

Stand density, drought, and herbivory constrain ponderosa pine regeneration pulse

www.nrfirescience.org/resource/21939

Trees in dry forests often regenerate in episodic pulses when wet periods coincide with ample seed production. Factors leading to success or failure of regeneration pulses are poorly understood. We investigated the impacts of stand thinning on survival and growth of the 2013 cohort of ponderosa pine (*Pinus ponderosa* Douglas ex P....

Author(s): Thomas E. Kolb, Kelsey Flathers, John Bradford, Caitlin M. Andrews, Lance A. Asherin, W.K. Moser

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Standing dead trees contribute significantly to carbon budgets in Australian savannas

www.nrfirescience.org/resource/20945

Previous estimates of greenhouse gas emissions from Australian savanna fires have incorporated on-ground dead wood but ignored standing dead trees. However, research from eucalypt woodlands in southern Queensland has shown that the two pools of dead wood burn at similar rates. New field data from semiarid savannas across northern...

Author(s): Garry D. Cook, Adam C. Liedloff, Carl P. Meyer, Anna E. Richards, Steven G. Bray

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Smoke and Roadway Safety Guide

www.nrfirescience.org/resource/22041

The Smoke and Roadway Safety Guide provides wildland fire personnel the tools and methods to effectively plan and forecast for roadway smoke impacts and to monitor, respond to, and mitigate smoke on roadways to reduce the risk to the public and fire personnel. This publication: •Outlines a sequential process which readers may...

Author(s): Gary M. Curcio, David Mueller, Peter Lahm, Mark Fitch, Joshua C. Hyde

Year Published: 2020

Type: Document

Technical Report or White Paper

Haze emissions from smouldering peat: the roles of inorganic content and bulk density

www.nrfirescience.org/resource/21287

Smouldering peat fires are reported across continents and their emissions result in regional haze crisis (large scale accumulation of smoke at low altitudes) and large carbon foot prints. Inorganic content (IC) and bulk density vary naturally in peatlands and are among the important parameters governing peat fires. However, their...

Author(s): Yuqi Hu, Wuquan Cui, Guillermo Rein

Year Published: 2020

Type: Document

Book or Chapter or Journal Article

Can peat soil support a flaming wildfire?

www.nrfirescience.org/resource/20000

Smouldering wildfire in peatlands is one of the largest and longest-lasting fire phenomena on Earth, but whether peat can support a flaming fire like other surface fuels is still unclear. Our experiments demonstrate the successful piloted flaming ignition of peat soil with moisture up to 100 wt-% under external radiation, indicating...

Author(s): Shaorun Lin, Peiyi Sun, Xinyan Huang
Year Published: 2019
Type: Document
Book or Chapter or Journal Article

The Effect of Ecophysiological Traits on Live Fuel Moisture Content

www.nrfirescience.org/resource/19642

Live fuel moisture content (LFMC) is an important metric for fire danger ratings. However, there is limited understanding of the physiological control of LFMC or how it varies among co-occurring species. This is a problem for biodiverse yet fire-prone regions such as southern California. We monitored LFMC and water potential for 11...

Author(s): Alexandria L. Pivovarov, Nathan Emery, M. Rasoul Sharifi, Marti Witter, Jon E. Keeley, Philip W. Rundel

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Flame spread and burning rates through vertical arrays of wooden dowels

www.nrfirescience.org/resource/19365

Fuel loads in real-world fire scenarios often feature discrete elements, discontinuities, or inhomogeneities; however, most models for flame spread only assume a continuous, homogeneous fuel. Because discrete fuels represent a realistic scenario not yet well-modeled, it is of interest to find simple methods to model fire growth...

Author(s): Jiang Lin, Zhao Zhao, Wei Tang, Colin H. Miller, Jin-Hua Sun, Michael J. Gollner

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

The downed and dead wood inventory of forests in the United States

www.nrfirescience.org/resource/19180

The quantity and condition of downed dead wood (DDW) is emerging as a major factor governing forest ecosystem processes such as carbon cycling, fire behavior, and tree regeneration. Despite this, systematic inventories of DDW are sparse if not absent across major forest biomes. The Forest Inventory and Analysis program of the United...

Author(s): Christopher W. Woodall, Vicente J. Monleon, Shawn Fraver, Matthew B. Russell, Mark H. Hatfield, John L. Campbell, Grant M. Domke

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

www.nrfirescience.org/resource/19034

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

Fire temperatures and Sphagnum damage during prescribed burning on peatlands

www.nrfirescience.org/resource/20026

Prescribed burning affects plant community composition including the abundance of peat-forming Sphagnum mosses. Understanding the processes by which fire impacts occur and the variability of impacts according to fire severity is important when making fire management decisions. We monitored fire temperatures and their impact on...

Author(s): Alice Noble, Alistair Crowle, David J. Glaves, Sheila M. Palmer, Joseph Holden

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Fuel Characteristic Classification System (FCCS) field sampling and fuelbed development guide

www.nrfirescience.org/resource/19832

The Fuel Characteristic Classification System (FCCS) was designed to store and archive wildland fuel characteristics within fuelbeds, defined as the inherent physical characteristics of fuels that contribute to fire behavior and effects. The FCCS represents fuel characteristics in six strata including canopy, shrubs, herbaceous...

Author(s): Susan J. Prichard, Anne Andreu, Roger D. Ottmar, Ellen Eberhardt

Year Published: 2019

Type: Document

Technical Report or White Paper

Fuel dynamics after reintroduced fire in an old-growth Sierra Nevada mixed-conifer forest

www.nrfirescience.org/resource/19612

Background: Surface fuel loadings are some of the most important factors contributing to fire intensity and fire spread. In old-growth forests where fire has been long excluded, surface fuel loadings can be high and can include woody debris >100 cm in diameter. We assessed surface fuel loadings in a long-unburned old-growth mixed-...

Author(s): C. Alina Cansler, Mark E. Swanson, Tucker J. Furniss, Andrew J. Larson, James A. Lutz

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Flame temperatures saturate with increasing dead material in *Ulex europaeus*, but flame duration, fuel consumption and overall flammability continue to increase

www.nrfirescience.org/resource/19340

A key determinant of wildfire behaviour is the flammability of constituent plants. One plant trait that influences flammability is the retention of dead biomass, as the low moisture content of dead material means less energy is required to achieve combustion. However, the effect of the dead-to-live ratio of fuel on plant...

