richard F. Miller, Michael L. Pellant, Frederick B. Pierson, David A. Pyke, Kimberly Rollins, Bruce A. Roundy, Eugene Schupp, Robin J. Tausch, David Turner, Michael J. Wisdom

Year Published: 2011

Type: Document

Technical Report or White Paper

## **Review of fuel treatment effectiveness in forests and rangelands and a case study from the 2007 megafires in central, Idaho, USA**

[www.nrfirescience.org/resource/11449](http://www.nrfirescience.org/resource/11449)

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: Document

Synthesis, 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](http://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

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

[www.nrfirescience.org/resource/8189](http://www.nrfirescience.org/resource/8189)

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

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

Year Published: 2010

Type: Document

Book or Chapter or Journal Article

## **Prescribed fire as a means of reducing forest carbon emissions in the western United States**

[www.nrfirescience.org/resource/8328](http://www.nrfirescience.org/resource/8328)

Carbon sequestration by forested ecosystems offers a potential climate change mitigation benefit. However, wildfire has the potential to reverse this benefit. In the western United States, climate change and land management practices have led to increases in wildfire intensity and size. One potential means of reducing carbon...

Author(s): Christine Wiedinmyer, Matthew D. Hurteau

Year Published: 2010

Type: Document

Book or Chapter or Journal Article

## **Fuel reduction management practices in riparian areas of the Western USA**

[www.nrfirescience.org/resource/12577](http://www.nrfirescience.org/resource/12577)

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

### **Biomass utilization for bioenergy in the western United States**

[www.nrfirescience.org/resource/8178](http://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

### **Restoring whitebark pine forests of the northern Rocky Mountains, USA**

[www.nrfirescience.org/resource/8394](http://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

### **Wildfire risk and hazard: procedures for the first approximation**

[www.nrfirescience.org/resource/12726](http://www.nrfirescience.org/resource/12726)

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

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

Year Published: 2010

Type: Document

Technical Report or White Paper

### **Prescribed fires as ecological surrogates for wildfires: a stream and riparian perspective**

[www.nrfirescience.org/resource/11444](http://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

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

[www.nrfirescience.org/resource/11143](http://www.nrfirescience.org/resource/11143)

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

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

[www.nrfirescience.org/resource/8206](http://www.nrfirescience.org/resource/8206)

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

**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 (FHAC)**

[www.nrfirescience.org/resource/11135](http://www.nrfirescience.org/resource/11135)

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

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

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

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

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

Year Published: 2010

Type: Document

Book or Chapter or Journal Article

**Effects of fuel treatments on carbon-disturbance relationships in forests of the Northern Rocky**

## **Mountains**

[www.nrfirescience.org/resource/8188](http://www.nrfirescience.org/resource/8188)

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

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

[www.nrfirescience.org/resource/11465](http://www.nrfirescience.org/resource/11465)

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

Author(s): Paul F. Hessburg, Keith M. Reynolds, Robert E. Keane, Kevin M. James, R. Brion Salter

Year Published: 2010

Type: Document

Technical Report or White Paper

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

[www.nrfirescience.org/resource/8376](http://www.nrfirescience.org/resource/8376)

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: Document

Book or Chapter or Journal Article

## **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](http://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

## **Assessing fuel treatment effectiveness using satellite imagery and spatial statistics**

[www.nrfirescience.org/resource/8227](http://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

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

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

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

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

Year Published: 2009

Type: Document

Conference Proceedings, Technical Report or White Paper

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

[www.nrfirescience.org/resource/11435](http://www.nrfirescience.org/resource/11435)

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

### **Breakthrough at the Missouri River Breaks: a quick tool for comparing burned and unburned sites**

[www.nrfirescience.org/resource/11085](http://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](http://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. Mclver, John D. Bailey, Christopher J. Fettig, Carl E. Fiedler, Richy J. Harrod, Jason J. Moghaddas, Kenneth W. Outcalt, Carl

N. Skinner, Scott L. Stephens, Thomas A. Waldrop, Daniel A. Yaussy, Andrew P. Youngblood  
Year Published: 2009  
Type: Document  
Book or Chapter or Journal Article

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

[www.nrfirescience.org/resource/12616](http://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

### **Bark beetle responses to vegetation management treatments**

[www.nrfirescience.org/resource/11070](http://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

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

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

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

Author(s): Alan E. Watson, Roian Matt, Tim Waters, Kari Gunderson, Stephen J. Carver, Brett Davis

Year Published: 2009

Type: Document

Conference Proceedings

### **Fire treatment effects on vegetation structure, fuels, and potential fire severity in western U.S. forests**

[www.nrfirescience.org/resource/13352](http://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

**Fuel treatment guidebook: illustrating treatment effects on fire hazard**

[www.nrfirescience.org/resource/8155](http://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

**Implementation of National Fire Plan fuel treatments near the wildland-urban interface in the western United States**

[www.nrfirescience.org/resource/8225](http://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

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

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

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

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

Year Published: 2008

Type: Document

Book or Chapter or Journal Article

**Forests at risk: integrating risk science into fuel management strategies**

[www.nrfirescience.org/resource/11089](http://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

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

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

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

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

Year Published: 2008

Type: Document

Book or Chapter or Journal Article

### **Restoration of northern Rocky Mountain moist forests: integrating fuel treatments from the site to the landscape**

[www.nrfirescience.org/resource/11991](http://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

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

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

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

Author(s): Rhonda L. Mazza

Year Published: 2008

Type: Document

Research Brief or Fact Sheet

### **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](http://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

### **Maintaining soil productivity during forest or biomass-to-energy thinning harvests in the western United States**

[www.nrfirescience.org/resource/11018](http://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...

Author(s): Marcia Patton-Mallory, Richard Nelson, Kenneth E. Skog, Bryan Jenkins, Nathan Parker, Peter Tittman, Quinn Hart, Ed Gray, Anneliese Schmidt, Gayle Gordon

Year Published: 2008

Type: Document

Conference Proceedings, Synthesis

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

[www.nrfirescience.org/resource/8230](http://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

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

[www.nrfirescience.org/resource/12724](http://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

### **Objectives and considerations for wildland fuel treatment in forested ecosystems of the interior western United States**

[www.nrfirescience.org/resource/8194](http://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

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

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

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

Author(s): Alexander M. Evans

Year Published: 2008

Type: Document  
Synthesis, Technical Report or White Paper

### **Forest harvest can increase subsequent forest fire severity**

[www.nrfirescience.org/resource/11054](http://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...

