Post-fire tree regeneration (or lack thereof) can change ecosystems
www.nrfirescience.org/resource/20639
This review is focused on tree seedling regeneration for several reasons. First, a high mortality event, like a high-severity wildfire, kills the mature trees needed to maintain forest cover. When fire-caused mortality is minimal, we are less concerned about tree regeneration, but a high severity fire creates the need for tree...
Author(s): Camille Stevens-Rumann, Penelope Morgan, Kimberley T. Davis, Kerry Kemp, Jarod Blades
Year Published: 2020
Type: Document
Synthesis

Still standing: recent patterns of post-fire conifer refugia in ponderosa pine-dominated forests of the Colorado Front Range
www.nrfirescience.org/resource/20680
Forested fire refugia (trees that survive fires) are important disturbance legacies that provide seed sources for post-fire regeneration. Conifer regeneration has been limited following some recent western fires, particularly in ponderosa pine (Pinus ponderosa) forests. However, the extent, characteristics, and predictability of...
Author(s): Teresa B. Chapman, Tania L. Schoennagel, Thomas T. Veblen, Kyle Rodman
Year Published: 2020
Type: Document
Book or Chapter or Journal Article

Global fire season severity analysis and forecasting
www.nrfirescience.org/resource/20694
Fire activity has a huge impact on human lives. Different models have been proposed to predict fire activity, which can be classified into global and regional ones. Global fire models focus on longer timescale simulations and can be very complex. Regional fire models concentrate on seasonal forecasting but usually require inputs...
Author(s): Leonardo N. Ferreira, Didier A. Vega-Oliveros, Liang Zhao, Manoel F. Cardoso, Elbert E.N. Macau
Year Published: 2020
Type: Document
Book or Chapter or Journal Article

Incorporating biophysical gradients and uncertainty into burn severity maps in a temperate fire-prone forested region
www.nrfirescience.org/resource/19054
As forest fire activity increases worldwide, it is important to track changing patterns of burn severity (i.e., degree of fire-caused ecological change). Satellite data provide critical information across space and time, yet how satellite indices relate to individual measures of burn severity on the ground (e.g., tree mortality or...
Author(s): Brian J. Harvey, Robert A. Andrus, Sean C. Anderson
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Giving ecological meaning to satellite-derived fire severity metrics across North American forests
www.nrfirescience.org/resource/19917
Satellite-derived spectral indices such as the relativized burn ratio (RBR) allow fire severity maps to be
produced in a relatively straightforward manner across multiple fires and broad spatial extents. These indices often have strong relationships with field-based measurements of fire severity, thereby justifying their widespread...

Author(s): Sean A. Parks, Lisa M. Holsinger, Michael J. Koontz, Luke Collins, Ellen Whitman, Marc-Andre Parisien, Rachel A. Loehman, Jennifer L. Barnes, Jean-François Bourdon, Jonathan Boucher, Yan Boucher, Anthony C. Caprio, Adam Collingwood, Ronald J. Hall, Jane Park, Lisa B. Saperstein, Charlotte Smetanka, Rebecca J. Smith, Nicholas O. Soverel

Year Published: 2019
Type: Book or Chapter or Journal Article

Fire severity and changing composition of forest understory plant communities

Questions: Gradients of fire severity in dry conifer forests can be associated with variation in understory floristic composition. Recent work in California, USA, dry conifer forests has suggested that more severely burned stands contain more thermophilic taxa (those associated with warmer and drier conditions), and that forest...

Author(s): Jens T. Stevens, Jesse E. D. Miller, Paula J. Fornwalt

Year Published: 2019
Type: Book or Chapter or Journal Article

Wildfires and climate change push low-elevation forests across a critical climate threshold for tree regeneration

Climate change is increasing fire activity in the western United States, which has the potential to accelerate climate-induced shifts in vegetation communities. Wildfire can catalyze vegetation change by killing adult trees that could otherwise persist in climate conditions no longer suitable for seedling establishment and survival...

Author(s): Kimberley T. Davis, Solomon Z. Dobrowski, Philip E. Higuera, Zachary A. Holden, Thomas T. Veblen, Monica T. Rother, Sean A. Parks, Anna Sala, Marco Maneta

Year Published: 2019
Type: Book or Chapter or Journal Article

Sources of inherent infiltration variability in post-wildfire soils

An automated disk infiltrometer was developed to improve the measurements of soil hydraulic properties (saturated hydraulic conductivity and sorptivity) of soils affected by wildfire. Guideline are given for interpreting curves showing cumulative infiltration as a function of time measured by the autodisk. The autodisk was used to...

Author(s): John A. Moody, Richard G. Martin, Brian A. Ebel

Year Published: 2019
Type: Book or Chapter or Journal Article

The survival of Pinus ponderosa saplings subjected to increasing levels of fire behavior and impacts on post-fire growth

Improved predictions of tree species mortality and growth metrics following fires are important to assess fire impacts on forest succession, and ultimately forest growth and yield. Recent studies have shown
that North American conifers exhibit a ‘toxicological dose-response’ relationship between fire behavior and the resultant...

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

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

Integrated fire severity–land cover mapping using very-high-spatial-resolution aerial imagery and point clouds

Wildfires cause substantial environmental and socioeconomic impacts and threaten many Spanish forested landscapes. We describe how LiDAR-derived canopy fuel characteristics and spatial fire simulation can be integrated with stand metrics to derive models describing fire behaviour. We assessed the potential use of very-low-density...

Got shrubs? Precipitation mediates long-term shrub and introduced grass dynamics in chaparral communities after fire

Background: Short-term post-fire field studies have shown that native shrub cover in chaparral ecosystems negatively affects introduced cover, which is influenced by burn severity, elevation, aspect, and climate. Using the southern California 2003 Old and Simi fires and the 2008 Sesnon Fire, we investigated the role of native shrubs...

Contributions of fire refugia to resilient ponderosa pine and dry mixed-conifer forest landscapes

Altered fire regimes can drive major and enduring compositional shifts or losses of forest ecosystems. In western North America, ponderosa pine and dry mixed-conifer forest types appear increasingly vulnerable to uncharacteristically extensive, high-severity wildfire. However, unburned or only lightly...
Burning increases post-fire carbon emissions in a heathland and a raised bog, but experimental manipulation of fire severity has no effect
go to website
Large amounts of carbon are stored in northern peatlands. There is concern that greater wildfire severity following projected increases in summer drought will lead to higher post-fire carbon losses. We measured soil carbon dynamics in a Calluna heathland and a raised peat bog after experimentally manipulating fire severity. A...
go to website

Impacts of successive wildfire on soil hydraulic properties: implications for debris flow hazards and system resilience
go to website
Climate and land use changes have led to recent increases in fire size, severity, and/or frequency in many different geographic regions and ecozones. Most post-wildfire geomorphology studies focus on the impact of a single wildfire but changing wildfire regimes underscore the need to quantify the effects of repeated disturbance by...
go to website

The effects of previous wildfires on subsequent wildfire behavior and post-wildfire recovery
go to website
Over the past several decades, size and extent of wildfires have been increasing in the western United States (Westerling et al. 2006; Littell et al. 2009). As the number and size of recent wildfires increases across landscapes, fire managers are questioning how past wildfires may influence the spread and effects of subsequent...
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Season of fire influences seed dispersal by wind in a serotinous obligate seeding tree
go to website
In temperate ecosystems, fire management involving prescribed burning and wildfire suppression often causes a shift in fire season from hot and dry summer conditions to cooler, moister conditions in spring or autumn. The effects of this change on seed dispersal by wind after fire are unknown. However, calmer wind conditions and...
go to website
Belowground community responses to fire: meta-analysis reveals contrasting responses of soil microorganisms and mesofauna
www.nrfirescience.org/resource/19216
Global fire regimes are shifting due to climate and land use changes. Understanding the responses of belowground communities to fire is key to predicting changes in the ecosystem processes they regulate. We conducted a comprehensive meta-analysis of 1634 observations from 131 empirical studies to investigate the effect of fire on...
Author(s): Yamina Pressler, John C. Moore, M. Francesca Cotrufo
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Wildfires alter forest watersheds and threaten drinking water quality
www.nrfirescience.org/resource/20045
Wildfires are a natural part of most forest ecosystems, but due to changing climatic and environmental conditions, they have become larger, more severe, and potentially more damaging. Forested watersheds vulnerable to wildfire serve as drinking water supplies for many urban and rural communities. The highly variable nature of...
Author(s): Amanda K. Hohner, Charles C. Rhoades, Paul Wilkerson, Fernando L. Rosario-Ortiz
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Incorporating biophysical gradients and uncertainty into burn severity maps in a temperate fire-prone forested region
www.nrfirescience.org/resource/19096
As forest fire activity increases worldwide, it is important to track changing patterns of burn severity (i.e., degree of fire-caused ecological change). Satellite data provide critical information across space and time, yet how satellite indices relate to individual measures of burn severity on the ground (e.g., tree mortality or... 
Author(s): Brian J. Harvey, Robert A. Andrus, Sean C. Anderson
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Climate will increasingly determine post-fire tree regeneration success in low-elevation forests, Northern Rockies, USA.
www.nrfirescience.org/resource/19947
Climate change is expected to cause widespread shifts in the distribution and abundance of plant species through direct impacts on mortality, regeneration, and survival. At landscape scales, climate impacts will be strongly mediated by disturbances, such as wildfire, which catalyze shifts in species distributions through widespread...
Author(s): Kerry Kemp, Philip E. Higuera, Penelope Morgan, John T. Abatzoglou
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Wildfire severity and its environmental effects revealed by soil magnetic properties
Strong wildfires pose significant damage to all soil compartments and lead to land degradation. The complex nature and properties of fire-derived materials require multidisciplinary efforts for their reliable characterization. The main objective of our study was to evaluate the suitability of magnetic properties of fire-affected...  

Author(s): Neli Jordanova, Diana Jordanova, Vidal Barrón  
Year Published: 2019  
Type: Document  
Book or Chapter or Journal Article

Effects of fire severity on the composition and functional traits of litter-dwelling macroinvertebrates in a temperate forest

High severity fires are likely to become more prevalent with global climate change, so it is critical that we understand their effects on forest ecosystems. Leaf litter dependent fauna are likely to be particularly vulnerable to habitat loss resulting from fire, which often destroys their leaf litter habitat. We hypothesised that,...  

Author(s): Sebastian Buckingham, Nick P. Murphy, Heloise Gibb  
Year Published: 2019  
Type: Document  
Book or Chapter or Journal Article

Event-based integrated assessment of environmental variables and wildfire severity through Sentinel-2 data

To optimize suppression, restoration, and prevention plans against wildfire, postfire assessment is a key input. Since little research has been carried out on applying Sentinel-2 imagery through an integrated approach to evaluate how environmental parameters affect fire severity, this work aims to fill this gap. A set of large...  

Author(s): Juan Picos, Laura Alonso, Guillermo Bastos, Julia Armesto  
Year Published: 2019  
Type: Document  
Book or Chapter or Journal Article

The survival of Pinus ponderosa saplings subjected to increasing levels of fire behavior and impacts on post-fire growth

Improved predictions of tree species mortality and growth metrics following fires are important to assess fire impacts on forest succession, and ultimately forest growth and yield. Recent studies have shown that North American conifers exhibit a 'toxicological dose-response' relationship between fire behavior and the resultant...  

Author(s): Wade D. Steady, Raquel Partelli Feltrin, Daniel M. Johnson, Aaron M. Sparks, Crystal A. Kolden, Alan F. Talhelm, James A. Lutz, Luigi Boschetti, Andrew T. Hudak, Andrew S. Nelson, Alistair M. S. Smith  
Year Published: 2019  
Type: Document  
Book or Chapter or Journal Article

Wildfire impacts on freshwater detrital food webs depend on runoff load, exposure time and burnt forest type

www.nrfirescience.org/resource/20427
In the last decades, land-use changes have made Mediterranean forests highly susceptible to wildfires, which can cause several impacts not only on burnt areas, but also on adjacent aquatic ecosystems. Post-fire runoff from burnt areas may transport toxic substances to streams by surface runoff, including polycyclic aromatic aromatic...

*Author(s):* Francisco Carvalho, Arunava Pradhan, Nelson Abrantes, Isabel Campos, Jan J. Keizer, Fernanda Cássio, Cláudia Pascoal
*Year Published:* 2019
*Type:* Document
*Book or Chapter or Journal Article*

**Fire regime and ecosystem responses: adaptive forest management in a changing world (Part 1)**
[www.nrfirescience.org/resource/19617](www.nrfirescience.org/resource/19617)

Although fire is an intrinsic factor in most terrestrial biomes, it is often perceived as a negative disturbance that must be suppressed. The application of successful fire prevention policies can lead to unsustainable fire events for ecosystems adapted to a specific fire regime. In addition, new climate and land use scenarios are...

*Author(s):* Daniel Moya, Giacomo Certini, Peter Z. Fule
*Year Published:* 2019
*Type:* Document
*Book or Chapter or Journal Article*

**Drivers of lodgepole pine recruitment across a gradient of bark beetle outbreak and wildfire in British Columbia**
[www.nrfirescience.org/resource/20390](www.nrfirescience.org/resource/20390)

Seedbanks are essential for forest resilience, and disturbance interactions could potentially modify seedbank availability, subsequent forest regeneration patterns, and successional trajectories. Regional mountain pine beetle outbreaks have altered forest structure and seedbanks in fire prone-landscapes across western North America...

*Author(s):* Anna C. Talucci, Kenneth P. Lertzman, Meg A. Krawchuk
*Year Published:* 2019
*Type:* Document
*Book or Chapter or Journal Article*

**Examining post-fire vegetation recovery with Landsat time series analysis in three western North American forest types**
[www.nrfirescience.org/resource/19436](www.nrfirescience.org/resource/19436)

Background: Few studies have examined post-fire vegetation recovery in temperate forest ecosystems with Landsat time series analysis. We analyzed time series of Normalized Burn Ratio (NBR) derived from LandTrendr spectral-temporal segmentation fitting to examine post-fire NBR recovery for several wildfires that occurred in three...

*Author(s):* Benjamin C. Bright, Andrew T. Hudak, Robert E. Kennedy, Justin D. Braaten, Azad Henareh Khalyani
*Year Published:* 2019
*Type:* Document
*Book or Chapter or Journal Article*

**Systematic review and meta-analysis of fire regime research in ponderosa pine (Pinus ponderosa) ecosystems, Colorado, USA**
[www.nrfirescience.org/resource/20356](www.nrfirescience.org/resource/20356)

Background: Forest management, especially restoration, is informed by understanding the dominant natural disturbance regime. In many western North American forests, the keystone disturbance is fire,
and a plethora of research exists characterizing various fire regime parameters, although often only one or two parameters are...

**Belowground community responses to fire: meta-analysis reveals contrasting responses of soil microorganisms and mesofauna**

www.nrfirescience.org/resource/19382

Global fire regimes are shifting due to climate and land use changes. Understanding the responses of belowground communities to fire is key to predicting changes in the ecosystem processes they regulate. We conducted a comprehensive meta-analysis of 1634 observations from 131 empirical studies to investigate the effect of fire on...

Author(s): Yamina Pressler, John C. Moore, M. Francesca Cotrufo

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

**Predicting increasing high severity area burned for three forested regions in the western United States using extreme value theory**

www.nrfirescience.org/resource/18791

More than 70 years of fire suppression by federal land management agencies has interrupted fire regimes in much of the western United States. The result of missed fire cycles is a buildup of both surface and canopy fuels in many forest ecosystems, increasing the risk of severe fire. The frequency and size of fires has increased in...

Author(s): Alisa Keyser, Anthony L. Westerling

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

**The species diversity x fire severity relationship is hump-shaped in semiarid yellow pine and mixed conifer forests**

www.nrfirescience.org/resource/20255

The combination of direct human influences and the effects of climate change are resulting in altered ecological disturbance regimes, and this is especially the case for wildfires. Many regions that historically experienced low–moderate severity fire regimes are seeing increased area burned at high severity as a result of...

Author(s): Clark Richter, Marcel Rejmánek, Jesse E. D. Miller, Kevin R. Welch, JonahMaria Weeks, Hugh Safford

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

**Wildfire effects on soil properties in fire-prone pine ecosystems: indicators of burn severity legacy over the medium term after fire**

www.nrfirescience.org/resource/19352

The aim of this study was to determine the effects of burn severity on soil properties (chemical, biochemical and microbiological) in fire-prone pine ecosystems three years after fire. To achieve these goals, we selected two large wildfires that occurred in summer 2012 within the Iberian Peninsula: the Sierra del Teleno wildfire,...
Fire Intensity Affects the Relationship between Species Diversity and the N Utilization Stability of Dominant Species

www.nrfirescience.org/resource/19307
Stabilizing the local elemental stoichiometry is an important step toward restoring species diversity in a damaged ecosystem, especially those affected by wildfire. Stability of nitrogen (N) utilization is mainly affected by wildfire through restoration, which is one of the most important parts of stoichiometric utilization. However...

How Much Forest Persists Through Fire? High-Resolution Mapping of Tree Cover to Characterize the Abundance and Spatial Pattern of Fire Refugia Across Mosaics of Burn Severity

www.nrfirescience.org/resource/20148
Wildfires in forest ecosystems produce landscape mosaics that include relatively unaffected areas, termed fire refugia. These patches of persistent forest cover can support fire-sensitive species and the biotic legacies important for post-fire forest recovery, yet little is known about their abundance and distribution within fire...

Varying relationships between fire radiative power and fire size at a global scale

www.nrfirescience.org/resource/19174
Vegetation fires are an important process in the Earth system. Fire intensity locally impacts fuel consumption, damage to the vegetation, chemical composition of fire emissions and also how fires spread across landscapes. It has been observed that fire occurrence, defined as the frequency of active fires detected by the MODIS sensor...