Author(s): Jennifer M. Dent, Hannah L. Buckley, Audrey Lustig, Timothy J. Curran

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Estimating uncertainty in the volume and carbon storage of downed coarse woody debris

www.nrfirescience.org/resource/19043

Downed coarse woody debris, also known as coarse woody detritus or downed dead wood, is challenging to estimate for many reasons, including irregular shapes, multiple stages of decay, and the

difficulty of identifying species. In addition, some properties are commonly not measured, such as wood density and carbon concentration. As a...

Author(s): John L. Campbell, Mark B. Green, Ruth D. Yanai, Christopher W. Woodall, Shawn Fraver, Mark E. Harmon, Mark A. Hatfield, Charles J. Barnett, Craig R. See, Grant M. Domke

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Why is the effect of live fuel moisture content on fire rate of spread underestimated in field experiments in shrublands?

www.nrfirescience.org/resource/19002

Live fuel moisture content (LFMC) influences fire activity at landscape scale and fire behaviour in laboratory experiments. However, field evidence linking LFMC to fire behaviour are very limited, despite numerous field experiments. In this study, we reanalyse a shrubland fire dataset with a special focus on LFMC to investigate this...

Author(s): F. Pimont, Julien Ruffault, Nicolas K. Martin-StPaul, Jean-Luc Dupuy

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Aging Effects on Biomass Burning Aerosol Mass and Composition: A Critical Review of Field and Laboratory Studies

www.nrfirescience.org/resource/20343

Biomass burning is a major source of atmospheric particulate matter (PM) with impacts on health, climate, and air quality. The particles and vapors within biomass burning plumes undergo chemical and physical aging as they are transported downwind. Field measurements of the evolution of PM with plume age range from net decreases to...

Author(s): Anna L. Hodshire, Ali Akherati, Matthew J. Alvarado, Benjamin Brown-Steiner, Shantanu H. Jathar, Jose L. Jimenez, Sonia M. Kreidenweis, Chantelle R. Lonsdale, Timothy B. Onasch, Amber M. Ortega, Jeffrey R. Pierce

Year Published: 2019

Type: Document

Book or Chapter or Journal Article

Does plant flammability differ between leaf and litter bed scale? Role of fuel characteristics and consequences for flammability assessment

www.nrfirescience.org/resource/17696

The increasing concern regarding fire in the wildland–urban interface (WUI) around the world highlights the need to better understand the flammability of WUI fuels. Research on plant flammability is rapidly increasing but commonly only considers a single fuel scale. In some cases, however, different fuel scales (e.g. leaf and...

Author(s): Anne Ganteaume

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Conceptualizing Ecological Flammability: An Experimental Test of Three Frameworks Using Various Types and Loads of Surface Fuels

www.nrfirescience.org/resource/17609

Vegetation flammability remains poorly defined and involves many intercorrelated components and metrics. Schwilk (2015) proposed a flammability framework with only two axes: total heat release and

rate of spread. Pausas et al. (2017) modified this framework by standardizing the heat release axis by fuel load, and adding a third axis...

Author(s): Lynda D. Prior, Brett P. Murphy, David M. J. S. Bowman

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Quaking aspen woodland after conifer control: Herbaceous dynamics

www.nrfirescience.org/resource/16720

Western juniper (*Juniperus occidentalis* Hook.) woodlands are replacing low elevation (< 2100 m) quaking aspen (*Populus tremuloides* Michx.) stands in the northern Great Basin. Restoring aspen woodlands is important because they provide wildlife habitat for many species and contain a high diversity of understory shrubs and...

Author(s): Jonathan D. Bates, Kirk W. Davies

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Surface analysis as a method to reconstruct past and recent dynamics of forest ecosystems

www.nrfirescience.org/resource/16707

The most direct way of deciphering the dynamics of an ecosystem is to examine its biotic and abiotic components based on analysis of living and dead organisms distributed above ground. The surface analysis method presented here provides a centennial to millennial stand-scale composition and disturbance history and is applicable in...

Author(s): Vanessa Pilon, Serge Payette, Pierre-Luc Couillard, Jason Laflamme

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Quantifying understory vegetation density using small-footprint airborne lidar

www.nrfirescience.org/resource/17961

The ability to quantify understory vegetation structure in forested environments on a broad scale has the potential to greatly improve our understanding of wildlife habitats, nutrient cycling, wildland fire behavior, and wildland firefighter safety. Lidar data can be used to model understory vegetation density, but the accuracy of...

Author(s): Michael J. Campbell, Philip E. Dennison, Andrew T. Hudak, Lucy M. Parham, Bret W. Butler

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Modelling the management of forest ecosystems: Importance of wood decomposition

www.nrfirescience.org/resource/17790

Scarce and uncertain data on woody debris decomposition rates are available for calibrating forest ecosystem models, owing to the difficulty of their empirical estimations. Using field data from three experimental sites which are part of the North American Long-Term Soil Productivity (LTSP) Study in south-eastern British Columbia (...)

Author(s): Juan A. Blanco, Deborah S. Page-Dumroese, Martin F. Jurgensen, Michael P. Curran, Joanne M. Tirocke, Joanna Walitalo

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Moisture Content, Ignitability, and Fire Risk of Vegetation in Vertical Greenery Systems

www.nrfirescience.org/resource/17684

Vertical greenery systems (VGS) are getting popular as a green cladding material. However, they have not been adequately assessed in terms of fire safety. Lack of maintenance and improper irrigation systems will cause drying of plants in VGS, creating substantial fire risk. Dry plants may be easily ignited and intensify the vertical...

Author(s): Kalani C. Dahanayake, Cheuk Lun Chow

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Change of clonal frequency in the second root sucker generation of hybrid aspen

www.nrfirescience.org/resource/16718

Two hybrid aspen (*Populus tremula* L. x *P. tremuloides* Michx.) trials in southern Sweden were used for studies of clonal composition in the second of two root sucker regenerations. Trial 1 was established in 1998 and originally included eight clones randomly distributed in four plots, each having 10x10 positions. Trial 2 was planted...

Author(s): Lars-Göran Stener, Dainis Rungis, Viktorija Belevich, Johan Malm

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Woody material structural degradation through decomposition

www.nrfirescience.org/resource/16439

Dead woody material (DWM) plays numerous important roles in forest ecosystems; however, through the process of decomposition, it undergoes structural and chemical changes that progressively alter its function in these roles. Much remains unknown about how DWM mechanical strength and structural integrity change through decomposition...

Author(s): Shawn Fraver, Mehdi Tajvidi, Anthony W. D'Amato, Daniel I. Lindner, Jodi A. Forrester, Amy M. Milo

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 precursory 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

Aging masticated fuels - How do they change over time?

www.nrfirescience.org/resource/15226

Mastication is becoming a common fuel treatment method in forests and shrublands of the United States, especially where prescribed fire or mechanical fuel removal is difficult. Such sites are often

located in the wildland urban interface (WUI) where fuel treatments must be carefully administered because of the risk to nearby...

