Geomorphic complexity and sensitivity in channels to fire and floods in mountain catchments
www.nrfirescience.org/resource/19900
Fires and floods are important drivers of geomorphic change. While the hydrologic and geomorphic effects of fires have been studied at the hillslope scale, we have much more limited data on post-fire runoff, channel changes, and inferred or measured sediment storage and delivery at larger scales. In this study we intensively...
Author(s): Dan Brogan, Lee H. MacDonald, Peter A. Nelson, Jacob A. Morgan
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Soil carbon and nitrogen eroded after severe wildfire and erosion mitigation treatments
www.nrfirescience.org/resource/19840
Erosion of soil carbon (C) and nitrogen (N) following severe wildfire may have deleterious effects on downstream resources and ecosystem recovery. Although C and N losses in combustion and runoff have been studied extensively, soil C and N transported by post-fire erosion has rarely been quantified in burned landscapes. To better...
Author(s): Derek N. Pierson, Peter R. Robichaud, Charles C. Rhoades, Robert E. Brown
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Evolution of debris-flow initiation mechanisms and sediment sources during a sequence of post-wildfire rainstorms
www.nrfirescience.org/resource/19820
Wildfire alters vegetation cover and soil hydrologic properties, substantially increasing the likelihood of debris flows in steep watersheds. Our understanding of initiation mechanisms of post-wildfire debris flows is limited, in part, by a lack of direct observations and measurements. In particular, there is a need to understand...
Author(s): Luke A. McGuire, Francis K. Rengers, Jason W. Kean, Dennis M. Staley, Joel B. Smith
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Post-fire wood mulch for reducing erosion potential increases tree seedlings with few impacts on understory plants and soil nitrogen
www.nrfirescience.org/resource/20585
Following high-severity wildfire, application of mulch on the soil surface is commonly used to stabilize slopes and limit soil erosion potential, protecting ecosystem values at risk. Despite the widespread use of mulch, relatively little is known about its effects on ecosystem recovery and soil processes important for plant re-...
Author(s): Jayne L. Jonas, Erin Berryman, Brett Wolk, Penelope Morgan, Peter R. Robichaud
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

The effects of post-fire forest management on soil erosion rates 3 and 4 years after a wildfire, demonstrated on the 2010 Mount Carmel fire
www.nrfirescience.org/resource/19621
During 2-5 December 2010, an area of 2500 ha in the Carmel forests was consumed by a severe wildfire, causing soil erosion from the exposed slopes. Whereas most studies show that post-fire
erosion rates tend to decline after the second year, in this case, we aim to address the ongoing consequences that different management...

Author(s): Rami Zituni, Lea Wittenberg, Dan Malkinson
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Long-Term Vegetation Recovery and Invasive Annual Suppression in Native and Introduced Postfire Seeding Treatments
www.nrfirescience.org/resource/20244
Seed mixes used for postfire seeding in the Great Basin are often selected on the basis of short-term rehabilitation objectives, such as ability to rapidly establish and suppress invasive exotic annuals (e.g., cheatgrass, Bromus tectorum L.). Longer-term considerations are also important, including whether seeded plants persist...

Author(s): Jeffrey E. Ott, Francis F. Kilkenny, Daniel D. Summers, Tyler W. Thompson
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Effect of moss crusts on mitigation of post-fire soil erosion
www.nrfirescience.org/resource/19387
Mosses and wildfires are ubiquitous occurrences. Their correlation has been assessed in few studies. Mosses have been pointed as pioneer species in post-fire environments. However, reasons for moss crusting in post-wildfire soils and their ecosystem role in preventing soil erosion have not been quantitatively assessed. Moss crusts...

Author(s): Flávio C. Silva, Diana C.S. Vieira, Els van der Spek, J. Jacob Keizer
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Post-wildfire sediment cascades: a modeling framework linking debris flow generation and network-scale sediment routing
www.nrfirescience.org/resource/20180
Wildfires represent one of the largest disturbances in watersheds of the Intermountain West. Yet, we lack models capable of predicting post?wildfire impacts on downstream ecosystems and infrastructure. Here we present a novel modeling framework that links new and existing models to simulate the post?wildfire sediment cascade,...

Author(s): Brendan P. Murphy, Jonathan A. Czuba, Patrick Belmont
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Postwildfire seeding to restore native vegetation and limit exotic annuals: an evaluation in juniper-dominated sagebrush steppe
www.nrfirescience.org/resource/19222
Reestablishment of perennial vegetation is often needed after wildfires to limit exotic species and restore ecosystem services. However, there is growing body of evidence that questions if seeding after wildfires increases perennial vegetation and reduces exotic plants. The concern that seeding may not meet restoration goals is even...

Author(s): Kirk W. Davies, Jonathan D. Bates, Chad S. Boyd
Year Published: 2019
Transient population dynamics impede restoration and may promote ecosystem transformation after disturbance

www.nrfirescience.org/resource/20172

The apparent failure of ecosystems to recover from increasingly widespread disturbance is a global concern. Despite growing focus on factors inhibiting resilience and restoration, we still know very little about how demographic and population processes influence recovery. Using inverse and forward demographic modelling of 531 post...

Author(s): Robert K. Shriver, Caitlin M. Andrews, Robert S. Arkle, David M Barnard, Michael C. Duniway, Matthew J. Germino, David S. Pilliod, David A. Pyke, Justin L. Welty, John Bradford
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Effectiveness of straw bale check dams at reducing post-fire sediment yields from steep ephemeral channels

www.nrfirescience.org/resource/20036

Post-fire flooding and elevated sediment loads in channels can pose hazards to people and structures within the wildland-urban interface. Mitigation of these hazards is essential to protect downstream resources. Straw bale check dams are one treatment designed to reduce sediment yields in small ephemeral catchments (<2 ha)....