Author(s): Carter Stone, Andrew T. Hudak, Penelope Morgan

Year Published: 2008

Type: Document

Conference Proceedings, Technical Report or White Paper

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

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

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

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

Year Published: 2008

Type: Document

Book or Chapter or Journal Article

### **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](http://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

Conference Proceedings, Synthesis, Technical Report or White Paper

### **Spatial-endogenous fire risk and efficient fuel management and timber harvest**

[www.nrfirescience.org/resource/8277](http://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

### **The homeowner view of thinning methods for fire hazard reduction: more positive than many think**

[www.nrfirescience.org/resource/11486](http://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

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

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

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

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

Year Published: 2008

Type: Document

Book or Chapter or Journal Article

### **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](http://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

### **The relation between tree burn severity and forest structure in the Rocky Mountains**

[www.nrfirescience.org/resource/11987](http://www.nrfirescience.org/resource/11987)

Many wildfire events have burned thousands of hectares across the western United States, such as the Bitterroot (Montana), Rodeo-Chediski (Arizona), Hayman (Colorado), and Biscuit (Oregon) fires. These events led to Congress enacting the Healthy Forest Restoration Act of 2003, which, with other policies, encourages federal and state...

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

Year Published: 2007

Type: Document

Conference Proceedings, Technical Report or White Paper

### **Ten-year responses of ponderosa pine growth, vigor, and recruitment to restoration treatments in the Bitterroot Mountains, Montana, USA**

[www.nrfirescience.org/resource/13370](http://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

### **Fuel consumption and flammability thresholds in shrub-dominated ecosystems - Final Report to the Joint Fire Science Program**

[www.nrfirescience.org/resource/11164](http://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

### **Free selection: a silvicultural option**

[www.nrfirescience.org/resource/12133](http://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

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

[www.nrfirescience.org/resource/11166](http://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

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

[www.nrfirescience.org/resource/8166](http://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

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

[www.nrfirescience.org/resource/15006](http://www.nrfirescience.org/resource/15006)

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...

Author(s): Pamela J. Jakes

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](http://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

### **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](http://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

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

[www.nrfirescience.org/resource/11129](http://www.nrfirescience.org/resource/11129)

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 (...)

Author(s): Joe H. Scott, Elizabeth D. Reinhardt

Year Published: 2007

Type: Document

Conference Proceedings, Technical Report or White Paper

### **Managing forest structure and fire hazard - A tool for planners**

[www.nrfirescience.org/resource/8404](http://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...

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

Year Published: 2007

Type: Document

Book or Chapter or Journal Article

### **Science information for informing forest fuel management in dry forests of the western United States**

[www.nrfirescience.org/resource/7929](http://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

### **Science-based strategic planning for hazardous fuel treatment**

[www.nrfirescience.org/resource/15017](http://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

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

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

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

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

Year Published: 2007

Type: Document

Book or Chapter or Journal Article

### **Biomass utilization modeling on the Bitterroot National Forest**

[www.nrfirescience.org/resource/11008](http://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...

Author(s): Robin P. Silverstein, Dan R. Loeffler, J. Greg Jones, David E. Calkin, Hans R. Zuuring,

Martin Twer  
Year Published: 2006  
Type: Document  
Conference Proceedings

### **An analytical framework for quantifying wildland fire risk and fuel treatment benefit**

[www.nrfirescience.org/resource/12720](http://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<sup>-1</sup> or \$ yr<sup>-1</sup> ac<sup>-1</sup>). Fire risk at a point on the landscape is a function of the probability of burning at that point, the relative frequency of fire behaviors expected if the...

Author(s): Joe H. Scott  
Year Published: 2006  
Type: Document  
Conference Proceedings

### **Changes in downed wood and forest structure after prescribed fire in ponderosa pine forests**

[www.nrfirescience.org/resource/11002](http://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

### **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](http://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  
Conference Proceedings

### **Wilderness fire management in a changing world**

[www.nrfirescience.org/resource/7963](http://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

### **Snow accumulation in thinned lodgepole pine stands, Montana, USA**

[www.nrfirescience.org/resource/8192](http://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

### **Evaluation of silvicultural treatments and biomass use for reducing fire hazard in western states**

[www.nrfirescience.org/resource/11189](http://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...

Author(s): Kenneth E. Skog, R. James Barbour, Karen L. Abt, Edward M. Bilek, Frank Burch, Roger D. Fight, Robert J. Huggett, Patrick D. Miles, Elizabeth D. Reinhardt, Wayne D. Shepperd

Year Published: 2006

Type: Document

Technical Report or White Paper

### **FTM-West model results for selected fuel treatment scenarios**

[www.nrfirescience.org/resource/10985](http://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

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

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

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

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

Year Published: 2006

Type: Document

Conference Proceedings

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

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

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

economic feasibility, and long-term...

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

Year Published: 2006

Type: Document

Book or Chapter or Journal Article

### **Design and objectives of FTM-West model**

[www.nrfirescience.org/resource/10975](http://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

### **Prescribed fire: what influences public approval?**

[www.nrfirescience.org/resource/8440](http://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

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

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

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

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

Year Published: 2006

Type: Document

Book or Chapter or Journal Article, Synthesis

### **Wildlife and invertebrate response to fuel reduction treatments in dry coniferous forests of the Western United States: a synthesis**

[www.nrfirescience.org/resource/11192](http://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

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

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

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

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

Year Published: 2006

Type: Document

Book or Chapter or Journal Article, Synthesis

### **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](http://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

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

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

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

Author(s): Roger D. Fight, R. James Barbour

Year Published: 2006

Type: Document

Research Brief or Fact Sheet

### **Integrating fuel treatments into comprehensive ecosystem management**

[www.nrfirescience.org/resource/10973](http://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...

Author(s): Kevin D. Hyde, J. Greg Jones, Robin P. Silverstein, Keith Stockmann, Dan R. Loeffler

Year Published: 2006

Type: Document

Conference Proceedings

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

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

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

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

### **Estimating woody biomass supply from thinning treatments to reduce fire hazard in the US West**

[www.nrfirescience.org/resource/10995](http://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  
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](http://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

### **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](http://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

### **FTM-West: fuel treatment market model for US West**

[www.nrfirescience.org/resource/10974](http://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

### **Effects of slash, machine passes, and soil moisture on penetration resistance in a cut-to-length harvesting**

[www.nrfirescience.org/resource/7936](http://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...