Time series of high-resolution images enhances efforts to monitor post-fire condition and recovery, Waldo Canyon fire, Colorado, USA

www.nrfirescience.org/resource/18249
Interpretations of post-fire condition and rates of vegetation recovery can influence management priorities, actions and perception of latent risks from landslides and floods. In this study, we used the Waldo Canyon fire (2012, Colorado Springs, Colorado, USA) as a case study to explore how a time series (2011–2016) of high-...
The nature of the beast: examining climate adaptation options in forests with stand-replacing fire regimes
www.nrfirescience.org/resource/17221
Building resilience to natural disturbances is a key to managing forests for adaptation to climate change. To date, most climate adaptation guidance has focused on recommendations for frequent-fire forests, leaving few published guidelines for forests that naturally experience infrequent, stand-replacing wildfires. Because most...
Author(s): Joshua S. Halofsky, Daniel C. Donato, Jerry F. Franklin, Jessica E. Halofsky, David L. Peterson, Brian J. Harvey
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

How does forest recovery following moderate-severity fire influence effects of subsequent wildfire in mixed-conifer forests?
www.nrfirescience.org/resource/18117
Given regional increases in fire activity in western North American forests, understanding how fire influences the extent and effects of subsequent fires is particularly relevant. Remotely sensed estimates of fire effects have allowed for spatial partitioning into different severity categories based on the degree of fire-caused...
Author(s): Brandon M. Collins, Jamie M. Lydersen, Richard G. Everett, Scott L. Stephens
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Sparking New Opportunities for Charcoal-Based Fire History Reconstructions
www.nrfirescience.org/resource/17103
Paleofire research is the study of past fire regimes using a suite of proxies (frequency, area burned, severity, intensity, etc.). Charcoal preserved in sedimentary archives constitutes one of the most ubiquitous measures of past fire regimes along with fire-scarred tree rings, chemical markers of fire, and black carbon residue [1,2...
Author(s): Julie C. Aleman, Andy Hennebelle, Boris Vannière, Olivier Blarquez, Global Paleofire Working Group
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

How vegetation recovery and fuel conditions in past fires influences fuels and future fire management in five western U.S. ecosystems - JFSP Final Report
www.nrfirescience.org/resource/18062
Mixed severity wildfires burn large areas in western North America forest ecosystems in most years and this is expected to continue or increase with climate change. Little is understood about vegetation recovery and changing fuel conditions more than a decade post-fire because it exceeds the duration of most studies of fire effects...
Author(s): Andrew T. Hudak, Beth A. Newingham, Eva K. Strand, Penelope Morgan
Year Published: 2018
Type: Document
Historic frequency and severity of fire in whitebark pine forests of the Cascade Mountain Range, USA

www.nrfirescience.org/resource/16810

Whitebark pine (Pinus albicaulis Engelm.) is a foundation species of high elevation forest ecosystems in the Cascade Mountain Range of Oregon, Washington, and British Columbia. We examined fire evidence on 55 fire history sites located in the Cascade Range. To estimate dates of historic fires we analyzed 57 partial cross-sections...

Author(s): Michael P. Murray, Joel Siderius
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Determining the minimum sampling frequency for ground measurements of burn severity

www.nrfirescience.org/resource/17932

Understanding burn severity is essential to provide an overview of the precurser conditions leading to fires as well as understanding the constraints placed on fire management services when mitigating their effects. Determining the minimum sampling frequency for ground measurements is not only essential for accurately assessing...

Author(s): Alexander W. Holmes, Christoph Rüdiger, Sarah Harris, Nigel J. Tapper
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Fire enhances the complexity of forest structure in alpine treeline ecotones

www.nrfirescience.org/resource/16637

Alpine treelines are expected to move upward in a warming climate, but downward in response to increases in wildfire. We studied the effects of fire on vegetation structure and composition across four alpine treeline ecotones extending from Abies lasiocarpa/Picea engelmannii forests at lower elevations, through Pinus albicaulis/...

Author(s): C. Alina Cansler, Donald McKenzie, Charles B. Halpern
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Towards improved quantification and prediction of post-fire recovery in conifers: Expanding laboratory fire radiative energy-tree physiology experiments to a mature forest stand - JFSP Final Report

www.nrfirescience.org/resource/17721

Current assessments of the ecological impacts of fires, termed burn severity, investigate the degree to which an ecosystem has changed due to a fire and typically encompass both vegetation and soil effects. Burn severity assessments at local to regional scales are typically achieved using spectral indices (such as the differenced...)

Author(s): Crystal A. Kolden, Aaron M. Sparks
Year Published: 2018
Type: Document
Technical Report or White Paper

Land surveys show regional variability of historical fire regimes and structure of dry forests of
An understanding of how historical fire and structure in dry forests (ponderosa pine, dry mixed conifer) varied across the western USA remains incomplete. Yet, fire strongly affects ecosystem services, and forest restoration programs are underway. We used General Land Office survey reconstructions from the late-1800s across 11...

Author(s): William L. Baker, Mark A. Williams
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

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

Author(s): Ryan B. Walker, Jonathan D. Coop, Sean A. Parks, Laura Trader
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

The development of frameworks for better-understanding ecological syndromes and putative evolutionary strategies of plant adaptation to fire has recently received a flurry of attention, including a new model hypothesizing that plants have diverged into three different plant flammability strategies due to natural selection. We...

Author(s): Helen M. Poulos, Andrew M. Barton, Jasper A. Slingsby, David M. J. S. Bowman
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Setting suitable conservation targets is an important part of ecological fire planning. Growth-stage optimisation (GSO) determines the relative proportions of post-fire growth stages (categorical representations of time since fire) that maximise species diversity, and is a useful method for determining such targets. Optimisation...

Author(s): Matthew Swan, Holly Sitters, Jane G. Cawson, Thomas J. Duff, Yohannes Wibisono, Alan York
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Natural resource managers need to know how past wildfires influence the severity and ecological effects of subsequent wildfires fires in order to make informed decisions during and after wildfire events,
and to effectively plan for the future. The overarching goals for this study were to quantify and compare the effects of single...

Author(s): Andrew J. Larson, R. Travis Belote
Year Published: 2018
Type: Document
Technical Report or White Paper

**High severity fire: evaluating its key drivers and mapping its probability across western US forests**

www.nrfirescience.org/resource/17224

Wildland fire is a critical process in forests of the western United States (US). Variation in fire behavior, which is heavily influenced by fuel loading, terrain, weather, and vegetation type, leads to heterogeneity in fire severity across landscapes. The relative importance of these factors in driving fire severity, however, is...

Author(s): Sean A. Parks, Lisa M. Holsinger, Matthew Panunto, William Matt Jolly, Solomon Z. Dobrowski, Gregory K. Dillon
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

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

www.nrfirescience.org/resource/18177

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

Author(s): Max A. Moritz, Christopher Topik, Craig D. Allen, Paul F. Hessburg, Penelope Morgan, Dennis C. Odion, Thomas T. Veblen, Ian M. McCullough
Year Published: 2018
Type: Document
Technical Report or White Paper

**Land surveys show regional variability of historical fire regimes and dry forest structure of the western United States**

www.nrfirescience.org/resource/17218

An understanding of how historical fire and structure in dry forests (ponderosa pine, dry mixed conifer) varied across the western United States remains incomplete. Yet, fire strongly affects ecosystem services, and forest restoration programs are underway. We used General Land Office survey reconstructions from the late 1800s...

Author(s): William L. Baker, Mark A. Williams
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

**Fire patterns in piñon and juniper land cover types in the Semiarid Western United States from 1984 through 2013**

www.nrfirescience.org/resource/18084

Increases in area burned and fire size have been reported across a wide range of forest and shrubland types in the Western United States in recent decades, but little is known about potential changes in fire regimes of piñon and juniper land cover types. We evaluated spatio-temporal patterns of fire in piñon
and juniper land cover...
Author(s): David Board, Jeanne C. Chambers, Richard F. Miller, Peter J. Weisberg
Year Published: 2018
Type: Document
Technical Report or White Paper

A World in Pixels: How New Research Is Helping to Predict Probability of High-Severity Fire
www.nrfirescience.org/resource/18051
With drought across much of the southern and western States, it’s shaping up to be another record year for wildfires. According to the National Oceanic and Atmospheric Administration, May 2018 was the fourthworst May since 2000 in terms of U.S. acres burned by wildfires. The year 2000 is a significant measuring point, since the...
Author(s): Sean A. Parks
Year Published: 2018
Type: Document
Research Brief or Fact Sheet

Mean composite fire severity metrics computed with Google Earth engine offer improved accuracy and expanded mapping potential
www.nrfirescience.org/resource/17913
Landsat-based fire severity datasets are an invaluable resource for monitoring and research purposes. These gridded fire severity datasets are generally produced with pre- and post-fire imagery to estimate the degree of fire-induced ecological change. Here, we introduce methods to produce three Landsat-based fire severity metrics...
Author(s): Sean A. Parks, Lisa M. Holsinger, Morgan A. Voss, Rachel A. Loehman, Nathaniel P. Robinson
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Limits to Ponderosa Pine Regeneration Following Large High-Severity Forest Fires in the United States Southwest
www.nrfirescience.org/resource/17687
High-severity fires in dry conifer forests of the United States Southwest have created large (>1000 ha) treeless areas that are unprecedented in the regional historical record. These fires have reset extensive portions of Southwestern ponderosa pine (Pinus ponderosa Lawson & C. Lawson var. scopulorum Engelm.) forest...
Author(s): Collin M. Haffey, Thomas D. Sisk, Craig D. Allen, Andrea E. Thode, Ellis Q. Margolis
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Composition and Structure of Forest Fire Refugia: What Are the Ecosystem Legacies across Burned Landscapes?
www.nrfirescience.org/resource/17619
Locations within forest fires that remain unburned or burn at low severity—known as fire refugia—are important components of contemporary burn mosaics, but their composition and structure at regional scales are poorly understood. Focusing on recent, large wildfires across the US Pacific Northwest (Oregon and Washington), our...
Author(s): Garrett W. Meigs, Meg A. Krawchuk
Year Published: 2018
High-severity fire: Evaluating its key drivers and mapping its probability across western US forests

Wildland fire is a critical process in forests of the western United States (US). Variation in fire behavior, which is heavily influenced by fuel loading, terrain, weather, and vegetation type, leads to heterogeneity in fire severity across landscapes. The relative influence of these factors in driving fire severity, however, is...

Author(s): Sean A. Parks, Lisa M. Holsinger, Matthew Panunto, William Matt Jolly, Solomon Z. Dobrowski, Gregory K. Dillon
Year Published: 2018
Type: Document

Effects of fuels management on fire intensity, rate of spread, severity, and resultant forest structure within the 2013 Rim Fire landscape - Final Report to the Joint Fire Science Program

Large wildfires with uncharacteristically high severity are occurring more frequently in western U.S. forests. The increasing size and severity of wildfires has been attributed to both an increase in weather conducive to fire spread and changes to forest structure and fuel loads due to management practices that included fire...

Author(s): Brandon M. Collins, Jamie M. Lydersen, Van R. Kane, Nicholas A. Povak, Matthew L. Brooks, Douglas F. Smith
Year Published: 2018
Type: Document

Sustainability and wildland fire: The origins of Forest Service Wildland Fire Research

On June 1, 2015, the Forest Service, an agency of the U.S. Department of Agriculture (USDA), celebrated the 100th anniversary of the Branch of Research. Established in 1915 to centralize and elevate the pursuit of research throughout the agency, the Branch of Research focused on everything from silvicultural investigations conducted...

Author(s): Diane M. Smith
Year Published: 2017
Type: Document

Assessment of fire effects based on forest inventory and analysis data and a long-term fire mapping data set

Integration of Forest Inventory and Analysis (FIA) plot data with Monitoring Trends in Burn Severity (MTBS) data can provide new information about fire effects on forests. This integration allowed broad-scale assessment of the cover types burned in large fires, the relationship between prefire stand conditions and fire severity, and...

Author(s): John D. Shaw, Sara Goeking, James Menlove, Charles E. Werstak
Year Published: 2017
Type: Document
Spatial patterns of ponderosa pine regeneration in high-severity burn patches
www.nrfirescience.org/resource/16541
Contemporary wildfires in southwestern US ponderosa pine forests can leave uncharacteristically large patches of tree mortality, raising concerns about the lack of seed-producing trees, which can prevent or significantly delay ponderosa pine regeneration. We established 4-ha plots in high-severity burn patches in two Arizona...
Author(s): Suzanne M. Owen, Carolyn Hull Sieg, Andrew Sanchez Meador, Peter Z. Fule, Jose M. Iniguez, Scott L. Baggett, Paula J. Fornwalt, Michael A. Battaglia
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Temporal trends in burn severity in Selway Bitterroot Wilderness 1880-2012
www.nrfirescience.org/resource/17662
Multidecadal trends in areas burned with high severity shape ecological effects of fires, but most assessments are limited to ?30 years of satellite data. We analysed the proportion of area burned with high severity, the annual area burned with high severity, the probability areas burned with high severity and also the area...
Author(s): Penelope Morgan, Andrew T. Hudak, Ashley Wells, Sean A. Parks, Scott L. Baggett, Benjamin C. Bright, Patricia Green
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Climatic influences on interannual variability in regional burn severity across western US forests
www.nrfirescience.org/resource/15202
Interannual variability in burn severity is assessed across forested ecoregions of the western United States to understand how it is influenced by variations in area burned and climate during 1984–2014. Strong correlations (|r| > 0.6) between annual area burned and climate metrics were found across many of the studied...
Author(s): John T. Abatzoglou, Crystal A. Kolden, A. Park Williams, James A. Lutz, Alistair M. S. Smith
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Mixed-severity fire and salvage logging in dry forests of Oregon's western Cascades
www.nrfirescience.org/resource/15054
Interest in PNW forests is shifting from a focus on old-growth forests alone to include the ecological value and processes of early-seral communities. However, focusing on the alpha and omega states of a linear successional model does not account for the suite of conditions derived from mixed-severity fire common in many forests....
Author(s): Christopher J. Dunn, John D. Bailey
Year Published: 2017
Type: Document
Technical Report or White Paper

Multidecadal trends in area burned with high severity in the Selway-Bitterroot Wilderness Area 1880-2012
Multidecadal trends in areas burned with high severity shape ecological effects of fires, but most assessments are limited to ≈30 years of satellite data. We analysed the proportion of area burned with high severity, the annual area burned with high severity, the probability areas burned with high severity and also the area reburned...
Author(s): Penelope Morgan, Andrew T. Hudak, Ashley Wells, Sean A. Parks, Scott L. Baggett, Benjamin C. Bright, Patricia Green
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Interacting effects of fire severity, time since fire and topography on vegetation structure after wildfire
Author(s): Michelle Bassett, Steven W.J. Leonard, Evelyn K. Chia, Michael F. Clarke, Andrew F. Bennett
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Disturbance regimes and the historical range and variation in terrestrial ecosystems

Author(s): Robert E. Keane
Year Published: 2017
Type: Document
Synthesis

Fire regimes of ponderosa pine communities in the Black Hills and surrounding areas
Author(s): Shannon K. Murphy
Year Published: 2017
Type: Document
Synthesis

Deciphering the complexity of historical fire regimes: diversity among forests of western North America

Author(s): Shannon K. Murphy
Year Published: 2017
Type: Document
Synthesis
reconstructions of historical fire frequency, severity, spatial variability, and extent, corroborated by other lines of...

Author(s): Lori D. Daniels, Larissa L. Yocom Kent, Rosemary L. Sherriff, Emily K. Heyerdahl
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

**Does the presence of large down wood at the time of a forest fire impact soil recovery?**

[www.nrfirescience.org/resource/15068](http://www.nrfirescience.org/resource/15068)

Fire may remove or create dead wood aboveground, but it is less clear how high severity burning of soils affects belowground microbial communities and soil processes, and for how long. In this study, we investigated soil fungal and bacterial communities and biogeochemical responses of severely burned “red” soil and less severely...

Author(s): Jane E. Smith, Laurel A. Kluber, Tara N. Jennings, Donaraye McKay, Greg Brenner, Elizabeth W. Sulzman
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

**Evidence of fuels management and fire weather influencing fire severity in an extreme fire event**

[www.nrfirescience.org/resource/17228](http://www.nrfirescience.org/resource/17228)

Following changes in vegetation structure and pattern, along with a changing climate, large wildfire incidence has increased in forests throughout the western United States. Given this increase, there is great interest in whether fuels treatments and previous wildfire can alter fire severity patterns in large wildfires. We assessed...

Author(s): Jamie M. Lydersen, Brandon M. Collins, Matthew L. Brooks, John R. Matchett, Kristen L. Shive, Nicholas A. Povak, Van R. Kane, Douglas F. Smith
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

**Spatial interpolation and mean fire interval analyses quantify historical mixed-severity fire regimes**

[www.nrfirescience.org/resource/15005](http://www.nrfirescience.org/resource/15005)

Tree-age data in combination with fire scars improved inverse-distance-weighted spatial modelling of historical fire boundaries and intervals for the Darkwoods, British Columbia, Canada. Fire-scarred trees provided direct evidence of fire. The presence of fire-sensitive trees at sites with no fire scars indicated fire-free periods...

Author(s): Gregory A. Greene, Lori D. Daniels
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

**Drivers and trends in landscape patterns of stand-replacing fire in forests of the US Northern Rocky Mountains (1984-2010)**

[www.nrfirescience.org/resource/14513](http://www.nrfirescience.org/resource/14513)

Resilience in fire-prone forests is strongly affected by landscape burn-severity patterns, in part by governing propagule availability around stand-replacing patches in which all or most vegetation is killed. However, little is known about drivers of landscape patterns of stand-replacing fire, or whether...