Author(s): Peter R. Robichaud, Keenan A. Storrar, Joseph W. Wagenbrenner
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Physical vulnerabilities from wildfires: Flames, floods, and debris flows

www.nrfirescience.org/resource/19841

Humans live in or adjacent to wildland ecosystems that burn periodically and are part of nearly all ecosystems that are in the pyrosphere. There are many hazards posed by wildfire and certain consequences of living in these ecosystems. Most are associated with wildfire, but the increased use of prescribed fire is an issue because of...

Author(s): Daniel G. Neary, Jackson M. Leonard
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/18803

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
Partitioned by process: Measuring post-fire debris-flow and rill erosion with structure from motion photogrammetry
www.nrfirescience.org/resource/20624
After wildfire, hillslope and channel erosion produce large amounts of sediment and can contribute significantly to long-term erosion rates. However, pre-erosion high-resolution topographic data (e.g. lidar) is often not available and determining specific contributions from post-fire hillslope and channel erosion is...
Author(s): Nicholas G. Ellett, Jennifer L. Pierce, Nancy F. Glenn
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Hydrologic and erosion responses to compaction and added surface cover in post-fire logged areas: Isolating splash, interrill and rill erosion
www.nrfirescience.org/resource/19835
Soil compaction during post-fire logging can increase runoff and erosion. Increasing surface cover is an effective way to reduce erosion, but this has not been tested on soils impacted by both fire and compaction. We measured the effects of compaction (bulk density of 0.9 or 1.1 g cm\(^{-3}\)) and surface cover (0% or 60%) using bark...
Author(s): Sergio A. Prats, Maruxa C. Malvar, Celeste O.A. Coelho, Joseph W. Wagenbrenner
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Progress in simplifying hydrologic model parameterization for broad applications to post-wildfire flooding and debris-flow hazards
www.nrfirescience.org/resource/20610
Predicting the timing of overland flow in burned watersheds can help to estimate debris-flow timing and the location of debris-flow initiation. Numerical models can produce flow predictions, but they are limited by our knowledge of appropriate model parameters. Moreover, opportunities to test and calibrate model parameters in...
Author(s): Francis K. Rengers, Luke A. McGuire, Jason W. Kean, Dennis M. Staley, Ann M. Youberg
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Long-term vegetation response following post-fire straw mulching
www.nrfirescience.org/resource/19710
Background: Straw mulching is one of the most common treatments applied immediately post fire to reduce soil erosion potential and mitigate post-fire effects on water quality, downstream property, and infrastructure, but little is known about the long-term effects on vegetation response. We sampled six fires that were mulched...
Author(s): Jonathan D. Bontrager, Penelope Morgan, Andrew T. Hudak, Peter R. Robichaud
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Partitioned by process: measuring post-fire debris-flow and rill erosion with structure from motion photogrammetry
www.nrfirescience.org/resource/20574
After wildfire, hillslope and channel erosion produce large amounts of sediment and can contribute significantly to long-term erosion rates. However, pre-erosion high-resolution topographic data (e.g., lidar) is often not available and determining specific contributions from post-fire hillslope and channel erosion is...

Author(s): Nicholas G. Ellett, Jennifer L. Pierce, Nancy F. Glenn
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Post-fire recruitment of Great Basin big sagebrush species: spatial and temporal controls along regional gradients of soil temperature and moisture - JFSP Final Report
www.nrfirescience.org/resource/19622
In sagebrush-dominated shrublands of western North America, warmer temperatures coupled with annual grass invasions are increasing the frequency and extent of wildfires. Postfire sagebrush recovery rates are unpredictable and many recent fires have resulted in the apparent loss of sagebrush habitat, resulting in a pressing need to...

Author(s): Alexandra K. Urza, Peter J. Weisberg, Jeanne C. Chambers, Stanley G. Kitchen, Bruce A. Roundy
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Post-fire soil erosion mitigation at the scale of swales using forest logging residues at a reduced application rate
www.nrfirescience.org/resource/20482
Mulching with forest residues has proved to be highly effective in reducing post-fire soil losses at the plot scale. However, its effectiveness has not been quantified at the application rates that are typically used in operational post-fire land management (2-3 Mg ha⁻¹ using straw), as well as at scales larger than 100 m²....

Author(s): Sergio A. Prats, Oscar González-Pelayo, Flávio C. Silva, K. J. Bokhorst, J. E. M. Baartman, Jan J. Keizer
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
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

Post-fire wood mulch for reducing erosion potential increases tree seedlings with few impacts on understory plants and soil nitrogen
www.nrfirescience.org/resource/20215
Following high-severity wildfire, application of mulch on the soil surface is commonly used to stabilize slopes and limit soil erosion potential, protecting ecosystem values at risk. Despite the widespread use
of mulch, relatively little is known about its effects on ecosystem recovery and soil processes important
for plant re-...
Author(s): Jayne L. Jonas, Erin Berryman, Brett Wolk, Penelope Morgan, Peter R. Robichaud
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Ponderosa pine regeneration, wildland fuels management, and habitat conservation: identifying trade-offs following wildfire
www.nrfirescience.org/resource/19304
Increasing wildfires in western North American conifer forests have led to debates surrounding the application of post-fire management practices. There is a lack of consensus on whether (and to what extent) post-fire management assists or hinders managers in achieving goals, particularly in under-studied regions like eastern...
Author(s): Victoria M. Donovan, Caleb P. Roberts, Carissa L. Wonkka, David A. Wedin, Dirac Twidwell
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Impacts of successive wildfire on soil hydraulic properties: implications for debris flow hazards and system resilience
www.nrfirescience.org/resource/20177
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...
Author(s): Luke A. McGuire, Ann M. Youberg
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Origins of abrupt change? Postfire subalpine conifer regeneration declines nonlinearly with warming and drying
www.nrfirescience.org/resource/19044
Robust tree regeneration following high-severity wildfire is key to the resilience of subalpine and boreal forests, and 21st century climate could initiate abrupt change in forests if postfire temperature and soil moisture become less suitable for tree seedling establishment. Using two widespread conifer species, lodgepole pine (... 
Author(s): Winslow D. Hansen, Monica G. Turner
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