Author(s): Pamela G. Sikkink

Year Published: 2017

Type: Document

Research Brief or Fact Sheet

Improving forest sampling strategies for assessment of fuel reduction burning

www.nrfirescience.org/resource/16665

Land managers typically make post hoc assessments of the effectiveness of fuel reduction burning (FRB), but often lack a rigorous sampling framework. A general, but untested, assumption is that variability in soil and fuel properties increases from small (1 m) to large spatial scales (10–100 km). Based on a recently published...

Author(s): Mana Gharun, Malcolm Possell, Meaghan E. Jenkins, Lai Fan Poon, Tina L. Bell, Mark A. Adams

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

Density-dependent woody detritus accumulation in an even-aged, single-species forest

www.nrfirescience.org/resource/16462

Deadwood in forests influences fire intensity, stores carbon and nutrients, and provides wildlife habitat. We used a 54-year-old density management experiment in *Larix occidentalis* Nutt. forests to evaluate density dependence of woody detritus accumulation. Based on self-thinning theory, we expected woody detritus produced by the...

Author(s): Michael S. Schaedel, Andrew J. Larson, Cullen J. Weisbrod, Robert E. Keane

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

Effect of particle aging on chemical characteristics, smoldering, and fire behavior in mixed-conifer masticated fuel

www.nrfirescience.org/resource/15782

Mastication is a silvicultural technique that grinds, shreds, or chops trees or shrubs into pieces and redistributes the biomass onto the forest floor to form a layer of woody debris. Unlike other fuel treatments that remove this biomass, masticated biomass often remains on site, which increases total fuel loading and causes concern...

Author(s): Pamela G. Sikkink, Theresa B. Jain, James J. Reardon, Faith A. Heinsch, Robert E. Keane, Bret W. Butler, Scott L. Baggett

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

Prediction of forest canopy and surface fuels from lidar and satellite time series data in a bark beetle-affected forest

www.nrfirescience.org/resource/15535

Wildfire behavior depends on the type, quantity, and condition of fuels, and the effect that bark beetle outbreaks have on fuels is a topic of current research and debate. Remote sensing can provide estimates of fuels across landscapes, although few studies have estimated surface fuels from remote sensing data. Here we predicted and...

Author(s): Benjamin C. Bright, Andrew T. Hudak, Arjan J. H. Meddens, Todd J. Hawbaker, Jennifer S.

Briggs, Robert E. Kennedy
Year Published: 2017
Type: Document
Book or Chapter or Journal Article

Decomposition rates for hand-piled fuels

www.nrfirescience.org/resource/15138

Hand-constructed piles in eastern Washington and north-central New Mexico were weighed periodically between October 2011 and June 2015 to develop decay-rate constants that are useful for estimating the rate of piled biomass loss over time. Decay-rate constants (k) were determined by fitting negative exponential curves to time series...

Author(s): Clinton S. Wright, Alexander M. Evans, Joseph C. Restaino

Year Published: 2017

Type: Document

Technical Report or White Paper

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

www.nrfirescience.org/resource/16668

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

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

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

Changes in mass, carbon, nitrogen, and phosphorus in logs decomposing for 30 years in three Rocky Mountain coniferous forests

www.nrfirescience.org/resource/16468

Estimates of decomposition rates of coarse woody debris (CWD) and fluxes of nutrients therein are essential components of carbon (C) and nutrient budget models. In a 30-year field experiment, we periodically measured mass remaining and nutrient concentrations in log segments of pine, spruce, and fir in natural, mature coniferous...

Author(s): Cindy E. Prescott, Kristen Corrao, Anya Reid, Jenna M. Zuskwert, Shalom D. Addo-Danso

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

Are litter decomposition and fire linked through plant species traits?

www.nrfirescience.org/resource/16276

Biological decomposition and wildfire are connected carbon release pathways for dead plant material: slower litter decomposition leads to fuel accumulation. Are decomposition and surface fires also connected through plant community composition, via the species' traits? Our central concept involves two axes of trait variation...

Author(s): Johannes H. C. Cornelissen, Saskia Grootemaat, Lieneke M. Verheijen, William K. Cornwell, Peter M. van Bodegom, Rene Van der Wal, Rien Aerts

Year Published: 2017

Type: Document

Book or Chapter or Journal Article

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

www.nrfirescience.org/resource/15582

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

Author(s): Robert E. Keane, Pamela G. Sikkink, Theresa B. Jain, James J. Reardon

Year Published: 2017

Type: Document

Technical Report or White Paper

Estimating ladder fuels: a new approach combining field photography with LiDAR

www.nrfirescience.org/resource/14768

Forests historically associated with frequent fire have changed dramatically due to fire suppression and past harvesting over the last century. The buildup of ladder fuels, which carry fire from the surface of the forest floor to tree crowns, is one of the critical changes, and it has contributed to uncharacteristically large and...

Author(s): Heather A. Kramer, Brandon M. Collins, Frank K. Lake, Marek K. Jakubowski, Scott L. Stephens, Maggi Kelly

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Seasonal relationships between foliar moisture content, heat content and biochemistry of lodgepole pine and big sagebrush foliage

www.nrfirescience.org/resource/14378

Wildland fires propagate by liberating energy contained within living and senescent plant biomass. The maximum amount of energy that can be generated by burning a given plant part can be quantified and is generally referred to as its heat content (HC). Many studies have examined heat content of wildland fuels but studies examining...

Author(s): Yi Qi, William Matt Jolly, Philip E. Dennison, Rachel C. Kropp

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Fuel moisture sensitivity to temperature and precipitation: climate change implications

www.nrfirescience.org/resource/13839

The objective of this paper is to examine the sensitivity of fuel moisture to changes in temperature and precipitation and explore the implications under a future climate. We use the Canadian Forest Fire Weather Index System components to represent the moisture content of fine surface fuels (Fine Fuel Moisture Code, FFMC), upper...

Author(s): Michael D. Flannigan, B. Mike Wotton, Ginny A. Marshall, William J. de Groot, Jill F. Johnstone, N. Jurko, Alan S. Cantin

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Development of the rangeland vegetation simulator: a module for FVS

www.nrfirescience.org/resource/15570

The escalating awareness of non-forested landscapes and realization that more emphasis is needed for an all lands approach to management increasingly requires timely information to improve management effectiveness. The Forest Vegetation Simulator (FVS) has been used in a large number of studies to project future vegetation...