Author(s): Brian J. Harvey, Daniel C. Donato, Monica G. Turner
Year Published: 2016
Tree mortality based fire severity classification for forest inventories: a Pacific Northwest national forests example
www.nrfirescience.org/resource/13821
Determining how the frequency, severity, and extent of forest fires are changing in response to changes in management and climate is a key concern in many regions where fire is an important natural disturbance. In the USA the only national-scale fire severity classification uses satellite image change-detection to produce maps for...
Author(s): Thomas R. Whittier, Andrew N. Gray
Year Published: 2016
Type: Document

Duff distribution influences fire severity and post-fire vegetation recovery in sagebrush steppe
www.nrfirescience.org/resource/14820
Woody plant expansion is a global phenomenon that alters the spatial distribution of nutrients, biomass, and fuels in affected ecosystems. Altered fuel patterns across the landscape influences ecological processes including fire behavior, fire effects, and can impact post-fire plant germination and establishment. The purpose of this...
Author(s): Nathan I. Weiner, Eva K. Strand, Stephen C. Bunting, Alistair M. S. Smith
Year Published: 2016
Type: Document

Prior wildfires influence burn severity of subsequent large fires
www.nrfirescience.org/resource/14814
With longer and more severe fire seasons predicted, the incidence and extent of fires are expected to increase in western North America. As more area is burned, past wildfires may influence the spread and burn severity of subsequent fires, with implications for ecosystem resilience and fire management. We examined how previous burn...
Author(s): Camille Stevens-Rumann, Susan J. Prichard, Eva K. Strand, Penelope Morgan
Year Published: 2016
Type: Document

Average stand age from forest inventory plots does not describe historical fire regimes in ponderosa pine and mixed-conifer forests of western North America
www.nrfirescience.org/resource/14438
Quantifying historical fire regimes provides important information for managing contemporary forests. Historical fire frequency and severity can be estimated using several methods; each method has strengths and weaknesses and presents challenges for interpretation and verification. Recent efforts to quantify the timing of historical...
Year Published: 2016
Type: Document
Does increased forest protection correspond to higher fire severity in frequent-fire forests of the western United States?
www.nrfirescience.org/resource/14718
There is a widespread view among land managers and others that the protected status of many forestlands in the western United States corresponds with higher fire severity levels due to historical restrictions on logging that contribute to greater amounts of biomass and fuel loading in less intensively managed areas, particularly...
Author(s): Curtis M. Bradley, Chad T. Hanson, Dominick A. DellaSala
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Altered mixed-severity fire regime has homogenised montane forests of Jasper National Park
www.nrfirescience.org/resource/14201
Fire suppression has altered the historical mixed-severity fire regime and homogenised forest structures in Jasper National Park, Canada. We used dendrochronology to reconstruct fire history and assess forest dynamics at 29 sites in the montane forests. Based on fire scars and even-aged post-fire cohorts, we determined 18 sites had...
Author(s): Raphael D. Chavardes, Lori D. Daniels
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Topographic and fire weather controls of contemporary fire refugia in forested ecosystems of northwestern North America
www.nrfirescience.org/resource/18922
Fire refugia, sometimes referred to as fire islands, shadows, skips, residuals, or fire remnants, are an important element of the burn mosaic, but we lack a quantitative framework that links observations of fire refugia from different environmental contexts. Here, we develop and test a conceptual model for how predictability of fire...
Author(s): Meg A. Krawchuk, Sandra L. Haire, Jonathan D. Coop, Marc-Andre Parisien, Ellen Whitman, Geneva W. Chong, Carol Miller
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Protecting the source: tools to evaluate fuel treatment cost vs. water quality protection
www.nrfirescience.org/resource/14698
High-intensity wildfires are one of the leading causes of severe soil erosion in western U.S. watersheds. This erosion can lead to disruptive deposits of sediment in reservoirs and water supply systems. Fuel treatments such as controlled burns and forest thinning can reduce wildfire intensity and help preserve topsoil. But while...
Author(s): Brian Cooke
Year Published: 2016
Type: Document
Research Brief or Fact Sheet

Post-fire vegetation and fuel development influences fire severity patterns in reburns
www.nrfirescience.org/resource/14638
In areas where fire regimes and forest structure have been dramatically altered, there is increasing concern that contemporary fires have the potential to set forests on a positive feedback trajectory with successive reburns, one in which extensive stand-replacing fire could promote more stand-replacing fire. Our study utilized an...

Author(s): Michelle Coppoletta, Kyle E. Merriam, Brandon M. Collins  
Year Published: 2016  
Type: Document  
Book or Chapter or Journal Article

**Fire regimes of Northern Rocky Mountain ponderosa pine communities**  
[www.nrfirescience.org/resource/14602](www.nrfirescience.org/resource/14602)  
Hundreds of articles are published about wildland fires in Northern Rocky Mountain ponderosa pine communities. The author of this FEIS synthesis reviewed over 300 publications on historical and contemporary fuel loads, stand structure, and fire regimes in ponderosa pine communities. Most studies found that prior to fire exclusion,...

Author(s): Janet L. Fryer  
Year Published: 2016  
Type: Document  
Synthesis, Technical Report or White Paper

**Infiltration and interrill erosion rates after a wildfire in western Montana, USA**  
[www.nrfirescience.org/resource/14528](www.nrfirescience.org/resource/14528)  
The 2000 Valley Complex wildfire burned in steep montane forests with ash cap soils in western Montana, USA. The effects of high soil burn severity on forest soil hydrologic function were examined using rainfall simulations (100mmh-1 for 1 h) on 0.5-m2 plots. Infiltration rates, sediment yields and sediment concentrations were...

Author(s): Peter R. Robichaud, Joseph W. Wagenbrenner, Frederick B. Pierson, Kenneth E. Spaeth, Louise E. Ashmun, Corey A. Moffet  
Year Published: 2016  
Type: Document  
Book or Chapter or Journal Article

**Tamm Review: Management of mixed-severity fire regime forests in Oregon, Washington, and Northern California**  
[www.nrfirescience.org/resource/13976](www.nrfirescience.org/resource/13976)  
Increasingly, objectives for forests with moderate- or mixed-severity fire regimes are to restore successionaly diverse landscapes that are resistant and resilient to current and future stressors. Maintaining native species and characteristic processes requires this successional diversity, but methods to achieve it are poorly...

Year Published: 2016  
Type: Document  
Book or Chapter or Journal Article, Synthesis

**Cumulative disturbance on the landscape: lessons from the Pole Creek fire, Oregon**  
[www.nrfirescience.org/resource/14519](www.nrfirescience.org/resource/14519)  
Previous research has focused on quantifying fuel loadings and using operational fire behavior models to understand changes in fire severity following MPB outbreaks. In this study however, researchers
Relating fire-caused change in forest structure to remotely sensed estimates of fire severity
www.nrfirescience.org/resource/14891
Fire severity maps are an important tool for understanding fire effects on a landscape. The relative differenced normalized burn ratio (RdNBR) is a commonly used severity index in California forests, and is typically divided into four categories: unchanged, low, moderate, and high. RdNBR is often calculated twice—from images...
Author(s): Jamie M. Lydersen, Brandon M. Collins, Jay D. Miller, Danny L. Fry, Scott L. Stephens
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Evaluation of spectral indices for estimating burn severity in semiarid grasslands
www.nrfirescience.org/resource/13799
Using Landsat imagery, this study was conducted to evaluate a fire disturbance that occurred in Canada’s Grasslands National Park on 27 April 2013. We used spectral indices (e.g. Normalised Burn Ratio (NBR) and Mid-infrared Burn Index (MIRBI)) derived from Landsat images to evaluate burn severity and to analyse the vegetation...
Author(s): Bing Lu, Yuhong He, Alexander Tong
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Sensitivity of reconstructed fire histories to detection criteria in mixed-severity landscapes
www.nrfirescience.org/resource/14818
In heterogeneous forest landscapes prone to wildfires, accurate classification of the fire regime beyond direct observations and records is difficult. This is in part due to the methods used to reconstruct historical fires in complex, heterogeneous landscapes with varying fire severities. Mixed-severity fire regimes, defined as...
Author(s): Vanessa Stretch, Ze'ev Gedalof, Jacklyn Cockburn, Michael F. Pisaric
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Avian relationships with wildfire at two dry forest locations with different historical fire regimes
www.nrfirescience.org/resource/14479
Wildfire is a key factor influencing bird community composition in western North American forests. We need to understand species and community responses to wildfire and how responses vary regionally to effectively manage dry conifer forests for maintaining biodiversity. We compared avian relationships with wildfire burn severity...
Author(s): Quresh Latif, Jamie Sanderlin, Victoria A. Saab, William M. Block, Jonathan G. Dudley
Year Published: 2016
Type: Document
Book or Chapter or Journal Article
**Fire weather conditions and fire-atmosphere interactions observed during low-intensity prescribed fires - Rxcadre 2012**

www.nrfirescience.org/resource/16908

The goal of this paper is to describe the overall meteorological measurement campaign design and methods and present some initial results from analyses of two burn experiments.

Author(s): Craig B. Clements, Neil Lareau, Daisuke Seto, Jonathan Contezac, Braniff Davis, Casey Teske, Thomas J. Zajkowski, Andrew T. Hudak, Benjamin C. Bright, Matthew B. Dickinson, Bret W. Butler, Daniel M. Jimenez, J. Kevin Hiers

Year Published: 2016
Type: Document
Book or Chapter or Journal Article

**Burn me twice, shame on who? Interactions between successive forest fires across a temperate mountain region**

www.nrfirescience.org/resource/14793

Increasing rates of natural disturbances under a warming climate raise important questions about how multiple disturbances interact. Escalating wildfire activity in recent decades has resulted in some forests re-burning in short succession, but how the severity of one wildfire affects that of a subsequent wildfire is not fully...

Author(s): Brian J. Harvey, Daniel C. Donato, Monica G. Turner

Year Published: 2016
Type: Document
Book or Chapter or Journal Article

**Do insect outbreaks reduce the severity of subsequent forest fires?**

www.nrfirescience.org/resource/14260

Understanding the causes and consequences of rapid environmental change is an essential scientific frontier, particularly given the threat of climate- and land use-induced changes in disturbance regimes. In western North America, recent widespread insect outbreaks and wildfires have sparked acute concerns about potential insect—...

Author(s): Garrett W. Meigs, Harold S. Zald, John L. Campbell, William S. Keeton, Robert E. Kennedy

Year Published: 2016
Type: Document
Book or Chapter or Journal Article

**Spatial and temporal variations of fire regimes in the Canadian Rocky mountains and foothills of southern Alberta**

www.nrfirescience.org/resource/14701

Like many fire-adapted ecosystems, decades of fire exclusion policy in the Rocky Mountains and Foothills natural regions of southern Alberta, Canada are raising concern over the loss of ecological integrity. Departure from historical conditions is evaluated using median fire return intervals (MdFRI) based on fire history data from...

Author(s): Michael D. Flannigan, Brad C. Hawkes, Marc-Andre Parisien, Marie-Pierre Rogeau, Rick Arthur

Year Published: 2016
Type: Document
Book or Chapter or Journal Article

**1984–2010 trends in fire burn severity and area for the conterminous US**

www.nrfirescience.org/resource/14199
Burn severity products created by the Monitoring Trends in Burn Severity (MTBS) project were used to analyse historical trends in burn severity. Using a severity metric calculated by modelling the cumulative distribution of differenced Normalized Burn Ratio (dNBR) and Relativized dNBR (RdNBR) data, we examined burn area and burn...

Author(s): Joshua J. Picotte, Birgit Peterson, Gretchen Meier, Stephen M. Howard
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

**Positive effects of fire on birds may appear only under narrow combinations of fire severity and time-since-fire**

[www.nrfirescience.org/resource/14642](http://www.nrfirescience.org/resource/14642)

We conducted bird surveys in 10 of the first 11 years following a mixed-severity fire in a dry, low-elevation mixed-conifer forest in western Montana, United States. By defining fire in terms of fire severity and time-since-fire, and then comparing detection rates for species inside 15 combinations of fire severity and time-since-...

Author(s): Richard L. Hutto, David A. Patterson
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

**Toward a more ecologically informed view of severe forest fires**

[www.nrfirescience.org/resource/14023](http://www.nrfirescience.org/resource/14023)

We use the historical presence of high-severity fire patches in mixed-conifer forests of the western United States to make several points that we hope will encourage development of a more ecologically informed view of severe wildland fire effects. First, many plant and animal species use, and have sometimes evolved to depend on,...

Author(s): Richard L. Hutto, Robert E. Keane, Rosemary L. Sherriff, Christopher T. Rota, Lisa A. Eby, Victoria A. Saab
Year Published: 2016
Type: Document
Book or Chapter or Journal Article, Synthesis

**Soil heating during the complete combustion of mega-logs and broadcast burning in central Oregon USA pumice soils**

[www.nrfirescience.org/resource/14604](http://www.nrfirescience.org/resource/14604)

The environmental effect of extreme soil heating, such as occurs with the complete combustion of large downed wood during wildfires, is a post-fire management concern to forest managers. To address this knowledge gap, we stacked logs to create ‘mega-log’ burning conditions and compared the temperature, duration and penetration...

Author(s): Jane E. Smith, Ariel D. Cowan, Stephen A. Fitzgerald
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

**Fire severity and cumulative disturbance effects in the post-mountain pine beetle lodgepole pine forests of the Pole Creek Fire**

[www.nrfirescience.org/resource/14007](http://www.nrfirescience.org/resource/14007)

Recent large scale mountain pine beetle (Dendroctonus ponderosae Hopkins, MPB) outbreaks have created concern regarding increased fuel loadings and exacerbated fire behavior and have prompted a desire to understand the effects of sequential disturbances on the landscape. However, previous
research has focused on quantifying fuel...
Author(s): Michelle Agne, Travis J. Woolley, Stephen A. Fitzgerald
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Recovering lost ground: effects of soil burn intensity on nutrients and ectomycorrhiza communities of ponderosa pine seedlings
www.nrfirescience.org/resource/14547
Fuel accumulation and climate shifts are predicted to increase the frequency of high-severity fires in ponderosa pine (Pinus ponderosa) forests of central Oregon. The combustion of fuels containing large downed wood can result in intense soil heating, alteration of soil properties, and mortality of microbes. Previous studies show...
Author(s): Ariel D. Cowan, Jane E. Smith, Stephen A. Fitzgerald
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

How will climate change affect wildland fire severity in the western US?
www.nrfirescience.org/resource/13983
Fire regime characteristics in North America are expected to change over the next several decades as a result of anthropogenic climate change. Although some fire regime characteristics (e.g., area burned and fire season length) are relatively well-studied in the context of a changing climate, fire severity has received less...
Author(s): Sean A. Parks, Carol Miller, John T. Abatzoglou, Lisa M. Holsinger, Marc-Andre Parisien, Solomon Z. Dobrowski
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Fire and drought
www.nrfirescience.org/resource/14525
Historical and presettlement relationships between drought and wildfire have been well documented in much of North America, with forest fire occurrence and area burned clearly increasing in response to drought. Drought interacts with other controls (forest productivity, topography, and fire weather) to affect fire intensity and...
Author(s): Jeremy S. Littell, David L. Peterson, Karen L. Riley, Yongqiang Liu, Charles H. Luce
Year Published: 2016
Type: Document
Technical Report or White Paper

Towards a new paradigm in fire severity research using dose-response experiments
www.nrfirescience.org/resource/13917
Most landscape-scale fire severity research relies on correlations between field measures of fire effects and relatively simple spectral reflectance indices that are not direct measures of heat output or changes in plant physiology. Although many authors have highlighted limitations of this approach and called for improved...
Author(s): Alistair M. S. Smith, Aaron M. Sparks, Crystal A. Kolden, John T. Abatzoglou, Alan F. Talhelm, Daniel M. Johnson, Luigi Boschetti, James A. Lutz, Kent G. Apostol, Kara M. Yedinak, Wade T. Tinkham, Robert L. Kremens
Year Published: 2016
**Paths of recovery: landscape variability in forest structure, function, and fuels after the 1988 Yellowstone Fires**

www.nrfirescience.org/resource/13720

Understanding the rates, trajectories, and spatial variability in succession following severe wildfire is increasingly important for forest managers in western North America and critical for anticipating the resilience or vulnerability of forested landscapes to changing environmental conditions. However, few long-term...

Author(s): Monica G. Turner, William H. Romme, Daniel B. Tinker, Daniel C. Donato, Brian J. Harvey

Year Published: 2015

Type: Document

Technical Report or White Paper

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**Does wildfire likelihood or severity increase following insect outbreaks in conifer forests?**

www.nrfirescience.org/resource/14153

Although there is acute concern that insect-caused tree mortality increases the likelihood or severity of subsequent wildfire, previous studies have been mixed, with findings typically based on stand-scale simulations or individual events. This study investigates landscape- and regional-scale wildfire likelihood following outbreaks...

Author(s): Garrett W. Meigs, John L. Campbell, Harold S. Zald, John D. Bailey, David C. Shaw, Robert E. Kennedy

Year Published: 2015

Type: Document

Book or Chapter or Journal Article

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**Assessing soil and vegetation recovery following the 2005 School Fire, Umatilla National Forest - 10-year update**

www.nrfirescience.org/resource/12811

Following the 2005 School Fire which burned ~ 50,000 acres across forest and grasslands, managers were particularly concerned with treating severely burned areas to mitigate weed spread and to limit soil erosion. Various mulching treatments (wheat straw, wood strand, and hydromulch) were implemented to control...

Author(s): Peter R. Robichaud, Penelope Morgan, Leigh B. Lentile, Sarah A. Lewis, Andrew T. Hudak, Deborah S. Page-Dumroese

Year Published: 2015

Type: Document

Research Brief or Fact Sheet

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**Fire legacies impact conifer regeneration across environmental gradients in the U.S. northern Rockies**

www.nrfirescience.org/resource/14018

Context: An increase in the incidence of large wildfires worldwide has prompted concerns about the resilience of forest ecosystems, particularly in the western U.S., where recent changes are linked with climate warming and 20th-century land management practices. Objectives: To study forest resilience to recent wildfires, we examined...

Author(s): Kerry Kemp, Philip E. Higuera, Penelope Morgan

Year Published: 2015

Type: Document

Book or Chapter or Journal Article
Daily weather and other factors influencing burn severity in central Idaho and western Montana

Burn severity as inferred from satellite-derived differenced Normalized Burn Ratio (dNBR) is useful for evaluating fire impacts on ecosystems but the environmental controls on burn severity across large forest fires are both poorly understood and likely to be different than those influencing fire extent. We related dNBR to...

