FIRESEV Severe Fire Potential, forest and woodland settings, 90th percentile 1000-hour fuel moisture index

Metadata also available as ArcGIS metadata attached to individual raster products at http://www.frames.gov/firesev

Metadata:

Identification_Information:

Citation:

Citation_Information:

Title:

FIRESEV Severe Fire Potential, forest and woodland settings, 90th percentile 1000-hour fuel moisture index

Edition: First release, December 2012, predictions based on 2011

Geospatial_Data_Presentation_Form: raster digital data

Online_Linkage: <http://www.frames.gov/firesev>

Originator:

Dillon, G.K., J.M. Herynk, Z.A. Holden, P. Morgan, R.P. Silverstein

Publication_Date: 2012/12/31

Description:

Abstract:

The Fire Severity Mapping System project (FIRESEV) is geared toward providing fire managers across the western United States critical information about the potential ecological effects of wildland fire at multiple levels of thematic, spatial, and temporal detail. A major component of FIRESEV is a comprehensive map of the western U.S. depicting the potential for fires to burn with high severity if they should occur. Developed as a 30m-resolution raster dataset, the map is intended to be an online resource that managers can download and use to evaluate the potential ecological effects associated with new and potential fire events. Using satellite-derived burn severity data from over 7,000 fires that burned from 1984 to 2007, together with geospatial topography, fuel moisture, and vegetation data, we produced statistical models using the

Random Forest machine learning algorithm. We developed Random Forest models separately for forested and non-forested settings in each of 17 mapping regions. For each model, we selected the set of predictor variables (i.e., landscape characteristics) that provided the best possible predictions of high severity fire occurrence. Cross-validated classification accuracies for individual models ranged from 65% to 83% for forest models, and 69% to 82% for non-forest models. We used the Random Forest models to predict, for every 30m pixel in the West, the potential for severe fire, conditional on that pixel experiencing fire at a particular percentile level of a 1000-hour fuel moisture index (where higher percentiles equal dryer conditions). This raster dataset represents the predicted severe fire potential at the 90th percentile, with non-burnable areas added in from the LANDFIRE 2008 Fire Behavior Fuel Model layer.
Purpose:
This datset is part of a seamless, wall-to-wall, 30-meter raster geospatial layer covering all lands in the western Untied States that depicts the potential for high severity fire for each 30-m cell, based on empirical observations and statistical modeling.
Status:
Progress: Complete
Maintenance_and_Update_Frequency: None planned
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -129.243752
East_Bounding_Coordinate: -94.685049
North_Bounding_Coordinate: 51.983236
South_Bounding_Coordinate: 23.203382
Keywords:
Theme:
Theme_Keyword_Thesaurus: None
Theme_Keyword: wildland fire
Theme_Keyword: burn severity
Place:
Place_Keyword_Thesaurus: None
Place_Keyword: Western United States
Place_Keyword: Region 1: Pacific Northwest Coast and Western Cascade Mountains
Place_Keyword: Region 2: Eastern Cascade Mountains and Blue Mountains
Place_Keyword: Region 3: Northern Rocky Mountains
Place_Keyword: Region 4: Intermountain Cold Semi-Desert
Place_Keyword: Region 5: Klamath Mountains
Place_Keyword: Region 6: Sierra Nevada Mountains
Place_Keyword: Region 7: Southern California Coast and Central Valley
Place_Keyword: Region 8: Southern Great Basin
Place_Keyword: Region 9: Southwest Deserts
Place_Keyword: Region 10: Mogollon Rim and Southwestern Sky Island Mountains
Place_Keyword: Region 11: Colorado Plateau
Place_Keyword: Region 12: Southern Rocky Mountains
Place_Keyword: Region 13: Northwestern Great Plains
Place_Keyword: Region 14: Western Great Plains