Author(s): Matthew C. Reeves

Year Published: 2016

Type: Document

Technical Report or White Paper

Assessing the effectiveness of spatially heterogeneous fuels reduction restoration treatments - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/17044

In response to increasing wildfire severity and extent across the dry forests of the western United States in the last several decades, federal policy initiatives have encouraged joint vegetation management and fuels treatments to restore ecosystem composition, structure and function and reduce the potential for extreme fire...

Author(s): Chad M. Hoffman, Michael A. Battaglia, Tony S. Cheng, Yvette Dickinson, Frederick W. Smith

Year Published: 2016

Type: Document

Technical Report or White Paper

Landscape variation in tree regeneration and snag fall drive fuel loads in 24-year old post-fire lodgepole pine forests

www.nrfirescience.org/resource/14901

Escalating wildfire in subalpine forests with stand-replacing fire regimes is increasing the extent of early-seral forests throughout the western USA. Post-fire succession generates the fuel for future fires, but little is known about fuel loads and their variability in young post-fire stands. We sampled fuel profiles in 24-year-old...

Author(s): Kellen N. Nelson, Monica G. Turner, William H. Romme, Daniel B. Tinker

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Spatiotemporal variability of wildland fuels in US Northern Rocky Mountain forests

www.nrfirescience.org/resource/14689

Fire regimes are ultimately controlled by wildland fuel dynamics over space and time; spatial distributions of fuel influence the size, spread, and intensity of individual fires, while the temporal distribution of fuel deposition influences fire's frequency and controls fire size. These "shifting fuel mosaics" are both a cause and a...

Author(s): Robert E. Keane

Year Published: 2016

Type: Document

Book or Chapter or Journal Article

Data assimilation of dead fuel moisture observations from remote automated weather stations

www.nrfirescience.org/resource/14377

Fuel moisture has a major influence on the behaviour of wildland fires and is an important underlying factor in fire risk assessment. We propose a method to assimilate dead fuel moisture content (FMC) observations from remote automated weather stations (RAWS) into a time lag fuel moisture model. RAWS are spatially sparse and a...

Author(s): Martin Vejmelka, Adam K. Kochanski, Jan Mandel
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Developing a post-processor to link the Forest Vegetation Simulator (FVS) and the Fuel Characteristic Classification System (FCCS)

www.nrfirescience.org/resource/15561

In this project, we developed a Forest Vegetation Simulator (FVS, JFSP Project #) post-processor (FVS2FCCS) to convert FVS simulated treelist and surface fuel data into Fuel Characteristics Classification System (FCCS, JFSP Project #98-1-1-06) fuelbed format (.xml) that can be read and processed by the FCCS to create estimates of...

Author(s): Morris C. Johnson, Sarah J. Beukema, Stephanie A. Rebain, Paige C. Eagle, Kjell Swedin, Maria Petrova, Susan J. Prichard
Year Published: 2015
Type: Document
Technical Report or White Paper

Temporal fuel dynamics following high-severity fire in dry mixed conifer forests of the eastern Cascades, Oregon, USA

www.nrfirescience.org/resource/12889

Fire-resilient landscapes require the recurrent use of fire, but successful use of fire in previously burned areas must account for temporal fuel dynamics. We analysed factors influencing temporal fuel dynamics across a 24-year spatial chronosequence of unmanipulated dry mixed conifer forests following high-severity fire. Duff and...

Author(s): Christopher J. Dunn, John D. Bailey
Year Published: 2015
Type: Document
Book or Chapter or Journal Article

The flammability of forest and woodland litter: a synthesis

www.nrfirescience.org/resource/13276

Fire behavior and effects in forests and woodlands are influenced by surface fuels and senesced leaf litter in particular. We have known that species exhibit differential flammability for some time, but isolated efforts have often attributed differences to disparate mechanisms. Recent research has expanded the diversity of species...

Author(s): J. Morgan Varner, Jeffrey M. Kane, Jesse K. Kreye, Eamon A. Engber
Year Published: 2015
Type: Document
Book or Chapter or Journal Article, Synthesis

Spectroscopic analysis of seasonal changes in live fuel moisture content and leaf dry mass

www.nrfirescience.org/resource/13001

Live fuel moisture content (LFMC), the ratio of water mass to dry mass contained in live plant material, is an important fuel property for determining fire danger and for modeling fire behavior. Remote sensing estimation of LFMC often relies on an assumption of changing water and stable dry mass over time. Fundamental understanding...

Author(s): Yi Qi, Philip E. Dennison, William Matt Jolly, Rachel C. Kropp, Simon C. Brewer
Year Published: 2014
Type: Document
Book or Chapter or Journal Article

De-coupling seasonal changes in water content and dry matter to predict live conifer foliar moisture content

www.nrfirescience.org/resource/12959

Live foliar moisture content (LFMC) significantly influences wildland fire behaviour. However, characterising variations in LFMC is difficult because both foliar mass and dry mass can change throughout the season. Here we quantify the seasonal changes in both plant water status and dry matter partitioning. We collected new and old...

Author(s): William Matt Jolly, Ann M. Hadlow, Kathleen Huguet

Year Published: 2014

Type: Document

Book or Chapter or Journal Article

Building resilience into quaking aspen management

www.nrfirescience.org/resource/16373

Throughout the 20th century, forest scientists and land managers were guided by principles of succession with regard to aspen forests. The historical model depicted aspen as a "pioneer species" that colonizes a site following disturbance and is eventually overtopped by conifers. Aspen systems are more diverse, however, than...

Author(s): Paul C. Rogers

Year Published: 2014

Type: Document

Research Brief or Fact Sheet

Tables for estimating canopy fuel characteristics from stand variables in four interior west conifer forest types

www.nrfirescience.org/resource/12975

Tables have been constructed for use in making quick estimates of canopy base height, canopy fuel load, and canopy bulk density from visual observations or field measurements of stand height, basal area, and stand density for pure stands of ponderosa pine (*Pinus ponderosa* Dougl. ex Laws.), lodgepole pine (*Pinus contorta* Dougl. ex...

Author(s): Martin E. Alexander, Miguel G. Cruz

Year Published: 2014

Type: Document

Book or Chapter or Journal Article

Dead fuel moisture research: 1991-2012

www.nrfirescience.org/resource/12389

The moisture content of dead fuels is an important determinant of many aspects of bushfire behaviour. Understanding the relationships of fuel moisture with weather, fuels and topography is useful for fire managers and models of fuel moisture are an integral component of fire behaviour models. This paper reviews research into dead...

