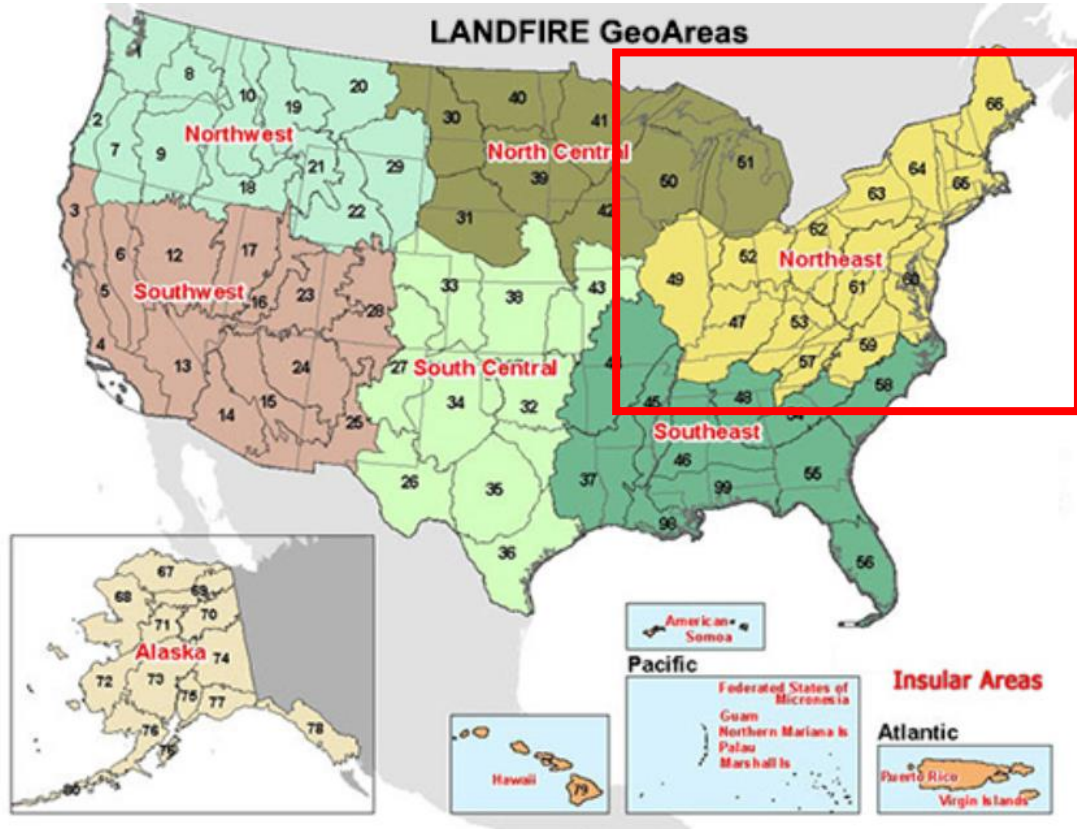


LANDFIRE Webinar

LANDFIRE Remap for the Northeastern United States



Hosted by North Atlantic Fire Exchange
Randy Swaty and Jim Smith, TNC LANDFIRE Team
Inga La Puma, LANDFIRE Technical Lead KBR

Agenda

The Foundation

The Present

The Future

Northeast
Results

Feedback and
Learn More



What is LANDFIRE?

An interagency/multi-partner program designed to create and periodically update comprehensive **vegetation**, **fire**, and **fuel** characteristics data using a consistent process for the entire U.S.

The primary partners in the LANDFIRE Program are:

US Forest Service Fire and Aviation Management
US Department of the Interior Office of Wildland Fire
The Nature Conservancy North America Region
USGS EROS Data Center



Past: The LANDFIRE Foundation

LANDFIRE Charter establishes 4-C's:

- **Comprehensive**
- **Compatible**
- **Current**
- **Consistent**

.... which are our design criteria/design constraints for

20+ current and historic vegetation/fuels/condition 30m, spatial data layers and 800+ quantitative state-and-transition BpS models and descriptions.

Delivered versions circa 2000/1 (LF National/Improved), updates in 2008, 2010, 2012 and 2014, and now **LF Remap**