Coupling wildfire spread and erosion models to quantify post-fire erosion before and after fuel treatments
www.nrfirescience.org/resource/20106
Wildfires are known to change post-fire watershed conditions such that hillslopes can become prone to increased erosion and sediment delivery. In this work, we coupled wildfire spread and erosion prediction modelling to assess the benefits of fuel reduction treatments in preventing soil runoff. The study was conducted in a 68,000-ha...
Author(s): Michele Salis, Liliana Del Giudice, Peter R. Robichaud, Alan A. Ager, Annalisa Canu,
Recovery of small-scale infiltration and erosion after wildfires
www.nrfirescience.org/resource/18831
Wildfires naturally occur worldwide, however the potential disruption to ecosystem services from subsequent post-fire flooding and erosion often necessitates a response from land managers. The impact of high severity wildfire on infiltration and interrill erosion responses was evaluated for five years after the 2003 Hot Creek Fire...
Author(s): Sierra S. Larson-Nash, Peter R. Robichaud, Frederick B. Pierson, Corey A. Moffet, C. Jason Williams, Kenneth E. Spaeth, Robert E. Brown, Sarah A. Lewis
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Vegetation succession in post-fire seeding treatments - Final Report to the Joint Fire Science Program
www.nrfirescience.org/resource/18258
Seed mixes used for post-fire seeding in the Great Basin are often selected based on short-term rehabilitation objectives, such as ability to rapidly establish and suppress invasive exotic annuals that drive altered fire-regimes via fine build-up (e.g. cheatgrass, Bromus tectorum L.), but longer-term considerations are also...
Author(s): Francis F. Kilkenny, Jeffrey E. Ott, Daniel D. Summers, Tyler W. Thompson
Year Published: 2018
Type: Document
Technical Report or White Paper

Rainfall thresholds for post-fire runoff and sediment delivery from plot to watershed scales
www.nrfirescience.org/resource/18063
Wildfire increases the likelihood of runoff, erosion, and downstream sedimentation in many of the watersheds that supply water for Colorado’s Front Range communities. The objectives of this study were to: (1) identify rainfall intensity thresholds for a post-fire runoff or sediment delivery response at plots (?0.06 ha),...
Author(s): Codie Wilson, Stephanie Kampf, Joseph W. Wagenbrenner, Lee H. MacDonald
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Post-fire water-quality response in the western United States
www.nrfirescience.org/resource/17502
Wildfires are increasing in size and severity in forested landscapes across the Western United States. Not only do fires alter land surfaces, but they also affect the surface water quality in downstream systems. Previous studies of individual fires have observed an increase in various forms of nutrients, ions, sediments and metals...
Author(s): Ashley J. Rust, Terri S. Hogue, Samuel Saxe, John McRary
Year Published: 2018
Type: Document
Book or Chapter or Journal Article
Estimating post-fire debris-flow hazards prior to wildfire using a statistical analysis of historical distributions of fire severity from remote sensing data

www.nrfirescience.org/resource/18131
Following wildfire, mountainous areas of the western United States are susceptible to debris flow during intense rainfall. Convective storms that can generate debris flows in recently burned areas may occur during or immediately after the wildfire, leaving insufficient time for development and implementation of risk mitigation...

Author(s): Dennis M. Staley, Anne Tillery, Jason W. Kean, Luke A. McGuire, Hannah E. Pauling, Francis K. Rengers, Joel B. Smith
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Post-wildfire seeding to restore native vegetation and limit exotic annuals: an evaluation in juniper-dominated sagebrush steppe

www.nrfirescience.org/resource/17926
Reestablishment of perennial vegetation is often needed after wildfires to limit exotic species and restore ecosystem services. However, there is growing body of evidence that questions if seeding after wildfires increases perennial vegetation and reduces exotic plants. The concern that seeding may not meet restoration goals is even...

Author(s): Kirk W. Davies, Jonathan D. Bates, Chad S. Boyd
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Do Post-Fire Mulching Treatments Affect Regeneration in Serotinous Lodgepole Pine?

www.nrfirescience.org/resource/16336
Broadcast mulching is a widely implemented post-fire erosion control method, although it remains uncertain how it affects post-fire regeneration in serotinous conifers. We used field data and unbiased conditional inference trees with random effects to test if mulching affects lodgepole pine (Pinus contorta Dougl. ex Loud. var....

Author(s): Micah Wright, Monique E. Rocca
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Rapid-response tools and datasets for post-fire modeling: linking earth observations and process-based hydrological models to support post-fire remediation

www.nrfirescience.org/resource/15538
Post-wildfire flooding and erosion can threaten lives, property and natural resources. Increased peak flows and sediment delivery due to the loss of surface vegetation cover and fire-induced changes in soil properties are of great concern to public safety. Burn severity maps derived from remote sensing data reflect fire-induced...

Author(s): Mary Ellen Miller, Michael Billmire, William J. Elliot, Kevin A. Endsley, Peter R. Robichaud
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Rapid-response tools and datasets for post-fire remediation: linking remote sensing and
Post-wildfire flooding and erosion can threaten lives, property and natural resources. Increased peak flows and sediment delivery due to the loss of surface vegetation cover and fire-induced changes in soil properties are of great concern to public safety. Burn severity maps derived from remote sensing data reflect fire-induced...