Author(s): Stuart Matthews

Year Published: 2014

Type: Document

Book or Chapter or Journal Article, Synthesis

Fuel Characteristic Classification System version 3.0: technical documentation

www.nrfirescience.org/resource/12407

The Fuel Characteristic Classification System (FCCS) is a software module that records wildland fuel

characteristics and calculates potential fire behavior and hazard potentials based on input environmental variables. The FCCS 3.0 is housed within the Integrated Fuels Treatment Decision Support System (Joint Fire Science Program...

Author(s): Susan J. Prichard, David V. Sandberg, Roger D. Ottmar, Ellen Eberhardt, Anne Andreu, Paige C. Eagle, Kjell Swedin

Year Published: 2013

Type: Document

Technical Report or White Paper

Relationships between moisture, chemistry, and ignition of Pinus contorta needles during the early stages of mountain pine beetle attack

www.nrfirescience.org/resource/8317

Very little is known about how foliar moisture and chemistry change after a mountain pine beetle attack and even less is known about how these intrinsic foliar characteristics alter foliage ignitability. Here, we examine the fuel characteristics and ignition potential of Pinus contorta (lodgepole pine) foliage during the early...

Author(s): William Matt Jolly, Russell A. Parsons, Ann M. Hadlow, Greg M. Cohn, Sara S. McAllister, John B. Popp, Robert M. Hubbard, Jose F. Negron

Year Published: 2012

Type: Document

Book or Chapter or Journal Article

Spatial scaling of wildland fuels for six forest and rangeland ecosystems of the Northern Rocky Mountains, USA

www.nrfirescience.org/resource/8355

Wildland fuels are important to fire managers because they can be manipulated to achieve management goals, such as restoring ecosystems, decreasing fire intensity, minimizing plant mortality, and reducing erosion. However, it is difficult to accurately measure, describe, and map wildland fuels because of the great variability of...

Author(s): Robert E. Keane, Kathy L. Gray, Valentina Bacciu, Signe B. Leirfallom

Year Published: 2012

Type: Document

Book or Chapter or Journal Article

A comparison of two methods for estimating conifer live foliar moisture content

www.nrfirescience.org/resource/8319

Foliar moisture content is an important factor regulating how wildland fires ignite in and spread through live fuels but moisture content determination methods are rarely standardised between studies. One such difference lies between the uses of rapid moisture analysers or drying ovens. Both of these methods are commonly used in...

Author(s): William Matt Jolly, Ann M. Hadlow

Year Published: 2012

Type: Document

Book or Chapter or Journal Article

Properties affecting the consumption of sound and rotten coarse woody debris in northern Idaho: a preliminary investigation using laboratory fires

www.nrfirescience.org/resource/8333

This study evaluates the consumption of coarse woody debris in various states of decay. Samples from a northern Idaho mixed-conifer forest were classified using three different classification methods, ignited with two different ignition methods and consumption was recorded. Intrinsic properties that

change with decay were measured...

Author(s): Joshua C. Hyde, Alistair M. S. Smith, Roger D. Ottmar

Year Published: 2012

Type: Document

Book or Chapter or Journal Article

Guide for quantifying post-treatment fuels in the sagebrush steppe and juniper woodlands of the Great Basin

www.nrfirescience.org/resource/11108

Invasive species and woodland encroachment have caused extensive changes in the fire regimes of sagebrush steppe over the past 150 years. Land managers and resource specialists of the Great Basin are increasingly required to implement vegetation treatments to maintain habitat, reduce fire risk and restore landscapes to a more...

Author(s): Andrea Bourne, Stephen C. Bunting

Year Published: 2011

Type: Document

Research Brief or Fact Sheet

The combustion of sound and rotten coarse woody debris: a review

www.nrfirescience.org/resource/13132

Coarse woody debris serves many functions in forest ecosystem processes and has important implications for fire management as it affects air quality, soil heating and carbon budgets when it combusts. There is relatively little research evaluating the physical properties relating to the combustion of this coarse woody debris with...

Author(s): Joshua C. Hyde, Alistair M. S. Smith, Roger D. Ottmar, Ernesto Alvarado, Penelope Morgan

Year Published: 2011

Type: Document

Book or Chapter or Journal Article

Experimental measurements during combustion of moist individual foliage samples

www.nrfirescience.org/resource/11434

Individual samples of high moisture fuels from the western and southern United States and humidified aspen excelsior were burned over a flat-flame burner at $987^{\circ} \pm 12^{\circ}\text{C}$ and $10 \pm 0.5 \text{ mol\% O}_2$. Time-dependent mass and temperature profiles of these samples were obtained and analysed. It was observed that significant amounts of...

Author(s): Brent M. Pickett, Carl Isackson, Rebecca Wunder, Thomas H. Fletcher, Bret W. Butler, David R. Weise

Year Published: 2010

Type: Document

Book or Chapter or Journal Article

Comment on 'Estimating canopy fuel characteristics in five conifer stands in the western United States using tree and stand measurements'

www.nrfirescience.org/resource/8220

Reinhardt et al. (E. Reinhardt, J. Scott, K. Gray, and R. Keane, Can. J. For. Res. 36: 2803-2814, 2006) questioned the validity of the regression equations for estimating canopy base heights in coniferous forest fuel types developed by Cruz et al. (M.G. Cruz, M.E. Alexander, and R.H. Wakimoto, Int. J. Wildland Fire, 12: 39-50, 2003...

Author(s): Miguel G. Cruz, Martin E. Alexander, Ronald H. Wakimoto

Year Published: 2010

Type: Document

Book or Chapter or Journal Article

From the ground up, way up: measuring live fuel moisture with satellite imagery to fine-tune fire modeling in western ecosystems

www.nrfirescience.org/resource/11431

Remote sensing from space may well become one of the world's most effective, accurate, and efficient ways to assess fire risk and thus manage large landscapes. The technology is evolving quickly, and researchers are busy keeping up. Some major western U.S. landscapes are just now being assessed for integrating remote sensing data...

Author(s): Rachel Clark

Year Published: 2009

Type: Document

Research Brief or Fact Sheet

Equations to convert compacted crown ratio to uncompact crown ratio for trees in the Interior West

www.nrfirescience.org/resource/8368

Crown ratio is the proportion of total tree length supporting live foliage. Inventory programs of the US Forest Service generally define crown ratio in terms of compacted or uncompact measurements. Measurement of compacted crown ratio (CCR) involves envisioning the transfer of lower branches of trees with asymmetric crowns to fill...

Author(s): Chris Toney, Matthew C. Reeves

Year Published: 2009

Type: Document

Book or Chapter or Journal Article

Guide for quantifying fuels in the sagebrush steppe and juniper woodlands of the Great Basin

www.nrfirescience.org/resource/11107

Prescribed fire is increasingly used for fuels management and ecosystem restoration. Managers and fuels specialists of the Great Basin are often required to estimate fuel loadings to predict fire behavior, recommend fuel treatments, or restore an area to its natural fire regime. Because of invasive species and woodland encroachment...

