How vegetation recovery and fuel conditions in past fires influences fuels and future fire management in five western U.S. ecosystems - JFSP Final Report

Mixed severity wildfires burn large areas in western North America forest ecosystems in most years and this is expected to continue or increase with climate change. Little is understood about vegetation recovery and changing fuel conditions more than a decade post-fire because it exceeds the duration of most studies of fire effects...

Author(s): Andrew T. Hudak, Beth A. Newingham, Eva K. Strand, Penelope Morgan

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

Detection of Annual Spruce Budworm Defoliation and Severity Classification Using Landsat Imagery

Spruce budworm (SBW) is the most destructive forest pest in eastern forests of North America. Mapping annual current-year SBW defoliation is challenging because of the large landscape scale of infestations, high temporal/spatial variability, and the short period of time when detection is possible. We used Landsat-5 and Landsat-MSS...

Author(s): Parinaz Rahimzadeh-Bajgiran, Aaron R. Weiskittel, Daniel Kneeshaw, David A. MacLean

Year Published: 2018

Type: Document

Book or Chapter or Journal Article

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

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

Author(s): Crystal A. Kolden, Aaron M. Sparks

Year Published: 2018

Type: Document

Technical Report or White Paper

A World in Pixels: How New Research Is Helping to Predict Probability of High-Severity Fire

With drought across much of the southern and western States, it's shaping up to be another record year for wildfires. According to the National Oceanic and Atmospheric Administration, May 2018 was the fourthworst May since 2000 in terms of U.S. acres burned by wildfires. The year 2000 is a significant measuring point, since the...

Author(s): Sean A. Parks

Year Published: 2018

Type: Document

Research Brief or Fact Sheet

Improved prediction of stream flow based on updating land cover maps with remotely sensed forest change detection

The water balance in a watershed can be disrupted by forest disturbances such as harvests and fires. Techniques to accurately and efficiently map forest cover changes due to disturbance are evolving quickly, and it is of interest to ask how useful maps of different types of disturbances over time can be in the prediction of water...
Author(s): Alexander J. Hernandez, Sean P. Healey, Hongsheng Huang, R. Douglas Ramsey
Year Published: 2018
Type: Document
Book or Chapter or Journal Article

Mean composite fire severity metrics computed with Google Earth engine offer improved accuracy and expanded mapping potential

www.nrfirescience.org/resource/17913

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

Landscape-scale quantification of fire-induced change in canopy cover following mountain pine beetle outbreak and timber harvest

www.nrfirescience.org/resource/15137

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

Selecting Control Sites for Post-Fire Ecological Studies Using Biological Criteria and MODIS Time Series Data

www.nrfirescience.org/resource/16737

Wildland fires play a key role in the functioning and structure of vegetation. The availability of sensors aboard satellites, such as Moderate Resolution Imaging Spectroradiometer (MODIS), makes possible the construction of a time series of vegetation indices (VI) and the monitoring of post-fire vegetation recovery. One of the...
Author(s): Marcos A. Landi, Carlos Di Bella, Silvia Ojeda, Paola Salvatierra, Juan Argañaraz, Laura M. Bellis
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

Measuring radiant emissions from entire prescribed fires with ground, airborne, and satellite sensors - RxCADRE 2012

www.nrfirescience.org/resource/13855

Characterising radiation from wildland fires is an important focus of fire science because radiation relates directly to the combustion process and can be measured across a wide range of spatial extents and resolutions. As part of a more comprehensive set of measurements collected during the 2012 Prescribed Fire Combustion and...
Author(s): Matthew B. Dickinson, Andrew T. Hudak, Thomas J. Zajkowski, E. Louise Loudermilk, Wilfrid Schroeder, Luke Ellison, Robert L. Kremens, William Holley, Otto Martinez, Alexander Paxton, Benjamin C. Bright, Joseph J. O'Brien, Benjamin Hornsby, Charles Ichoku, Jason Faulring, Aaron Gerace, David L. Peterson, Joseph Mauceri
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Modifying LANDFIRE geospatial data for local applications

www.nrfirescience.org/resource/15167

LANDFIRE's suite of spatial data layers are a valuable resource for land managers because they stretch "wall-to-wall" across the US, are created with a consistent methodology and are updated over time. These data are designed to support broad-scale land management activities, and users are encouraged to critique and modify...
Author(s): Don Helmbrecht, Kori Blankenship
Year Published: 2016
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

Development and validation of fuel height models for terrestrial lidar - RxCADRE 2012

www.nrfirescience.org/resource/13846

Terrestrial laser scanning (TLS) was used to collect spatially continuous measurements of fuelbed

characteristics across the plots and burn blocks of the 2012 RxCADRE experiments in Florida. Fuelbeds were scanned obliquely from plot/block edges at a height of 20 m above ground. Pre-fire blocks were scanned from six perspectives and...
Author(s): Eric Rowell, Carl A. Seielstad, Roger D. Ottmar
Year Published: 2016
Type: Document
Book or Chapter or Journal Article