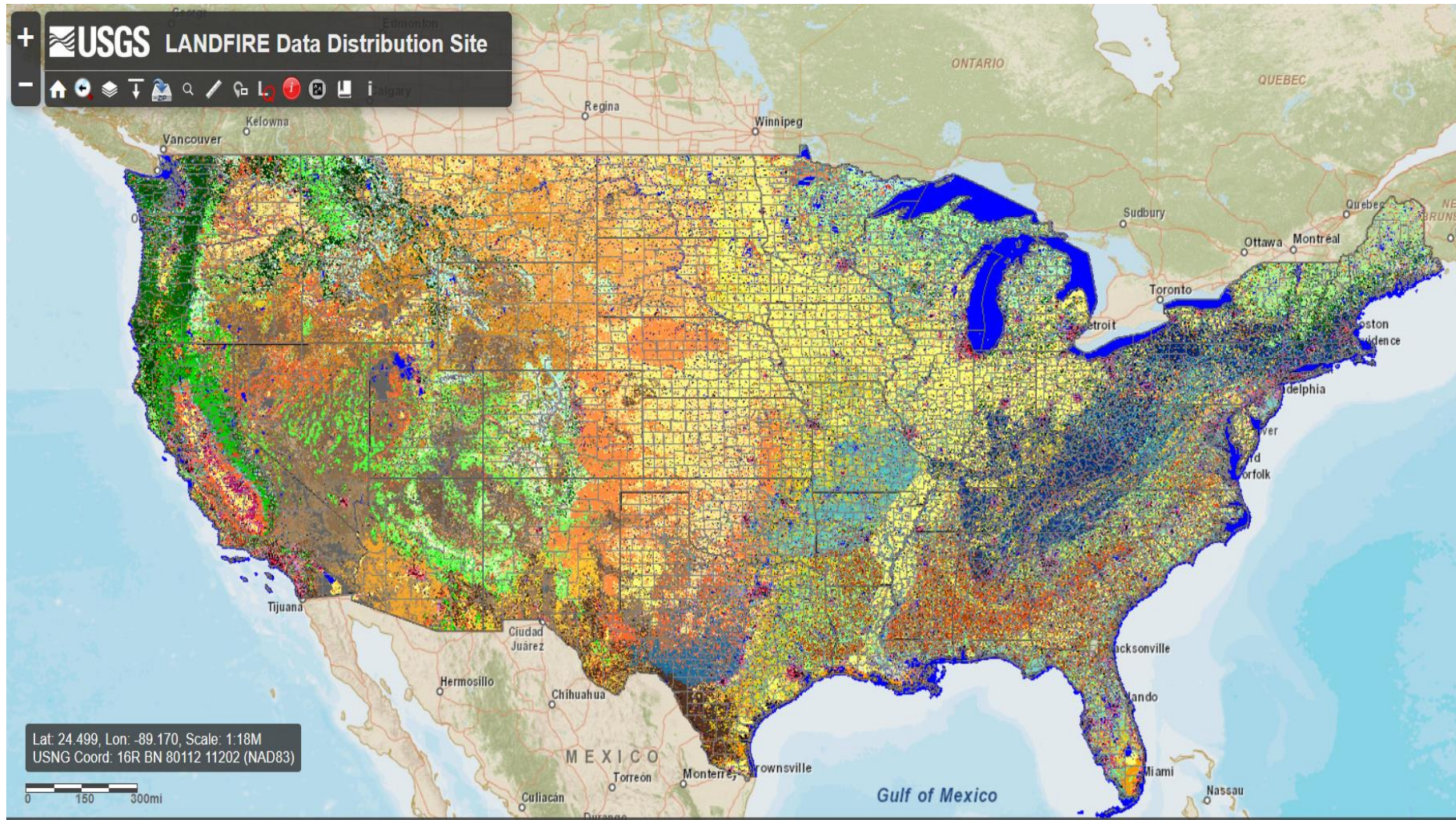


Past: The LANDFIRE Foundation

PRODUCT NAME	ABBREV	THEME	DDS	LF 2001 LF 1.0.5	LF 2008 LF 1.1.0	LF 2010 LF 1.2.0	LF 2012 LF 1.3.0	LF 2014 LF 1.4.0	LF REMAP LF 2.0.0
LF Reference Database	LFRDB	Reference	--	US AK HI	n/c	n/c	n/c	n/c	o
Public Events Geodatabase_1999_YEAR		Reference	x	--	US AK HI	US AK HI	US AK HI	US AK HI	US AK HI
Forest Vegetation Simulator Ready Database	FVSRDB	Reference	--	--	--	--	US AK HI	--	--
Disturbance	DistYear	Disturbance	x	--	US AK	US AK	US AK HI	US AK HI	US AK HI
Vegetation Disturbance	VDistYear	Disturbance	x	--	US AK HI	US AK HI	US AK HI	US AK HI	--
Historical Disturbance	HDist	Disturbance	--	--	--	--	--	--	US AK HI
Vegetation Transition Magnitude	VTMYear	Disturbance	x	--	--	US AK	US AK HI	US AK HI	--
Forest Vegetation Transitions Database	FVTDB	Disturbance	--	--	--	--	US AK HI	n/c	--
Non-forest Vegetation Transitions Database	NFVTDB	Disturbance	--	--	--	--	US AK HI	n/c	--
Fuel Disturbance	FDistYear	Disturbance	x	--	US AK HI	US AK HI	US AK HI	US AK HI	US19 US20 AK HI
Forest Vegetation Simulator Disturbance Database	FVSDDB	Disturbance	--	--	--	--	US AK HI	n/c	--
Biophysical Settings	BPS	Vegetation	x	US AK HI	US AK HI	US AK HI IA	US AK HI	US AK HI	US AK HI
Environmental Site Potential	ESP	Vegetation	x	US AK HI *	n/c	US AK HI	n/c	n/c	--
Existing Vegetation Cover	EVC	Vegetation	x	US AK HI	US AK HI	US AK HI IA	US AK HI	US AK HI	US AK HI
Existing Vegetation Height	EVH	Vegetation	x	US AK HI	US AK HI	US AK HI IA	US AK HI	US AK HI	US AK HI
Existing Vegetation Type	EVT	Vegetation	x	US AK HI	US AK HI	US AK HI IA	US AK HI	US AK HI	US AK HI
National Vegetation Classification	NVC	Vegetation	--	--	--	--	--	--	US AK HI
Biophysical Settings Models and Descriptions	BpS	Vegetation	--	BpS_Models	n/c	n/c	n/c	n/c	--
13 Anderson Fire Behavior Fuel Models	FBFM13	Fuel	x	US AK HI	US AK HI	US AK HI IA	US AK HI	US AK HI	US19 US20 AK HI
40 Scott and Burgan Fire Behavior Fuel Models	FBFM40	Fuel	x	US AK HI	US AK HI	US AK HI IA	US AK HI	US AK HI	US19 US20 AK HI
Canadian Forest Fire Danger Rating System	CFDRS	Fuel	x	--	--	AK	AK	AK	o
Forest Canopy Bulk Density	CBD	Fuel	x	US AK HI	US AK HI	US AK HI IA	US AK HI	US AK HI	US19 US20 AK HI
Forest Canopy Base Height	CBH	Fuel	x	US AK HI	US AK HI	US AK HI IA	US AK HI	US AK HI	US19 US20 AK HI
Forest Canopy Cover	CC	Fuel	x	US AK HI	US AK HI	US AK HI IA	US AK HI	US AK HI	US19 US20 AK HI
Forest Canopy Height	CH	Fuel	x	US AK HI	US AK HI	US AK HI IA	US AK HI	US AK HI	US19 US20 AK HI
Fuel Characteristic Classification System Fuelbeds	FCCS	Fuel	x	US AK HI	US AK HI	--	--	US AK HI	US AK HI
Fuel Loading Models	FLM	Fuel	x	US AK	US AK	--	--	--	--
Fuel Vegetation Cover	FVC	Fuel	--	--	--	--	--	--	US19 US20 AK HI
Fuel Vegetation Height	FVH	Fuel	--	--	--	--	--	--	US19 US20 AK HI
Fuel Vegetation Type	FVT	Fuel	--	--	--	--	--	--	US19 US20 AK HI
Fuel Rulesets Database	--	Fuel	--	--	--	US AK HI	US AK HI	US AK HI	o
Fire Regime Groups	FRG	Fire Regime	x	US AK HI	n/c	US AK HI	n/c	n/c	Δ
Mean Fire Return Interval	MFRI	Fire Regime	x	US AK HI	n/c	US AK HI	n/c	n/c	Δ
Percent Low-severity Fire	PLS	Fire Regime	x	US AK HI	n/c	US AK HI	n/c	n/c	Δ
Percent Mixed-severity Fire	PMS	Fire Regime	x	US AK HI	n/c	US AK HI	n/c	n/c	Δ
Percent Replacement-severity Fire	PRS	Fire Regime	x	US AK HI	n/c	US AK HI	n/c	n/c	Δ
Succession Classes	SClass	Fire Regime	x	US AK HI	US AK HI	US AK HI	n/c	US AK HI	US AK HI
Vegetation Condition Class**	VCC	Fire Regime	x	US AK HI	US AK HI	--	US AK HI	US AK HI	US AK HI
Vegetation Departure Index**	VDep	Fire Regime	x	US AK HI	US AK HI	--	US AK HI	US AK HI	US AK HI
Aspect ***	ASP	Topographic	x	n/c	n/c	US AK HI IA	n/c	n/c	US AK HI IA
Elevation ***	DEM	Topographic	x	n/c	n/c	US AK HI IA	n/c	n/c	US AK HI IA
Slope ***	SLP	Topographic	x	n/c	n/c	US AK HI IA	n/c	n/c	US AK HI IA



Present: LF Remap



LF Remap – What Remains the Same?

LANDFIRE Program has the **same design criteria/constraints**: comprehensive, compatible, consistent and current.

The **basic product suite is the same**, but there are changes to mapping processes and thematic content intended to improve product usability.

Should still be considered a large landscape, regional, national data set as delivered out-of-the-box.



LF Remap – What's New?