Author(s): Mary Ellen Miller, William J. Elliot, Peter R. Robichaud, Kevin A. Endsley
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

High and dry: post?fire tree seedling establishment in subalpine forests decreases with post?fire drought and large stand?replacing burn patches

Aim Climate warming and increased wildfire activity are hypothesized to catalyse biogeographical shifts, reducing the resilience of fire?prone forests worldwide. Two key mechanisms underpinning hypotheses are: (1) reduced seed availability in large stand?replacing burn patches, and (2) reduced seedling establishment/survival...

Author(s): Brian J. Harvey, Daniel C. Donato, Monica G. Turner
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Rapid response tools and datasets for post-fire modeling: linking earth observations and process-based hydrological models to support post-fire remediation

Preparation is key to utilizing Earth Observations and process-based models to support post-wildfire mitigation. Post-fire flooding and erosion can pose a serious threat to life, property and municipal water supplies. Increased runoff and sediment delivery due to the loss of surface cover and fire-induced changes in soil...

Author(s): Mary Ellen Miller, Michael Billmire, William J. Elliot, Kevin A. Endsley, Peter R. Robichaud
Year Published: 2015
Type: Document
Conference Proceedings

Predicting spatial distribution of postfire debris flows and potential consequences for native trout in headwater streams

Habitat fragmentation and degradation and invasion of nonnative species have restricted the distribution of native trout. Many trout populations are limited to headwater streams where negative effects of predicted climate change, including reduced stream flow and increased risk of catastrophic fires, may further jeopardize their...

Author(s): Edwin R. Sedell, Robert E. Gresswell, Thomas E. McMahon
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

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

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

A synthesis of post-fire Burned Area Reports from 1972 to 2009 for western US Forest Service lands: trends in wildfire characteristics and post-fire stabilisation treatments and expenditures
www.nrfirescience.org/resource/13010
Over 1200 post-fire assessment and treatment implementation reports from four decades (1970s-2000s) of western US forest fires have been examined to identify decadal patterns in fire characteristics and the justifications and expenditures for the post-fire treatments. The main trends found were: (1) the area burned by wildfire...
Author(s): Peter R. Robichaud, Hakjun Rhee, Sarah A. Lewis
Year Published: 2014
Type: Document
Book or Chapter or Journal Article, Synthesis

New insights into debris-flow hazards from an extraordinary event in the Colorado Front Range
www.nrfirescience.org/resource/18709
Rainfall on 9–13 September 2013 triggered at least 1,138 debris flows in a 3430 km2 area of the Colorado Front Range. The historical record reveals that the occurrence of these flows over such a large area in the interior of North America is highly unusual. Rainfall that triggered the debris flows began after ~75 mm of antecedent...
Climate change impacts in the United States: The third National Climate Assessment
www.nrcclimatechange.org/resource/18981
Climate change is already affecting the American people in farreaching ways. Certain types of extreme weather events with links to climate change have become more frequent and/or intense, including prolonged periods of heat, heavy downpours, and, in some regions, floods and droughts. In addition, warming is causing sea level to rise...
Year Published: 2014
Type: Document
Technical Report or White Paper

Using native annual plants to restore post-fire habitats in western North America
www.nrfirescience.org/resource/12139
Increasing fire frequencies and uncharacteristic severe fires have created a need for improved restoration methods across rangelands in western North America. Traditional restoration seed mixtures of native perennial mid- to late-seral plant species may not be suitable for intensely burned sites that have been returned to an early-...
Author(s): Christopher M. Herron, Jayne L. Jonas, Paul J. Meiman, Mark W. Paschke
Year Published: 2013
Type: Document
Book or Chapter or Journal Article

Effectiveness of post-fire Burned Area Emergency Response (BAER) road treatments: results from three wildfires
www.nrfirescience.org/resource/12142
Wildland fires often cause extreme changes in the landscape that drastically influence surface runoff and soil erosion, which can impact forest resources, aquatic habitats, water supplies, public safety, and forest access infrastructure such as forest roads. Little information is available on the effectiveness of various post-fire...
Author(s): Randy B. Foltz, Peter R. Robichaud
Year Published: 2013
Type: Document
Technical Report or White Paper

Post-fire mulching for runoff and erosion mitigation; Part I: effectiveness at reducing hillslope erosion rates
www.nrfirescience.org/resource/11994
Mulch treatments often are used to mitigate post-fire increases in runoff and erosion rates but the comparative effectiveness of various mulches is not well established. The ability of mulch treatments to reduce sediment yields from natural rainfall and resulting overland flow was measured using hillslope plots on areas burned at...
Author(s): Peter R. Robichaud, Sarah A. Lewis, Joseph W. Wagenbrenner, Louise E. Ashmun, Robert E. Brown
Year Published: 2013
Type: Document
Book or Chapter or Journal Article
Does seeding after wildfires in rangelands reduce erosion or invasive species?
www.nrfirescience.org/resource/12132
Mitigation of ecological damage caused by rangeland wildfires has historically been an issue restricted to the western United States. It has focused on conservation of ecosystem function through reducing soil erosion and spread of invasive plants. Effectiveness of mitigation treatments has been debated recently. We reviewed recent...
Author(s): David A. Pyke
Year Published: 2013
Type: Document
Book or Chapter or Journal Article, Synthesis

