NE – Wildland Fire Management Tools – Fall 2020:

AGENDA:

ANDFIRE

- What is it?
- Why it's important
- Budget (use and not used)
- **NE** Remap and future

LANDFIRE is a program that provides over 20 national geo-spatial layers (e.g. vegetation, fuel, disturbance, etc.), databases, and ecological models that are available to the public for the US and insular areas. Learn more...

FIRE LAND land cover change regional / national use fuel treatments endangered species monitoring budget allocation fire suppression fire management nate - carbon - ecological modeling/research planning active fire wildlife / habitat activities managemer

LANDFIRE ... more than fire



Landscape Fire and Resource Management Planning Tools Project

- Comprehensive
- Consistent
- Compatible

Prescribed Fire

Wildfire

Current

Vegetation









Wildland Fire Leadership Council



Interagency Partnership Work







What is it?

BRIEF DESCRIPTION: LANDFIRE - Landscape Fire and Resource Management Planning Tools, is a multi-partner program producing consistent and comprehensive geospatial data and databases describing vegetation, wildland fuel, and fire regimes for all lands regardless of ownership. LANDFIRE provides a common "all-lands" data set of biological/ecological data for vegetation, land cover, biophysical and wildland fire and fuels data (30 meter pixel geospatial data and databases) across all 50 states and territories.

Human/Natural Disturbance (4+)