Author(s): Andrea Stebleton, Stephen C. Bunting

Year Published: 2009

Type: Document

Research Brief or Fact Sheet

Assessing post-fire Douglas-fir mortality and Douglas-fir beetle attacks in the Northern Rocky Mountains

www.nrfirescience.org/resource/11126

Douglas-fir has life history traits that greatly enhance resistance to injury from fire, thereby increasing post-fire survival rates. Tools for predicting the probability of tree mortality following fire are important components of both pre-fire planning and post-fire management efforts. Using data from mixed-severity wildfire in...

Author(s): Sharon M. Hood, Barbara J. Bentz, Ken E. Gibson, Kevin C. Ryan, Gregg DeNitto

Year Published: 2007

Type: Document

Technical Report or White Paper

The photoload sampling technique: estimating surface fuel loadings from downward-looking

photographs of synthetic fuelbeds

www.nrfirescience.org/resource/11128

Fire managers need better estimates of fuel loading so they can more accurately predict the potential fire behavior and effects of alternative fuel and ecosystem restoration treatments. This report presents a new fuel sampling method, called the photoload sampling technique, to quickly and accurately estimate loadings for six common...

Author(s): Robert E. Keane, Laura J. Dickinson

Year Published: 2007

Type: Document

Technical Report or White Paper

Development and evaluation of the photoload sampling technique

www.nrfirescience.org/resource/11204

Wildland fire managers need better estimates of fuel loading so they can accurately predict potential fire behavior and effects of alternative fuel and ecosystem restoration treatments. This report presents the development and evaluation of a new fuel sampling method, called the photoload sampling technique, to quickly and...

Author(s): Robert E. Keane, Laura J. Dickinson

Year Published: 2007

Type: Document

Technical Report or White Paper

Do high-density patches of coarse wood and regenerating saplings create browsing refugia for aspen (*Populus tremuloides*) in Yellowstone National Park (USA)?

www.nrfirescience.org/resource/13546

Following the extensive 1988 fires in Yellowstone, a mosaic of high-density patches of fallen logs and regenerating lodgepole pine (*Pinus contorta* var. *latifolia* Engelm. ex Wats.) saplings developed in the landscape. Such patches could potentially provide browsing refugia for post-fire aspen (*Populus tremuloides* Michx.)...

Author(s): James D. Forester, Dean P. Anderson, Monica G. Turner

Year Published: 2007

Type: Document

Book or Chapter or Journal Article

Estimating canopy fuel characteristics in five conifer stands in the western United States using tree and stand measurements

www.nrfirescience.org/resource/8128

Assessment of crown fire potential requires quantification of canopy fuels. In this study, canopy fuels were measured destructively on plots in five Interior West conifer stands. Observed canopy bulk density, canopy fuel load, and vertical profiles of canopy fuels are compared with those estimated from stand data using several...

Author(s): Elizabeth D. Reinhardt, Joe H. Scott, Kathy L. Gray, Robert E. Keane

Year Published: 2006

Type: Document

Book or Chapter or Journal Article

Foliar moisture contents of North American conifers

www.nrfirescience.org/resource/11014

Foliar moisture content (FMC) is a primary factor in the canopy ignition process as surface fire transitions to crown fire. In combination with measured stand data and assumed environmental conditions, reasonable estimates of foliar moisture content are necessary to determine and justify

silvicultural targets for canopy fuels...

Author(s): Christopher R. Keyes

Year Published: 2006

Type: Document

Conference Proceedings, Synthesis

Amount, position, and age of coarse wood influence litter decomposition in postfire *Pinus contorta* stands

www.nrfirescience.org/resource/8222

Spatial variation in vegetation and coarse wood is a major source of forest heterogeneity, yet little is known about how this affects ecosystem processes. In 15-year-old postfire lodgepole pine (*Pinus contorta* var. *latifolia* Englem.) stands in Yellowstone National Park, Wyoming, we investigated how the decomposition rate varies with...

Author(s): Alysia J. Remsburg, Monica G. Turner

Year Published: 2006

Type: Document

Book or Chapter or Journal Article

Landscape fragmentation and forest fuel accumulation: effects of fragment size, age, and climate - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/12115

Landscape fragmentation can affect fuel accumulation, increase the spatial variability of fuel loads, and affect the susceptibility of forests to fire. Fragmentation creates a complex environment in which to manage forests in the United States and Puerto Rico and few studies have related the combined effects of fragmentation,...

Author(s): William A. Gould, Grizelle Gonzalez, Andrew T. Hudak

Year Published: 2005

Type: Document

Technical Report or White Paper

Stereo photo guide for estimating canopy fuel characteristics in conifer stands

www.nrfirescience.org/resource/11199

Stereo photographs, hemispherical photographs, and stand data are presented with associated biomass and canopy fuel characteristics for five Interior West conifer stands. Canopy bulk density, canopy base height, canopy biomass by component, available canopy fuel load, and vertical distribution of canopy fuel are presented for each...

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

Year Published: 2005

Type: Document

Technical Report or White Paper

Quantitative comparison of spectral indices and transformations of multi-resolution remotely sensed data using ground measurements: implications for fire severity modeling - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/11156

The primary factor in estimating fire danger is fuel moisture. Fuel moisture varies seasonally and should be measured over an entire fire season using remote sensing technologies and verified using ground measurements. Recent advances in spaceborne and airborne imaging systems can potentially significantly improve the ability to...

Author(s): Jennifer L. Rechel, Dar A. Roberts

Year Published: 2005

Type: Document
Technical Report or White Paper

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

www.nrfirescience.org/resource/11879

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

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

Year Published: 2005

Type: Document

Technical Report or White Paper

Predicting seasonal fuel moisture in the western United States using endmember fractions at multiple spatial and spectral resolutions

www.nrfirescience.org/resource/10998

Fuel moisture is one of the major components of fire risk assessment in the western United States. Regional and landscape fuel moisture estimates are currently derived from coarse resolution remotely sensed imagery without ground measurements to validate the estimates. Additionally, these estimates are determined using the...

Author(s): Jennifer L. Rechel, Seth H. Peterson, Dar A. Roberts, Jan W. van Wagtendonk

Year Published: 2005

Type: Document

Conference Proceedings

Photo series for major natural fuel types of the United States - Phase II -- Progress Report

www.nrfirescience.org/resource/11170

The natural fuels stereo photo series is a collection of geo-referenced data and photographs that display a range of natural conditions, fuel loadings, and other fuelbed characteristics in a wide variety of forest-, woodland-, shrub-, and grass-dominated ecosystem types. The photo series are useful tools for quickly and...