Author(s): Han-Sup Han, Deborah S. Page-Dumroese, S-K Han, Joanne M. Tirocke

Year Published: 2006

Type: Document

Book or Chapter or Journal Article

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

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

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

Author(s): Jeff Halbrook, Han-Sup Han, Russell T. Graham, Theresa B. Jain, Robert Denner

Year Published: 2006

Type: Document

Conference Proceedings

### **Ponderosa pine ecosystems**

[www.nrfirescience.org/resource/11142](http://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

Synthesis, Technical Report or White Paper

### **Restoration treatment effects on the understory of ponderosa pine/Douglas-fir forests in western Montana, USA**

[www.nrfirescience.org/resource/7900](http://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

### **Social science to improve fuels management: a synthesis of research relevant to communicating with homeowners about fuels management**

[www.nrfirescience.org/resource/15007](http://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

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

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

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

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

Year Published: 2006

Type: Document

Research Brief or Fact Sheet

### **Stand establishment and tending in the inland northwest**

[www.nrfirescience.org/resource/11141](http://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

### **Fire ecology of ponderosa pine and the rebuilding of fire-resilient ponderosa pine ecosystems**

[www.nrfirescience.org/resource/11074](http://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<sup>-1</sup> (20-50 trees acre<sup>-1</sup>) to a range...

Author(s): Stephen A. Fitzgerald

Year Published: 2005

Type: Document

Conference Proceedings, Synthesis

### **Application of free selection in mixed forests of the inland northwestern United States**

[www.nrfirescience.org/resource/7933](http://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

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

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

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

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

Year Published: 2005

Type: Document

Book or Chapter or Journal Article

### **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](http://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

### **Social science to improve fuels management: a synthesis of research on collaboration**

[www.nrfirescience.org/resource/15016](http://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

### **Root diseases in coniferous forests of the Inland Northwest: potential implications of fuels treatments**

[www.nrfirescience.org/resource/11172](http://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. Rippey, 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

## **Social science to improve fuels management: a synthesis of research on aesthetics and fuels management**

[www.nrfirescience.org/resource/15009](http://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

## **Acceptability of smoke from prescribed forest burning in the northern inland west: a focus group approach**

[www.nrfirescience.org/resource/8393](http://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

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

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

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

Author(s): David E. Calkin

Year Published: 2005

Type: Document

Research Brief or Fact Sheet

## **A strategic assessment of forest biomass and fuel reduction treatments in Western States**

[www.nrfirescience.org/resource/11197](http://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...

Author(s): Robert B. Rummer, Jeffrey P. Prestemon, Dennis May, Patrick D. Miles, John Vissage, Ronald E. McRoberts, Greg C. Liknes, Wayne D. Shepperd, Dennis E. Ferguson, William J. Elliot, I. Sue Miller, Stephen E. Reutebuch, R. James Barbour, Jeremy S. Fried, Bryce J. Stokes, Edward M. Bilek, Kenneth E. Skog

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](http://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

### **Effect of alternative silvicultural treatments on snow accumulation in lodgepole pine stands, Montana, U.S.A.**

[www.nrfirescience.org/resource/8413](http://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

### **When to prescribe**

[www.nrfirescience.org/resource/11500](http://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

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

[www.nrfirescience.org/resource/11169](http://www.nrfirescience.org/resource/11169)

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

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

Year Published: 2005

Type: Document

Technical Report or White Paper

### **New technology for fuel breaks and green strips in urban interface and wildland areas**

[www.nrfirescience.org/resource/11039](http://www.nrfirescience.org/resource/11039)

Threat from wildfire can be greatly minimized through proactive efforts that reduce and slow spread through use of green strips or fuel breaks, and decrease fire volatility by reducing fuel load. This results

in greater safety to fire fighters and protection to key urban interface areas or wildlife habitat. The fight against western...

Author(s): Jennifer L. Vollmer

Year Published: 2005

Type: Document

Conference Proceedings

**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](http://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

**Social science to improve fuels management: a synthesis of research on assessing social acceptability of fuels treatments**

[www.nrfirescience.org/resource/15014](http://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

**Distribution of bark beetle attacks after whitebark pine restoration treatments: a case study**

[www.nrfirescience.org/resource/8366](http://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

**Predicting cumulative watershed effects of fuel management with improved WEPP technology**

[www.nrfirescience.org/resource/8436](http://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

**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](http://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](http://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'Brian

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](http://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

**Fuels planning: science synthesis and integration; environmental consequences fact sheet 8: evaluating sedimentation risks associated with fuel management**

[www.nrfirescience.org/resource/14946](http://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 5: prescriptions and fire effects**

[www.nrfirescience.org/resource/14943](http://www.nrfirescience.org/resource/14943)

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

**Science basis for changing forest structure to modify wildfire behavior and severity**

[www.nrfirescience.org/resource/15018](http://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; economic uses fact sheet 8: prescribed fire costs**

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

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

Author(s): Geoffrey H. Donovan

Year Published: 2004

Type: Document

Research Brief or Fact Sheet

**Fuels planning: science synthesis and integration; environmental consequences fact sheet 2: First Order Fire Effects Model (FOFEM)**

[www.nrfirescience.org/resource/11098](http://www.nrfirescience.org/resource/11098)

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

**Fuels planning: science synthesis and integration; economic uses fact sheet 1: mastication treatments and costs**

[www.nrfirescience.org/resource/14937](http://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

### **Effectiveness of thinning and prescribed fire in reducing wildfire severity**

[www.nrfirescience.org/resource/11072](http://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

Conference Proceedings, Synthesis, Technical Report or White Paper

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

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

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

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

Year Published: 2004

Type: Document

Technical Report or White Paper

### **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](http://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

Type: Document

Research Brief or Fact Sheet

### **Fuels planning: science synthesis and integration; social issues fact sheet 4: three critical topics to cover when talking about hazards**

[www.nrfirescience.org/resource/14952](http://www.nrfirescience.org/resource/14952)

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

**A strategic assessment of crown fire hazard in Montana: potential effectiveness and costs of hazard reduction treatments**