Automated integration of lidar into the LANDFIRE product suite
www.nrfirescience.org/resource/13609
Accurate information about three-dimensional canopy structure and wildland fuel across the landscape is necessary for fire behaviour modelling system predictions. Remotely sensed data are invaluable for assessing these canopy characteristics over large areas; lidar data, in particular, are uniquely suited for quantifying three-...
Author(s): Birgit Peterson, Kurtis J. Nelson, Carl A. Seielstad, Jason Stoker, William Matt Jolly, Russell A. Parsons
Year Published: 2015
Type: Document
Book or Chapter or Journal Article

Wildfire, wildlands, and people: understanding and preparing for wildfire in the wildland-urban interface - a forests on the edge report
www.nrfirescience.org/resource/16861
Fire has historically played a fundamental ecological role in many of America's wildland areas. However, the rising number of homes in the wildland-urban interface (WUI), associated impacts on lives and property from wildfire, and escalating costs of wildfire management have led to an urgent need for communities to become "fire-...
Author(s): Susan M. Stein, Sara J. Comas, James P. Menakis, Mary A. Carr, Susan I. Stewart, Helene Cleveland, Lincoln Bramwell, Volker C. Radeloff
Year Published: 2013
Type: Document
Technical Report or White Paper

Beyond fire behavior and fuels: learning from the past to help guide us in the future
www.nrfirescience.org/resource/18397
The third IAWF Fire Behavior and Fuels Conference was held in Spokane, Washington, October 25-29, 2010, and commemorated the 100th anniversary of the 1910 fires in the Northern Rocky Mountains. The theme of the conference was appropriately titled 'Beyond Fire Behavior and Fuels: Learning from the Past to Help Guide Us in the...
Year Published: 2011
Type: Document
Conference Proceedings

Mapping and estimating forest fuel with radar remote sensing
www.nrfirescience.org/resource/11084
With an increase in the risk of large fires across much of the Western United States, along with a growing variety of fuel types that result from changes in the landscape and management strategies, there has never been a more pressing need for accurate, cost-efficient, large scale forest fuel maps. Emerging remote sensing...
Author(s): Rachel Clark
Year Published: 2009

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

Regression modeling and mapping of coniferous forest basal area and tree density from discrete-return lidar and multispectral satellite data

www.nrfirescience.org/resource/13131

We compared the utility of discrete-return light detection and ranging (lidar) data and multispectral satellite imagery, and their integration, for modeling and mapping basal area and tree density across two diverse coniferous forest landscapes in north-central Idaho. We applied multiple linear regression models subset from a suite...

Author(s): Andrew T. Hudak, Nicholas L. Crookston, Jeffrey S. Evans, Michael J. Falkowski, Alistair M. S. Smith, Paul E. Gessler, Penelope Morgan
Year Published: 2006
Type: Document
Book or Chapter or Journal Article

Accuracy and precision of two indirect methods for estimating canopy fuels

www.nrfirescience.org/resource/11036

We compared the accuracy and precision of digital hemispherical photography and the LI-COR LAI-2000 plant canopy analyzer as predictors of canopy fuels. We collected data on 12 plots in western Montana under a variety of lighting and sky conditions, and used a variety of processing methods to compute estimates. Repeated measurements...

Author(s): Abran Steele-Feldman, Elizabeth D. Reinhardt, Russell A. Parsons
Year Published: 2006
Type: Document
Conference Proceedings

Fuels Management - How to Measure Success: Conference Proceedings

www.nrfirescience.org/resource/18399

Fuels management programs are designed to reduce risks to communities and to improve and maintain ecosystem health. The International Association of Wildland Fire initiated the 1st Fire Behavior and Fuels Conference to address development, implementation, and evaluation of these programs. The focus was on how to measure success....

Author(s): Patricia L. Andrews, Bret W. Butler
Year Published: 2006
Type: Document
Conference Proceedings

Characterizing and mapping forest fire fuels using ASTER imagery and gradient modeling

www.nrfirescience.org/resource/7925

Land managers need cost-effective methods for mapping and characterizing forest fuels quickly and accurately. The launch of satellite 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...

Author(s): Michael J. Falkowski, Paul E. Gessler, Penelope Morgan, Andrew T. Hudak, Alistair M. S. Smith

Year Published: 2005

Type: Document

Book or Chapter or Journal Article

The use of Landsat 7 (ETM+) and AVIRIS data to map fuel characteristic classes in western ecosystems - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/11174

Summary of Findings: (1) Satellite imagery has the potential to map fuel models at the national and local levels: (a) Landsat. The Landfire project has shown that Landsat 7 (ETM+) data are useful for mapping fuels at the national level. Critical to developing accurate maps are data collected in the field on fuels and vegetation. At...