Relations between soil hydraulic properties and burn severity

Wildfire can affect soil hydraulic properties, often resulting in reduced infiltration. The magnitude of change in infiltration varies depending on the burn severity. Quantitative approaches to link burn severity with changes in infiltration are lacking. This study uses controlled laboratory measurements to determine relations...

Mixed severity fire effects within the Rim fire: relative importance of local climate, fire weather, topography, and forest structure

Recent and projected increases in the frequency and severity of large wildfires in the western U.S. makes understanding the factors that strongly affect landscape fire patterns a management priority for optimizing treatment location. We compared the influence of variations in the local environment on burn severity patterns on the...

Using bird ecology to learn about the benefits of severe fire

In this chapter in the book "The Ecological Importance of Mixed Severity Fires: Nature's Phoenix, the authors do not provide an encyclopedic review of the more than 450 published papers that describe some kind of effect of fire on birds. Instead, they chose to highlight underappreciated principles or lessons that emerge from...

Vegetation, topography and daily weather influenced burn severity in central Idaho and western
Montana forests

Burn severity as inferred from satellite-derived differenced Normalized Burn Ratio (dNBR) is useful for evaluating fire impacts on ecosystems but the environmental controls on burn severity across large forest fires are both poorly understood and likely to be different than those influencing fire extent. We related dNBR to...

Author(s): Donovan Birch, Penelope Morgan, Crystal A. Kolden, John T. Abatzoglou, Gregory K. Dillon, Andrew T. Hudak, Alistair M. S. Smith

Year Published: 2015
Type: Document
Book or Chapter or Journal Article

Identification of Fire Refugia in Rocky Mountain Ecosystems of the U.S. and Canada: Development and Application of the Refugium Concept for Biodiversity Conservation over Large Spatial and Temporal Scales

The purpose of this report is to provide a summary of findings and products from our FY2014 research project on fire refugia. We summarize the products and findings of our work, including: development of regional datasets; use of a climate space framework to select sample fires; development of fire refugia models across the climate...

Author(s): Geneva W. Chong

Year Published: 2015
Type: Document
Technical Report or White Paper

The climate space of fire regimes in north-western North America

Aim: Studies of fire activity along environmental gradients have been undertaken, but the results of such studies have yet to be integrated with fire-regime analysis. We characterize fire-regime components along climate gradients and a gradient of human influence. Location: We focus on a climatically diverse region of north-western...

Author(s): Ellen Whitman, E. Batllori, Marc-Andre Parisien, Carol Miller, Jonathan D. Coop, Meg A. Krawchuk, Geneva W. Chong, Sandra L. Haire

Year Published: 2015
Type: Document
Book or Chapter or Journal Article

Are high-severity fires burning at much higher rates recently than historically in dry-forest landscapes of the western USA?

Dry forests at low elevations in temperate-zone mountains are commonly hypothesized to be at risk of exceptional rates of severe fire from climatic change and land-use effects. Their setting is fire-prone, they have been altered by land-uses, and fire severity may be increasing. However, where fires were excluded, increased fire...

Author(s): William L. Baker

Year Published: 2015
Type: Document
Book or Chapter or Journal Article

Vegetation response to burn severity, native grass seeding, and salvage logging
As the size and extent of wildfires has increased in recent decades, so has the cost and extent of post-fire management, including seeding and salvage logging. However, we know little about how burn severity, salvage logging, and post-fire seeding interact to influence vegetation recovery long-term. We sampled understory plant...

Author(s): Penelope Morgan, Marshell Moy, Christine A. Droske, Leigh B. Lentile, Sarah A. Lewis, Peter R. Robichaud, Andrew T. Hudak, Christopher Jason Williams
Year Published: 2015
Type: Document
Book or Chapter or Journal Article

Empirical Support for the Use of Prescribed Burning
www.nrfirescience.org/resource/19974
Prescribed burning as a fuel treatment seeks to moderate wildfire impacts and decreases the areal extent of wildfires by increasing the effectiveness of fire suppression. Assessment of prescribed burning effectiveness is frequently anecdotal or based on simulation. This paper examines recent observational evidence of prescribed fire...

Author(s): Paulo M. Fernandes
Year Published: 2015
Type: Document
Book or Chapter or Journal Article

Is proportion burned severely related to daily area burned?
www.nrfirescience.org/resource/13018
The ecological effects of forest fires burning with high severity are long-lived and have the greatest impact on vegetation successional trajectories, as compared to low-to-moderate severity fires. The primary drivers of high severity fire are unclear, but it has been hypothesized that wind-driven, large fire-growth days play a...

Author(s): Donovan Birch, Penelope Morgan, Crystal A. Kolden, Andrew T. Hudak, Alistair M. S. Smith
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

Recent mountain pine beetle outbreaks, wildfire severity, and postfire tree regeneration in the US northern Rockies
www.nrfirescience.org/resource/13007
Widespread tree mortality caused by outbreaks of native bark beetles (Circulionidae: Scolytinae) in recent decades has raised concern among scientists and forest managers about whether beetle outbreaks fuel more ecologically severe forest fires and impair postfire resilience. To investigate this question, we collected extensive...

Author(s): Brian J. Harvey, Daniel C. Donato, Monica G. Turner
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

Examining fire-prone forest landscapes as coupled human and natural systems
www.nrfirescience.org/resource/19561
Fire-prone landscapes are not well studied as coupled human and natural systems (CHANS) and present many challenges for understanding and promoting adaptive behaviors and institutions. Here, we explore how heterogeneity, feedbacks, and external drivers in this type of natural hazard system can lead to complexity and can limit the...

Author(s): Thomas A. Spies, Eric M. White, Jeffrey D. Kline, A. Paige Fischer, Alan A. Ager, John D.
Integrating satellite imagery with simulation modeling to improve burn severity mapping
www.nrfirescience.org/resource/12957
Both satellite imagery and spatial fire effects models are valuable tools for generating burn severity maps that are useful to fire scientists and resource managers. The purpose of this study was to test a new mapping approach that integrates imagery and modeling to create more accurate burn severity maps. We developed and assessed...
Author(s): Eva C. Karau, Pamela G. Sikkink, Robert E. Keane, Gregory K. Dillon
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

Previous fires moderate burn severity of subsequent wildland fires in two large western US wilderness areas
www.nrfirescience.org/resource/12051
Wildland fire is an important natural process in many ecosystems. However, fire exclusion has reduced frequency of fire and area burned in many dry forest types, which may affect vegetation structure and composition, and potential fire behavior. In forests of the western U.S., these effects pose a challenge for fire and land...
Author(s): Sean A. Parks, Carol Miller, Cara R. Nelson, Zachary A. Holden
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

High-severity fire corroborated in historical dry forests of the western United States: response to Fule et al.
www.nrfirescience.org/resource/13490
Accurate assessment of changing fire regimes is important, since climatic change and people may be promoting more wildfires. Government wildland fire policies and restoration programmes in dry western US forests are based on the hypothesis that high-severity fire was rare in historical fire regimes, modern fire severity is...
Author(s): Mark A. Williams, William L. Baker
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

Challenge of assessing fire and burn severity using field measures, remote sensing and modelling
www.nrfirescience.org/resource/18881
Comprehensive assessment of ecological change after fires have burned forests and rangelands is important if we are to understand, predict and measure fire effects. We highlight the challenges in effective assessment of fire and burn severity in the field and using both remote sensing and simulation models. We draw on diverse recent...
Author(s): Penelope Morgan, Robert E. Keane, Gregory K. Dillon, Theresa B. Jain, Andrew T. Hudak, Eva C. Karau, Pamela G. Sikkink, Zachary A. Holden, Eva K. Strand
Year Published: 2014
Fire severity and tree regeneration following bark beetle outbreaks: the role of outbreak stage and burning conditions
www.nrfirescience.org/resource/13328
The degree to which recent bark beetle (Dendroctonus ponderosae) outbreaks may influence fire severity and postfire tree regeneration is of heightened interest to resource managers throughout western North America, but empirical data on actual fire effects are lacking. Outcomes may depend on burning conditions (i.e., weather during...
Author(s): Brian J. Harvey, Daniel C. Donato, William H. Romme, Monica G. Turner
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

A new metric for quantifying burn severity: the relativized burn ratio
www.nrfirescience.org/resource/13053
Satellite-inferred burn severity data have become increasingly popular over the last decade for management and research purposes. These data typically quantify spectral change between pre-and post-fire satellite images (usually Landsat). There is an active debate regarding which of the two main equations, the delta normalized burn...
Author(s): Sean A. Parks, Gregory K. Dillon, Carol Miller
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

Fire activity and severity in the western US vary along proxy gradients representing fuel amount and fuel moisture
www.nrfirescience.org/resource/13016
Numerous theoretical and empirical studies have shown that wildfire activity (e.g., area burned) at regional to global scales may be limited at the extremes of environmental gradients such as productivity or moisture. Fire activity, however, represents only one component of the fire regime, and no studies to date have characterized...
Author(s): Sean A. Parks, Marc-Andre Parisien, Carol Miller, Solomon Z. Dobrowski
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

Briefing: climate and wildfire in western U.S. forests
www.nrfirescience.org/resource/12991
Wildfire in western U.S. federally managed forests has increased substantially in recent decades, with large (>1000 acre) fires in the decade through 2012 over five times as frequent (450 percent increase) and burned area over ten times as great (930 percent increase) as the 1970s and early 1980s. These changes are closely linked...
Author(s): Anthony L. Westerling, Timothy J. Brown, Tania L. Schoennagel, Thomas W. Swetnam, Monica G. Turner, Thomas T. Veblen
Year Published: 2014
Type: Document
Technical Report or White Paper
Challenges of assessing fire and burn severity using field measures, remote sensing and modeling

www.nrfirescience.org/resource/15319

Comprehensive assessment of ecological change after fires have burned forests and rangelands is important if we are to understand, predict and measure fire effects. We highlight the challenges in effective assessment of fire and burn severity in the field and using both remote sensing and simulation models. We draw on diverse recent...

Author(s): Penelope Morgan, Robert E. Keane, Gregory K. Dillon, Theresa B. Jain, Andrew T. Hudak, Eva C. Karau, Pamela G. Sikkink, Zachary A. Holden, Eva K. Strand
Year Published: 2014
Type: Document
Synthesis

Examining historical and current mixed-severity fire regimes in ponderosa pine and mixed-conifer forests of western North America

www.nrfirescience.org/resource/12904

There is widespread concern that fire exclusion has led to an unprecedented threat of uncharacteristically severe fires in ponderosa pine (Pinus ponderosa Dougl. ex. Laws) and mixed-conifer forests of western North America. These extensive montane forests are considered to be adapted to a low/moderate-severity fire regime that...

Author(s): Dennis C. Odion, Chad T. Hanson, Andre Arsenault, William L. Baker, Dominick A. DellaSala, Richard L. Hutto, Walt Klenner, Max A. Moritz, Rosemary L. Sherriff, Thomas T. Veblen, Mark A. Williams
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

Vegetation response after post-fire mulching and native grass seeding

www.nrfirescience.org/resource/15317

Post-fire mulch and seeding treatments, often applied on steep, severely burned slopes immediately after large wildfires, are meant to reduce the potential of erosion and establishment of invasive plants, especially non-native plants, that could threaten values at risk. However, the effects of these treatments on native vegetation...

Author(s): Penelope Morgan, Marshell Moy, Christine A. Droske, Leigh B. Lentile, Sarah A. Lewis, Peter R. Robichaud, Andrew T. Hudak
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

Mapping day-of-burning with coarse-resolution satellite fire-detection data

www.nrfirescience.org/resource/12764

Evaluating the influence of observed daily weather on observed fire-related effects (e.g. smoke production, carbon emissions and burn severity) often involves knowing exactly what day any given area has burned. As such, several studies have used fire progression maps - in which the perimeter of an actively burning fire is mapped at...

Author(s): Sean A. Parks
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

Influence of wildland fire along a successional gradient in sagebrush steppe and western
Western juniper (Juniperus occidentalis Hook. var. occidentalis) has been expanding into sagebrush (Artemisia L. spp.) steppe over the past 130 years in Idaho, Oregon, and California. Fuel characteristics and expected fire behavior and effects change as sagebrush steppe transitions into juniper woodlands. Little is currently known...

Author(s): Eva K. Strand, Stephen C. Bunting, Robert F. Keefe
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

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

Sagebrush landscapes provide habitat for Sage-Grouse and other sagebrush obligates, yet historical fire regimes and the structure of historical sagebrush landscapes are poorly known, hampering ecological restoration and management. To remedy this, General Land Office Survey (GLO) survey notes were used to reconstruct over two...

Author(s): Beth E. Bukowski, William L. Baker
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

Large, severe fires are ecologically and socially important because they have lasting effects on vegetation and soils, can potentially threaten people and property, and can be costly to manage. The goals of the Fire Severity Mapping Project (FIRESEV), which covers lands in the continental western United States, are to understand...

Author(s): Rocky Mountain Research Station
Year Published: 2013
Type: Document
Research Brief or Fact Sheet

We employed meta-analysis and information theory to synthesize findings reported in the literature on the effects of fuel treatments on subsequent fire intensity and severity. Data were compiled from 19 publications that reported observed fire responses from 62 treated versus untreated contrasts. Effect
Fire regimes of quaking aspen in the mountain west
www.nrfirescience.org/resource/11975
Quaking aspen (Populus tremuloides Michx.) is the most widespread tree species in North America, and it is found throughout much of the Mountain West (MW) across a broad range of bioclimatic regions. Aspen typically regenerates asexually and prolifically after fire, and due to its seral status in many western conifer forests, aspen...

Interactive effects of wildfire, forest management, and isolation on amphibian and parasite abundance
www.nrfirescience.org/resource/11970
Projected increases in wildfire and other climate-driven disturbances will affect populations and communities worldwide, including host-parasite relationships. Research in temperate forests has shown that wildfire can negatively affect amphibians, but this research has occurred primarily outside of managed landscapes where...

Is burn severity related to fire intensity? Observations from landscape scale remote sensing
www.nrfirescience.org/resource/12026
Biomass burning by wildland fires has significant ecological, social and economic impacts. Satellite remote sensing provides direct measurements of radiative energy released by the fire (i.e. fire intensity) and surrogate measures of ecological change due to the fire (i.e. fire or burn severity). Despite anecdotal observations...

Latent resilience in ponderosa pine forest: effects of resumed frequent fire
www.nrfirescience.org/resource/12018
Ecological systems often exhibit resilient states that are maintained through negative feedbacks. In ponderosa pine forests, fire historically represented the negative feedback mechanism that maintained ecosystem resilience; fire exclusion reduced that resilience, predisposing the transition to an alternative ecosystem state upon...

The impacts of changing disturbance regimes on serotinous plant populations and communities

Climatic change is anticipated to alter disturbance regimes for many ecosystems. Among the most important effects are changes in the frequency, size, and intensity of wildfires. Serotiny (long-term canopy storage and the heat-induced release of seeds) is a fire-resilience mechanism found in many globally important terrestrial...

Author(s): Brian Buma, Carissa D. Brown, Daniel C. Donato, Joseph B. Fontaine, Jill F. Johnstone
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

Rapid increases and time-lagged declines in amphibian occupancy after wildfire

Climate change is expected to increase the frequency and severity of drought and wildfire. Aquatic and moisture-sensitive species, such as amphibians, may be particularly vulnerable to these modified disturbance regimes because large wildfires often occur during extended droughts and thus may compound environmental threats. However...

Author(s): Blake R. Hossack, Winsor H. Lowe, Paul S. Corn
Year Published: 2012
Type: Document
Book or Chapter or Journal Article

A new forest fire paradigm: the need for high-severity fires

During the 2012 fire season from June through August, wildfires in the droughtstricken western and central United States burned more than 3.6 million acres of forest and shrubland. In the hot, dry, windy conditions seen that season, a single spark can start an understory fire that ascends into the...

Author(s): Monica L. Bond, Rodney B. Siegel, Richard L. Hutto, Victoria A. Saab, Stephen A. Shunk
Year Published: 2012
Type: Document
Book or Chapter or Journal Article

Measurements of convective and radiative heating in wildland fires

Time-resolved irradiance and convective heating and cooling of fast-response thermopile sensors were measured in 13 natural and prescribed wildland fires under a variety of fuel and ambient conditions. It was shown that a sensor exposed to the fire environment was subject to rapid fluctuations of convective transfer whereas...

Author(s): David Frankman, Brent W. Webb, Bret W. Butler, Daniel M. Jimenez, Jason M. Forthofer, Paul Sopko, Kyle S. Shannon, J. Kevin Hiers, Roger D. Ottmar
Year Published: 2012
Type: Document
Book or Chapter or Journal Article

Wildfire severity mediates fluxes of plant material and terrestrial invertebrates to mountain streams

Wildfire effects upon riparian plant community structure, composition, and distribution may strongly influence the dynamic relationships between riparian vegetation and stream ecosystems. However, few
Pattern and process of prescribed fires influence effectiveness at reducing wildfire severity in dry coniferous forests

We examined the effects of three early season (spring) prescribed fires on burn severity patterns of summer wildfires that occurred 1-3 years post-treatment in a mixed conifer forest in central Idaho. Wildfire and prescribed fire burn severities were estimated as the difference in normalized burn ratio (dNBR) using Landsat imagery....

Spatially extensive reconstructions show variable-severity fire and heterogeneous structure in historical western United States dry forests

Aim: Wildfire is often considered more severe now than historically in dry forests of the western United States. Tree-ring reconstructions, which suggest that historical dry forests were park-like with large, old trees maintained by low-severity fires, are from small, scattered studies. To overcome this limitation, we developed...

Effects of spring prescribed burning and wildfires on watershed nitrogen dynamics of central Idaho headwater areas

Fire is known for its potential to profoundly affect nitrogen (N) dynamics in both terrestrial and aquatic ecosystems. However, few studies have investigated fire effects on several important watershed N pools simultaneously or have directly compared effects of spring prescribed burns and wildfires that occurred in the same...