Assessing the success of postfire reseeding in semiarid rangelands using terra MODIS
www.nrfirescience.org/resource/11489
Successful post-fire reseeding efforts may aid rangeland ecosystem recovery by rapidly establishing a desired plant community and thereby reducing the likelihood of infestation by invasive plants. While the success of post-fire remediation is critical, few efforts have been made to leverage existing geospatial technologies to...
Author(s): Fang Chen, Keith T. Weber, John L. Schnase
Year Published: 2012
Type: Document
Book or Chapter or Journal Article

Probability and volume of potential postwildfire debris flows in the 2012 High Park Burn Area near Fort Collins, Colorado
www.nrfirescience.org/resource/18725
This report presents a preliminary emergency assessment of the debris-flow hazards from drainage basins burned by the 2012 High Park fire near Fort Collins in Larimer County, Colorado. Empirical models derived from statistical evaluation of data collected from recently burned basins throughout the intermountain western United States...
Author(s): Kristine L. Verdin, Jean A. Dupree, John G. Elliott
Year Published: 2012
Type: Document
Technical Report or White Paper

Enhanced sediment delivery in a changing climate in semi-arid mountain basins: implications for water resource management and aquatic habitat in the northern Rocky Mountains
www.nrfirescience.org/resource/18718
The delivery and transport of sediment through mountain rivers affects aquatic habitat and water resource infrastructure. While climate change is widely expected to produce significant changes in hydrology and stream temperature, the effects of climate change on sediment yield have received less attention. In the northern Rocky...
Author(s): Jaime R. Goode, Charles H. Luce, John M. Buffington
Year Published: 2012
Type: Document
Book or Chapter or Journal Article

Recent trends in post-wildfire seeding in western US forests: costs and seed mixes
www.nrfirescience.org/resource/8284
Broadcast seeding is one of the most commonly used post-fire rehabilitation treatments to establish...
ground cover for erosion control and mitigation of non-native plant species invasions. Little quantitative information is available on overall trends of post-fire seeding expenditures and seed mixes used over time in forested...

Author(s): Donna Peppin, Peter Z. Fule, Carolyn Hull Sieg, Jan L. Beyers, Molly E. Hunter, Peter R. Robichaud
Year Published: 2011
Type: Document
Book or Chapter or Journal Article, Synthesis

**Does seeding after severe forest fires in western USA mitigate negative impacts on soils and plant communities?**
[www.nrfirescience.org/resource/11501](http://www.nrfirescience.org/resource/11501)

Broadcast seeding is one of the most widely used post-wildfire emergency response treatments intended to reduce soil erosion, increase vegetative ground cover, and minimize establishment and spread of non-native plant species. However, seeding treatments can also have negative effects such as competition with recovering native...

Author(s): Donna Peppin, Peter Z. Fule, Jan L. Beyers, Carolyn Hull Sieg, Molly E. Hunter
Year Published: 2011
Type: Document
Synthesis, Technical Report or White Paper

**Getting results: measuring post-wildfire erosion control treatment effectiveness**
[www.nrfirescience.org/resource/11031](http://www.nrfirescience.org/resource/11031)

In the past decade, wildfires around the world have continued to increase in size, severity, and cost. The number of people living in wildland areas has also increased, putting public safety, homes, roads, public infrastructure, water quality, and valued natural resources at risk from wildfire and secondary fire effects. Major...

Author(s): Peter R. Robichaud, Robert E. Brown, Peter M. Wohlgemuth, Joseph W. Wagenbrenner
Year Published: 2011
Type: Document
Conference Proceedings

**Post-fire treatment effectiveness for hillslope stabilization**
[www.nrfirescience.org/resource/12594](http://www.nrfirescience.org/resource/12594)

This synthesis of post-fire treatment effectiveness reviews the past decade of research, monitoring, and product development related to post-fire hillslope emergency stabilization treatments, including erosion barriers, mulching, chemical soil treatments, and combinations of these treatments. In the past ten years, erosion barrier...

Author(s): Peter R. Robichaud, Louise E. Ashmun, Bruce D. Sims
Year Published: 2010
Type: Document
Synthesis, Technical Report or White Paper

**Continued evaluation of post-fire recovery and treatment effectiveness for validation of the ERMiT erosion model (combined proposals P07-2-2-10 and P07-2-3-06) - Final Report to the Joint Fire Science Program**
[www.nrfirescience.org/resource/11227](http://www.nrfirescience.org/resource/11227)

The use and cost of post-fire emergency stabilization treatments continues to grow. To help maximize the impact of these treatments, many assessment teams use the Erosion Risk Management Tool (ERMiT) erosion model to predict postfire erosion and mitigation effects. However, despite several completed JFSP projects, the long-term...
Post-wildfire seeding in forests of the western United States: an evidence-based review

Broadcast seeding is one of the most widely used post-wildfire emergency response treatments intended to reduce soil erosion, increase vegetative ground cover, and minimize establishment and spread of non-native plant species. We conducted an evidence-based review to examine the effectiveness and effects of post-wildfire seeding...

A synthesis of postfire road treatments for BAER teams: methods, treatment effectiveness, and decisionmaking tools for rehabilitation

We synthesized post-fire road treatment information to assist BAER specialists in making road rehabilitation decisions. We developed a questionnaire; conducted 30 interviews of BAER team engineers and hydrologists; acquired and analyzed gray literature and other relevant publications; and reviewed road rehabilitation procedures and...

The increasing wildfire and post-fire debris-flow threat in Western USA, and implications for consequences of climate change

In southern California and the intermountain west of the USA, debris flows generated from recently-burned basins pose significant hazards. Increases in the frequency and size of wildfires throughout the western USA can be attributed to increases in the number of fire ignitions, fire suppression practices, and climatic influences....