- Mapping footprints based on **Omernik Level III** ecoregions instead of NLCD Map Zones.
- New **compositing/tiling/masking methods** that provide an improved and more consistent image base.
- New, **improved plot “Auto-Keys”** for assigning vegetation type to field plots.
- Landsat 8 imagery and Landsat Analysis Ready Data Sets (**image stacks**).
- Included **external review** of the Existing Vegetation Type legend and draft products.
- Experience/Feedback

LF Remap – What's New?

- Many more **field-plots** and more diverse field-plots to support mapping.
- Incorporation of **lidar** data sets to improve the thematic resolution of structure products.
- Review of **Biophysical Settings** models and descriptions.
- **New products**: Historic disturbance, Year-Capable Fuels Products.
- New, **backwardly compatible** Fire Regime Group schema.

New Fire Regime Group Schema

Original Fire Regime Group	New Group Designation	All Fire Fire Return Interval	% Replacement Fire
I	I-A	0 - 5 years	Less than 66.7%
	I-B	6 - 15 years	
	I-C	16 - 35 years	
II	II-A	0 - 5 years	66.7% or greater
	II-B	6 - 15 years	
	II-C	16 - 35 years	
III	III-A	36 - 100 years	Less than 80%
	III-B	101- 200 years	Less than 66.7%
IV	IV-A	36 - 100 years	80% or greater
	IV-B	101- 200 years	66.7% or greater
V	V-A	201 to 500 years	Any severity
	V-B	501+ years	

LF Remap Quality

- EVT assessments for Ecological Systems, NVC Group, NVC Macrogroup, and SAF/SRM cover type
- ~10,000 independent assessment plots in NE
- Traditional Contingency Table

LANDFIRE	7302 Laurentian-Acadian Northern Hardwoods Forest	7303 Northeastern Interior Dry-Mesic Oak Forest	
7247 Southern Appalachian Grass Bald	0	0	
7248 Northern Atlantic Coastal Plain Dune and Swale Grassland	0	0	
7249 Atlantic Coastal Plain Peatland Pocosin and Canebrake Shrubland	0	0	
7289 Acadian-Appalachian Subalpine Heath-Krummholz	0	0	
7302 Laurentian-Acadian Northern Hardwoods Forest	235	1	
7303 Northeastern Interior Dry-Mesic Oak Forest	1	291	
7304 Ozark-Ouachita Dry-Mesic Oak Forest	0	0	
7305 Southern Interior Low Plateau Dry-Mesic Oak Forest	0	0	
7306 East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland	0	0	

Category	A	B	C	D	E	Col Total
A	5	0	2	5	0	12
B	3	6	1	0	2	12
C	0	1	5	0	2	8
D	1	2	3	6	3	15
E	0	2	0	3	5	10
Row Total	9	11	11	14	12	57

Sum of major diagonal: 27
Overall Agreement: 47%

Category	A, C	B	D, E
A, C	5+0+2+5	D+1	5+0+0+2
B	3+1	6	0+2
D, E	1+0+3+0	2+2	6+3+3+5

Add the cell values from combined rows and columns

Category	A, C	B	D, E	Col Total
A, C	12	1	7	20
B	4	6	2	12
D, E	4	4	17	25
Row Total	20	11	26	57

Sum of major diagonal: 35
Overall Agreement: 61%

- Example of how to collapse categories in the contingency table now included

LF Remap Quality

- Category Agreement Table

EVT_Name	Data_Source	Row Total (pixels)	% of Row Pixels	Row Agreement	Primary Within Row Mismatch	Secondary Within Row Mismatch	Tertiary Within Row Mismatch
Laurentian-Acadian Pine-Hemlock Forest	LANDFIRE LFRDB	219	2.0%	52.05%	7362 Laurentian-Acadian Northern Pine Forest; 23 Incorrect Pixels	9185 Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp; 17 Incorrect Pixels	7302 Laurentian-Acadian Northern Hardwoods Forest; 12 Incorrect Pixels
Northern Atlantic Coastal Plain Maritime Forest	LANDFIRE LFRDB	75	0.69%	52.0%	7324 Northern Atlantic Coastal Plain Hardwood Forest; 16 Incorrect Pixels	7248 Northern Atlantic Coastal Plain Dune and Swale Grassland; 5 Incorrect Pixels	7522 Northern Atlantic Coastal Plain Heathland; 4 Incorrect Pixels
Southern Piedmont Mesic Forest	LANDFIRE LFRDB	160	1.46%	51.88%	7368 Southern Piedmont Dry Pine Forest; 42 Incorrect Pixels	9259 Southern Piedmont Small Floodplain and Riparian Forest; 21 Incorrect Pixels	9315 Northern & Central Native Ruderal Forest; 7 Incorrect Pixels
South-Central Interior Mesophytic Forest	LANDFIRE LFRDB	496	4.53%	50.81%	7305 Southern Interior Low Plateau Dry-Mesic Oak Forest; 49 Incorrect Pixels	7318 Southern and Central Appalachian Cove Forest; 43 Incorrect Pixels	7370 Appalachian Hemlock Forest; 35 Incorrect Pixels
Central and Southern Appalachian Montane Oak Forest	LANDFIRE LFRDB	257	2.35%	50.58%	7318 Southern and Central Appalachian Cove Forest; 26 Incorrect Pixels	7315 Southern Appalachian Oak Forest; 24 Incorrect Pixels	7309 Southern Appalachian Northern Hardwood Forest; 19 Incorrect Pixels

- We are hoping to perform a statistical assessment of Vegetation Cover (EVC) and Vegetation Height (EVH), and perhaps FBFM.

LANDFIRE Future

- Remap 2016 is complete for CONUS and Hawai'i, and Alaska and the island territories are underway.
- Because “remapping” is more expensive than “updating,” we may not be able to conduct another remap in the future.
- The goal is to find a way to provide more frequent updates (annually, delivered within a few months) with decreased latency.