Mapped versus actual burned area within wildfire perimeters: characterizing the unburned
Cumulative effects of fire and fuels management on stream water quality and ecosystem dynamics - Final Report to the Joint Fire Science Program
www.nrfirescience.org/resource/18951
Prescribed fires and wildland fire-use are increasingly important management tools used to reduce fuel loads and restore the ecological integrity of western forests. Although a basic understanding of the effects of fire on aquatic ecosystems exists, the cumulative and possibly synergistic effects of wildfire following prescribed...
Author(s): David S. Pilliod, Robert S. Arkle
Year Published: 2012
Type: Document
Technical Report or White Paper

Can climate change increase fire severity independent of fire intensity? - Final Report to the Joint Fire Science Program
www.nrfirescience.org/resource/11228
We tested the idea that climate may affect forest fire severity independent of fire intensity. Pervasive warming can lead to chronic stress on forest trees (McDowell et al. 2008; Raffa et al. 2008), resulting in higher sensitivity to fire-induced damage (van Mantgem et al. 2003). Thus, there may be ongoing increases in fire severity...
Author(s): Phillip J. van Mantgem, MaryBeth Keifer, Robert C. Klinger, Eric E. Knapp
Year Published: 2012
Type: Document
Technical Report or White Paper

The effect of sampling rate on interpretation of the temporal characteristics of radiative and convective heating in wildland flames
www.nrfirescience.org/resource/8373
Time-resolved radiative and convective heating measurements were collected on a prescribed burn in coniferous fuels at a sampling frequency of 500 Hz. Evaluation of the data in the time and frequency domain indicate that this sampling rate was sufficient to capture the temporal fluctuations of radiative and convective heating. The...
Author(s): David Frankman, Brent W. Webb, Bret W. Butler, Daniel M. Jimenez, Michael G. Harrington
Year Published: 2012
Type: Document
Book or Chapter or Journal Article

Effects of bark beetle-caused tree mortality on wildfire
www.nrfirescience.org/resource/13294
Millions of trees killed by bark beetles in western North America have raised concerns about subsequent wildfire, but studies have reported a range of conclusions, often seemingly contradictory, about effects on fuels and wildfire. In this study, we reviewed and synthesized the published literature on modifications to fuels and fire...
Author(s): Jeffrey A. Hicke, Morris C. Johnson, Jane L. Hayes, Haiganoush K. Preisler
Year Published: 2012
Type: Document
Book or Chapter or Journal Article, Synthesis
Wildfire extent and severity correlated with annual streamflow distribution and timing in the Pacific Northwest, USA (1984-2005)

Climate change effects on wildfire occurrence have been attributed primarily to increases in temperatures causing earlier snowpack ablation and longer fire seasons. Variability in precipitation is also an important control on snowpack accumulation and, therefore, on timing of meltwater inputs. We evaluate the correlation of total...

Author(s): Zachary A. Holden, Charles H. Luce, Michael A. Crimmins, Penelope Morgan
Year Published: 2011
Type: Document
Book or Chapter or Journal Article

The human dimension of fire regimes on Earth

Humans and their ancestors are unique in being a fire-making species, but ‘natural’ (i.e. independent of humans) fires have an ancient, geological history on Earth. Natural fires have influenced biological evolution and global biogeochemical cycles, making fire integral to the functioning of some biomes. Globally, debate rages...

Author(s): David M. J. S. Bowman
Year Published: 2011
Type: Document
Book or Chapter or Journal Article

Mapping the potential for high severity wildfire in the western United States

Each year, large areas are burned in wildfires across the Western United States. Assessing the ecological effects of these fires is crucial to effective postfire management. This requires accurate, efficient, and economical methods to assess the severity of fires at broad landscape scales (Brennan and Hardwick 1999; Parsons and...)

Author(s): Gregory K. Dillon, Penelope Morgan, Zachary A. Holden
Year Published: 2011
Type: Document
Synthesis

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

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

Both topography and climate affected forest and woodland burn severity in two regions of the western US

Fire is a keystone process in many ecosystems of western North America. Severe fires kill and consume large amounts of above- and belowground biomass and affect soils, resulting in long-lasting consequences for vegetation, aquatic ecosystem productivity and diversity, and other ecosystem
properties. We analyzed the occurrence of...
Author(s): Gregory K. Dillon, Zachary A. Holden, Penelope Morgan, Michael A. Crimmins, Emily K. Heyerdahl, Charles H. Luce
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
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

Rill erosion rates in burned forests
www.nrfirescience.org/resource/11032
Wildfires often produce large increases in runoff and erosion rates (e.g., Moody and Martin, 2009), and land managers need to predict the frequency and magnitude of postfire erosion to determine the needs for hazard response and possible erosion mitigation to reduce the impacts of increased erosion on public safety and valued...
Author(s): Joseph W. Wagenbrenner, Peter R. Robichaud
Year Published: 2011
Type: Document
Conference Proceedings

Synthesis of knowledge: fire history and climate change
www.nrfirescience.org/resource/12582
This report synthesizes available fire history and climate change scientific knowledge to aid managers with fire decisions in the face of ongoing 21st Century climate change. Fire history and climate change (FHCC) have been ongoing for over 400 million years of Earth history, but increasing human influences during the Holocene epoch...
Author(s): William T. Sommers, Stanley G. Coloff, Susan G. Conard
Year Published: 2011
Type: Document
Synthesis, Technical Report or White Paper

Fire effects on the cheatgrass seed bank pathogen Pyrenophora semeniperda
www.nrfirescience.org/resource/11450
The generalist fungal pathogen Pyrenophora semeniperda occurs primarily in cheatgrass (Bromus tectorum) seed banks, where it causes high mortality. We investigated the relationship between this pathogen and its cheatgrass host in the context of fire, asking whether burning would facilitate host escape from the pathogen or increase...
Author(s): Julie Beckstead, Laura E. Street, Susan E. Meyer, Phil S. Allen
Year Published: 2011
Type: Document
Book or Chapter or Journal Article
The beauty of a burned forest
www.nrfirescience.org/resource/14506
In the Northern Rockies, forests that have escaped fire are rare. In the Crown, fire is just as important as rainfall and sunlight are to plants and animals. For the vast majority of forest types within the region, the predominant fire regime is one of infrequent, intense, stand-replacement fires—not one of...
Author(s): Richard L. Hutto
Year Published: 2011
Type: Document
Research Brief or Fact Sheet

Predicted fates of ground-nesting bees in soil heated by wildfire: thermal tolerances of life stages and a survey of nesting depths
www.nrfirescience.org/resource/12144
Periodic wildfire defines plant community composition and dynamics in many of the world's semi-arid biomes, whose climates and florals also favor wild bee diversity. Invasive flammable grasses, deforestation, historical fire suppression and human ignition are increasing fire frequency and intensifying its severity, as well as...
Author(s): James H. Cane, John L. Neff
Year Published: 2011
Type: Document
Book or Chapter or Journal Article

Multi-scale controls of historical forest-fire regimes: new insights from fire-scar networks
www.nrfirescience.org/resource/8298
Anticipating future forest-fire regimes under changing climate requires that scientists and natural resource managers understand the factors that control fire across space and time. Fire scars-proxy records of fires, formed in the growth rings of long-lived trees-provide an annually accurate window into past low-severity fire...
Author(s): Donald A. Falk, Emily K. Heyerdahl, Peter M. Brown, Calvin A. Farris, Peter Z. Fule, Donald McKenzie, Thomas W. Swetnam, Alan H. Taylor, Megan L. Van Horne
Year Published: 2011
Type: Document
Book or Chapter or Journal Article, Synthesis

Modeling effects of climate change and fire management on western white pine (Pinus monticola) in the northern rocky mountains, USA
www.nrfirescience.org/resource/13512
Climate change is projected to profoundly influence vegetation patterns and community compositions, either directly through increased species mortality and shifts in species distributions or indirectly through disturbance dynamics such as increased wildfire activity and extent, shifting fire regimes, and pathogenesis. Mountainous...
Author(s): Rachel A. Loehman, Jason A. Clark, Robert E. Keane
Year Published: 2011
Type: Document
Book or Chapter or Journal Article

Influence of fire on mycorrhizal colonization of planted and natural whitebark pine seedlings: ecology and management implications
www.nrfirescience.org/resource/11898
Whitebark pine (Pinus albicaulis) is a threatened keystone species in subalpine zones of Western North
America that plays a role in watershed dynamics and maintenance of high elevation biodiversity (Schwandt, 2006). Whitebark pine has experienced significant mortality due to white pine blister rust, mountain pine beetle outbreaks...

Author(s): Paul E. Trusty, Cathy L. Cripps
Year Published: 2011
Type: Document
Conference Proceedings

The myth of "catastrophic" wildfire - a new ecological paradigm of forest health
www.nrfirescience.org/resource/16302
Every fire season in the western United States, we see on television the predictable images of 100-foot flames spreading through tree crowns, while grim-faced news anchors report how many acres of forest were “destroyed” by the latest “catastrophic” fire. The reaction is understandable. For decades, countless Smokey the Bear...

Author(s): Chad T. Hanson
Year Published: 2010
Type: Document
Technical Report or White Paper

Burn severity mapping using simulation modelling and satellite imagery
www.nrfirescience.org/resource/8205
Although burn severity maps derived from satellite imagery provide a landscape view of fire impacts, fire effects simulation models can provide spatial fire severity estimates and add a biotic context in which to interpret severity. In this project, we evaluated two methods of mapping burn severity in the context of rapid post-fire...

Author(s): Eva C. Karau, Robert E. Keane
Year Published: 2010
Type: Document
Book or Chapter or Journal Article

Restoring whitebark pine forests of the northern Rocky Mountains, USA
www.nrfirescience.org/resource/8394
Whitebark pine (Pinus albicaulis) has been declining across much of its range in North America because of the combined effects of mountain pine beetle (Dendroctonus ponderosae) epidemics, fire exclusion policies, and widespread exotic blister rust infections. Whitebark pine seed is dispersed by a bird, the Clark's nutcracker (...)

Author(s): Robert E. Keane, Russell A. Parsons
Year Published: 2010
Type: Document
Book or Chapter or Journal Article

Fire and climate variation in western North America from fire-scar and tree-ring networks
www.nrfirescience.org/resource/8221
Fire regimes (i.e., the pattern, frequency and intensity of fire in a region) reflect a complex interplay of bottom-up and top-down controls (Lertzman et al., 1998; McKenzie et al., in press). Bottom-up controls include local variations in topographic, fuel and weather factors at the time of a burn (e.g., fuel moisture and...

Author(s): Donald A. Falk, Emily K. Heyerdahl, Peter M. Brown, Thomas W. Swetnam, Elaine Kennedy Sutherland, Ze'ev Gedalof, Larissa L. Yocom, Timothy J. Brown
Year Published: 2010
Type: Document
Using fuzzy C-means and local autocorrelation to cluster satellite-inferred burn severity classes
www.nrfirescience.org/resource/11447
Burn severity classifications derived from multitemporal Landsat Thematic Mapper images and the Normalised Burn Ratio (NBR) are commonly used to assess the post-fire ecological effects of wildfires. Ongoing efforts to retrospectively map historical burn severity require defensible, objective methods of classifying continuous...
Author(s): Zachary A. Holden, Jeffrey S. Evans
Year Published: 2010
Type: Document
Book or Chapter or Journal Article

Field guide for mapping post-fire soil burn severity
www.nrfirescience.org/resource/15310
Following wildfires in the United States, the U.S. Department of Agriculture and U.S. Department of the Interior mobilize Burned Area Emergency Response (BAER) teams to assess immediate post-fire watershed conditions. BAER teams must determine threats from flooding, soil erosion, and instability. Developing a postfire soil burn...
Author(s): Annette Parson, Peter R. Robichaud, Sarah A. Lewis, Carolyn Napper, Jess T. Clark
Year Published: 2010
Type: Document
Book or Chapter or Journal Article

Effects of timber harvest following wildfire in western North America
www.nrfirescience.org/resource/11122
Timber harvest following wildfire leads to different outcomes depending on the biophysical setting of the forest, pattern of burn severity, operational aspects of tree removal, and other management activities. Fire effects range from relatively minor, in which fire burns through the understory and may kill a few trees, to severe, in...
Year Published: 2009
Type: Document
Technical Report or White Paper

Influence of wildfire severity on riparian plant community heterogeneity in an Idaho, USA wilderness
www.nrfirescience.org/resource/11445
Despite the increasing recognition of riparian zones as important ecotones that link terrestrial and aquatic ecosystems and of fire as a critical natural disturbance, much remains unknown regarding the influence of fire on stream-riparian ecosystems. To further this understanding, we evaluated the effects of mixed severity wildfire...
Author(s): Breeanne K. Jackson, S. Mazeika P. Sullivan
Year Published: 2009
Type: Document
Book or Chapter or Journal Article

Three years of hillslope sediment yields following the Valley Complex fires, western Montana
www.nrfirescience.org/resource/11147
The 2000 Bitterroot Valley wildfires provided an opportunity to measure post-fire effects and recovery rates. We established 24 small (0.01 ha [0.02 acre]) plots in four high-severity burn sites. We measured sediment yields at each site with silt fences. We also measured rainfall characteristics, soil water repellency, vegetative...

Author(s): Peter R. Robichaud, Joseph W. Wagenbrenner, Robert E. Brown, Kevin M. Spigel
Year Published: 2009
Type: Document
Technical Report or White Paper

Listening to the message of the Black-backed Woodpecker, a hot fire specialist
www.nrfirescience.org/resource/11083
The Black-backed Woodpecker is an uncommon bird of the northern coniferous forests of North America. It is one of several species of fauna that are considered fire specialists. This woodpecker nests in cavities it creates in dead standing trees and feeds on wood-boring beetles and their larvae, which are also attracted to stressed...

Author(s): Elise LeQuire
Year Published: 2009
Type: Document
Research Brief or Fact Sheet

Fire intensity, fire severity and burn severity: a brief review
www.nrfirescience.org/resource/16309
Several recent papers have suggested replacing the terminology of fire intensity and fire severity. Part of the problem with fire intensity is that it is sometimes used incorrectly to describe fire effects, when in fact it is justifiably restricted to measures of energy output. Increasingly, the term has created confusion because...

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

Thermal characteristics of amphibian microhabitats in a fire-disturbed landscape
www.nrfirescience.org/resource/8402
Disturbance has long been a central issue in amphibian conservation, often regarding negative effects of logging or other forest management activities, but some amphibians seem to prefer disturbed habitats. After documenting increased use of recently burned forests by boreal toads (Bufo boreas), we hypothesized that burned habitats...

Author(s): Blake R. Hossack, Lisa A. Eby, C. Gregory Guscio, Paul S. Corn
Year Published: 2009
Type: Document
Book or Chapter or Journal Article

The ecological importance of severe wildfires: some like it hot
www.nrfirescience.org/resource/8229
Many scientists and forest land managers concur that past fire suppression, grazing, and timber harvesting practices have created unnatural and unhealthy conditions in the dry, ponderosa pine forests of the western United States. Specifically, such forests are said to carry higher fuel loads and experience fires that are more severe...

Author(s): Richard L. Hutto
Year Published: 2008
Type: Document
Long-term fire history from alluvial fan sediments: the role of drought and climate variability, and implications for management of Rocky Mountain forests

Alluvial fan deposits are widespread and preserve millennial-length records of fire. We used these records to examine changes in fire regimes over the last 2000 years in Yellowstone National Park mixed-conifer forests and drier central Idaho ponderosa pine forests. In Idaho, frequent, small, fire-related erosional events occurred...

Author(s): Jennifer L. Pierce, Grant A. Meyer
Year Published: 2008
Type: Document

Earth and fire: forests rely on healthy soils for a well-rounded diet

Historically, frequent low-intensity, dormant-season fire shaped the landscape across a variety of forests in the United States, from eastern hardwood and hardwood/conifer mixtures to western coniferous forests. Decades of fire exclusion have resulted in heavy fuel loads and increased threat of severe wildfire compared to historic...

Author(s): Elise LeQuire
Year Published: 2008
Type: Document

Large fire locations by Fire Regime Condition Classes 2 and 3 for all historical natural fire regimes

A map of large fires across the western United States.

Author(s): Wendel J. Hann
Year Published: 2008
Type: Document

Spatial characteristics of fire severity in relation to fire growth in a Rocky Mountain subalpine forest

We compared the spatial characteristics of fire severity patches within individual fire "runs" (contiguous polygons burned during a given day) resulting from a 72,000 ha fire in central Idaho in 1994. Our hypothesis was that patch characteristics of four fire severity classes (high, moderate, low, and unburned), as captured by five...

Author(s): Calvin A. Farris, Ellis Q. Margolis, John A. Kupfer
Year Published: 2008
Type: Document

Living artifacts: the ancient ponderosa pines of the West

Until late in the nineteenth century, magnificent ponderosa pine forests blanketed much of the inland West. They covered perhaps 30 million acres, an area the size of New York state, spreading across the
Mountains of New Mexico, Arizona, and California and flourishing throughout the eastern Cascades, the intermountain Pacific...

Author(s): Stephen F. Arno, Lars Ostlund, Robert E. Keane
Year Published: 2008
Type: Document
Book or Chapter or Journal Article

Soil water repellency and infiltration in coarse-textured soils of burned and unburned sagebrush ecosystems

www.nrfirescience.org/resource/11424

Millions of dollars are spent each year in the United States to mitigate the effects of wildfires and reduce the risk of flash floods and debris flows. Research from forested, chaparral, and rangeland communities indicate that severe wildfires can cause significant increases in soil water repellency resulting in increased runoff and...

Author(s): Frederick B. Pierson, Peter R. Robichaud, Corey A. Moffet, Kenneth E. Spaeth, Christopher Jason Williams, Stuart P. Hardegree, Patrick E. Clark
Year Published: 2008
Type: Document
Book or Chapter or Journal Article

CCE fire regimes and their management

www.nrfirescience.org/resource/8369

A spectacular forest in the center of the Crown of the Continent Ecosystem (CCE) cuts a 15- by 5-km swath along the Flathead River's South Fork around Big Prairie in the middle of the Bob Marshall Wilderness Area in Montana (Figure 13-1). This wide valley bottom, which contains two patches (of about 1,000 ha each) of the last...