[www.nrfirescience.org/resource/11181](http://www.nrfirescience.org/resource/11181)

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 planning: science synthesis and integration; social issues fact sheet 2: developing personal responsibility for fuels reduction: types of information to encourage proactive behavior**

[www.nrfirescience.org/resource/14949](http://www.nrfirescience.org/resource/14949)

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

**Fuels planning: science synthesis and integration; environmental consequences fact sheet 6: wildland fire use: the 'other' treatment option**

[www.nrfirescience.org/resource/14944](http://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

**Fuels planning: science synthesis and integration; environmental consequences fact sheet 4: wildlife responses to fuels treatments: key considerations**

[www.nrfirescience.org/resource/14942](http://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

### **Red Lodge, Montana: steps to improve community preparedness for wildfire**

[www.nrfirescience.org/resource/11104](http://www.nrfirescience.org/resource/11104)

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

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

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

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

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

Year Published: 2004

Type: Document

Technical Report or White Paper

### **Fuels planning: science synthesis and integration; economic uses fact sheet 3: economic impacts of fuel treatments**

[www.nrfirescience.org/resource/14940](http://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

### **Restoring vigor and reducing hazard in an old growth western larch stand (Montana)**

[www.nrfirescience.org/resource/7926](http://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

### **Comparing potential fuel treatment trade-off models: initial results**

[www.nrfirescience.org/resource/8412](http://www.nrfirescience.org/resource/8412)

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

### **Performance of fuel treatments subjected to wildfires**

[www.nrfirescience.org/resource/11038](http://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

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

[www.nrfirescience.org/resource/13144](http://www.nrfirescience.org/resource/13144)

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

### **A collaborative fire hazard reduction/ecosystem restoration stewardship project in a Montana mixed ponderosa pine/Douglas-fir/western larch wildland-urban interface**

[www.nrfirescience.org/resource/11009](http://www.nrfirescience.org/resource/11009)

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

### **Combining simulation and optimization for evaluating the effectiveness of fuel treatments for four different fuel conditions at landscape scales**

[www.nrfirescience.org/resource/8431](http://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

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

[www.nrfirescience.org/resource/11028](http://www.nrfirescience.org/resource/11028)

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 viewsheds. 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

### **Simulating fire hazard reduction, wood flows, and economics of fuel treatments with FVS, FEEMA, and FIA data**

[www.nrfirescience.org/resource/8432](http://www.nrfirescience.org/resource/8432)

This paper demonstrates protocols to analyze and illustrate trends in the long-term effects of repeated fire hazard reduction entries at broad state-level scales. 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

### **Effect of thinning and prescribed burning on crown fire severity in ponderosa pine forests**

[www.nrfirescience.org/resource/8121](http://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

### **Use of fire and silvicultural techniques for whitebark pine restoration successes, caveats, and assessment techniques**

[www.nrfirescience.org/resource/10982](http://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 (*Dendroctonus ponderosae*) and blister rust (...)

Author(s): Robert E. Keane, Katherine Kendall, Robert Crabtree

Year Published: 2002

Type: Document

Conference Proceedings

### **Alternative ponderosa pine restoration treatments in the western United States**

[www.nrfirescience.org/resource/8409](http://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

### **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

### **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

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

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

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

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

Year Published: 2001

Type: Document

Book or Chapter or Journal Article

### **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

**The Bitterroot Ecosystem Management Research Project: what we have learned, symposium proceedings; May 18-20, 1999; Missoula, MT**

[www.nrfirescience.org/resource/11890](http://www.nrfirescience.org/resource/11890)

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](http://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

**Silvicultural treatments**

[www.nrfirescience.org/resource/11891](http://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

**Sequential use of simulation and optimization in analysis and planning**

[www.nrfirescience.org/resource/11045](http://www.nrfirescience.org/resource/11045)

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

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

Year Published: 2000

Type: Document

Conference Proceedings

**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

### **Associated riparian communities**

[www.nrfirescience.org/resource/10962](http://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

### **The use of shaded fuelbreaks in landscape fire management**

[www.nrfirescience.org/resource/8372](http://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](http://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

### **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

### **Effects of selection harvest and prescribed fire on the soil nitrogen status of ponderosa pine forests**

[www.nrfirescience.org/resource/8272](http://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

### **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

### **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

### **The effects of thinning and similar stand treatments on fire behavior in western forests**

[www.nrfirescience.org/resource/11183](http://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](http://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](http://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

### **Use of the helitorch to enhance diversity on riparian corridors in mature pinyon-juniper communities: a conceptual approach**

[www.nrfirescience.org/resource/12109](http://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

### **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](http://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

### **Appendix A - Biological assessment, TCEF research project for Lewis and Clark National Forest**

[www.nrfirescience.org/resource/11505](http://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

### **Modeling effects of prescribed fire on wildlife habitat: stand structure, snag recruitment and coarse woody debris**

[www.nrfirescience.org/resource/11027](http://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

### **Miller Creek Demonstration Forest - A forest born of fire: a field guide**

[www.nrfirescience.org/resource/11239](http://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

### **Effects of slash pile burning on the physical and chemical soil properties of Vassar soils**

[www.nrfirescience.org/resource/13125](http://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

### **Reduce fire hazards in ponderosa pine by thinning**

[www.nrfirescience.org/resource/8148](http://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

### **Fuel reduction in residential and scenic forests: a comparison of three treatments in a western**

### **Montana ponderosa pine stand**

[www.nrfirescience.org/resource/11242](http://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

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

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

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

Author(s): Armando Gonzalez-Caban

Year Published: 1997

Type: Document

Book or Chapter or Journal Article

### **Harvesting cost model for small trees in natural stands in the interior northwest**

[www.nrfirescience.org/resource/11209](http://www.nrfirescience.org/resource/11209)

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

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

[www.nrfirescience.org/resource/11244](http://www.nrfirescience.org/resource/11244)

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

### **Dealing with public concerns in restoring fire to the forest**

[www.nrfirescience.org/resource/11253](http://www.nrfirescience.org/resource/11253)

Public support is important to all restoration efforts on public lands. Some types of restoration activities are easier for the public to support than others. Restoring wetlands, habitat restoration for salmon or burrowing owls, and vegetative rehabilitation are generally acceptable practices. Most restoration projects and...