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Current Vegetation Type,
Height Cover (3)
```

Potential Vegetation (2)

Surface/Canopy Fuels (8)

Pre-European Fire Regimes/Vegetation Departure (7)

Elevation (3)



Products (Spatial and Non-spatial)

What is it?



LF Remap Work



LF – Data Providers & Data Consumers



LANDFIRE SPONSORS: USDA Forest Service and US Department of the Interior

LF - Remap Improvements

- ۲ Remap ۱۳۰۰ • Process Improvements 4 major areas:
 - Unlimited access to the Landsat archive
 - Better imagery image composites, fewer seamlines,
 - Better map (water, barren) and modeling masks (riparian, alpine)
 - Vegetation Structure and Lifeform
 - Improved plot selection, better base imagery, lidar inputs -> continuous structure
 - Existing Vegetation Type Recently disturbed, WUI, New and improved auto-keys – expert review and feedback
 - Improved processes refined production units... more training data (partnerships)



Data processing (ground plot data with remote sensing data). **Production Flow Chart**

Product Development Flow





Landsat Satellite Imagery is the Foundation for LANDFIRE Products



Image Compositing - Best Pixel Algorithm





non-masked pixels

closest to target date

Non-masked pixel closest to target date and most similar to other pixels chosen for composite

LANDFIRE Reference Database (LFRDB)



Data pulled by LANDFIRE





LF Reference Database (LFRDB) – Data Contributions (775 Sources; Over 1 Million Plots)

- USFS Forest Inventory Analysis (FIA)
- NPS Inventory and Monitoring (I&M) and FFI (Feat/Firemon Integrated)
- NRCS National Resource Inventory (NRI)
- BLM -National Assessment, Inventory, and Monitoring Data (AIM)
- State Natural Heritage Data



Data Contributions by Agency: Percent of all CONUS LFRDB plots accredited to the different agencies.



LFRDB Plot Distribution (National to ReMap)





LFRDB Plot Numbers (National to ReMap by GeoArea)



LFNational Plots
 LFReMAP Plots

Stacked bar graph showing the number of plots we have for each GeoArea. We were able to add a significant amount data to some areas that were underrepresented during LF National.

LF – LFRDB Plot Type (Species Composition, Structure, Occurrence, & Fuels)





Graph showing the percentage of total plots that have information about each data type.



LF – Auto Keys (NatureServe – Regions)





LF – Disturbance Production Flow







LANDFIRE



LANDFIRE



Mapping Methods Existing Vegetation Cover (EVC) and Existing Vegetation Height (EVH)

- Continuous data (10-100m)
- Model
 - Regression Tree using CUBIST algorithm
 - Boundary: aggregate of EPA Level III Ecoregions (Vegetation Production Units) {Omernick}
 - Independent variables
 - Landsat seasonal composites for Spring, Summer, Fall, and Winter
 - tasseled-cap
 - temporal NDVI (5-year maximum, minimum, median, and max-median)

• Training data

- LANDFIRE Reference Database (LFRDB) plots
- Lidar
- NLCD fractional vegetation

Masks

- lifeform (tree, shrub, herb)
- barren and sparse vegetation
- other classes (agriculture, developed land, roads, water, ice/snow)

• Classification (Legend)

- Ecological Systems
- National Vegetation Classification System







LF –2014 Existing Vegetation Cover (EVC) by map zone

CA/NV State Line







LF 2016 Remap - EVC









Compare Existing Vegetation and Fuel Vegetation

FVH 2.0 (Remap)

Example – Existing Vegetation Height (EVH) and Fuel Vegetation Height (FVH)



	Herb Height = 0.4 meter	Tree Height = 17 meters
	Shrub Height = 0.5 meter	Tree Height = 18 meters
	Shrub Height = 0.6 meter	Tree Height = 19 meters
1	Shrub Height = 1.4 meters	Tree Height = 2 meters
	Shrub Height = 2.5 meters	Tree Height = 20 meters
	Sparse Vegetation Canopy	Tree Height = 21 meters
	Tree Height = 1 meter	Tree Height = 25 meters
	Tree Height = 10 meters	Tree Height = 3 meters
1	Tree Height = 11 meters	Tree Height = 4 meters
	Tree Height = 12 meters	Tree Height = 5 meters
2	Tree Height = 13 meters	Tree Height = 6 meters
	Tree Height = 14 meters	Tree Height = 7 meters
1	Tree Height = 15 meters	Tree Height = 8 meters
	Tree Height = 16 meters	Tree Height = 9 meters



EVH 1.4 (2014 Update)







CO

NE



Compare Existing Vegetation and Fuel Vegetation

Example – Existing Vegetation Type (EVT) and Fuel Vegetation Type (FVT)



- EVT Separately maps sparsely vegetated Ecological Systems
- FVT Aggregates sparsely vegetated Ecological Systems (1-9% veg) and includes Barren (0% veg)







Satellite image of the Ranch Fire on August 15, 2018.