Author(s): Robert E. Keane, Carl H. Key
Year Published: 2007
Type: Document
Book or Chapter or Journal Article

Vegetation and soil effects from prescribed, wild, and combined fire events along a ponderosa pine and grassland mosaic

www.nrfirescience.org/resource/11241

We describe the efficacy of prescribed fires after two wildfires burned through and around these fires located in eastern Montana within the Missouri River Breaks. The objectives of the prescribed fires were to decrease tree density and favor increased herbaceous cover, thus decreasing the potential for crown fire. Our objective was...

Author(s): Theresa B. Jain, Molly Juillerat, Jonathan Sandquist, Mike Ford, Brad Sauer, Robert J. Mitchell, Scott McAvoy, Justin Hanley, Jon David
Year Published: 2007
Type: Document
Technical Report or White Paper

Delayed Conifer Tree Mortality Following Fire in California

www.nrfirescience.org/resource/16311

Fire injury was characterized and survival monitored for 5,246 trees from five wildfires in California that occurred between 1999 and 2002. Logistic regression models for predicting the probability of mortality were developed for incense-cedar, Jeffrey pine, ponderosa pine, red fir and white fir. Two-year post-fire preliminary...

Author(s): Sharon M. Hood, Sheri L. Smith, Danny R. Cluck
The relationship of multispectral satellite imagery to immediate fire effects
www.nrfirescience.org/resource/8390
The Forest Service Remote Sensing Applications Center (RSAC) and the U.S. Geological Survey Earth Resources Observation and Science (EROS) Data Center produce Burned Area Reflectance Classification (BARC) maps for use by Burned Area Emergency Response (BAER) teams in rapid response to wildfires. BAER teams desire maps indicative of...
Author(s): Andrew T. Hudak, Penelope Morgan, Michael J. Bobbitt, Alistair M. S. Smith, Sarah A. Lewis, Leigh B. Lentile, Peter R. Robichaud, Jess T. Clark, Randy McKinley
Year Published: 2007
Type: Document
Book or Chapter or Journal Article

Post-fire burn severity and vegetation response following eight large wildfires across the western United States
www.nrfirescience.org/resource/8168
Vegetation response and burn severity were examined following eight large wildfires that burned in 2003 and 2004: two wildfires in California chaparral, two each in dry and moist mixed-conifer forests in Montana, and two in boreal forests in interior Alaska. Our research objectives were: 1) to characterize one year post-fire...
Author(s): Leigh B. Lentile, Penelope Morgan, Andrew T. Hudak, Michael J. Bobbitt, Sarah A. Lewis, Alistair M. S. Smith, Peter R. Robichaud
Year Published: 2007
Type: Document
Book or Chapter or Journal Article

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

Forest fire and climate change in western North America: insights from sediment charcoal records
www.nrfirescience.org/resource/7930
Millennial-scale records of forest fire provide important baseline information for ecosystem management, especially in regions with too few recent fires to describe the historical range of variability. Charcoal records from lake sediments and soil profiles are well suited for reconstructing the incidence of past fire and its...
Author(s): Daniel G. Gavin, Douglas J. Hallett, Feng S. Hu, Kenneth P. Lertzman, Susan J. Prichard, Kendrick J. Brown, Jason A. Lynch, Patrick J. Bartlein, David L. Peterson
Year Published: 2007
Type: Document
Comparison of fire scars, fire atlases, and satellite data in the northwestern United States
www.nrfirescience.org/resource/11427
We evaluated agreement in the location and occurrence of 20th century fires recorded in digital fire atlases with those inferred from fire scars that we collected systematically at one site in Idaho and from existing fire-scar reconstructions at four sites in Washington. Fire perimeters were similar for two of three 20th century...
Author(s): Lauren B. Shapiro, Emily K. Heyerdahl, Penelope Morgan
Year Published: 2007
Type: Document

Simulation of the consequences of different fire regimes to support wildland fire use decisions
www.nrfirescience.org/resource/11429
The strategy known as wildland fire use, in which lightning-ignited fires are allowed to burn, is rapidly gaining momentum in the fire management community. Managers need to know the consequences of an increase in area burned that might result from an increase in wildland fire use. One concern of land managers as they consider...
Author(s): Carol Miller
Year Published: 2007
Type: Document

Runoff and erosion effects after prescribed fire and wildfire on volcanic ash-cap soils
www.nrfirescience.org/resource/11041
After prescribed burns at three locations and one wildfire, rainfall simulations studies were completed to compare postfire runoff rates and sediment yields on ash-cap soil in conifer forest regions of northern Idaho and western Montana. The measured fire effects were differentiated by burn severity (unburned, low, moderate, and... 
Author(s): Peter R. Robichaud, Frederick B. Pierson, Robert E. Brown
Year Published: 2007
Type: Document
Conference Proceedings

Fire, fuels and restoration of ponderosa pine-Douglas fir forests in the Rocky Mountains, USA
www.nrfirescience.org/resource/8223
Forest restoration in ponderosa pine and mixed ponderosa pine-Douglas fir forests in the US Rocky Mountains has been highly influenced by a historical model of frequent, low-severity surface fires developed for the ponderosa pine forests of the Southwestern USA. A restoration model, based on this low-severity fire model, focuses on...
Author(s): William L. Baker, Thomas T. Veblen, Rosemary L. Sherriff
Year Published: 2007
Type: Document

Fire effects on vegetation recovery following eight large western wildfires
www.nrfirescience.org/resource/10986
We examined vegetation diversity and landscape pattern relative to burn severity following eight large wildfires that burned in 2003 and 2004 in California chaparral, in mixed conifer forests in Montana, and
in boreal forests in interior Alaska. Our goal was to relate post-fire vegetation recovery and field and remotely sensed...

Evaluate sensitivities of burn-severity mapping algorithms for different ecosystems and fire histories in the United States - Final Report to the Joint Fire Science Program
www.nrfirescience.org/resource/18930
This research effort is designed to investigate effectiveness of burn severity mapping, using differenced Normalized Burn Ratio (dNBR) for ecosystem monitoring at the 30m scale. The hypothesis of our research is that the differenced normalized burn ratio, calibrated and validated using post-fire ground data (Composite Burn Index, or...

The complexity of managing fire-dependent ecosystems in wilderness: relict ponderosa pine in the Bob Marshall Wilderness
www.nrfirescience.org/resource/7953
Isolated wilderness ecosystems with a history of frequent, low-severity fires have been altered due to many decades of fire exclusion and, as a result, are difficult to restore for philosophical and logistical reasons. In this paper, we describe the successional conditions of ponderosa pine (Pinus ponderosa) communities along the...

History of fire and Douglas-fir establishment in a savanna and sagebrush-grassland mosaic, southwestern Montana, USA
www.nrfirescience.org/resource/7942
Over the past century, trees have encroached into grass- and shrublands across western North America. These include Douglas-fir trees (Pseudotsuga menziesii (Mirb.) Franco var. glauca (Beissn.) Franco) encroaching into mountain big sagebrush Nutt. ssp. vaseyana (Rydb.) Beetle) from stable islands of savanna in southwestern Montana....

Vegetation response to restoration treatments in ponderosa pine-Douglas-fir forests
www.nrfirescience.org/resource/11503
The study site is located at the University of Montana's Lubrecht Experimental Forest, Missoula County, Montana, USA. This study is 1 of 13 in a nationwide network of Fire/Fire Surrogate (FFS) studies investigating the interdisciplinary effects of treatments designed to reduce fire hazard and restore the structure and function of...

Author(s): Leigh B. Lentile, Penelope Morgan, Michael J. Bobbitt, Sarah A. Lewis, Andrew T. Hudak, Peter R. Robichaud
Year Published: 2006
Type: Document
Conference Proceedings

Author(s): Zhiliang Zhu, Carl H. Key, Donald Ohlen, Nathan C. Benson
Year Published: 2006
Type: Document
Technical Report or White Paper

Author(s): Robert E. Keane, Stephen F. Arno, Laura J. Dickinson
Year Published: 2006
Type: Document
Book or Chapter or Journal Article

Author(s): Emily K. Heyerdahl, Richard F. Miller, Russell A. Parsons
Year Published: 2006
Type: Document
Book or Chapter or Journal Article

Author(s): Kerry L. Metlen, Erich K. Dodson, Carl E. Fiedler
Managing fire-prone forests in the Western United States
www.nrfirescience.org/resource/16308
The management of fire-prone forests is one of the most controversial natural resource issues in the US today, particularly in the west of the country. Although vegetation and wildlife in these forests are adapted to fire, the historical range of fire frequency and severity was huge. When fire regimes are altered by human activity,...
Author(s): Reed F. Noss, Jerry F. Franklin, William L. Baker, Tania L. Schoennagel, Peter B. Moyle
Year Published: 2006
Type: Document
Book or Chapter or Journal Article

The relation between forest structure and soil burn severity
www.nrfirescience.org/resource/10978
A study funded through National Fire Plan evaluates the relation between pre-wildfire forest structure and post-wildfire soil burn severity across three forest types: dry, moist, and cold forests. Over 73 wildfires were sampled in Idaho, Oregon, Montana, Colorado, and Utah, which burned between 2000 and 2003. Because of the study's...
Author(s): Theresa B. Jain, Russell T. Graham, David S. Pilliod
Year Published: 2006
Type: Document
Conference Proceedings

Ecological science relevant to management policies for fire-prone forests of the western United States, Society for Conservation Biology scientific panel of fire in western U.S. forests
www.nrfirescience.org/resource/11190
Fire is a primary natural disturbance in most forests of western North America and has shaped their plant and animal communities for millions of years. Native species and fundamental ecological processes are dependent on conditions created by fire. However, many western forests have experienced shifts in wildfire regimes and forest...
Author(s): Reed F. Noss, Jerry F. Franklin, William L. Baker, Tania L. Schoennagel, Peter B. Moyle
Year Published: 2006
Type: Document
Technical Report or White Paper

Measurement of post-fire hillslope erosion to evaluate and model rehabilitation treatment effectiveness and recovery
www.nrfirescience.org/resource/8137
The increasing size and severity of wildfires in the western United States has caused a corresponding increase in post-fire emergency erosion control activities. Hillslope treatments, such as broadcast seeding, mulching and installed barriers, are applied to reduce runoff and erosion, as well as downslope sedimentation. However,...
Author(s): Peter R. Robichaud
Year Published: 2005
Type: Document
Book or Chapter or Journal Article
Variation in fire regimes of the Rocky Mountains: implications for avian communities and fire management

www.nrfirescience.org/resource/8144
Information about avian responses to fire in the U.S. Rocky Mountains is based solely on studies of crown fires. However, fire management in this region is based primarily on studies of low-elevation ponderosa pine (Pinus ponderosa) forests maintained largely by frequent understory fires. In contrast to both of these trends, most...
Author(s): Victoria A. Saab, Hugh D. W. Powell, Natasha B. Kotliar, Karen R. Newlon
Year Published: 2005
Type: Document
Book or Chapter or Journal Article, Synthesis

Effects of prescribed and wildland fire on aquatic ecosystems in western forests - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/11161
The goal of the project is to understand how fire in upland and riparian forests influence stream communities and whether prescription burning mimics the ecological function of fire in a watershed. The project has two components: wildland fire and prescribed fire. To document the range of biotic and abiotic responses to wildland...
Author(s): David S. Pilliod, R. Bruce Bury, Paul S. Corn
Year Published: 2005
Type: Document
Technical Report or White Paper

Restoration of ponderosa pine forests in the interior western U.S. after logging, grazing, and fire suppression

www.nrfirescience.org/resource/8195
No description entered.
Author(s): Merrill R. Kaufmann, Kevin C. Ryan, Peter Z. Fule, William H. Romme
Year Published: 2005
Type: Document
Book or Chapter or Journal Article

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

www.nrfirescience.org/resource/11074
The ponderosa pine ecosystems of the West have change dramatically since Euro-American settlement 140 years ago due to past land uses and the curtailment of natural fire. Today, ponderosa pine forests contain overabundance of fuel, and stand densities have increased from a range of 49-124 trees ha-1 (20-50 trees acre-1) to a range...
Author(s): Stephen A. Fitzgerald
Year Published: 2005
Type: Document
Conference Proceedings, Synthesis

Fish and stream habitat risks from uncharacteristic wildfire: observations from 17 years of fire-related disturbances on the Boise National Forest, Idaho

www.nrfirescience.org/resource/11451
Several large, uncharacteristic wildfires occurred on the Boise National Forest in Southwest Idaho, from 1986 to 2003. From 1987 to 1994, severe wildfires burned almost 50% of the ponderosa pine forest types (about 200,000 ha). The intensity of the fires varied across the landscape, with a mix of low to moderate severity, and lesser...
Dry forests and wildland fires of the inland Northwest USA: contrasting the landscape ecology of the pre-settlement and modern eras
www.nrfirescience.org/resource/7941
Prior to Euro-American settlement, dry ponderosa pine and mixed conifer forests (hereafter, the 'dry forests') of the Inland Northwest were burned by frequent low- or mixed-severity fires. These mostly surface fires maintained low and variable tree densities, light and patchy ground fuels, simplified forest structure, and favored...

Changes in bird abundance after wildfire: importance of fire severity and time since fire
www.nrfirescience.org/resource/8256
Fire can cause profound changes in the composition and abundance of plant and animal species, but logistics, unpredictability of weather, and inherent danger make it nearly impossible to study high-severity fire effects experimentally. We took advantage of a unique opportunity to use a before-after/control-impact (BACI) approach to...

Understory recovery after low-and high-intensity fires in northern Idaho ponderosa pine forests
www.nrfirescience.org/resource/11502
Comparisons between unburned sites, low-intensity fires, and high-intensity fires in this ponderosa pine-dominated community indicate that a majority of the species coverages and frequencies are unchanged regardless of burn treatment. Also, a majority of species that were impacted by the fires showed increased coverage and/or...

Assessing the causes, consequences and spatial variability of burn severity: a rapid response proposal - Final Report to the Joint Fire Science Program
www.nrfirescience.org/resource/11149
In this rapid response project, we have collected data on post-fire effects and pre-fire fuels and vegetation from 10 large fires that burned in 2003 and 2004. We use field and remotely sensed data collected during and soon after wildfires to quantify the interactions and spatial variability in fire effects, fuels, fire behavior,...
Restoring dry and moist forests of the inland northwestern U. S.

The complex topography of the inland northwestern U.S. (58.4 million ha) interacts with continental and maritime air masses to create a highly variable climate, which results in a variety of forest settings. Historically (1850 to 1900), approximately 20% of the area was covered by dry forests (Pinus ponderosa, Pseudotsuga menziesii).

Author(s): Theresa B. Jain, Russell T. Graham
Year Published: 2005
Type: Document
Book or Chapter or Journal Article

Lewis's Woodpecker (Melanerpes lewis): a technical conservation assessment

Lewis's woodpecker (Melanerpes lewis) is a locally common but patchily distributed woodpecker species usually seen in open forests of western North America. The combination of its sporadic distribution, its diet of adult-stage free-living insects (primarily aerial), its preference to nest in burned landscapes, and its variable...

Author(s): Stephen C. Abele, Victoria A. Saab, Edward O. Garton
Year Published: 2004
Type: Document
Technical Report or White Paper

Is forest structure related to fire severity? Yes, no, and maybe: methods and insights in quantifying the answer

Wildfires in 2000 burned over 500,000 forested ha in the Northern Rocky Mountains. In 2001, National Fire Plan funding became available to evaluate the influence of pre-wildfire forest structure on post wildfire fire severity. Results from this study will provide information on forest structures that are resilient to wildfire. Three...

Author(s): Theresa B. Jain, Russell T. Graham
Year Published: 2004
Type: Document
Conference Proceedings

The interaction of fire, fuels, and climate across Rocky Mountain forests

Understanding the relative influence of fuels and climate on wildfires across the Rocky Mountains is necessary to predict how fires may respond to a changing climate and to define effective fuel management approaches to controlling wildfire in this increasingly populated region. The idea that decades of fire suppression have...

Author(s): Tania L. Schoennagel, Thomas T. Veblen, William H. Romme
Year Published: 2004
Type: Document
Book or Chapter or Journal Article

Field validation of Burned Area Reflectance Classification (BARC) products for post fire assessment

The USFS Remote Sensing Applications Center (RSAC) and the USGS EROS Data Center (EDC) produce Burned Area Reflectance Classification (BARC) maps for use by Burned Area Emergency
Rehabilitation (BAER) teams in rapid response to wildfires. BAER teams desire maps indicative of soil burn severity, but photosynthetic and...

**Author(s):** Andrew T. Hudak, Peter R. Robichaud, Jeffrey B. Evans, Jess T. Clark, Keith Lannom, Penelope Morgan, Carter Stone
**Year Published:** 2004
**Type:** Document
**Conference Proceedings**

**The relationship of field burn severity measures to satellite-derived Burned Area Reflectance Classification (BARC) maps**

www.nrfirescience.org/resource/10971

Preliminary results are presented from ongoing research on spatial variability of fire effects on soils and vegetation from the Black Mountain Two and Cooney Ridge wildfires, which burned in western Montana during the 2003 fire season. Extensive field fractional cover data were sampled to assess the efficacy of quantitative...

**Author(s):** Andrew T. Hudak, Penelope Morgan, Carter Stone, Peter R. Robichaud, Theresa B. Jain, Jess T. Clark
**Year Published:** 2004
**Type:** Document
**Conference Proceedings**

**Spatial heterogeneity of lodgepole pine sapling densities following the 1988 fires in Yellowstone National Park, Wyoming, USA**

www.nrfirescience.org/resource/8255

Large disturbances create spatial heterogeneity in vegetation re-establishment, and documenting such variability is critical for understanding and predicting succession. We quantified the spatial heterogeneity of lodgepole pine sapling densities 10 years after the 1988 fires in Yellowstone National Park using color infrared...