Author(s): Roger D. Ottmar

Year Published: 2005

Type: Document

Technical Report or White Paper

Evaluating ASTER imagery and gradient modeling for mapping wildland fire fuels

www.nrfirescience.org/resource/11280

Land managers need cost-effective methods for mapping and characterizing fire fuels quickly and accurately. The advent of sensors with increased spatial resolution may improve the accuracy and reduce the cost of fuels mapping. The objective of this research is to evaluate the accuracy and utility of imagery from the Advanced...

Author(s): Michael J. Falkowski

Year Published: 2004

Type: Document

Research Brief or Fact Sheet

Fuels planning: science synthesis and integration; forest structure and fire hazard fact sheet 2:

fire hazard

www.nrfirescience.org/resource/14954

Fire hazard reflects the potential fire behavior and magnitude of effects as a function of fuel conditions. This fact sheet discusses crown fuels, surface fuels, and ground fuels and their contribution and involvement in wildland fire.

Author(s): Kelly O'Brian

Year Published: 2004

Type: Document

Research Brief or Fact Sheet

Analysis of algorithms for predicting canopy fuel

www.nrfirescience.org/resource/10958

We compared observed canopy fuel characteristics with those predicted by existing biomass algorithms. We specifically examined the accuracy of the biomass equations developed by Brown (1978). We used destructively sampled data obtained at 5 different study areas. We compared predicted and observed quantities of foliage and crown...

Author(s): Kathy L. Gray, Elizabeth D. Reinhardt

Year Published: 2004

Type: Document

Conference Proceedings

Using airborne laser altimetry to determine fuel models for estimating fire behavior

www.nrfirescience.org/resource/8348

Airborne laser altimetry provides an unprecedented view of the forest floor in timber fuel types and is a promising new tool for fuels assessments. It can be used to resolve two fuel models under closed canopies and may be effective for estimating coarse woody debris loads. A simple metric-obstacle density-provides the necessary...

Author(s): Carl A. Seielstad, Lloyd P. Queen

Year Published: 2003

Type: Document

Book or Chapter or Journal Article

Estimating live fuels for shrubs and herbs with BIOPAK

www.nrfirescience.org/resource/8175

ABSTRACT: This paper describes use of BIOPAK to calculate size classes of live fuels for shrubs and herbs. A library of equations to estimate such fuels in the Pacific Northwest and northern Rocky Mountains is presented and used in an example. These methods can be used in other regions if the user first enters fuel size-class...

Author(s): Carl E. Fiedler, Charles E. Keegan, Todd A. Morgan, Christopher W. Woodall

Year Published: 2003

Type: Document

Book or Chapter or Journal Article

Estimating canopy fuels in conifer forests

www.nrfirescience.org/resource/8403

Crown fires occur in a variety of coniferous forest types (Agee 1993), including some that are not historically prone to crown fire, such as ponderosa pine (Mutch and others 1993). The head fire spread rate of a crown fire is usually several times faster than that of a surface fire burning under the same conditions, which leads to a...

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

Year Published: 2002

Type: Document
Book or Chapter or Journal Article

Restoring fire-dependent ponderosa pine forests in western Montana

www.nrfirescience.org/resource/13364

Many foresters and ecologists recognize that disruption of the historic pattern of frequent fires in ponderosa pine forests has resulted in major ecological changes, including increasingly severe wildfires and insect and disease epidemics (Weaver, 1943; Covington and Moore, 1992; Mutch and others, 1993; Everett, 1994). In response...

Author(s): Stephen F. Arno, Michael G. Harrington, Carl E. Fiedler, Clinton E. Carlson

Year Published: 1995

Type: Document
Book or Chapter or Journal Article

Fuel moisture as measured and predicted during the 1988 fires in Yellowstone National Park

www.nrfirescience.org/resource/11109

Fine fuel moisture content, relative humidity, air temperature, and fire behavior were observed hourly for 48 hours on the North Fork Fire in Yellowstone National Park from August 25 to August 27, 1988. Fine fuel reached minimum moisture content of 3 to 5 percent late in the afternoon, remained below 8 percent until after midnight,...

Author(s): Roberta A. Hartford, Richard C. Rothermel

Year Published: 1991

Type: Document
Research Brief or Fact Sheet

Surface fuel loadings and predicted fire behavior for vegetation types in the northern Rocky Mountains

www.nrfirescience.org/resource/11930

Means, standard deviations, and quartiles of fuel loadings were determined for litter, for downed woody material of 0 to one-fourth inch, one-fourth to 1 inch, 0 to 1 inch, and 1 to 3 inches, for herbaceous vegetation, and for shrubs by cover types and fire groups. The studies were conducted at four locations in northwestern Wyoming...

Author(s): James K. Brown, Collin D. Bevins

Year Published: 1986

Type: Document
Research Brief or Fact Sheet

Fuel and fire behavior prediction in big sagebrush

www.nrfirescience.org/resource/11957

Relationships between height of big sagebrush and crown area, fuel loading, bulk density, size distribution of foliage and stemwood, and fraction dead stemwood are presented. Based upon these relationships, modeled rate-of-fire spread and fireline intensity are shown for sagebrush ranging in height from 20 to 120 cm and in coverage...

Author(s): James K. Brown

Year Published: 1982

Type: Document
Technical Report or White Paper

Photo guide for appraising downed woody fuels in Montana forests: Grand fir - larch - Douglas-fir, western hemlock, western redcedar - western hemlock, and western redcedar cover types

www.nrfirescience.org/resource/11264

Four series of color photographs show different levels of downed woody material resulting from natural processes in four forest cover types in Montana. Each photo is supplemented by fuel inventory data and potential fire behavior ratings.

Author(s): William C. Fischer

Year Published: 1981

Type: Document

Technical Report or White Paper

Residue characteristics in the Northern Rocky Mountains

www.nrfirescience.org/resource/11131

ANNOTATION: In the northern Rocky Mountains, 350-450 million cubic feet (9.9 to 12.7 million cubic meters) of logging residue is generated each year. Up to 60 percent of the residue material is technologically suitable for wood products, but condition, size and product potential vary among forest types. Other factors which influence...

Author(s): Robert E. Benson, Joyce A. Schlieter

Year Published: 1981

Type: Document

Conference Proceedings, Technical Report or White Paper

Photo guides for appraising downed woody fuels in Montana forests: how they were made

www.nrfirescience.org/resource/11101

Eight series of color photographs have been published as three separate photo guides for appraising downed woody fuels in Montana forests. This note tells how these photo guides were constructed. The techniques used to determine the weight and size class distribution of downed woody fuels are given.