Emergency post-fire rehabilitation treatment effects on burned area ecology and long-term restoration

The predicted continuation of strong drying and warming trends in the southwestern United States underlies the associated prediction of increased frequency, area, and severity of wildfires in the coming years. As a result, the management of wildfires and fire effects on public lands will continue to be a major land management...
Climate and wildfire area burned in western US ecoprovinces, 1916-2003
www.nrfirescience.org/resource/18977
The purpose of this paper is to quantify climatic controls on the area burned by fire in different vegetation types in the western United States. We demonstrate that wildfire area burned (WFAB) in the American West was controlled by climate during the 20th century (1916–2003). Persistent ecosystem-specific correlations between...
Author(s): Jeremy S. Littell, Donald McKenzie, David L. Peterson, Anthony L. Westerling
Year Published: 2009
Type: Document
Book or Chapter or Journal Article

A morphometric analysis of gullies scoured by post-fire progressively bulked debris flows in southwestern Montana, USA
www.nrfirescience.org/resource/18714
In the fall of 2001, an intense thunderstorm in southwest Montana triggered many debris flows in the burned area of Sleeping Child Creek. In most instances, the debris flows cut deep gullies into previously unchannelized colluvial hollows and deposited large volumes of sediment onto the valley floor. The presence of rill networks...
Author(s): Emmanuel J. Gabet, Andy Bookter
Year Published: 2008
Type: Document
Book or Chapter or Journal Article

Measuring effectiveness of three postfire hillslope erosion barrier treatments, western Montana, USA
www.nrfirescience.org/resource/8389
After the Valley Complex Fire burned 86 000 ha in western Montana in 2000, two studies were conducted to determine the effectiveness of contour-felled log, straw wattle, and hand-dug contour trench erosion barriers in mitigating postfire runoff and erosion. Sixteen plots were located across a steep, severely burned slope, with a...
Author(s): Peter R. Robichaud, Frederick B. Pierson, Robert E. Brown, Joseph W. Wagenbrenner
Year Published: 2008
Type: Document
Book or Chapter or Journal Article

Effectiveness of aerial seeding and straw mulch for reducing post-wildfire erosion, northwestern Montana, USA
www.nrfirescience.org/resource/8200
Various methods are available to reduce post-wildfire erosion, but there is limited quantitative information on the relative effectiveness of these techniques. We used rainfall simulations to compare the erosion and runoff rates from adjacent 0.5-m2 plots treated with aerial grass seeding and straw mulch with untreated control plots...
Author(s): Amy H. Groen, Scott W. Woods
Year Published: 2008
Type: Document
Book or Chapter or Journal Article

Evaluating the effectiveness of contour-felled log erosion barriers as a post-fire runoff and
erosion mitigation treatment in the western United States

Between 1998 and 2002, six sites were established immediately after large wildfires in the western United States to determine the effectiveness of contour-felled log erosion barriers in mitigating post-wildfire runoff and erosion. In each pair of matched, burned, and small watersheds (1-13 ha), one was treated with contour-felled...

Author(s): Peter R. Robichaud, Joseph W. Wagenbrenner, Robert E. Brown, Peter M. Wohlgemuth, Jan L. Beyers
Year Published: 2008
Type: Document
Book or Chapter or Journal Article

Predicting postfire erosion and mitigation effectiveness with a web-based probabilistic erosion model

The decision of where, when, and how to apply the most effective postfire erosion mitigation treatments requires land managers to assess the risk of damaging runoff and erosion events occurring after a fire. To meet this challenge, the Erosion Risk Management Tool (ERMiT) was developed. ERMiT is a web-based application that uses the...

Author(s): Peter R. Robichaud, William J. Elliot, Frederick B. Pierson, David E. Hall, Corey A. Moffet
Year Published: 2007
Type: Document
Book or Chapter or Journal Article

Protection from erosion following wildfire

Erosion in the first year after a wildfire can be up to three orders of magnitude greater than the erosion from undisturbed forests. To mitigate potential postfire erosion, various erosion control treatments are applied on highly erodible areas with downstream resources in need of protection. Because postfire erosion rates generally...

Author(s): Peter R. Robichaud, William J. Elliot
Year Published: 2006
Type: Document
Conference Proceedings

Fire management impacts on invasive plants in the western United States

Fire management practices affect alien plant invasions in diverse ways. I considered the impact of six fire management practices on alien invasions: fire suppression, forest fuel reduction, prescription burning in crown-fire ecosystems, fuel breaks, targeting of noxious aliens, and postfire rehabilitation. Most western United States...

Author(s): Jon E. Keeley
Year Published: 2006
Type: Document
Book or Chapter or Journal Article, Synthesis

Compilation of data relating to the erosive response of 606 recently burned basins in the western U.S.

This report presents a compilation of data on the erosive response, debris-flow initiation processes, basin morphology, burn severity, event-triggering rainfall, rock type, and soils for 608 basins recently
burned by 53 fires located throughout the Western United States. The data presented here are a combination of those collected...

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

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,...

Author(s): Penelope Morgan, Andrew T. Hudak, Peter R. Robichaud, Kevin C. Ryan
Year Published: 2005
Type: Document
Technical Report or White Paper

Basic principles of forest fuel reduction treatments
www.nrfirescience.org/resource/18976
Successful fire exclusion in the 20th century has created severe fire problems across the West. Not every forest is at risk of uncharacteristically severe wildfire, but drier forests are in need of active management to mitigate fire hazard. We summarize a set of simple principles important to address in fuel reduction treatments:....