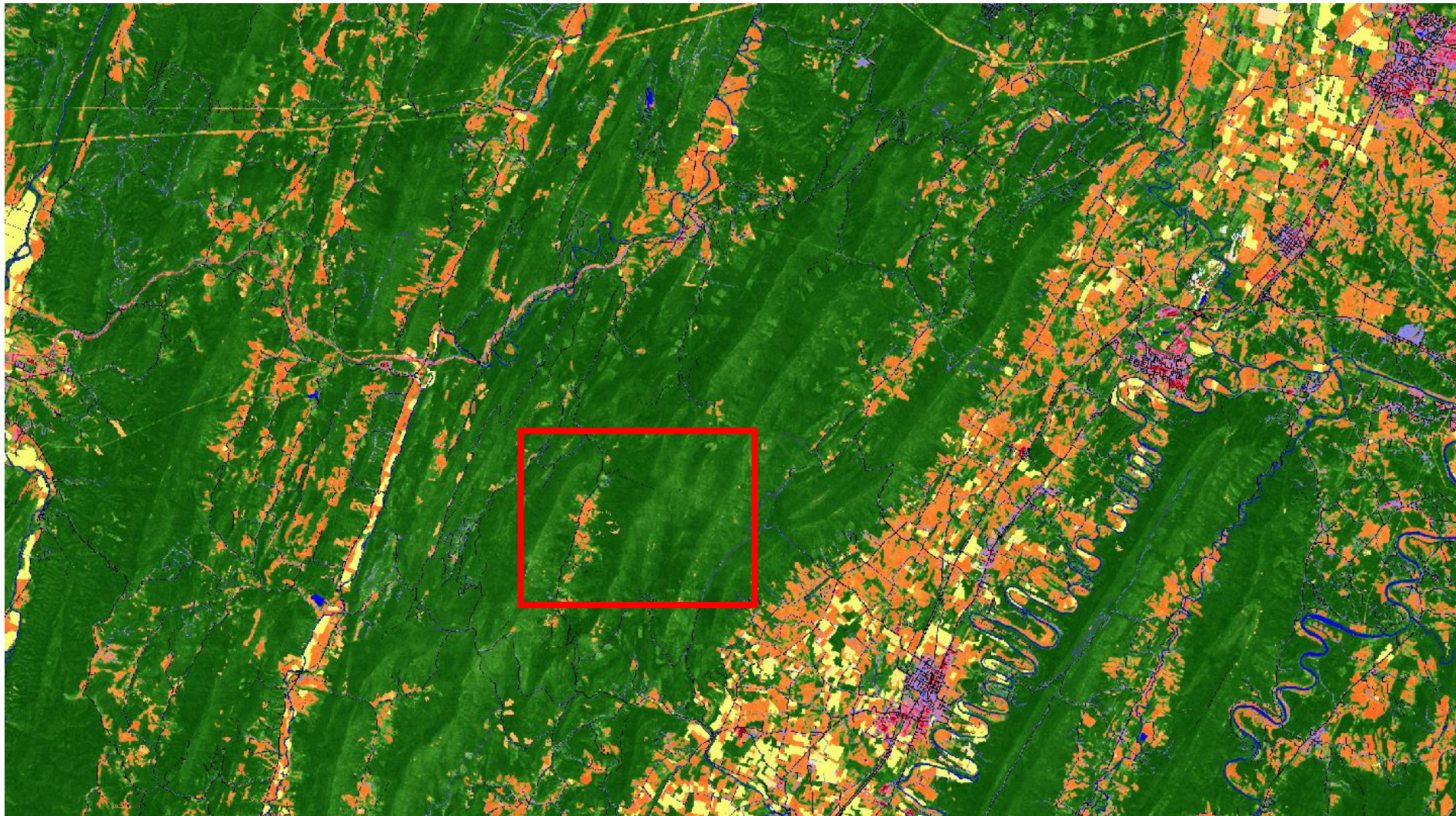
A photograph of a forest path in autumn. The path is covered in fallen yellow and brown leaves. The trees are tall and thin, with some yellowing leaves. The text "Northeast Results" and "Changes and Improvements" is overlaid in white. The background shows a dense forest with trees in various stages of autumn color, from green to yellow and brown. The path is a narrow, unpaved road that leads into the woods. The lighting is soft, suggesting an overcast day. The overall mood is serene and natural.

Northeast Results
Changes and Improvements

Improved Structure Thematic Resolution

Product	Lifeform	Categories	
		LF 2014	LF Remap
Existing Vegetation Height	Tree	5 multi-meter bins	1 meter bins
	Shrub	4 categories	0.1 meter bins
	Herb	3 categories	0.1 meter bins
Existing Vegetation Cover	Tree	10% bins	1% bins
	Shrub	10% bins	1% bins
	Herb	10% bins	1% bins

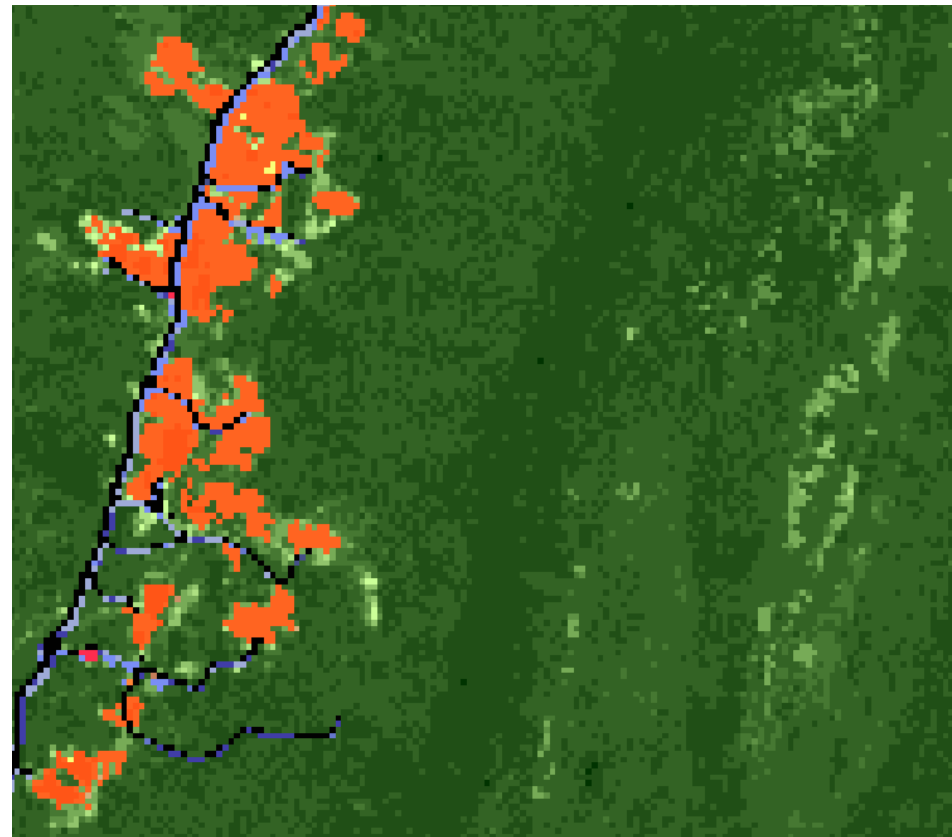
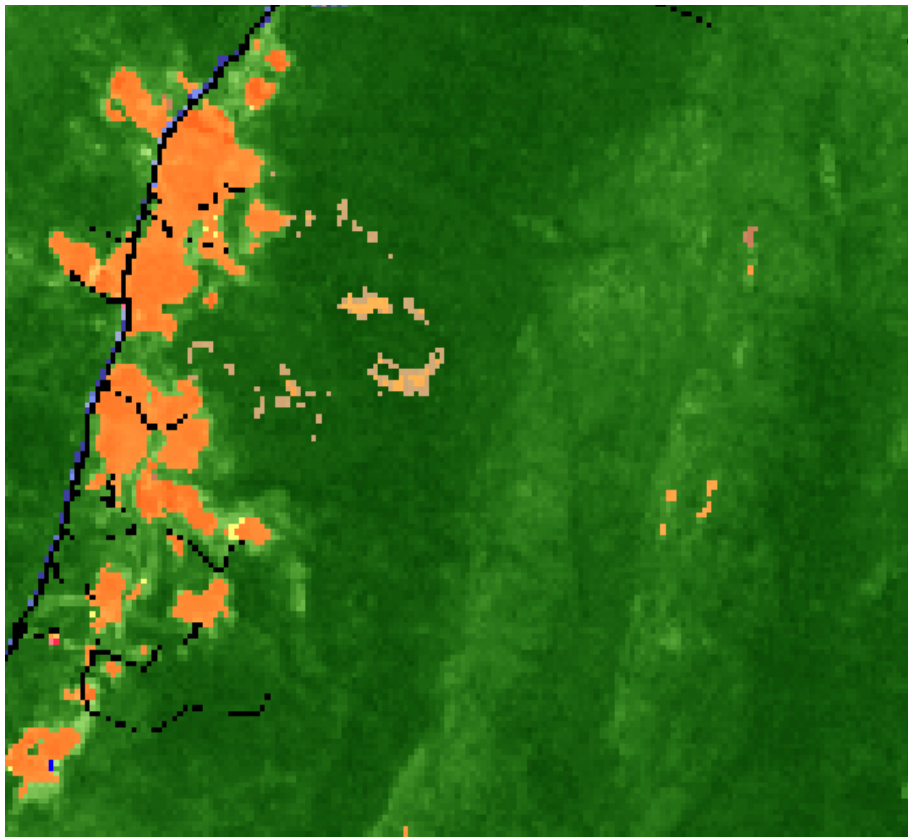
LF Remap—Northern Virginia