**Author(s):** Daniel M. Kashian, Daniel B. Tinker, Monica G. Turner, Frank L. Scarpace
**Year Published:** 2004
**Type:** Document
**Book or Chapter or Journal Article**

**Mapping relative fire regime condition class for the western United States**

www.nrfirescience.org/resource/10991

In 1999, a coarse-scale map of Fire Regime Condition Classes (FRCC) was developed for the conterminous United States (US) to help address contemporary fire management issues and to quantify changes in fuels from historical conditions. This map and its associated data have been incorporated into national policies (National Fire Plan...

**Author(s):** James P. Menakis, Melanie Miller, Thomas Thompson
**Year Published:** 2004
**Type:** Document
**Conference Proceedings**

**Mapping the cheatgrass-caused departure from historical natural fire regimes in the Great Basin, USA**

www.nrfirescience.org/resource/11490

Cheatgrass (Bromus tectorum) is an exotic grass that has increased fire hazard on millions of square kilometers of semi-arid rangelands in the western United States. Cheatgrass aggressively out competes native vegetation after fire and significantly enhances fire size and frequency. To evaluate the effect of cheatgrass on historical...
**The normalized burn ratio (NBR): A Landsat TM radiometric measure of burn severity**

www.nrfirescience.org/resource/11185

We used the Composite Burn Indices sampled in the field to test performance of radiometric measures as estimators of burn severity. Two 1994 fires occurring at Glacier National Park, Montana, were investigated. Indices incorporated band ratios and multi-temporal differencing derived from the Landsat Thematic Mapper, including: 1)...

**Performance of fuel treatments subjected to wildfires**

www.nrfirescience.org/resource/11038

Fire severity was evaluated in eight recent wildfires with standardized methods in adjacent treated and untreated stands. Sampled sites occurred in a variety of conifer forests throughout the Western United States. Treatments included reduction of surface fuels and crown fuels, both in isolation and in combination. Synthesis of our...

**Climatic controls on fire-induced sediment pulses in Yellowstone National Park and central Idaho: a long-term perspective**

www.nrfirescience.org/resource/7962

Fire management addressing postfire erosion and aquatic ecosystems tends to focus on short-term effects persisting up to about a decade after fire. A longer perspective is important in understanding natural variability in postfire erosion and sedimentation, the role of these processes in structuring habitat, and future expectations...

**Impacts of fire on hydrology and erosion in steep mountain big sagebrush communities**

www.nrfirescience.org/resource/11407

Wildfire is an important ecological process and management issue on western rangelands. Major unknowns associated with wildfire are its affects on vegetation and soil conditions that influence hydrologic processes including infiltration, surface runoff, erosion, sediment transport, and flooding. Post wildfire hydrologic response was...
The role of climate and vegetation change in shaping past and future fire regimes in the northwestern U.S. and the implications for ecosystem management

www.nrfirescience.org/resource/8382

Fire is an important part of the disturbance regimes of northwestern US forests and its role in maintaining and altering forest vegetation is evident in the paleoecological record of the region. Long-term reconstructions of Holocene fire regimes, provided by the analysis of charcoal, pollen, and other fire proxies in a network of...

Author(s): Cathy L. Whitlock, Sarah L. Shafer, Jennifer R. Marlon
Year Published: 2003
Type: Document
Book or Chapter or Journal Article

Using simulation to map fire regimes: an evaluation of approaches, strategies, and limitations

www.nrfirescience.org/resource/7951

Spatial depictions of fire regimes are indispensable to fire management because they portray important characteristics of wildland fire, such as severity, intensity, and pattern, across a landscape that serves as important reference for future treatment activities. However, spatially explicit fire regime maps are difficult and...

Author(s): Robert E. Keane, Geoffrey J. Cary, Russell A. Parsons
Year Published: 2003
Type: Document
Book or Chapter or Journal Article

Postfire aspen seedling recruitment across the Yellowstone (USA) landscape

www.nrfirescience.org/resource/13542

Landscape patterns of quaking aspen (Populus tremuloides) seedling occurrence and abundance were studied after a rare recruitment event following the 1988 fires in Yellowstone National Park, Wyoming, USA. Belt transects (1 to 17 km in length, 4 m width) along 18 foot trails were surveyed for aspen seedlings on the...

Author(s): Monica G. Turner, William H. Romme, Gerald A. Tuskan, Rebecca A. Reed
Year Published: 2003
Type: Document
Book or Chapter or Journal Article

Uncertainty in fire history and restoration of ponderosa pine forests in the western United States

www.nrfirescience.org/resource/11026

Fire-history data for ponderosa pine forests in the western U.S. have uncertainties and biases. Targeting multiple-scarred trees and using recorder trees when sampling for fire history may lead to incomplete records. For most of the western U.S., research is insufficient to conclude that high-severity fires did or did not occur in...

Author(s): William L. Baker, Donna S. Ehle
Year Published: 2003
Type: Document
Conference Proceedings

Fire as a coarse filter for snags and logs

www.nrfirescience.org/resource/11075

Fire played an important role in maintaining and creating conditions suitable for native flora and fauna in the forests of western North America. Recent coarse filter conservation strategies have advocated creating future landscapes that incorporate historic or natural ranges of variability, including fire
Wildfire and erosion: when to expect the unexpected
www.nrfirescience.org/resource/10999
Wildfire is a major ecological process and management issue in the western U.S. The 2000, 2001 and 2002 fire seasons were some of the biggest in history with over 2 million ha burned annually. What happens when the rains come? Most wildfires create a patchwork of low, moderate, and high severity burn areas, often causing spatially...
Author(s): Peter R. Robichaud
Year Published: 2002
Type: Document
Conference Proceedings

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

Landscape-scale controls over 20th century fire occurrence in two large Rocky Mountain (USA) wilderness areas
www.nrfirescience.org/resource/8140
Topography, vegetation, and climate act together to determine the spatial patterns of fires at landscape scales. Knowledge of landscape-fire-climate relations at these broad scales (1,000s ha to 100,000s ha) is limited and is largely based on inferences and extrapolations from fire histories reconstructed from finer scales. In this...
Author(s): Matthew G. Rollins, Penelope Morgan
Year Published: 2002
Type: Document
Book or Chapter or Journal Article

Impacts of wildfire on soil hydrological properties of steep sagebrush-steppe rangeland
www.nrfirescience.org/resource/11441
In late August 1996, a wildfire swept across the sagebrush-dominated foothills above Boise, Idaho. Fire impacts on infiltration and inter-rill erosion were examined 1 year following the fire with simulated rainfall. Densely vegetated north-facing slopes were compared with sparsely vegetated south-facing slopes under both burned (...
Uncertainty in surface-fire history: the case of ponderosa pine forests in the western United States
www.nrfirescience.org/resource/8257
Present understanding of fire ecology in forests subject to surface fires is based on fire-scar evidence. We present theory and empirical results that suggest that fire-history data have uncertainties and biases when used to estimate the population mean fire interval (FI) or other parameters of the fire regime. First, the population...
Author(s): William L. Baker, Donna S. Ehle
Year Published: 2001
Type: Document
Book or Chapter or Journal Article

Evaluating a century of fire patterns in two Rocky Mountain wilderness areas using digital fire atlases
www.nrfirescience.org/resource/8139
Changes in fire size, shape, and frequency under different fire-management strategies were evaluated using time series of fire perimeter data (fire atlases) and mapped potential vegetation types (PVTs) in the Gila-Aldo Leopold Wilderness Complex (GALWC) in New Mexico and the Selway-Bitterroot Wilderness Complex (SBWC) in Idaho and...
Author(s): Matthew G. Rollins, Thomas W. Swetnam, Penelope Morgan
Year Published: 2001
Type: Document
Book or Chapter or Journal Article

Water quality, substratum and biotic responses of five central Idaho (USA) streams during the first year following the Mortar Creek fire
www.nrfirescience.org/resource/11442
The Mortar Creek Fire burned 26 000 ha of mixed-conifer Rocky Mountain forest in July-August 1979. Changes in burn stream conditions were examined relative to reference streams for various ecological factors on two to six occasions, from October 1979 to August 1980. Factors included major ions and nutrients, suspended and benthic...
Author(s): G. Wayne Minshall, James T. Brock, Douglas A. Andrews, Christopher T. Robinson
Year Published: 2001
Type: Document
Book or Chapter or Journal Article

Infiltration rates after wildfires in the Bitterroot Valley
www.nrfirescience.org/resource/8425
Recent fires have renewed interest in fire's effect on different components of the ecosystem, in particular fire's effects on infiltration and runoff. Forests subjected to high severity burns often develop water repellent soil conditions. Under this condition, the infiltration of water into the soil is lowered and consequently...
Author(s): Juli A. Brady, Peter R. Robichaud, Frederick B. Pierson
Year Published: 2001
Type: Document
Conference Proceedings

Fire effects on infiltration rates after prescribed fire in Northern Rocky Mountain forests, USA
www.nrfirescience.org/resource/8134
Infiltration rates in undisturbed forest environments are generally high. These high infiltration rates may
be reduced when forest management activities such as timber harvesting and/or prescribed fires are used. Post-harvest residue burning is a common site preparation treatment used in the Northern Rocky Mountains, USA, to reduce...

Author(s): Peter R. Robichaud
Year Published: 2000
Type: Document
Book or Chapter or Journal Article

Fire, competition, and forest pests: landscape treatment to sustain ecosystem function
www.nrfirescience.org/resource/10988
Fire, competition for light and water, and native forest pests have interacted for millennia in western forests to produce a countryside dominated by seral species of conifers. These conifer-dominated ecosystems exist in six kinds of biotic communities. We divided one of these communities, the Rocky Mountain Montane Conifer Forest,....
Author(s): Geral I. McDonald, Alan E. Harvey, Jonalea R. Tonn
Year Published: 2000
Type: Document
Conference Proceedings

Fire in western forest ecosystems
www.nrfirescience.org/resource/11115
Description not entered
Author(s): Stephen F. Arno
Year Published: 2000
Type: Document
Technical Report or White Paper

The role of fire in management of watershed responses
www.nrfirescience.org/resource/12004
Hydrologic responses of watersheds are strongly related to vegetation and soil disturbances. Many of the storage and transfer components of the global hydrologic cycle are altered by the occurrence of fire. The major effect of fire on the hydrologic functioning of watersheds is the removal of vegetation and litter materials that...
Author(s): Malcomb J. Zwolinski
Year Published: 2000
Type: Document
Conference Proceedings

Associated riparian communities
www.nrfirescience.org/resource/10962
Some 100 years of fire exclusion in the Interior Northwest has resulted in riparian areas dominated by dense thickets of shade-tolerant trees. If former, more open conditions could be restored, these habitats could once more support a more diverse bird community. Efforts toward this at two study sites are described.
Author(s): Colin C. Hardy, Robert E. Keane, Michael G. Harrington
Year Published: 2000
Type: Document
Conference Proceedings

Native burning in western North America: implications for hardwood forest management
It is now widely acknowledged that frequent low-intensity fires once structured many western forests. What is not generally recognized, however, is that most of those fires were purposefully set by native people, not started by lightning. Data from the Rocky Mountains attest to the widespread use of fire by native people, as does...

Author(s): Charles E. Kay
Year Published: 2000
Type: Document
Conference Proceedings

Water repellency by laboratory burning of four Northern Rocky Mountain forest soils

Highly variable water repellent soil conditions have been reported after forest fires. We examined interactions among heating, soil water content and soil texture on water repellency. Undisturbed, 305-mm diameter cores were collected in the field from four soils commonly referred to as ash-cap, mixed ash-cap, no ash-cap and granitic...

Author(s): Peter R. Robichaud, Roger D. Hungerford
Year Published: 2000
Type: Document
Book or Chapter or Journal Article

Fuel: logs, sticks, needles, duff, and much more

Fuels burned by either prescribed or wildfires are complex and important components of forested ecosystems. Fine fuels consisting of fallen limbs, twigs, and leaves of shrubs and trees are rich in nutrients. If these fuels are not immediately burned, nutrients can leach from these materials into the forest floor, especially if they...

Author(s): Russell T. Graham, Theresa B. Jain, Alan E. Harvey
Year Published: 2000
Type: Document
Conference Proceedings, Synthesis

Mixed-severity fire regimes in the Northern Rocky Mountains: consequences of fire exclusion and options for the future

Findings from fire history studies have increasingly indicated that many forest ecosystems in the northern Rocky Mountains were shaped by mixed-severity fire regimes, characterized by fires of variable severities at intervals averaging between about 30 and 100 years. Perhaps because mixed-severity fire regimes and their resulting...

Author(s): Stephen F. Arno, David J. Parsons, Robert E. Keane
Year Published: 2000
Type: Document
Conference Proceedings, Synthesis

Fire in western shrubland, woodland, and grassland ecosystems

This state-of-knowledge review about the effects of fire on flora and fuels can assist land managers with ecosystem and fire management planning and in their efforts to inform others about the ecological role of fire. Chapter topics include fire regime classification, autecological effects of fire, fire regime characteristics and...

Author(s): Timothy E. Paysen, R. James Ansley, James K. Brown, Gerald J. Gottfried, Sally M. Haase,
Chapter 2: Fire autecology
www.nrfirescience.org/resource/12597
Fire is a key ecological process within most ecosystems in the United States and Canada. An understanding of factors controlling the initial response of vegetation to fire is essential to its management. Fire effects on plants can vary significantly among fires on different areas of the same fire. Fire behavior, fire duration, the...
Author(s): Melanie Miller
Year Published: 2000
Type: Document
Synthesis, Technical Report or White Paper

Prefire heterogeneity, fire severity, and early postfire plant reestablishment in subalpine forests of Yellowstone National Park, Wyoming
www.nrfirescience.org/resource/8212
The 1988 fires in Yellowstone National Park provided an opportunity to study effects of a large infrequent disturbance on a natural community. This study addressed two questions: (1) How does prefire heterogeneity of the landscape affect postfire patterns of fire severity? and (2) How do postfire patterns of burn severity influence...
Author(s): Monica G. Turner, William H. Romme, Robert H. Gardner
Year Published: 1999
Type: Document
Book or Chapter or Journal Article

Spatial interpolation and simulation of post-burn duff thickness after prescribed fire
www.nrfirescience.org/resource/8132
Prescribed fire is used as a site treatment after timber harvesting. These fires result in spatial patterns with some portions consuming all of the forest floor material (duff) and others consuming little. Prior to the burn, spatial sampling of duff thickness and duff water content can be used to generate geostatistical spatial...
Author(s): Peter R. Robichaud, S. M. Miller
Year Published: 1999
Type: Document
Book or Chapter or Journal Article

Fire history of an isolated subalpine mountain range of the intermountain region, United States
www.nrfirescience.org/resource/11438
Fire has historically been an important ecological component of forests in the Intermountain Region of the northwestern United States. This study is set in a small biogeographically disjunct mountain range. Our research objectives were to (1) investigate the historical frequency, severity, size, and spatial pattern of fire; (2)...
Author(s): Michael P. Murray, Stephen C. Bunting, Penelope Morgan
Year Published: 1998
Type: Document
Book or Chapter or Journal Article
Reduce fire hazards in ponderosa pine by thinning
www.nrfirescience.org/resource/8148
Forest stands of fire-dependent ponderosa pine cover about 40 million acres (16 million ha) in the Western United States. Ponderosa pine is commonly found in pure stands on dry sites, but in more moist conditions, it is associated with Douglas-fir, lodgepole pine, western larch, and others. Historically, these were often widely...
Author(s): Joe H. Scott
Year Published: 1998
Type: Document
Book or Chapter or Journal Article

Mapping historic fire regimes for the western United States: integrating remote sensing and biophysical data
www.nrfirescience.org/resource/7937
We have developed a spatial database of historic natural fire regimes for the eleven western States to provide information in support of expected national increases in prescribed burning. Fire regimes are described in terms both of frequency and severity, and we have classified five distinct fire regimes:
Author(s): Colin C. Hardy, James P. Menakis, Donald G. Long, James K. Brown, David L. Bunnell
Year Published: 1998
Type: Document
Conference Proceedings

Old-growth ponderosa pine and western larch stand structures: influences of pre-1900 fires and fire exclusion
www.nrfirescience.org/resource/11967
Presents detailed age structure for two western larch stands that historically experienced frequent fires. Compares age structures of eleven ponderosa pine and western larch stands representing a broad range of sites that had frequent fires. Interprets causal factors possibly linked to variations in stand age structures.
Author(s): Stephen F. Arno, Helen Y. Smith, Michael A. Krebs
Year Published: 1997
Type: Document
Technical Report or White Paper

Effects of fire size and pattern on succession in Yellowstone National Park
www.nrfirescience.org/resource/13535
The Yellowstone fires of 1988 affected >250000 ha, creating a mosaic of burn severities across the landscape and providing an ideal opportunity to study effects of fire size and pattern on postfire succession. We asked whether vegetation responses differed between small and large burned patches within the fire-created mosaic in...
Author(s): Monica G. Turner, William H. Romme, Robert H. Gardner, William W. Hargrove
Year Published: 1997
Type: Document
Book or Chapter or Journal Article

Geostatistics: a new tool for describing spatially-varied surface conditions from timber harvested and burned hillslopes
www.nrfirescience.org/resource/11012
Geostatistics provides a method to describe the spatial continuity of many natural phenomena. Spatial models are based upon the concept of scaling, kriging and conditional simulation. These techniques were used to describe the spatially-varied surface conditions on timber harvest and burned hillslopes.
Geostatistical techniques...
Author(s): Peter R. Robichaud
Year Published: 1997
Type: Document
Conference Proceedings

Spatially-varied erosion modeling using WEPP for timber harvested and burned hillslopes
www.nrfirescience.org/resource/11035
Spatially-varied hydrologic surface conditions exist on steep hillslopes after timber harvest operation and site preparation burning treatments. Site preparation burning creates low- and high-severity burn surface conditions or disturbances. In this study, a hillslope was divided into multiple combinations of surface conditions to...
Author(s): Peter R. Robichaud, T. M. Monroe
Year Published: 1997
Type: Document
Conference Proceedings

Restoring fire in lodgepole pine forests of the Intermountain West
www.nrfirescience.org/resource/8347
We are developing new management treatments for regenerating and sustaining lodgepole pine (Pinus contorta) forests through emulation of natural disturbance processes. Lodgepole pine is the principal forest cover on over 26 million hectares in western North America. While infrequent, stand replacing fires following mountain pine...
Author(s): Colin C. Hardy, Ward W. McCaughey
Year Published: 1997
Type: Document
Book or Chapter or Journal Article

A rare episode of sexual reproduction in aspen (Populus tremuloides Michx) following the 1988 Yellowstone fires
www.nrfirescience.org/resource/8236
No description available.
Author(s): William H. Romme, Monica G. Turner, Robert H. Gardner, William W. Hargrove, Gerald A. Tuskan, Don G. Despain, Roy A. Renkin
Year Published: 1997
Type: Document
Book or Chapter or Journal Article

Effects of fire size and pattern on early succession in Yellowstone National Park
www.nrfirescience.org/resource/8238
The Yellowstone fires of 1988 affected >250000 ha, creating a mosaic of burn severities across the landscape and providing an ideal opportunity to study effects of fire size and pattern on postfire succession. We asked whether vegetation responses differed between small and large burned patches within the fire-created mosaic in...
Author(s): Monica G. Turner, William H. Romme, Robert H. Gardner, William W. Hargrove
Year Published: 1997
Type: Document
Book or Chapter or Journal Article

Reestablishing fire-adapted communities to riparian forests in the ponderosa pine zone
Ecological research has implicated the practice of fire exclusion as a major contributor to forest health problems in the semiarid ponderosa pine (Pinus ponderosa) zone of the Inland West (Mutch and others 1993; Sampson and others 1994). Prior to 1900, frequent, low-intensity fires occurred on upland forests in this forest zone at...