Author(s): James K. Agee, Carl N. Skinner
Year Published: 2005
Type: Document
Book or Chapter or Journal Article

Postfire seeding for erosion control: effectiveness and impacts on native plant communities
www.nrfirescience.org/resource/7911
Large, high-severity wildfires remove vegetation cover and expose mineral soil, often causing erosion and runoff during postfire rain events to increase dramatically. Land-management agencies in the United States are required to assess site conditions after wildfire and, where necessary, implement emergency watershed rehabilitation...

Author(s): Jan L. Beyers
Year Published: 2004
Type: Document
Book or Chapter or Journal Article, Synthesis

Postfire management on forested public lands of the western United States
www.nrfirescience.org/resource/7913
Forest ecosystems in the western United States evolved over many millennia in response to disturbances such as wildfires. Land use and management practices have altered these ecosystems, however, including fire regimes in some areas. Forest ecosystems are especially vulnerable to postfire management practices because such practices...

Year Published: 2004
A review of prescribed burning effectiveness in fire hazard reduction
www.nrfirescience.org/resource/18713
Wildfire hazard abatement is one of the major reasons to use prescribed burning. Computer simulation, case studies, and analysis of the fire regime in the presence of active prescribed burning programs in forest and shrubland generally indicate that this fuel management tool facilitates fire suppression efforts by reducing the...
Author(s): Paulo M. Fernandes, Herminio S. Botelho
Year Published: 2003
Type: Document

Quick response small catchment monitoring techniques for comparing postfire rehabilitation treatment effectiveness
www.nrfirescience.org/resource/11000
Increased runoff and erosion commonly occur after wildfires with the onset of precipitation events. Various erosion mitigation treatments are often used after wildfires to reduce flooding and sedimentation. The effectiveness of these treatments has not been well documented in the literature; therefore we undertook a rapid response...
Author(s): Peter R. Robichaud, Robert E. Brown
Year Published: 2003
Type: Document

On the impact of fire suppression and BAER restoration on weeds
www.nrfirescience.org/resource/11043
In 2000, wildfires burned more than 200,000 acres on the Bitterroot National Forest of Montana and nearly 1.5 million acres in the Northern and Intermountain Regions. Management activities associated with fire suppression and post-fire restoration have had the unintentional consequence of promoting invasive weeds. As part of fire...
Author(s): Elaine Kennedy Sutherland
Year Published: 2003
Type: Document

Post-fire erosional processes: In the Pacific Northwest and Rocky Mountain region
www.nrfirescience.org/resource/18693
The objective of this paper is to provide a general overview of the influence of wildland fires on the erosional processes common to the forested landscapes of the western United States. Wildfire can accelerate erosion rates because vegetation is an important factor controlling erosion. There can be great local and regional...
Author(s): Steven M. Wondzell, John G. King
Year Published: 2003
Type: Document

Spatial and temporal effects of wildfire on the hydrology of a steep rangeland watershed
www.nrfirescience.org/resource/18620
Wildfire is a major ecological process and management issue on western rangelands. The impacts of wildfire on hydrologic processes such as infiltration, runoff, and erosion are not well understood. Small-plot rainfall simulation methods were applied in a rangeland wildfire setting to determine post-fire hydrologic response.

Author(s): Frederick B. Pierson, Peter R. Robichaud, Kenneth E. Spaeth
Year Published: 2001
Type: Document
Book or Chapter or Journal Article

Post-fire runoff and erosion from rainfall simulation: contrasting forests with shrublands and grasslands
www.nrfirescience.org/resource/18566

Rainfall simulations allow for controlled comparisons of runoff and erosion among ecosystems and land cover conditions. Runoff and erosion can increase greatly following fire, yet there are few rainfall simulation studies for post-fire plots, particularly after severe fire in semiarid forest. We conducted rainfall simulations.

Author(s): Matthew P. Johansen, Thomas E. Hakonson, David D. Breshears
Year Published: 2001
Type: Document
Book or Chapter or Journal Article

Linking wilderness research and management, volume 1. Wilderness fire restoration and management: an annotated reading list
www.nrfirescience.org/resource/19692

This reference list provides an overview of key literature relating to fire restoration and management in wilderness and similarly protected areas. This list, which centers on the United States, should be helpful to managers or researchers new to the topic, or to those seeking knowledge about specific aspects of wilderness fire.

Author(s): Marion Hourdequin
Year Published: 2001
Type: Document
Synthesis

Channel characteristics and large organic debris in adjacent burned and unburned watersheds a decade after wildfire
www.nrfirescience.org/resource/18692

Description available at link.
Author(s): Ronald B. Zelt
Year Published: 2001
Type: Document
Conference Proceedings

The influence of forest health and protection treatments on erosion and stream sedimentation in forested watersheds of eastern Oregon and Washington
www.nrfirescience.org/resource/18692

A variety of Forest Health and Protection treatments have been proposed to reduce long-term risks to forests from wildfire, insects, and disease. This review examines the potential effects of these treatments on sediment production in watersheds of eastern Oregon and Washington, USA, channel forming processes, riparian vegetation,...

Author(s): Steven M. Wondzell
Year Published: 2001
Initial hydrologic and geomorphic response following a wildfire in the Colorado Front Range

A wildfire in May 1996 burned 4690 hectares in two watersheds forested by ponderosa pine and Douglas fir in a steep, mountainous landscape with a summer, convective thunderstorm precipitation regime. The wildfire lowered the erosion threshold in the watersheds, and consequently amplified the subsequent erosional response to shorter...

Author(s): John A. Moody, Deborah A. Martin
Year Published: 2001
Type: Document

Evaluating the effectiveness of postfire rehabilitation treatments

Spending on postfire emergency watershed rehabilitation has increased during the past decade. A west-wide evaluation of USDA Forest Service burned area emergency rehabilitation (BAER) treatment effectiveness was undertaken as a joint project by USDA Forest Service Research and National Forest System staffs. This evaluation covers...