Existing Vegetation Cover

LF Remap

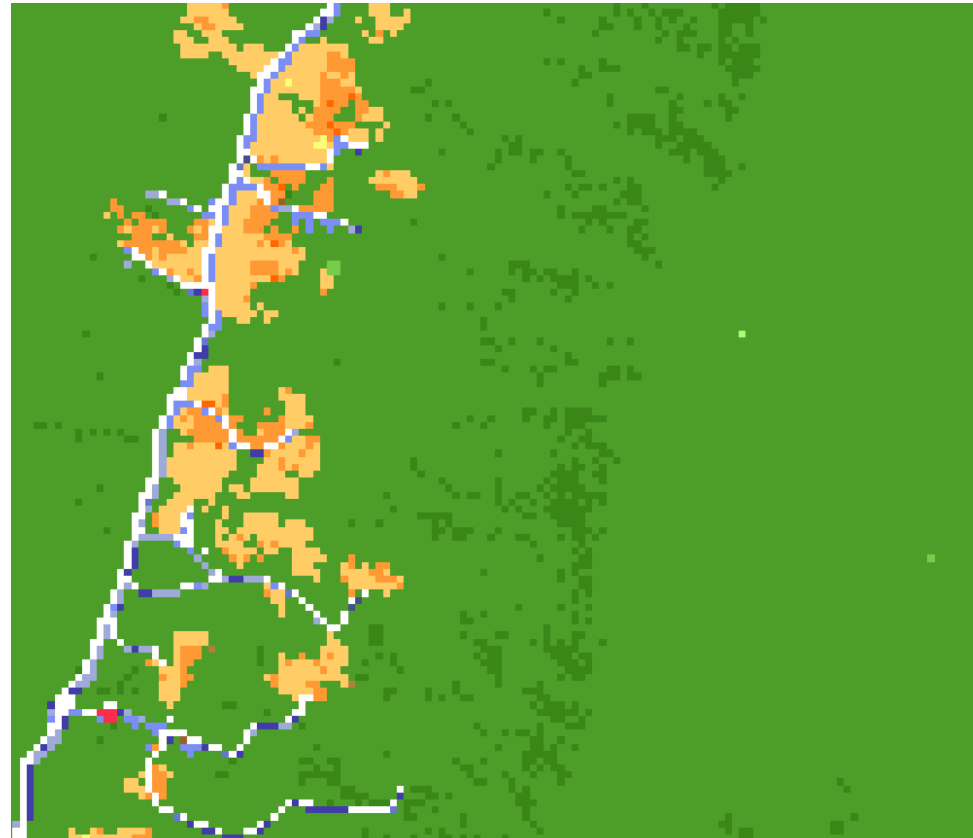
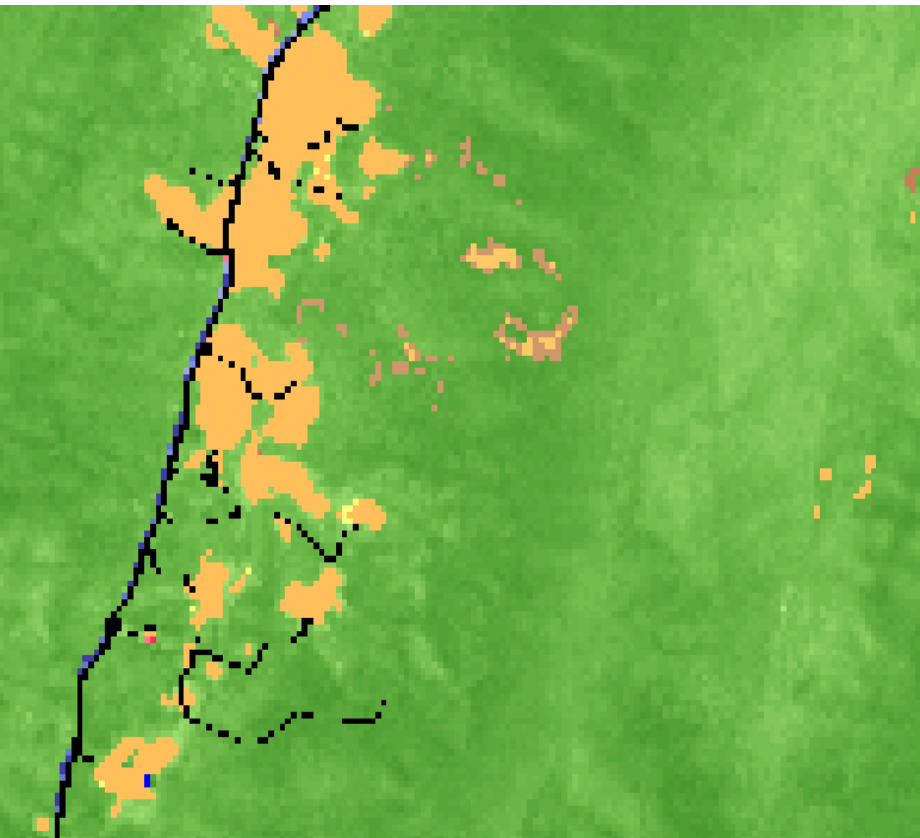
LF 2014