Author(s): Jan W. van Wagtendonk, Ralph Root, Carl H. Key

Year Published: 2005

Type: Document

Technical Report or White Paper

Demonstration and integration of systems for fire remote sensing, ground-based fire measurement, and fire modeling - Final Report to the Joint Fire Science Program

www.nrfirescience.org/resource/11158

Proof-of-concept research is being conducted to: compare airborne and in situ, ground-based fire measurement systems; begin evaluation of two fire-behavior simulation models with these data; test approaches to incorporating improved wind-field and weather data in these models; test the utility of the airborne remote sensing for...

Author(s): Colin C. Hardy, Philip J. Riggan

Year Published: 2005

Type: Document

Technical Report or White Paper

Mapping relative fire regime condition class for the western United States

www.nrfirescience.org/resource/10991

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

Author(s): James P. Menakis, Melanie Miller, Thomas Thompson

Year Published: 2004

Type: Document

Conference Proceedings

Evaluating the ASTER sensor for mapping and characterizing forest fire fuels in northern Idaho

www.nrfirescience.org/resource/8437

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, Paul E. Gessler, Penelope Morgan, Alistair M. S. Smith, Andrew T. Hudak
Year Published: 2004
Type: Document
Conference Proceedings

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

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

Effects of fire on landscape heterogeneity in Yellowstone National Park, Wyoming

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

Airborne infrared forest fire detection system: final report

This work was undertaken because of a mutual interest of the Department of Defense, Advanced Research Projects Agency (ARPA), and the USDA Forest Service in the problems of detecting hot targets against natural terrain backgrounds using airborne infrared (IR) line scanning instrumentation. The study objectives were broadly defined...
Author(s): Ralph A. Wilson, Stanley N. Hirsch, Forrest H. Madden, John B. Losensky
Year Published: 1971
Type: Document
Technical Report or White Paper

Project Fire Scan fire mapping final report, April 1962 to December 1966

Information about a fire's perimeter is a prerequisite for the control of large fires, whether caused by nuclear war, lightning, or man's carelessness. Visual aerial reconnaissance is usually limited by smoke. Location of a fire's perimeter with respect to surrounding terrain is difficult to determine at night by visual means. The...
Author(s): Stanley N. Hirsch
Year Published: 1968
Type: Document
Technical Report or White Paper

Project fire scan: fire detection interim report, April 1962 to December 1964

www.nrfirescience.org/resource/11935

The original program objectives were to develop and test a heat-sensitive system capable of: (1) locating small fires, (2) mapping fire perimeters, and (3) measuring rates of fire spread. The usefulness of infrared mappers was to be examined by surveillance of fire sources in forest environments. The capability for locating fire...

Author(s): Ralph A. Wilson, Nonan V. Noste

Year Published: 1966

Type: Document

Technical Report or White Paper

FTEM Release Webinar for USFS

www.nrfirescience.org/resource/18093

A webinar presenting the new Fuels Treatment Effectiveness Monitoring (FTEM) system to USDA FS. (Duration 01:05)

Type: Media

Webinar

Monitoring Trends in Burn Severity (MTBS)

www.nrfirescience.org/resource/18010

Monitoring Trends in Burn Severity (MTBS) is a multi-year project designed to consistently map the burn severity and perimeters of fires across all lands of the United States from 1984 and beyond. The data generated by MTBS will be used to identify national trends in burn severity, providing information necessary to monitor the...

Type: Website

Website

ArcFuels

www.nrfirescience.org/resource/18006

ArcFuels is a library of ArcGIS macros developed to streamline fire behavior modeling and spatial analyses for fuel treatment planning. The macros link: 1) key wildfire behavior models; 2) fuels and vegetation data (e.g. Landfire, FVS databases); 3) MS Office, and 4) ArcGIS. ArcFuels is used to rapidly design and test fuel...

Type: Website

Website

Techniques for Wildfire Detection and Monitoring Part 1

www.nrfirescience.org/resource/18086

Certain areas are experiencing longer fire seasons, with more frequent and severe droughts. Wildfire detection, monitoring, and mitigation is increasingly important in these regions. Satellite remote sensing data is useful for identifying active fires, evaluating burned areas, and assessing fire emissions. This advanced training...

Type: Media

Webinar

LANDFIRE

www.nrfirescience.org/resource/18009

LANDFIRE is an ongoing research project and database that contains geospatial data products that

describe existing vegetation composition and structure, potential vegetation, surface and canopy fuel characteristics, historical fire regimes, and fire regime condition class. LANDFIRE provides fire and land managers with the...
Type: Website

Website