Ranch Fire – CA.



Figure 1: Ranch Fire First 5 Day Progression Figure 1 exhibits the Ranch Fire progression from midafternoon on July 27, 2018 to 2300 hours on July 31, 2018



Figure 9: LF Remap July 27, 2018 thru July 31, 2018 Simulated Perimeters LF Remap LCP 4-day simulated perimeter over the actual Ranch Fire progression (dark lines).



Figure 5: LF 2014 5-Day Simulation July 27, 2018 thru July 31, 2018 Perimeters LF 2014 LCP 4-day simulated perimeter over the actual Ranch Fire progression (dark lines).



LF – Data Providers & Data Consumers



LANDFIRE SPONSORS: USDA Forest Service and US Department of the Interior



POWERED BY LANDFIRE WFDSS, IFTDSS, FMSF, landscape assessment, analysis, research, planning, monitoring, management, restoration/rehabilitation, performance measures, and provides key data for risk mapping and hazard analysis that are critical for wildland fire management.

Data to provide information for fire projections with elements such as:

- what the flame lengths may be,
- what the fire rate of spread may be,
- how the fire progression might play out on the landscape,
- fire probability information on where fires will reach locations across a landscape,
- when a fire would transition from a surface fire to a crown fire (e.g. height to live crown)



Why is it Important? *Risk Assessments*



Fire, Fuel, Smoke Science Program Rocky Mountain Research Station nt of Arrico GENERAL RESEARCH APPS & PRODUCTS 👻 CHARTERED PROGRAMS 👻

Application of the Wildfire Risk Assessment Framework

U.S. FOREST SERVICE

USDA

HOME

Home

In 2015, FMI analysts continued to be involved with application of a wildfire risk assessment framework developed largely by RMRS scientists from both the Fire, Fuel, and Smoke Science Program and the Human Dimensions Program. The risk assessment framework provides a means to assess the potential risk posed by wildfire to specific highly valued resources and assets (HVRAs) across large landscapes. It also provides a scientifically-based foundation for fire managers to think strategically and proactively about how to best manage fire and fuels on their landscapes in a way that integrates with broader land and resource management goals

At the national scale, Spatial Fire Analyst Greg Dillon continued work on an assessment of wildfire risk across all National Forest System lands in the contiguous U.S. In January 2015 Dillon completed draft calculations of a risk metric called Net Value Change (NVC), but final results are pending completion of new and improved wildfire simulation results.

Interestingly, while providing GIS support to the Northern Rockies Multi-Agency Coordination Group in August, Dillon was able to use the draft national NVC map to demonstrate the potential usefulness of risk assessment products a wildfire incident management and resource prioritization context

At the local scale, Dillon, along with Fire Behavior Specialist LaWen Hollingsworth and Ecologist Brett Davis has helped the Lolo National Forest and Bitterroot National Forest make significant progress toward completing risk assessments. In March they helped facilitate a successful workshop with fire managers and resource specialists from both forests to discuss the effects of fire on various resources and assets on the ground. In July, they participated in a workshop led by the TEAMS Enterprise Team to calibrate LANDFIRE fuels data for both forests to improve subsequent wildfire modeling. Lastly, in October, they participated in a series of meetings with fire managers and Forest Leadership Team members from both forests to facilitate the assignment of relative priorities to their resources and assets.

Also in 2015, FMI analysts, along with others from the RMRS Wildland Fire Management RD&A; Fire, Fuel, and Smoke Science Program; and Human Dimensions Program, presented material at two successful workshops for outreach and information sharing about risk assessment concepts and methods. The first was a Wildfire Risk and Fuel Treatment Analysi

SOUTHERN

attendees and an additional 50+ on-line pa Department of Interior Office of Wildland Fi General. Recordings of all sessions from th http://nrfirescience.org/event/wildfire-risk-July, was a workshop on synthesizing risk a revision, attended by approximately 25 peo



We specialize in Complete Wildfire Analysis: Hazard and Risk Assessme Fuel Inventory and Management, and Exposure Analysis.

Funding Contribu USFS Fire and Aviation Management,

WILDFIRE RISK ASSESSMENT PORTAL