Existing Vegetation Height

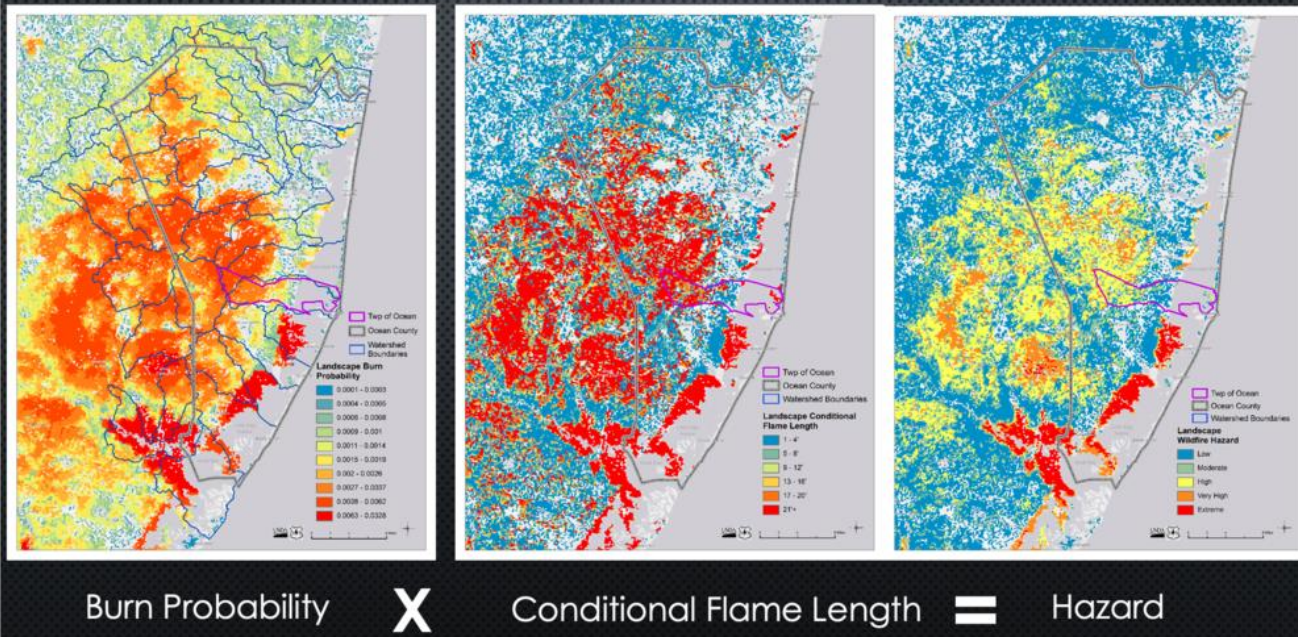
LF Remap

LF 2014



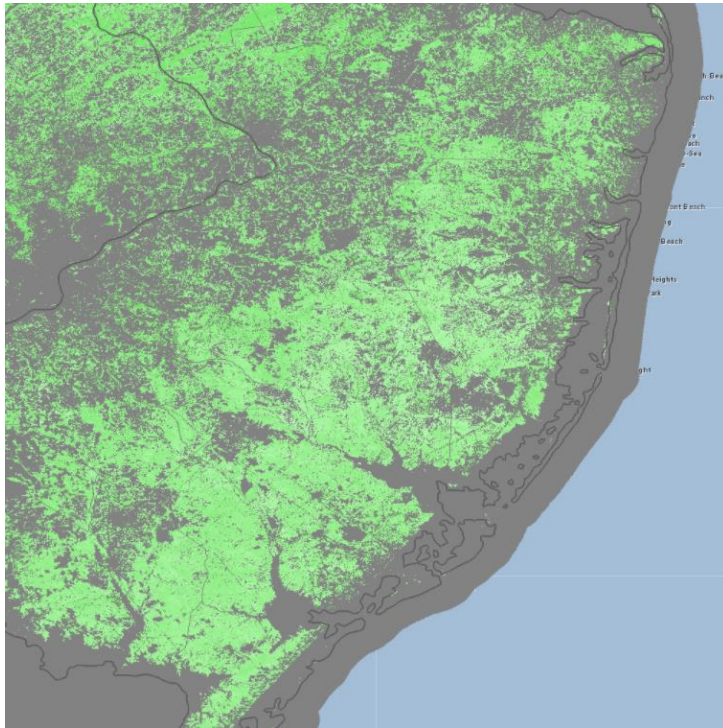
Landscape level hazard and risk models use Landfire fuel model inputs