Author(s): Leslie A. C. Weldon

Year Published: 1996  
Type: Document  
Technical Report or White Paper

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

[www.nrfirescience.org/resource/11246](http://www.nrfirescience.org/resource/11246)

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

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

[www.nrfirescience.org/resource/11247](http://www.nrfirescience.org/resource/11247)

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

**Prescribed burning considerations in sagebrush annual grassland communities**

[www.nrfirescience.org/resource/12152](http://www.nrfirescience.org/resource/12152)

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

**User's guide to version 2 of the Regeneration Establishment Model: part of the Prognosis Model**

[www.nrfirescience.org/resource/11148](http://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...

Author(s): Dennis E. Ferguson, Nicholas L. Crookston  
Year Published: 1991  
Type: Document  
Technical Report or White Paper

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

## **Montana**

[www.nrfirescience.org/resource/12028](http://www.nrfirescience.org/resource/12028)

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

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

[www.nrfirescience.org/resource/11965](http://www.nrfirescience.org/resource/11965)

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 sites. Most sites remained...

Author(s): Ward W. McCaughey, Carl E. Fiedler, Wyman C. Schmidt

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**

[www.nrfirescience.org/resource/11966](http://www.nrfirescience.org/resource/11966)

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

## **Vegetation response to helicopter logging and broadcast burning in Douglas-fir habitat types at Silver Creek, central Idaho**

[www.nrfirescience.org/resource/11963](http://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...

Author(s): Kathy Geier-Hayes

Year Published: 1989

Type: Document

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

### **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 more dominant on a site, the...

Author(s): Stephen C. Bunting

Year Published: 1987

Type: Document

Conference Proceedings, Technical Report or White Paper

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

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

Nearly all wildfires are extinguished when they are still small. The 3-5% that get out of control cause 95% of all wildfire-related costs and damages (Dodge 1972, Wilson 1985). There are two ways to deal with these problem fires. One practice is to limit fire by suppressing fires as soon as possible after they are detected....

Author(s): James M. Saveland

Year Published: 1987

Type: Document

Conference Proceedings

### **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

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

[www.nrfirescience.org/resource/13136](http://www.nrfirescience.org/resource/13136)

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...

Author(s): Dennis M. Cole, Wyman C. Schmidt

Year Published: 1986

Type: Document

Technical Report or White Paper

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

[www.nrfirescience.org/resource/11132](http://www.nrfirescience.org/resource/11132)

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

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

Year Published: 1986

Type: Document

Technical Report or White Paper

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

[www.nrfirescience.org/resource/11259](http://www.nrfirescience.org/resource/11259)

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...

Author(s): George E. Gruell, James K. Brown, Charles L. Bushey

Year Published: 1986

Type: Document

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](http://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

### **Fire, logging, and white-tailed deer interrelationships in the Swan Valley, northwestern Montana**

[www.nrfirescience.org/resource/11056](http://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

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

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

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

Author(s): Roland L. Barger, Robert E. Benson  
Year Published: 1981  
Type: Document  
Conference Proceedings, Technical Report or White Paper

### **Postharvest residue burning under alternative silvicultural practices**

[www.nrfirescience.org/resource/11927](http://www.nrfirescience.org/resource/11927)

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**

[www.nrfirescience.org/resource/11912](http://www.nrfirescience.org/resource/11912)

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

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

[www.nrfirescience.org/resource/11928](http://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](http://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...

Author(s): James K. Brown

Year Published: 1980

Type: Document

Technical Report or White Paper

### **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](http://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

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

[www.nrfirescience.org/resource/13140](http://www.nrfirescience.org/resource/13140)

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

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

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

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

Author(s): Donald Brent Wood

Year Published: 1979

Type: Document

Research Brief or Fact Sheet

### **Effects of burning moist fuels on seedbed preparation in cutover western larch forests**

[www.nrfirescience.org/resource/11955](http://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](http://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 crowns. 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](http://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  
Year Published: 1976  
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](http://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

### **Wildland fires and dwarf mistletoes: a literature review of ecology and prescribed burning**

[www.nrfirescience.org/resource/12412](http://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

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

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

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

Author(s): Robert E. Benson

Year Published: 1974

Type: Document

Technical Report or White Paper

### **30 years of vegetation change following burning of sagebrush-grass range**

[www.nrfirescience.org/resource/15395](http://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 sage-brush 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](http://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

### **Mid-succession fire effects and reburn potential in model sagebrush ecosystems**

[www.nrfirescience.org/resource/16090](http://www.nrfirescience.org/resource/16090)

Sagebrush steppe ecosystems evolved with periodic fire, but this relationship is altered across much of the arid west by invasive species, land use change, overgrazing, and climate change. While understanding the short-term impacts of fire on these systems, little is known about the longer-term trajectory of recovery. To fill this...

Type: Media

Webinar

### **Working across fence lines: multijurisdictional planning and prescribed fire**

[www.nrfirescience.org/resource/14308](http://www.nrfirescience.org/resource/14308)

Fire cuts across administrative boundaries and our restoration work needs to as well. Whether it is multijurisdictional planning or multiagency prescribed burning, working across boundaries presents a unique set of challenges. In this webinar, Eytan Krasilovksy discussed multijurisdictional NEPA planning in the Rio Trampas watershed...

Type: Media

Webinar

### **Catching fire: prescribed burning in Northern California**

[www.nrfirescience.org/resource/205](http://www.nrfirescience.org/resource/205)

Catching Fire tells a compelling story of how a small but committed group of local, tribal, state and federal land managers are bringing back the use of prescribed fire as a tool to protect communities and ecosystems across Northern California. It examines the use of fire by the Karuk Tribe of California, and the connection between...

Type: Media

Video

### **Using fire to increase the scale, benefits, and pace of forest management**

[www.nrfirescience.org/resource/14080](http://www.nrfirescience.org/resource/14080)

The current pace and scale of fuels treatment is a fraction of what's needed to effectively reduce fire hazard in California. With the Forest Service implementing a new planning rule and starting to revise plans for the 155 National Forests, new strategies need to be considered for fundamentally changing...

Type: Media

Webinar

### **Using climate information for risk mitigation and objective achievement in managed fire**

[www.nrfirescience.org/resource/12874](http://www.nrfirescience.org/resource/12874)

Considerable evidence exists that climate impacts wildfires and that climate change will continue to provide challenges for fire management. For fire managers, a key step in meeting those challenges is to identify ways to utilize climate information in order to both mitigate risks associated with wildfires and achieve objectives for...