Are You At Risk?

TIMMONS GROUP

SERVICES - PROJECTS - NEWS & EVE

COLORADO WILDFIRE RISK ASSESSMENT PORTAL



PROJECT SUMMARY

At a Glance

with the Colorado State Forest Service, Timmons Group has based wildfire risk information portal called CO-WRAP as Assessment Portal). The primary focus of CO-WRAP is to







PROFESSIONAL VIEWER

WILDFIRE RISK ASSESSMENT PORTAL









Data Use Examples – Wildfire Hazard Potential

Wildfire Hazard Potential Relative potential for wildfire

- Difficult to contain fires (past fire occurrence)
- Higher WFP values = increased probability of high-intensity fire
- LANDFIRE data provides canopy height, canopy cover, and canopy base height (critical data for this analysis).





Data Use Examples – Decision Support



WFDSS – Wildland Fire Decision Support System

Fire managers and analysts use LANDFIRE data in strategic and tactical decisions for fire incidents and line officers review and make decisions









Flame Length Modeling without accounting for Changes due to Fuels Treatments or Wildfire

Landscape Fire Behavior run at 97th percentile weather using the closest RAWS station (Quincy, CA.)

Proposed Treatment Mechanical Thinning: Reduce Canopy Cover Reduce Canopy Density Increase Canopy Base Height



Model fire behavior across large landscapes: Landscape Fire Behavior at the pixel level (FLAMMAP)





Model fire behavior across large landscapes: Landscape Burn Probability (FLAMMAP)





Eastern Mass-90m

- Name: Eastern Mass-90m
- · Owner: caroline
- Created: Sep 22, 2019 8:33:55 AM
- · Landscape: Eastern Mass
- · Status: Completed
- Model Type: Landscape Burn Probability
- · Wind Type: Gridded Winds
- · Wind Speed: 25
- Wind Direction: 225
- · Crown Fire Method: Scott/Reinhardt
- · Foliar Moisture: 100

Fuel Moisture Conditioning

· Conditioning: Off - Initial fuel moisture used

Initial Fuel Moistures

- · Fuel Model: All
- 1hr FM: 6
- 10hr FM: 7
- 100hr FM: 12
- Herbaceous FM: 90
- Woody FM: 110

Completed Fire Summary

- Number of fires run: 161155
- Number of fires failed: 0
- Percent burnable cells burned: 97.7 %



Wny is it is







Existing Conditions Treated Mean Conditional Flame Length **Mean CFL** HVRA Mean BP Mean CFL Mean BP 8.2 Infrastructure 0.0230 0.0199 7.6 Communities 0.0233 0.0286 11.1 9.7 0.0230 0.0278 11.9 10.8 Air Quality **Drinking Water** 0.0271 12.0 0.0227 10.8 **Ecosystem Function** 0.0278 0.0230 10.7 11.7





Why is it Important? **Performance Measures** AVOIDED COST MEASURE-FULL FIRE BEHAVIOR MITIGATION MEASURE **CONCEPTUAL BASIS** CONCEPT Simulated fire Within treated areas, Withrice. (encountered treatments removed) higher intensity may Encountered. increase segacts to Treatments Treatment some values in Foot-treatment absence of permisent condition Untreased Target Area Fael model change (fuel model-FM) Reduced flame length and/or apected flame length and/or rate-of-spread @ reference conditions ate-of-spread @ reference conditions. Larger fire in absence of treatment surv reach. ("Reference Conditions" - fuel maintures, slope, etc.) - Veluss-st-Rink addrigani values, with itterant degrees of team Aggregate over all (or all sampled) treatments for DOI measure Degrees of Inspect Name Fire Behavior mitigation (can't be done all lands without LF) Simulated fire (can't be done all lands without LF)

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Non-fire examples / applications Supporting the mission ----

WEB-HOSTED APPLICATION MAP PROJECTS - Updated June 2018 http://maps.tnc.org/landfire/

The LANDFIRE Web-Hosted Applications Map (WHAM!) is an online, interactive map that calls up many of the applications, their locations, and the partners we work with. This table comprises the list of applications on the WHAMI by geographical location. Need more? Write to landfire@tnc.org.

Project	Description It is important to review the major fires in a region to help the public and fire professionals understand the situation more completely. A great deal of information about what happened is available, but rarely does everyone see post-fire information on burn severity or comparisons between fires. This report is an attempt to fill the need for a concise, timely publication that summarizes the season's fire details in the Southwest, and compares the major fires and demonstrates regional trends from this past fire season. LANDFIRE EVT and VCC were key components of the analysis. Holden et al. observed, due to fire severity, the responses of soil microbial biomass, the carbon dioxide release of those microbes, and how fungus environments are affected from these fires. LANDFIRE EVT data helped inform their work.		project environmental impact assessment.		