'Landscape' wildfire hazard represents the 'large-fire' scenario



Canopy Attributes Added Atlantic Coastal Pitch Pine

LF Remap Canopy Height



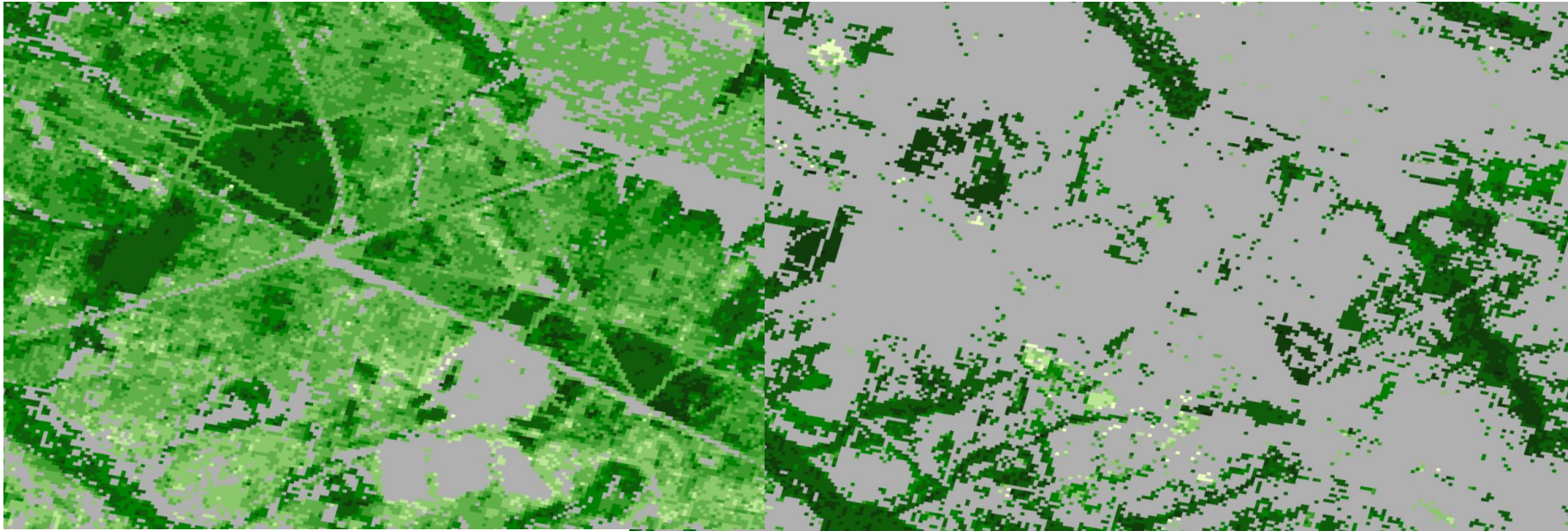
LF 2014 Canopy Height



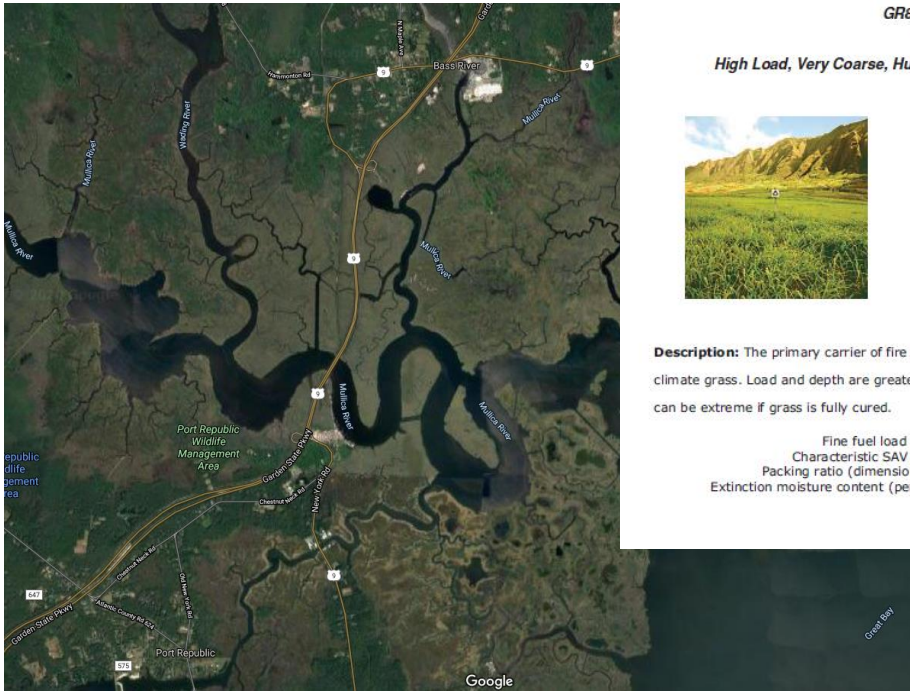
Canopy Attributes Added Atlantic Coastal Pitch Pine

LF Remap Canopy Cover

LF 2014 Canopy Cover



Phragmites vs. Spartina fuel models adjusted



GR8 (108)

High Load, Very Coarse, Humid Climate Grass (Dynamic)



Description: The primary carrier of fire in GR8 is continuous, very coarse, humid-climate grass. Load and depth are greater than GR6. Spread rate and flame length can be extreme if grass is fully cured.

Fine fuel load (t/ac) 7.8
 Characteristic SAV (ft-1) 1302
 Packing ratio (dimensionless) 0.00316
 Extinction moisture content (percent) 30

GR6 (106)

Moderate Load, Humid Climate Grass (Dynamic)



Description: The primary carrier of fire in GR6 is continuous humid-climate grass. Load is greater than GR5 but depth is about the same. Grass is less coarse than GR5.

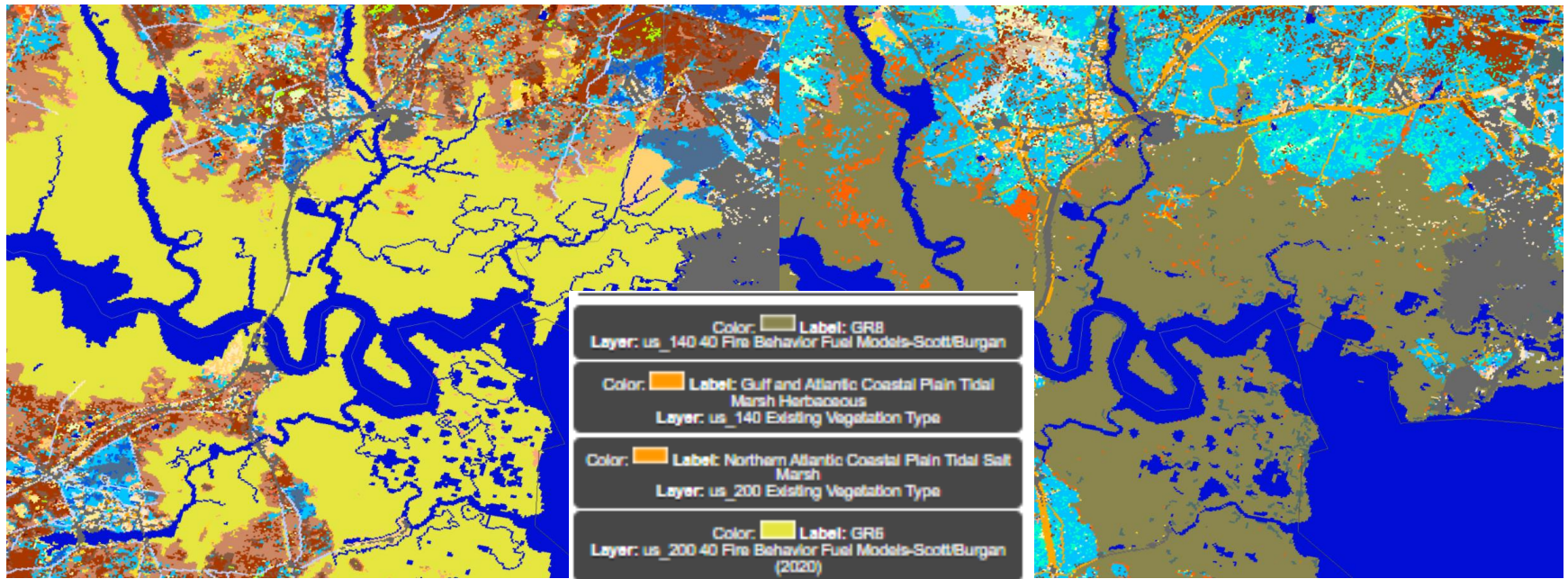
Fine fuel load (t/ac) 3.5
 Characteristic SAV (ft-1) 2006
 Packing ratio (dimensionless) 0.00335
 Extinction moisture content (percent) 40