Type: Media

Webinar

### **Rx Fire and Fire Use Lessons Learned**

[www.nrfirescience.org/resource/16018](http://www.nrfirescience.org/resource/16018)

Listen to the experiences and lessons learned from seven veteran fire management officers.

Type: Media

Video

### **Effectiveness of wildfire mitigation activities in the wildland-urban interface (WUI)**

[www.nrfirescience.org/resource/14048](http://www.nrfirescience.org/resource/14048)

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...

Type: Media

Webinar

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

[www.nrfirescience.org/resource/14872](http://www.nrfirescience.org/resource/14872)

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

Type: Media

Webinar

## **Landscape treatment designer: a multicriteria optimization tool for fuel treatment planning**

[www.nrfirescience.org/resource/14296](http://www.nrfirescience.org/resource/14296)

The Landscape Treatment Designer (LTD) is a multicriteria spatial prioritization and optimization system to help design and explore landscape fuel treatment scenarios. The program fills a gap between fire model programs such as FlamMap, and planning systems such as ArcFuels, in the fuel treatment planning process. The LTD uses...

Type: Media

Webinar

## **Effects of fuel treatments on the spatial probabilities of burning and final size of recent wildfire across the United States**

[www.nrfirescience.org/resource/12860](http://www.nrfirescience.org/resource/12860)

Large wildfire frequency has increased several-fold in recent decades throughout the western United States. These changes have resulted from a combination of human land use practices, altered climates and shifting forest and fire management policies. These fires have had increasingly severe consequences for ecosystems, human health...

Type: Media

Webinar

## **Prescribed Fire on Private Land - A WLA Practitioner Exchange**

[www.nrfirescience.org/resource/15928](http://www.nrfirescience.org/resource/15928)

As part of our effort to advance policies and practices that sustain working lands, connected landscapes, and native species, WLA is offering this interactive practitioner exchange focused on prescribed fire on private land. We are enlisting a panel of experts from across the West with experience in various aspects of prescribed...

Type: Media

Webinar

## **Evaluating effectiveness of multi-purpose fuel treatments in dry mixed-conifer forests**

[www.nrfirescience.org/resource/15100](http://www.nrfirescience.org/resource/15100)

This webinar was presented as part of the 2016-2017 RMRS Fire Sciences Laboratory's weekly seminar series.

Type: Media

Seminar

## **How will forests affect mountain snow storage in a warming climate**

[www.nrfirescience.org/resource/14863](http://www.nrfirescience.org/resource/14863)

Forests strongly influence snow processes and affect the amount and duration of snow storage on a landscape. Therefore, forest changes, from management activities or natural disturbances, have important consequences for spring and summer soil moisture availability, aquatic habitat, and water supply. Accounting for these effects of...

Type: Media

Webinar

## **Economics of ecological restoration and hazardous fuel reduction treatments**

[www.nrfirescience.org/resource/14290](http://www.nrfirescience.org/resource/14290)

What are the economic values of landscape-level ecological restoration and hazardous fuel treatments? The Ecological Restoration Institute at Northern Arizona University (ERI) assembled a team of wildland fire economists to conduct a rapid evidence-based assessment, as well as to design a timely and efficient way to answer the...

Type: Media

Webinar

### **ArcFuels: an ArcGIS interface for fuel treatment planning and wildfire risk assessment**

[www.nrfirescience.org/resource/12853](http://www.nrfirescience.org/resource/12853)

Potential fire behavior metrics, including fire spread, intensity, likelihood, and ecological risk need to be analyzed for proposed fuel treatment alternatives. We built ArcFuels to streamline the fuel management planning process, and provide tools for quantitative wildfire risk assessment. ArcFuels integrated a number of fire...

Type: Media

Webinar

### **Fire management, fuels, and climate change tipping points**

[www.nrfirescience.org/resource/13046](http://www.nrfirescience.org/resource/13046)

There will be dramatic changes to most landscapes of the western US over the next century, such as shifts in vegetation communities, changes in fire regimes, and increases in smoke emissions. These changes will result from complex interactions among vegetation, fuels, fire, and altered climate at the finest scales causing new and...

Type: Media

Webinar

### **These Once (and Future) Conflagrated Prairies**

[www.nrfirescience.org/resource/15848](http://www.nrfirescience.org/resource/15848)

A brief reconnaissance of the Great Plains and fire that will place its fire scene within the national narrative. From the onset of European contact, the grasslands were famous for their fires. They stimulated a debate about the relative roles of climate and humans. They prompted one of America's two national traditions of fire...

Type: Media

Webinar

### **The ecological effects of thinning treatments to restore whitebark pine**

[www.nrfirescience.org/resource/14780](http://www.nrfirescience.org/resource/14780)

This presentation by Colin Maher, Ph.D. Candidate, Department of Ecosystem and Conservation Sciences University of Montana, was part of the 2016 Whitebark Pine Ecosystem Foundation Annual Science and Management Workshop - Successes and Challenges in Managing the Jewel in the Crown of the Continent that occurred September 16, 2016 in...

Type: Media

Webinar

### **The IMAGINE prescribed fire prioritization model: a logistical and ecological approach to management**

[www.nrfirescience.org/resource/12845](http://www.nrfirescience.org/resource/12845)

IMAGINE aims to solve the issue of technology overload confronting prescribed fire managers today. As the demand to prescribe burn more acres increase, so do the demands on fire management officers (FMOs) to prioritize treatment areas. Prescribed fires accomplish multiple objectives including reducing hazardous fuels, improving...

Type: Media

Webinar

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

[www.nrfirescience.org/resource/15793](http://www.nrfirescience.org/resource/15793)

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

Type: Media

Seminar

## **Fire and fuel management in a changing fire environment: Forest Service perspectives**

[www.nrfirescience.org/resource/13215](http://www.nrfirescience.org/resource/13215)

Discussion of fire and fuel management presented by Elizabeth Reinhardt at Northern Arizona University in February 2014.

Type: Media

Webinar

## **Burn boss stories**

[www.nrfirescience.org/resource/14148](http://www.nrfirescience.org/resource/14148)

Veteran burn bosses share their stories and firsthand insights.