Author(s): Matthew K. Arno
Year Published: 1996
Type: Document
Technical Report or White Paper

**Restoring recreational and residential forests**

Several decades of fire suppression following logging around the turn-of-the-century has produced dense, evenage stands of ponderosa pine (Pinus ponderosa) and Douglas-fir (Pseudotsuga menziesii). They contrast with the original forests where frequent, low-intensity fires gave rise to open, parklike, and often uneven-age stands of...

Author(s): Joe H. Scott
Year Published: 1996
Type: Document
Technical Report or White Paper

**Consequences of fire on aquatic nitrate and phosphate dynamics in Yellowstone National Park**

Airborne remotely sensed data were collected and analyzed during and following the 1988 Greater Yellowstone Ecosystem (GYE) fires in order to characterize the fire front movements, burn intensities and various vegetative components of selected watersheds. Remotely sensed data were used to categorize the burn intensities as: severely...

Author(s): James A. Brass, Vincent G. Ambrosia, Philip J. Riggan, Paul D. Sebesta
Year Published: 1996
Type: Conference Proceedings

**Remote sensing of forest fire severity and vegetation recovery**

Burned forested areas have patterns of varying burn severity as a consequence of various topographic, vegetation, and meteorological factors. These patterns are detected and mapped using satellite data. Other ecological information can be abstracted from satellite data regarding rates of recovery of vegetation foliage and variation...

Author(s): Joseph D. White, Kevin C. Ryan, Carl H. Key, Steven W. Running
Year Published: 1996
Type: Document
Book or Chapter or Journal Article

**The concept: restoring ecological structure and process in ponderosa pine forests**

Elimination of the historic pattern of frequent low-intensity fires in ponderosa pine and pine-mixed conifer forests has resulted in major ecological disruptions. Prior to 1900, open stands of large, long-lived, fire-resistant ponderosa pine were typical. These were accompanied in some areas by other fire-dependent species such as...

Author(s): Stephen F. Arno
Year Published: 1996
Comparing the prescribed natural fire program with presettlement fires in the Selway-Bitterroot Wilderness
www.nrfirescience.org/resource/8217
The severity and extent of recent fires (1979-1990) were compared with that of presettlement fires (pre-1935) by eight major forest types in the Selway-Bitterroot Wilderness (SBW) in Idaho and Montana. Presettlement fire intervals were determined for estimating area burned. Presettlement annual area burned for the entire SBW was 4,...
Author(s): James K. Brown, Stephen F. Arno, Stephen W. Barrett, James P. Menakis
Year Published: 1994
Type: Document
Book or Chapter or Journal Article

Fire regimes on andesitic mountain terrain in northeastern Yellowstone National Park, Wyoming
www.nrfirescience.org/resource/8196
A fire history investigation was conducted for three forest community types in the Absaroka Mountains of Yellowstone National Park, Wyoming. Master fire chronologies were based on fire-initiated age classes and tree fire scars. The area's major forest type, lodgepole pine (Pinus contorta Dougl. var. latifolia) ecosystems, revealed a...
Author(s): Stephen W. Barrett
Year Published: 1994
Type: Document
Book or Chapter or Journal Article

Onsite sediment production and nutrient losses from a low-severity burn in the interior northwest
www.nrfirescience.org/resource/11013
Postharvest residue burning is a common site preparation treatment used in the interior Northwest to reduce forest fuels and prepare sites for tree regeneration. A study was conducted to measure runoff, sediment production, and nutrient changes caused by broadcast burning of logging slash. The site was a northern Idaho mixed conifer...
Author(s): Peter R. Robichaud, Russell T. Graham, Roger D. Hungerford
Year Published: 1994
Type: Document
Conference Proceedings

Effects of fire on landscape heterogeneity in Yellowstone National Park, Wyoming
www.nrfirescience.org/resource/18422
A map of Yellowstone National Park (YNP) was derived from Landsat Thematic Mapper (TM) imagery and used to assess the isolation of burned areas, the heterogeneity that resulted from fires burning under moderate and severe burning conditions, and the relationship between heterogeneity and fire size. The majority of severely burned...
Author(s): Monica G. Turner, William W. Hargrove, Robert H. Gardner, William H. Romme
Year Published: 1994
Type: Document
Book or Chapter or Journal Article

Fire history of Tenderfoot Creek Experimental Forest Lewis and Clark National Forest
The landscape and stand-level fire history of lodgepole pine dominated forest in Tenderfoot Creek Experimental Forest is assessed. Primary objective were to: 1) determine pre-1900 fire periodicities, severities, and burning patterns in the area’s lodgepole pine dominated stands, and 2) document and map the forest age class mosaic,...

When it’s hot, it’s hot... or maybe it’s not! (Surface flaming may not portend extensive soil heating)

Fire effects on a plant community, soil, and air are not apparent when judged only by surface fire intensity. The fire severity or fire impact can be described by the temperatures reached within the forest floor and the duration of heating experienced in the vegetation, forest floor, and underlying mineral soil. Temporal...

Fire damage on extensively vs. intensively managed forest stands within the North Fork Fire, 1988

The Greater Yellowstone fires of 1988 provide an opportunity to study important distinctions between lands managed for preservation versus multiple uses. We surveyed fuel loadings, fire severity, and fire damage to extensively managed, mature forest and to intensively managed, clearcut reproduction areas. Unburned, mature forests...

Management and productivity of western-montane forest soils, proceedings

Includes 35 papers and six poster synopses presenting state-of-the-art knowledge on the nature and problems of integrating soils information and expertise into management of inland western forest resources. Papers emphasize regional information, but include data from world literature and previously unpublished material from regional...

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

Describes results of prescribed burning 36 plots in northern Idaho mixed conifer logging slash. Fuel characteristics and methods for predicting duff and woody fuel consumption are reported. Guidelines are included for developing fire prescriptions.
Influence of fire on factors that affect site productivity
www.nrfirescience.org/resource/12002
Presettlement fire played an important role in nutrient conversion, plant succession, diversity, and stand dynamics in coniferous forests of western North America. Prescribed fire can maintain site quality and contribute to control of insect and disease problems while reducing wildfire hazard. Fire effects on soils are largely...

Predicting duff and woody fuel consumption in northern Idaho prescribed fires
www.nrfirescience.org/resource/7914
Experimental burns were conducted on 36 plots in mixed conifer logging slash in northern Idaho to investigate consumption of duff and woody fuel. Fires were conducted in spring and fall, in YUM (yarded unmerchantable material) and non-YUM dearcuts and seed-tree cuts. Preburn duff depth averaged 3.8 cm and consisted of a shallow...

Forest fire frequency and western spruce budworm outbreaks in western Montana
www.nrfirescience.org/resource/7908
Duration and intensity of western spruce budworm (Christoneura occidentalis Freeman) outbreaks have increased with the decrease in forest fire frequency in Montana since 1910. Frequency of budworm outbreaks, however, was not affected. Feeding activity and fire occurrence were measured in 20 mixed Douglas-fir (Pseudotsuga menziesii...)

First decade plant succession following the Sundance forest fire, northern Idaho
www.nrfirescience.org/resource/11915
Describes the first 10 years of vegetation development following disturbance by a holocaustic forest fire in a western redcedar-western hemlock type in the Selkirk Range. Postfire development of vegetation is represented as life-form stages and predominant cover species. Differential development of plant species established in the...
Influence of fire severity on response of evergreen ceanothus
www.nrfirescience.org/resource/11061
Fire plays an important role in Ceanothus velutinus habitat. Its impact varies with season and severity of fire. Knowledge of the interaction between fire severity and evergreen ceanothus habitat can assist managers in estimating the effect of fire on evergreen ceanothus and in developing burning prescriptions.
Author(s): Nonan V. Noste
Year Published: 1985
Type: Document
Conference Proceedings, Technical Report or White Paper

Fire ecology of antelope bitterbrush in the Northern Rocky Mountains
www.nrfirescience.org/resource/11058
Frequency of resprouting and number of newly established seedlings of antelope bitterbrush were sampled on sites burned by prescribed burns and wildfires 3 to 10 years previously to determine the effect of habitat type, growth form, and season of the burn on bitterbrush. Significant differences in resprouting response occurred among...
Author(s): Stephen C. Bunting, Leon F. Neuenschwander, George E. Gruell
Year Published: 1985
Type: Document
Conference Proceedings, Technical Report or White Paper

Fire's effects on a small bird population
www.nrfirescience.org/resource/11188
Changes in bird populations as a result of a 122 ha forest fire are evaluated. There is little evidence of any drastic effect on numbers of birds, species, or species diversity in the year of the fire or 2 years later.
Author(s): L. Jack Lyon, John M. Marzluff
Year Published: 1985
Type: Document
Technical Report or White Paper

Livestock grazing influences on community structure, fire intensity, and fire frequency within the Douglas-fir/ninebark habitat type
www.nrfirescience.org/resource/13126
Influences of livestock grazing on community structure, fire intensity, and normal fire frequency in the Douglas-fir/ninebark (Pseudotsuga menziesii/Physocarpus malvaceus) habitat type were studied at the University of Idaho's experimental forest in northern Idaho. Livestock grazing caused increased tree numbers...
Author(s): G. Thomas Zimmerman, Leon F. Neuenschwander
Year Published: 1984
Type: Document
Book or Chapter or Journal Article

Indian fires as an ecological influence in the Northern Rockies
www.nrfirescience.org/resource/7910
The importance of fire as an ecological disturbance in the Northern Rockies is well accepted. Lightning is generally thought to have been the main source of ignition prior to settlement by Europeans. But writings of explorers and pioneers mention deliberate burning by Indians frequently enough to warrant an investigation of its...
Author(s): Stephen W. Barrett, Stephen F. Arno
Clearcutting and fire in the larch/Douglas-fir forests of western Montana: a multifaceted research summary
www.nrfirescience.org/resource/11180
Logging slash on 73 clearcuts was broadcast burned over a wide range of conditions, achieving a broad array of fire intensities and effects. An intense wildfire was also evaluated. Fire effectiveness was measured and related to preburn conditions and fire intensity. Treatment effects on air quality, forest regeneration, vegetation...
Author(s): Norbert V. DeByle
Year Published: 1981
Type: Document
Technical Report or White Paper

Fire intensity and frequency as factors in the distribution and structure of northern ecosystems
www.nrfirescience.org/resource/8406
Most presettlement Canadian and Alaskan boreal forests and Rocky Mountain subalpine forests had lightning fire regimes of large-scale crown fires and high-intensity surface fires, causing total stand replacement on fire rotations (or cycles) to 50 to 200 years. Cycles and fire size varied with latitude, elevation, and topographic...
Author(s): Miron L. Heinselman
Year Published: 1981
Type: Document
Conference Proceedings

Fire history of western redcedar/hemlock forests in northern Idaho
www.nrfirescience.org/resource/12041
Evidence of fire history over the past few centuries was gathered in two areas (totaling 30,000 acres; 6000 ha) for fire management planning. Findings are some of the first detailed data for western redcedar-hemlock forests. On upland habitat types fires of variable intensities generally occurred at 50-to-150-year intervals, often...
Author(s): Stephen F. Arno, Dan H. Davis
Year Published: 1980
Type: Document
Conference Proceedings, Technical Report or White Paper

Fire history of a western larch/Douglas-fir forest type in northwestern Montana
www.nrfirescience.org/resource/12044
Mean frequencies were about 120 years for valleys and montane slopes and 150 years for subalpine slopes in this western larch/Douglas-fir forest from 1735 to 1976. Fires were small and moderately intense with occasional high intensity runs. Single burns thinned the overstory favoring mixed conifer regeneration. Multiple burns...
Author(s): Kathleen M. Davis
Year Published: 1980
Type: Document
Conference Proceedings, Technical Report or White Paper

Fire history terminology: report of the ad hoc committee
It is often quite difficult to compare fire history studies conducted by different investigators because different terms may be used to refer to the same concept and the same term may be used to refer to different concepts. To help resolve this difficulty, an ad hoc committee was formed early in the course of the workshop with the...

**Author(s):** William H. Romme
**Year Published:** 1980
**Type:** Document
**Conference Proceedings, Technical Report or White Paper**

**Forest fire history in the Northern Rockies**

Recent fire-scar studies in the northern Rocky Mountains have documented forest fire history over the past few centuries. They reveal that in some forest types fire maintained many-aged open stands of seral trees. In other types, major fires caused replacement of the stands. Often, however, fires burned at variable intensities,...

**Author(s):** Stephen F. Arno
**Year Published:** 1980
**Type:** Document
**Book or Chapter or Journal Article**

**Indian fires in the pre-settlement forests of western Montana**

Presents preliminary results of a two-year study examining the pattern of Indian fires in western Montana's lower elevation forests. Interviews and historic journals were used to reconstruct the characteristics of aboriginal burning. Fire scar data from paired stands indicate substantial differences in fire frequency between Indian...

**Author(s):** Stephen W. Berrett
**Year Published:** 1980
**Type:** Document
**Conference Proceedings**

**Fire frequency in subalpine forests of Yellowstone National Park**

Dead woody fuels were sampled in 16 upland forest stands representing a chronosequence of forest successional stages. Different fuel components show different temporal patterns, but adequate levels of all components necessary for an intense crown fire are not present simultaneously until stand age 300-400 yr. Therefore, the average...

**Author(s):** William H. Romme
**Year Published:** 1980
**Type:** Document
**Conference Proceedings, 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**

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...
The historical role of fire on the Bitterroot National Forest

www.nrfirescience.org/resource/11175

Presents frequencies, intensities, and influences of fire on stand structure and composition on the Bitterroot National Forest in west-central Montana. Three study areas were established, each having a wide range of elevations and forest types. Findings are based upon study of nearly 900 individual fire scars on living trees, and on...

Author(s): Stephen F. Arno
Year Published: 1976
Type: Document
Technical Report or White Paper

Seedbed characteristics in western larch forests after prescribed burning

www.nrfirescience.org/resource/11948

Establishment of western larch (Larix occidentalis Nutt.) seedlings is favored by site preparation that reduces both the duff layer and the sprouting potential of competing vegetation. A cooperative study of the use of fire in silviculture in northwestern Montana provided conditions to research the effectiveness of prescribed...

Author(s): Raymond C. Shearer
Year Published: 1975
Type: Document
Technical Report or White Paper

Smoke column height related to fire intensity

www.nrfirescience.org/resource/11946

Height of slash fire smoke columns, commonly thought to be a function of atmospheric conditions alone, through a series of 10-acre experimental fires is shown to be strongly related to fire intensity. By conducting intense fires, land managers can possibly burn forest debris and still maintain air quality when atmospheric conditions...

Author(s): Rodney A. Norum
Year Published: 1974
Type: Document
Technical Report or White Paper

Fire-dependent forests in the Northern Rocky Mountains

www.nrfirescience.org/resource/7935

One objective of wilderness and parkland fire ecology research is to describe the relationships between fire and unmanaged ecosystems, so that strategies can be determined that will provide a more nearly natural incidence of fire. More than 50 years of efforts directed toward exclusion of wildland fires in the Northern Rocky...

Author(s): James R. Habeck, Robert W. Mutch
Year Published: 1973
Type: Document
Book or Chapter or Journal Article

Wildfires in northern Yellowstone National Park

www.nrfirescience.org/resource/15398
A sample of 40 fire-scarred trees was used to reconstruct the frequency and size of fires during the past 300-400 years in northern Yellowstone National Park. Best estimates of frequency suggested mean intervals of about 20-25 years between fires, after adjustments had been made for the recent influence of modern man. Agreement in...

**Author(s):** Douglas B. Houston  
**Year Published:** 1973  
**Type:** Document

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**Temperatures in a large natural-fuel fire**  
[www.nrfirescience.org/resource/11475](http://www.nrfirescience.org/resource/11475)

Temperatures in a large natural fuel test fire were measured with bare, shielded aspirated, and shielded unaspirated chromel-alumel thermocouples. With the bare thermocouples, values of 2650 F. were recorded--much higher than most previously published data from field and laboratory wood fires. Soil temperatures were consistent with...

**Author(s):** Charles W. Philpot  
**Year Published:** 1966  
**Type:** Document

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Research Brief or Fact Sheet