2013 Wildfire Season Overview: Southwestern U.S.		California: Assessing Wildfire Risks Close to Dwellings and Examining Fuel Management Techniques on US Forest Service Land in the Sierra National Forest	Using a LANDFIRE fire modeling landscape file, <u>Scott et al</u> <u>explored the effectiveness of fuel treatment procedures</u> wildland urban interface (WUI) within close proximity to national forest land and looked at the threat of fire sprea from the ignition location, or risk transmission, and finall explored alternate fuel management procedures and		
		Conservation Forecasting	In September 2007, the Bureau of Land Management's Bishop Field Office entered into a cooperative agreement with The Nature Conservancy to develop a conservation		
Alaska: Microbial Responses to Fire in Boreal Forests			action plan using Landscape Conservation Forecasting methods. Approximately 200,000 acres in <u>California's Bo</u> <u>Hills and northern Mono Basin</u> are in the study area. LANDFIRE data and models were used to compare current		
Alaska: Seward Peninsula-Nulato Hills-Kotzebue Lowlands Rapid Ecoregional Assessment	The Bureau of Land Management in conjunction with NatureServe is conducting a Rapid Ecoregional Assessment for the Seward Peninsula, Nulato Hills, and Kotzebue Sound Lowlands Ecoregions in Alaska. The goals are to understand the ecoregions' existing conditions and to determine how the regions might respond to ongoing environmental changes and land use demands. LANDFIRE products, including vegetation type and vegetation dynamics models, are being used along with other data sets to answer these questions. Fleishman et al. discuss how the measurable effects of climate change such as increasing temperatures and aridity as well as earlier snowmelt and peak streamflow will affect geographic species distribution, land cover and types, phenological cycles of the ecosystem, and changes in disturbances regimes. Authors used LANDFIRE Existing: Vegetation Type data to mask out non-forested or non- woodland ecosystems for assessment of wildfires. Powered by:		help land managers make decisions based on best return investment scenarios.		
		California: Effectiveness of Fuels Treatments in the Context of Climate Change	In the study <u>Assessing Fuels Treatments in Southern</u> <u>California National Forests in the Context of Climate Change</u> Brown and others modeled fire behavior using LANDFIRE fuels layers to test the effectiveness of six fuel treatments under projected future extreme fire weather.		
Arizona: Assessment of Climate Change in the Southwest United States		California: Fire Frequency in California	This project was designed to generate a current, comprehensive summary of pre-settlement fire frequency estimates for California ecosystems that are dominated by woody plants, and then develop a foundational fire return interval departure (FRID) mapping and analysis report. LANDFIRE Biophysical Setting information provided the framework for the analysis.		
		California: Bobcat Habitat Fragmentation	The impact of habitat fragmentation on the functional connectivity in bobcat populations in coastal southern California was investigated by E.W. Ruell et al. and reported in American Midland Naturalist, 2012, Land-use dataset and		

Arkansas: Shortleaf Pine Restoration Monitoring

Arkansas: Simulating Treatment

Ouachita Mountains

Effects in Pine- Oak Forests of the



to monitor progress towards this desired ecological condition. In their extended abstract, Simulating Treatment Effects in Pine-Oak Forests of the Ouachita Mountains, Shlisky and others describe how a LANDFIRE vegetation dynamics model for pine-oak forest was adapted for the Ouachita National Forest, AR to demonstrate the use of the models in project planning and creating "what if" scenarios to supplement n ie. ts n

vegetation cover data were supplied by LANDFIRE.

The goal of the Short Leaf - Bluestem Community Project,

funded by the Collaborative Forest Landscape Restoration Program (CFLRP), is to restore large swaths of shortleaf pine-bluestem habitat on the Ouachita National Forest. The

desired condition for this habitat includes mature pine trees and scattered oak with an understory of bluestern grasses

and other prairie species. LANDFIRE and other data are used



DOI Fire Budget - Greenbook