Place_Keyword: Region 15: Middle Rocky Mountains
Place_Keyword: Region 16: Southwestern Great Plains and Tablelands
Place_Keyword: Region 17: Southcentral Great Plains and Crosstimbers
Temporal:
Temporal_Keyword_Thesaurus: None
Temporal_Keyword: 2011
Access_Constraints: None
Use_Constraints:
This product is the result of predictive statisitcal modeling. While it is based on empirical observations of burn severity from past wildland fires, those observations are subject to many sources of error. Those errors, combined with the inherent uncertainties in statistical modeling, create a certain degree of error and uncertainty in this data product. Users of this dataset should recognize this uncertainty and critically evaulate its usefullness on any future wildland fire incident in light of other sources of information about landscape characteristics, fuels, weather, and predicted fire behavior.
Point_of_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization:
USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Lab
Contact_Person: Greg Dillon
Contact_Position: Spatial Fire Analyst
Contact_Address:
Address_Type: Unknown
Address: 5775 US Hwy 10 W
City: Missoula
State_or_Province: MT
Postal_Code: 59802
Country: USA
Contact_Voice_Telephone: 406-829-6783
Contact_Electronic_Mail_Address: gdillon@fs.fed.us
Data_Set_Credit:
This product was developed at the USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Lab in Missoula, MT, USA, in cooperation with the Wildland Fire Program and College of Natural Resources at the University of Idaho, Moscow, ID, USA. Funding for this work was provided in part by the Joint Fire Science Program under JFSP project # 09-1-07-4, and facilitated via RJVA 09-JV-1221637-270 between University of Idaho and USDA Forest Service Rocky Mountain Research Station.
Native_Data_Set_Environment:
Microsoft Windows Server 2008 R2 Version 6.1 (Build 7601) Service Pack 1; ESRI ArcGIS 10.0.2.3200
Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 2011
Currentness_Reference: ground condition

Spatial_Data_Organization_Information:
Direct_Spatial_Reference_Method: Raster
Raster_Object_Information:
Raster_Object_Type: Pixel
Row_Count: 96125
Column_Count: 84760

Spatial_Reference_Information:
Horizontal_Coordinate_System_Definition:
Planar:
Map_Projection:
Map_Projection_Name: Albers Conical Equal Area
Albers_Conical_Equal_Area:
Standard_Parallel: 29.5
Standard_Parallel: 45.5
Longitude_of_Central_Meridian: -96.0
Latitude_of_Projection_Origin: 23.0
False_Easting: 0.0
False_Northing: 0.0
Planar_Coordinate_Information:
Planar_Coordinate_Encoding_Method: coordinate pair
Coordinate_Representation:
Abscissa_Resolution: 0.000000037527980722984474
Ordinate_Resolution: 0.000000037527980722984474
Planar_Distance_Units: Meter
Geodetic_Model:
Horizontal_Datum_Name: D North American 1983
Ellipsoid_Name: GRS 1980
Semi-major_Axis: 6378137.0
Denominator_of_Flattening_Ratio: 298.257222101

Entity_and_Attribute_Information:
Detailed_Description:
Entity_Type:
Entity_Type_Label: FIRESEV Severe Fire Potential (SFP)
Entity_Type_Definition: Predicted severe fire potential
Entity_Type_Definition_Source: None
Attribute:
Attribute_Label: Rowid
Attribute_Definition: Internal feature number.
Attribute_Definition_Source: ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Sequential unique whole numbers that are automatically generated.
Attribute:

Attribute_Label: VALUE
Attribute_Definition:
Predicted severe fire potential for each pixel, on a 0 to 100 scale; Values > 100 represent non-burnable land
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: 191
Enumerated_Domain_Value_Definition: Developed lands (urban, suburban, roads, etc.)
Enumerated_Domain_Value_Definition_Source: LANDFIRE 2008 FBFM40 raster dataset
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: 192
Enumerated_Domain_Value_Definition: Perrenial snow and ice
Enumerated_Domain_Value_Definition_Source: LANDFIRE 2008 FBFM40 raster dataset
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: 193
Enumerated_Domain_Value_Definition: Non-burnable agricultural lands
Enumerated_Domain_Value_Definition_Source: LANDFIRE 2008 FBFM40 raster dataset
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: 198
Enumerated_Domain_Value_Definition: Open water
Enumerated_Domain_Value_Definition_Source: LANDFIRE 2008 FBFM40 raster dataset
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: 199
Enumerated_Domain_Value_Definition: Bare ground
Enumerated_Domain_Value_Definition_Source: LANDFIRE 2008 FBFM40 raster dataset
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: 0 to 100
Enumerated_Domain_Value_Definition: Severe Fire Potential
Enumerated_Domain_Value_Definition_Source:
Percentage of classification trees (out of 1500) within the Random Forest model that predicted the given pixel would burn with high severity if it experienced fire at the specified 1000-hour fuel moisture percentile.
Beginning_Date_of_Attribute_Values: 20110201
Ending_Date_of_Attribute_Values: 20111030
Attribute_Definition_Source: Random Forest modeling and LANDFIRE FBFM40
Attribute:

Attribute_Label: COUNT
Attribute_Definition: Number of pixels in each value
Attribute_Domain_Values:
Unrepresentable_Domain: Values represent the count of pixels with each raster value
Attribute_Definition_Source: ESRI

Distribution_Information:
Distributor:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: Fire Research and Management Exchange System (FRAMES)
Contact_Instructions:
For problems with online data availability or download use the contact page at
<http://www.frames.gov/about/contact-frames/>
Contact_Address:
Address_Type: mailing and physical address
Address: <http://www.frames.gov>
City: NA
State_or_Province: NA
Postal_Code: NA
Country: NA
Contact_Voice_Telephone: NA
Distribution_Liability: See access and use constraints information.

Metadata_Reference_Information:
Metadata_Date: 20130102
Metadata_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization:
USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Lab
Contact_Person: Greg Dillon
Contact_Position: Spatial Fire Analyst
Contact_Address:
Address_Type: mailing and physical address
Address: 5775 US Hwy 10 W
City: Missoula
State_or_Province: MT
Postal_Code: 59808
Country: USA
Contact_Voice_Telephone: 406-829-6783
Contact_Electronic_Mail_Address: gdillon@fs.fed.us
Metadata_Standard_Name: FGDC Content Standard for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998

Data_Quality_Information:

Lineage:
Process_Step:
Process_Description:
This raster dataset is primarily the product of Random Forest model predictions. The main categories of inputs were as follows:

1. The response variable in Random Forest models was an observation of binary burn severity (severe or not) assembled from approximately 7,000 fires that burned between 1984 and 2007. We derived these burn severity observations from Relative differenced Normalized Burn Ratio (RdNBR) images produced using LANDSAT before and and after image pairs for each individual fire by the Monitoring Trends in Burn Severity project (<http://www.mtbs.gov>).

2. Topographic predictor variables were based on the 30-m National Elevation Dataset (NED) from the US Geological Survey, acquired in the fall of 2009. We derived several topographic indices from the NED, including: percent slope, hierarchical slope position, topographic position index (at different scales), Martonne's dissection coefficient (at different scales), and elevation relief ratio (at different scales).

3. Solar radiation predictor variables were also developed from the NED. They were calculated using a complex model (Solpet6, Alan Flint, USGS) that accounted for changes in sun angle and topographic shading at every 30-m pixel throughout each day of the year. The solar grids produced included: total annual incoming solar radition (max potential), total annual potential evapotranspiration, total growing season incoming solar radiation (max potential), and total growing season potential evapotranspiration.

4. Normalized Differenced Vegetation Index (NDVI). For building the Random Forest model, a pre-fire NDVI was calculated for each individual fire using the LANDSAT pre-fire scene acquired with the MTBS data. For creating a current (2011) spatial prediction, we used MODIS monthly NDVI products at 250m resolution. For each 1 degree x 1 degree latitude/longitude tile, we chose the monthly NDVI for the most common month of fire occurrence for that tile. We also adjusted the distribution of MODIS NDVI values to mtach the statistical distribution of the corresponding LANDSAT NDVI.

5. 1000-hour Fuel Moisture Index. For building the Random Forest model, we calculated the localized 1000-hour fuel moisture index percentile for each of our sample points. The input for this was a set of modeled daily gridded weather variables for 1980 to 2010 from the North American Regional Reanalysis (NARR). The native raster resolution of NARR products is 32km, but we acquired a set that had been downscaled to 4km. W.M. Jolly (USDA Forest Service, Fire Sciences Lab) adjusted the downscaled NARR data to produce potential temperature (i.e., temperature at sea level) and then calculated daily 1000-hour fuel moisture rasters at 4km. We extracted the full daily series at each of our sample pixel locations, then identified the lowest fuel moisture that occurred during the time each fire was burning (within 10 days of fire detection date). From these numbers, we calculated the 1000-hour fuel moisture percentile at the time of burning, specific to each sample location. As low fuel moisture values mean dryer conditions, but most other

fire weather indices (e.g., ERC) express higher fire potential with higher numbers, we flipped our fuel moisture index so that higher percentiles reflect dryer conditions. For creating a current (2011) spatial prediction, we simply set 1000-hour fuel moisture constant across the entire landscape. Therefore, the product associated with these metadata reflects an assumption of 90th percentile (i.e., very dry) 1000-hour fuel moisture index for every pixel.
Process_Date: 2012
Logical_Consistency_Report: None
Completeness_Report: None