Author(s): Peter R. Robichaud, Jan L. Beyers, Daniel G. Neary
Year Published: 2000
Type: Document

What happened after the smoke cleared: Onsite erosion rates after a wildfire in Eastern Oregon

Recent fires have renewed interest in fire's effect on different components of the ecosystems, particularly erosion and soil productivity. Our objectives were to (1) determine hillslope erosion rates after a high severity wildfire in an unmanaged forest stand; (2) determine fire's short-term effects on nutrient loss. The study site...

Author(s): Peter R. Robichaud, Robert E. Brown
Year Published: 1999
Type: Document

Stochastic forcing of sediment supply to channel networks from landsliding and debris flow

Sediment influx to channel networks is stochastically driven by rainstorms and other perturbations, which are discrete in time and space and which occur on a landscape with its own spatial variability in topography, colluvium properties, and state of recovery from previous disturbances. The resulting stochastic field of sediment...

Author(s): Lee E. Benda, Thomas Dunne
Year Published: 1997
Type: Document

Hydrologic and erosional responses of a granitic watershed to helicopter logging and broadcast burning

Sediment influx to channel networks is stochastically driven by rainstorms and other perturbations, which are discrete in time and space and which occur on a landscape with its own spatial variability in topography, colluvium properties, and state of recovery from previous disturbances. The resulting stochastic field of sediment...
Forest land managers are concerned about the effects of logging and site preparation on erosion, site productivity, streamflow, and water quality. Effects of helicopter logging and prescribed burning on streamflow and sediment yields from headwater drainages in the Idaho Batholith were evaluated, using paired watersheds monitored...

Author(s): Walter F. Megahan, John G. King, Kathleen A. Seyedbagheri
Year Published: 1995
Type: Document
Book or Chapter or Journal Article

Vegetal recovery following wildfire in seeded and unseeded sagebrush steppe
www.nrfirescience.org/resource/11459
Following an August wildfire, sagebrush (Artemisia L.)/grass benchlands adjacent to Pocatello, Ida., were seeded with a mixture of exotic wheatgrasses and forbs by rangeland drill in November 1987. The effects of seeding on vegetation development in the immediate postfire years were evaluated by comparing plant density, vegetal...

Author(s): Teresa D. Ratzlaff, Jay E. Anderson
Year Published: 1995
Type: Document
Book or Chapter or Journal Article

A simple definition of a landslide
www.nrfirescience.org/resource/18711
A landslide is the movement of a mass of rock, earth or debris down a slope.

Author(s): David Milne Cruden
Year Published: 1991
Type: Document
Book or Chapter or Journal Article

Predicting deposition of debris flows in mountain channels
www.nrfirescience.org/resource/18702
An empirical model for predicting deposition of coarse-textured debris flows in confined mountain channels is developed based on field measurements of 14 debris flows in the Pacific Northwest, U.S.A. The model uses two criteria for deposition: channel slope (less than 3.5°) and tributary junction angle (greater than 70°). The...

Author(s): Lee E. Benda, Terrance W. Cundy
Year Published: 1990
Type: Document
Book or Chapter or Journal Article

Runoff and soil loss following the 1988 Yellowstone fires
www.nrfirescience.org/resource/18589
abstract available at link but unable to capture.
Author(s): Richard A. Marston, David H. Haire
Year Published: 1990
Type: Document
Book or Chapter or Journal Article

Sediment routing by debris flow
www.nrfirescience.org/resource/18487
Forty-six debris flows in a fifth-order basin in the Oregon Coast Range, U.S.A., were studied to
determine the role and significance of debris flows in sediment routing. Dating of charcoal from basal colluvium in three bedrock hollows and in one first-order channel yielded an average landslide recurrence interval of approximately...

Author(s): Lee E. Benda, Thomas Dunne
Year Published: 1987
Type: Document
Conference Proceedings

The Sleeping Child Burn - 21 years of postfire change
www.nrfirescience.org/resource/11961
In early August 1961, more than 26,000 acres (10,500 ha) of upper montane and subalpine forest on the Bitterroot National Forest burned in a lightning-caused wildfire. At the time, the Sleeping Child Burn represented the single largest forest fire in the Northern Rocky Mountains in more than 20 years. Historically, large wildfires...

Author(s): L. Jack Lyon
Year Published: 1984
Type: Document
Technical Report or White Paper

Fire and geomorphic processes
www.nrfirescience.org/resource/18669
Fire, geomorphic processes, and landforms interact to determine natural patterns of ecosystems over landscapes. Fire alters vegetation and soil properties which change soil and sediment movement through watersheds. Landforms affect fire behavior and form firebreaks which determine burn boundaries. Geomorphic consequences of fire in...

Author(s): Frederick J. Swanson
Year Published: 1981
Type: Document
Conference Proceedings

Plant nutrients and soil losses in overland flow from burned forest clearcuts
www.nrfirescience.org/resource/18531
No description found
Author(s): Norbert V. DeByle, P.E. Packer
Year Published: 1972
Type: Document
Conference Proceedings

Progress in simplifying hydrologic model parameterization for broad applications to post-wildfire flooding and debris-flow hazards
www.nrfirescience.org/resource/20623
Predicting the timing of overland flow in burned watersheds can help to estimate debris-flow timing and the location of debris-flow initiation. Numerical models can produce flow predictions, but they are limited by our knowledge of appropriate model parameters. Moreover, opportunities to test and calibrate model parameters in...

Author(s): Francis K. Rengers, Luke A. McGuire, Jason W. Kean, Dennis M. Staley, Ann M. Youberg
Type: Document
Book or Chapter or Journal Article