BUDGET The United States Department of the Interior

and Performance Information Fiscal Year 2018

WILDLAND FIRE MANAGEMENT





Budget History

- FIREPRO
 - many resources and values were non-market and difficult to quantify in dollars
 - Use by NPS and FWS
- National Fire Management Analysis System (NFMAS)
 - Most Efficient Level {percentage breakouts}
 - Use by BIA, BLM, USFS
- FPA (Fire Program Analysis)
 - Retired / Transition components into WFIPS (Wildland Fire Investment Planning System) at FS Firelab.
- Recent DOI
 - Risk Based Wildland Fire Management (RBWFM)
 - Aligned with current state of wildfire risk science
 - Expected Value Acres Burned (EVAB)
 - geo-analysis process and modeling
 - Deputy Secretary Connor Memo





DOI Fire Budget - Greenbook





Wildland Fire Management									
(Dollars in Thousands)									
(around an a nonsound)									
				Internal	Program				
	2016	2017 CR	Fixed Costs	Transfers	Changes	2018			
Appropriation: Wildland Fire Management 14X1125	Actual	Baseline	(+/-)	(+/-)	(+/-)	Request			
Preparedness	323,685	323,070	+5,051		-5,942	322,179			
Fixed Costs			[+5,051]						
Reduce Personnel and Firefighting Assets					[-5,942]				
Suppression Operations	291,673	291,118			+98,288	389,406			
2010 FLAME Transfer	+/1,000				C . 00 0000				
Adjust for Change m 10-Year Suppression Average					[+98,288]				
Fuels Management	170.000	169 677	+1 975		22.086	149.466			
Final Costs	170,000	105,077	[+1,875]		-22,000	145,400			
Eliminate Resilient Landscapes Program			[11,075]		[-10.000]				
Reduce Fuels Treatment Canacity					[-12,086]				
reducer dels ricultari capacity					[-12,000]				
Other Operations	31,387	31,327			-18,860	12,467			
Burned Area Rehabilitiation (BAR)	18,970	18,934			-9,467	9,467			
Decrease Capacity (acres treated)					[-9,467]				
Facilities Construction and Maintenance	6,427	6,415			-6,415	0			
Eliminate Program					[-6,415]				
Joint Fire Science Program	5,990	5,978			-2,978	3,000			
Decrease Research and Delivery Capacity					[-2,978]				
TOTAL, Wildland Fire Appropriation	887,745	815,192	+6,926	0	+51,400	873,518			





Preparedness Allocations by Bureau











Fuels Allocations by Bureau











Forest Service Fuels Allocation

- Fire and Aviation Management (FAM) is part of State And Private Forestry (S&PF)
- Fire Funding includes:
 - Suppression
 - Prevention
 - Preparedness
 - Hazardous Fuels for NFS lands
 - <u>Transferred to states for treatment of non-FS lands</u>
- S&PF Grants
 - State Fire Assistance (SFA)
 - Volunteer Fire Assistance (VFA)





How Does LF influence Budget?

- Terms you may hear:
 - Fireshed or Fireshed Registry
 - Quantitative Wildfire Risk Assessment (QWRA)
 - Wildfire Risk to Communities (wildfirerisk.org)
 - Wildfire Hazard Potential (WHP)
 - Strategic Investment Planning

All these processes use some form of LANDFIRE data. National applications – LF data is out-of-the-box. For local use, the LF data is often calibrated first.

- Shared Stewardship = an agreement between state government and the federal government to share data, resources, and priorities to better coordinate actions.
- USDA Evidenced-Based Decision-Making



FS Hazardous Fuels Allocation

From Washington Office to the Regional Offices to the Forest Unit Offices

FireShed Registry







Wildfire Risk to Communities

www.wildfirerisk.org

You can set scale to state or national







Future⁷ LANDFIRE Annual Disturbance Mapping Annual Update Planning - Example



- For LANDFIRE Annual Disturbance mapping Landsat imagery is processed using several methods to help identify vegetation disturbances
- The result of this work is to develop the Annual Disturbance product (yellow). The areas in red were determined by the analysts to be falsely identified vegetation change



LANDFIRE Webinar

LANDFIRE Remap for the Northeastern United States



Webinar focused on the NE with the Forest Guild October 21, 2020



NE – Wildland Fire Management Tools – Fall 2020:

<u>AGENDA:</u>

ANDFIRE

- What is it?
- Why it's important
- Budget (use and not used)
- NE Remap and future

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Land cover change endangered species monitoring climate - carbon - ecological modeling/research wildlife / habitat activities habitat activ

LANDFIRE ... more than fire



Vegetation

LANDFIRE

Landscape Fire and Resource Management Planning Tools Project

Comprehensive Consistent

Compatible Current

Wildfire







Wildland Fire Leadership Council



Interagency Partnership Work