Type: Media

Video

## **Prescribed fire—Unique situations concerning fuel treatments within mixed dry conifer forests**

[www.nrfirescience.org/resource/12808](http://www.nrfirescience.org/resource/12808)

This webinar is the second of a four-part series for managers and scientists to discuss up-to-date information regarding the benefits, challenges, opportunities, and trade-offs among the different strategies and tools related to fuel treatment applications within dry mixed conifer forests of the western United States. Presenters:...

Type: Media

Webinar

## **Elizabeth Reinhardt - Beyond Hazardous Fuels: Restoring Fire (Opening Plenary)**

[www.nrfirescience.org/resource/16191](http://www.nrfirescience.org/resource/16191)

This 21 minute presentation was given at the 3rd SW Fire Ecology Conference & Applied Fire Science Workshop in Tucson, Arizona by Elizabeth Reinhardt, Retired US Forest Service.

Type: Media

Video

## **Learning from the experts: know when to go home**

[www.nrfirescience.org/resource/14117](http://www.nrfirescience.org/resource/14117)

Diane Hutton tells how she and her crew filled in their knowledge gaps while conducting a multi-year burn plan. This video comes from the Wildland Fire Lessons Learned Center.

Type: Media

Video

## **Fuel treatment for patch clear cuts on the Sloan-Venally timber sale**

[www.nrfirescience.org/resource/12797](http://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

### **The role of prescribed fire councils in restoring the West**

[www.nrfirescience.org/resource/13670](http://www.nrfirescience.org/resource/13670)

Speaker: J. Morgan Varner, Department of Forest Resources & Environmental Conservation, Virginia Tech. Event: Restoring the West Conference 2015 - Restoration and Fire in the Interior West.

Type: Media

Video

### **Learning from the experts: burning with optimism**

[www.nrfirescience.org/resource/14114](http://www.nrfirescience.org/resource/14114)

Ric Carlson relates one occurrence when his optimism in a burn plan colored his perspective. This video comes from the Wildland Fire Lessons Learned Center.

Type: Media

Video

### **Fuel control treatments in the sagebrush steppe**

[www.nrfirescience.org/resource/16091](http://www.nrfirescience.org/resource/16091)

This presentation aired as part of the Great Basin LCC webinar series on November 29, 2017. The presentation was given by Bruce Roundy of Brigham Young University.

Type: Media

Webinar

### **Development of the interagency fuels treatment decision support system**

[www.nrfirescience.org/resource/14097](http://www.nrfirescience.org/resource/14097)

This webinar was not recorded. Media link below is to a pdf of the webinar slide show. The web-based Interagency Fuels Treatment Decision Support System (IFT-DSS) was designed to provide fire and fuels managers with a single software solution to manage the many data, software applications, and tools available for fuels treatment...

Type: Media

Webinar

### **Fire behaviour: next gen Canadian Forest Fire Danger Rating System**

[www.nrfirescience.org/resource/16078](http://www.nrfirescience.org/resource/16078)

Mike Wotton from the Canadian Fire Service discussing the next generation Canadian Forest Fire Danger Rating System at the 2013 Fire Behaviour Symposium.

Type: Media

Video

### **Effectiveness and longevity of fuel treatments in coniferous forests across California**

[www.nrfirescience.org/resource/14079](http://www.nrfirescience.org/resource/14079)

The longevity of fuel treatment effectiveness to alter potential fire behavior is a critical question for managers preparing plans for fuel reduction, prescribed burning, fire management, and forest thinning. The presenters share findings from a region-wide fuel treatment effectiveness monitoring study that was initiated in 2001...

Type: Media

Webinar

### **Learning from escaped prescribed fire reviews: initial results**

[www.nrfirescience.org/resource/12861](http://www.nrfirescience.org/resource/12861)

Through a series of five dialogues sessions with fire managers from across the US (Denver, CO; Portland, OR; Salt Lake City, UT; Tallahassee, FL; and Tucson, AZ), we sought to understand and improve individual and organizational learning from reviews of escaped prescribed fires. Results have influenced the National Wildfire...

Type: Media

Webinar

### **How effective were fuel treatments in the 2011 Wallow fire?**

[www.nrfirescience.org/resource/14301](http://www.nrfirescience.org/resource/14301)

This webinar presents results of an opportunistic study to quantify the performance of thinning and surface fuel treatment in migrating wildfire behavior and severity, as represented by bole char, crown scorch proportion, tree burn severity index, on the largest wildfire in southwest USA history: 2011 Wallow fire. The results...

Type: Media

Webinar

### **Bridging the Divide - Video 3: Forest Management**

[www.nrfirescience.org/resource/15943](http://www.nrfirescience.org/resource/15943)

This video series is a compilation of post-fire interviews, workshops, and research presentations, highlighting the special conditions of the fire and the unique community outcomes. Through collaboration and partnerships, these mountain communities are learning to live with fire in the landscape. During the summer of 2013 over 1000...

Type: Media

Webinar

### **Can fuel treatments save money on suppression costs in the future?**

[www.nrfirescience.org/resource/14871](http://www.nrfirescience.org/resource/14871)

How fire suppression forces respond to an ignition may be determined by a number of factors (including proximity to values at risk and potential to improve habitat), which in essence amount to fire management personnel evaluating the fire's potential to have a net positive or negative effect. When using...

Type: Media

Webinar

### **Fuels reduction treatments in the coniferous forests of the Central Rockies**

[www.nrfirescience.org/resource/14295](http://www.nrfirescience.org/resource/14295)

This presentation at a NAU Forestry Department Seminar goes into detail about 3 projects. Battaglia begins with prescribed fire research in the Black Hills where he was using fire as a thinning agent in fuel treatments, then moves on to his post doc research in Colorado, which looks at the ecological impacts of mastication in a...

Type: Media

Seminar

### **Fuels management practices for ponderosa pine-dry mixed-conifer forests**

[www.nrfirescience.org/resource/12854](http://www.nrfirescience.org/resource/12854)

The focus of the synthesis is on dry mixed conifer forests that occur throughout the interior West, Utah, Cascade Range, Blue Mountains, Klamath Mountains, and Pacific Coast. There is substantial documentation on fire ecology and appropriate hazardous fuel management practices for pure ponderosa pine forests. The dry mixed conifer...