The procedure used to rate...

Author(s): William C. Fischer

Year Published: 1981

Type: Document

Research Brief or Fact Sheet

Photo guide for appraising downed woody fuels in Montana forests: lodgepole pine and Engelmann spruce - subalpine fir cover types

www.nrfirescience.org/resource/11262

Two series of color photographs show different levels of downed woody material resulting from natural processes in two forest cover types in Montana. Each photo is supplemented by fuel inventory data and potential fire- behavior ratings.

Author(s): William C. Fischer

Year Published: 1981

Type: Document

Technical Report or White Paper

Photo guide for appraising downed woody fuels in Montana forests: Interior ponderosa pine, ponderosa pine - larch - Douglas-fir, larch - Douglas-fir, and interior Douglas-fir cover types

www.nrfirescience.org/resource/11263

Four series of color photographs show different levels of downed woody material resulting from natural processes in four forest cover types in Montana. Each photo is supplemented by fuel inventory data and potential fire behavior ratings.

Author(s): William C. Fischer

Year Published: 1981

Type: Document

Predicting slash depth for fire modeling

www.nrfirescience.org/resource/11954

Development of equations for predicting fuel bed depth (called "bulk depth" herein) appropriate for modeling fire behavior in slash is described. Bulk depth (y) was correlated with the expected number of 1/4-to 1-inch-diameter particle intercepts per foot of vertical plane transect (x) by regressions of the form $y = a \cdot x$. Values of "...

Author(s): Frank A. Albini, James K. Brown

Year Published: 1978

Type: Document

Technical Report or White Paper

Weight and density of crowns of Rocky Mountain conifers

www.nrfirescience.org/resource/11205

ANNOTATION: Relationships between live and dead crown weight and DBH, crown length, tree height, and crown ratio are presented for 11 Rocky Mountain conifers. Also included are partitioned estimates of crown foliage and branchwood. This study shows a high correlation between DBH and crown weight.

Author(s): James K. Brown

Year Published: 1978

Type: Document

Technical Report or White Paper

Pre-feasibility assessment: small diameter underutilized (SDU) wood feedstock for a 10 MW co-generation facility at the Milltown dam site

www.nrfirescience.org/resource/11206

ANNOTATION: A pre-feasibility assessment is an early stage and limited analysis of the probable risks and returns of an investment. Focused on gathering preliminary information, it helps decision makers determine if there is a basis for investing additional capital and time in the proposed project. This pre-feasibility assessment to...

Author(s): James K. Brown, J. A. Kendall Snell, David L. Bunnell

Year Published: 1977

Type: Document

Technical Report or White Paper

Estimating fuel weights of grasses, forbs, and small woody plants

www.nrfirescience.org/resource/11923

Equations were developed for estimating fuel loading (g/m²) of grasses, narrow-leaved forbs, broad-leaved forbs, and small woody plants common to western Montana and north Idaho. Independent variables were plant height and percentage of ground covered. R² for the equations ranged from 0.30 to 0.91. The equations provide reasonable...

Author(s): James K. Brown, Michael A. Marsden

Year Published: 1976

Type: Document

Research Brief or Fact Sheet

Gain and loss of moisture in large forest fuels

www.nrfirescience.org/resource/11880

For many years there has been much interest in moisture studies of forest fuels. The study reported here was in its 17th year when the author became involved. The study was terminated 2 years later. All

data were compiled, adjusted, and analyzed; a report was prepared but not published. Continued interest in moisture content of...

Author(s): Arthur P. Brackebusch

Year Published: 1975

Type: Document

Technical Report or White Paper

The pyrolysis products and thermal characteristics of cottonwood and its components

www.nrfirescience.org/resource/11944

This study was undertaken to determine the thermal properties of, and the pyrolysis products from, western cottonwood (*Populus trichocavya*) and two of its major components: cellulose and xylan. The modifications due to treatment of the wood and its components with an acid and alkali were also documented. Differential thermal...

Author(s): Charles W. Philpot

Year Published: 1971

Type: Document

Technical Report or White Paper

Physical fuel properties of ponderosa pine forest floors and cheatgrasses

www.nrfirescience.org/resource/11940

Physical fuel properties were determined utilizing measurements of volume, surface area, and weight for ponderosa pine forest floors and cheatgrass. Average values of these properties for ponderosa pine needle litter and cheatgrass were respectively: surface area-to-volume ratio (a), 57.6 and 144.0 cm.³/cc.; particle density, 0.51...

Author(s): James K. Brown

Year Published: 1970

Type: Document

Technical Report or White Paper

Porosity of cheatgrass fuel related to weight

www.nrfirescience.org/resource/11922

Porosity (expressed as the ratio of air space surrounding plant material to surface area of plant material) was determined for a low forage producing community of cheatgrass. Porosity averaged 12.5 cm.³/cm.²- and correlated closely with weight per square meter. Estimation of porosity from weight per unit of ground area is a...

Author(s): James K. Brown

Year Published: 1969

Type: Document

Research Brief or Fact Sheet

Characteristics of backfires and headfires in a pine needle fuel bed

www.nrfirescience.org/resource/11920

Burning characteristics of backfires, headfires, and no-wind fires in fuel beds of ponderosa pine needles were compared at the Northern Forest Fire Laboratory. Data gathered under controlled laboratory conditions indicate that fires backed into the wind (backfires) consistently burn slower, longer, and deeper than fires burned with...

Author(s): William R. Beaufait

Year Published: 1965

Type: Document

Research Brief or Fact Sheet

Aridity and competition drive fire resistance trait covariation in mountain trees

www.nrfirescience.org/resource/18745

Fire resistance traits drive tree species composition in surface?fire ecosystems, but how they covary at different scales of variation and with the environment is not well documented. We assessed the covariation of bark thickness (BT), tree height, and crown base?to?height ratio across Alpine forests, after accounting for the...

Author(s): Thibaut Fréjaville, Albert Vilà?Cabrera, Thomas Curt, Christopher Carcaillet

Type: Document

Book or Chapter or Journal Article

Evidence for population differentiation among Jeffrey and Ponderosa pines in survival, growth and phenology

www.nrfirescience.org/resource/18740

Ecological restoration projects that include reforestation require that land managers select appropriate source of seeds for long-term persistence. In California, the standard approach for making this choice is based on seed zone and elevational band, both geographically-based measures. However, given the pace of contemporary...

Author(s): Alejandra Martínez-Berdeja, Jill A. Hamilton, Aurore Bontemps, Johanna Schmitt, Jessica W. Wright

Type: Document

Book or Chapter or Journal Article