Type: Media

Webinar

### **Waste to wisdom: improving soil productivity while reducing fire risk**

[www.nrfirescience.org/resource/13049](http://www.nrfirescience.org/resource/13049)

Bioenergy production from forest biomass offers a solution to reduce wildfire hazard fuel levels, decrease insect and disease outbreaks, and reduce the incidence of invasive species while producing a useful source of renewable energy. However, on-site bioenergy production and the subsequent application of biochar to forest sites...

Type: Media

Webinar

### **Lessons in creating and maintaining successful prescribed burn associations**

[www.nrfirescience.org/resource/15919](http://www.nrfirescience.org/resource/15919)

A Southern Fire Exchange webinar with John Weir of Oklahoma State University and the Oklahoma Prescribed Burn Association. Are you involved in creating, developing, guiding, or supporting a prescribed burn association (PBA)? Are you interested learning how prescribed burn associations work or how they're successfully sustained?...

Type: Media

Webinar

### **Balancing forest ecosystem restoration and old-forest species conservation in the Sierra Nevada, CA**

[www.nrfirescience.org/resource/15091](http://www.nrfirescience.org/resource/15091)

Concern over the social, economic, and ecological consequences of increasingly frequent "megafires" in California's Sierra Nevada have led some to propose large-scale forest restoration to increase ecosystem resilience. However, restoration efforts (e.g., forest thinning) may have collateral impacts on declining old-forest species....

Type: Media

Webinar

### **The Science of Budgeting Fire Programs - Integrating Fuels and Preparedness at National and Landscape Levels**

[www.nrfirescience.org/resource/16367](http://www.nrfirescience.org/resource/16367)

Doug Rideout discusses STARfire - a spatial planning and budgeting system integrating fuels, preparedness, and risk assessment guided by ROI. Scaleable from planning unit to regional to national levels.

Type: Media

Webinar

### **Introduction to the Interagency Fuels Treatment Decision Support System (IFTDSS)**

[www.nrfirescience.org/resource/12849](http://www.nrfirescience.org/resource/12849)

The web-based Interagency Fuels Treatment Decision Support System (IFTDSS) was designed to provide fire and fuels managers with a single software solution to manage the many data types, software applications, and tools available for fuels treatment planning. The IFTDSS project was initiated

in 2007 by the Joint Fire Science Program...

Type: Media

Webinar

### **Who's to blame? Fire management in mixed-ownership landscapes**

[www.nrfirescience.org/resource/15807](http://www.nrfirescience.org/resource/15807)

Fuels are the only component of the fire triangle that forest and fire managers can alter to change fire behavior. There have been numerous studies examining how fuel reduction treatments and salvage logging alter fire behavior, severity, and its' ecological impacts. However, less attention has been paid to how different forest...

Type: Media

Seminar

### **Prescribed fire: a multipurpose tool**

[www.nrfirescience.org/resource/13807](http://www.nrfirescience.org/resource/13807)

This video produced by the Northwest Fire Science Consortium illustrates the multiple uses of prescribed fire; whether for fuels reduction to reduce the risk of catastrophic wildfire or for habitat restoration, fire is a powerful tool.

Type: Media

Video

### **Fire perceptions**

[www.nrfirescience.org/resource/14194](http://www.nrfirescience.org/resource/14194)

A discussion of the use of fire in stand management and the perceptions of the public on fire use. Presented by John Tuttle at the Prescribed Fire and Timber Quality Workshop, October 16 & 17, 2012 in Poplar Bluff, MO.

Type: Media

Video

### **The ecology of dry mixed conifer forests—What makes them unique?**

[www.nrfirescience.org/resource/12809](http://www.nrfirescience.org/resource/12809)

This webinar is the first of a four-part series for managers and scientists to discuss up-to-date information regarding the benefits, challenges, opportunities, and trade-offs among the different strategies and tools related to fuel treatment applications within dry mixed conifer forests of the western United States. Presenters:...

Type: Media

Webinar

### **Diggin' dirt: fuel reduction practices and their effects on soil health**

[www.nrfirescience.org/resource/12939](http://www.nrfirescience.org/resource/12939)

In this webinar presented by Matt Busse on March 31, 2015 he covers: (1) ecological consequences of prescribed fire on soil heating, water repellency, and soil nutrient release, (2) pile burning, (3) whole tree harvesting and nutrient removal, and (4) the evils of soil compaction. He argues that with thoughtful planning and...

Type: Media

Webinar

### **Effects of fuel treatments and previous fires on subsequent fire management costs**

[www.nrfirescience.org/resource/15732](http://www.nrfirescience.org/resource/15732)

This webinar highlights results from a study on the effects of fuel treatments and previously burned areas on subsequent fire management costs. Presenter Kevin Barnett and his colleagues, Helen Naughton, Sean Parks, and Carol Miller, built models explaining variation in daily fire management costs that captured the influences of...

Type: Media

Webinar

### **Integrating wildlife habitat and forest resilience with fuels reduction - Ecosystem management concepts for mixed-conifer forests**

[www.nrfirescience.org/resource/14125](http://www.nrfirescience.org/resource/14125)

This talk covers the background and motivation for creating the USFS General Technical Report 220 before explaining the justifications and applications of the treatment guidelines included in the report.

Type: Media

Webinar

### **The economics of fuel treatments**

[www.nrfirescience.org/resource/12807](http://www.nrfirescience.org/resource/12807)

This webinar is the third of a four-part series for managers and scientists to discuss up-to-date information regarding the benefits, challenges, opportunities, and trade-offs among the different strategies and tools related to fuel treatment applications within dry mixed conifer forests of the western United States. Presenters-...

Type: Media

Webinar

### **Learning from the experts: building a 'Mac Truck' burn plan**

[www.nrfirescience.org/resource/14115](http://www.nrfirescience.org/resource/14115)

Ric Carlson describes how he develops the prescription window and uses a process of constant evaluation and updating that helps him avoid the traps always inherent with boundary selection. This video comes from the Wildland Fire Lessons Learned Center.

Type: Media

Video

### **Learning from experts: reflecting on a burn gone bad**

[www.nrfirescience.org/resource/14112](http://www.nrfirescience.org/resource/14112)

Riva Duncan shares her story of being involved in an escaped prescribed fire. Riva explains how, after this event, she changed her methods of writing and implementing prescription burn plans. The video comes from the Wildland Fire Lessons Learned Center.

Type: Media

Video