Phragmites vs. Spartina fuel models adjusted

LF Remap FBFM40

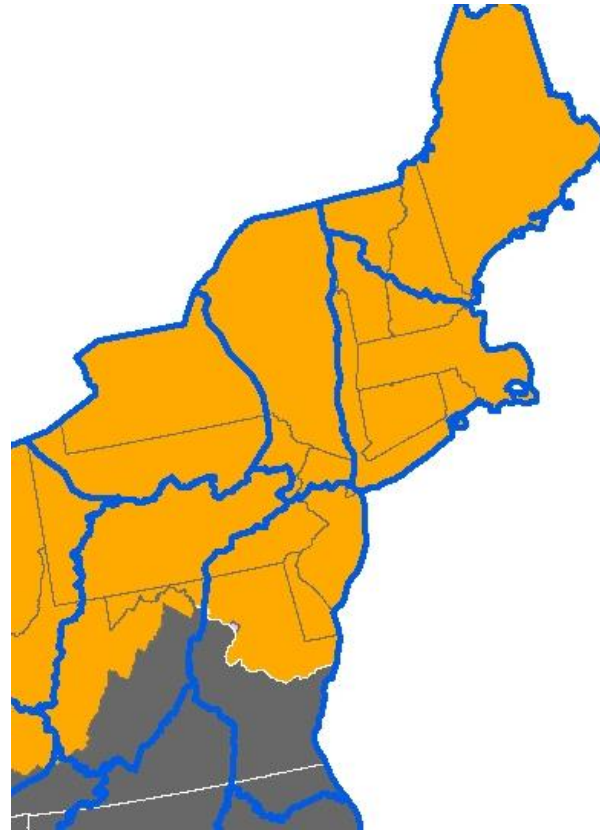
LF 2014 FBFM 40



Regional Fuel Model Review

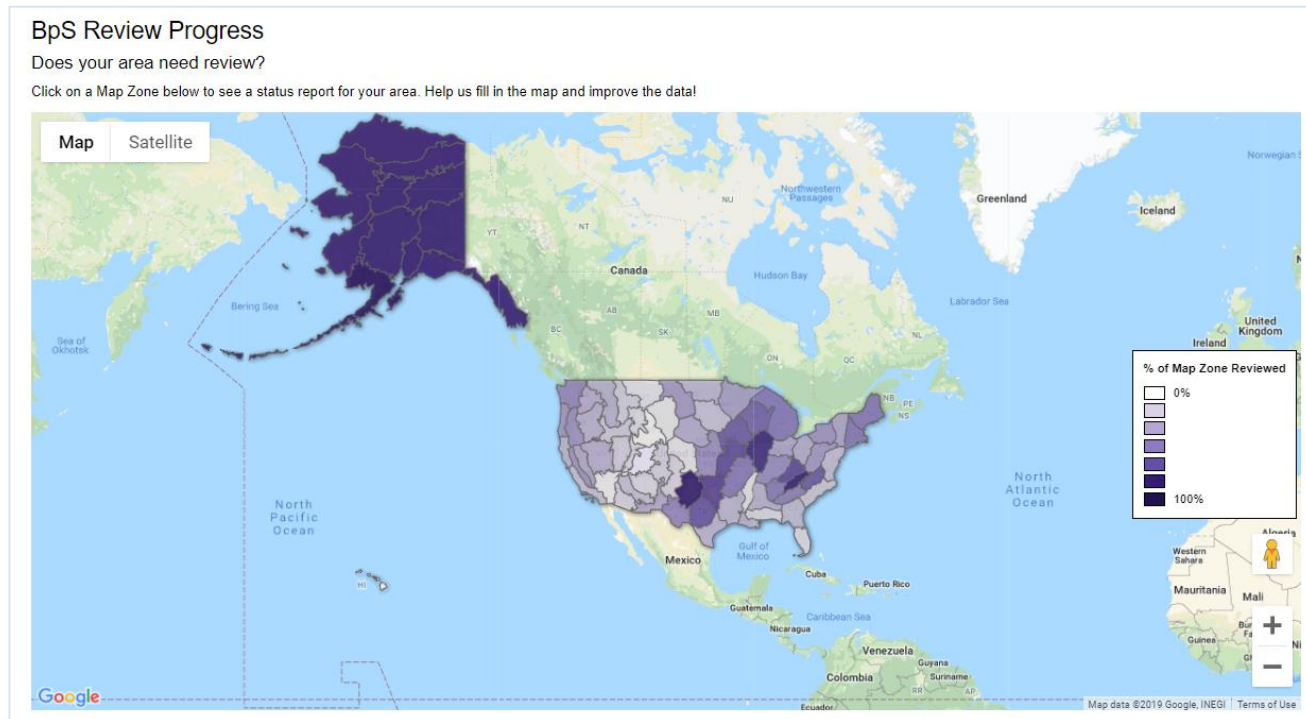
Albany Landfire fuel model calibrations

- 33 EVT's addressed by the workshop from the LF2014 landscape.
- Landfire adopted surface fuel rule changes for all but 2 EVT's
- Generally the changed surface fuel models increase fire behavior, but in some hardwood EVT's the assigned fuel models from the calibration reduce fire behavior.
- 13 of the 33 EVT's that had explicit canopy base height hardwired to achieve specific fire type in terms of crown fire activity for the risk assessment, which were not adopted in our assessment.

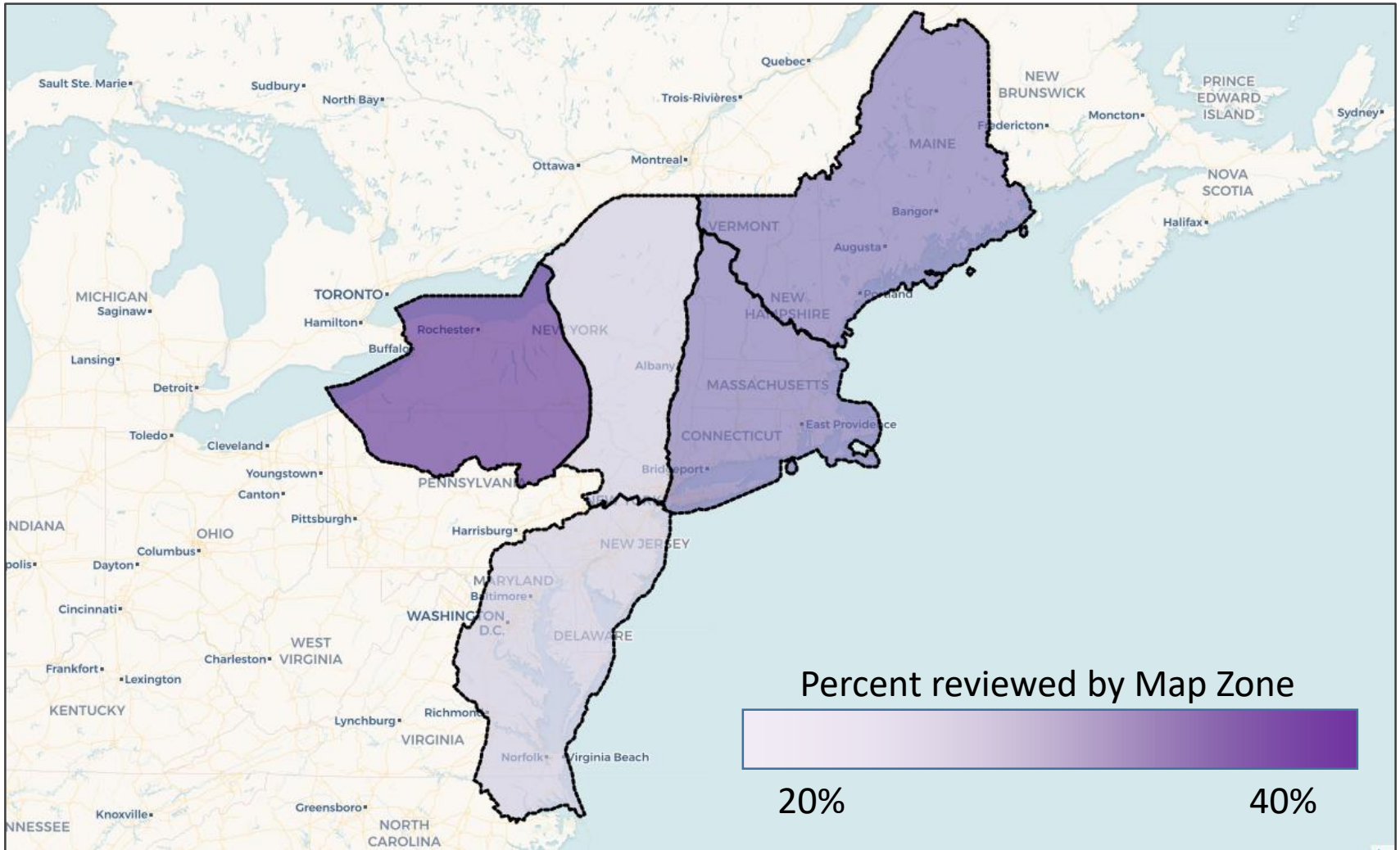


Biophysical Settings Review

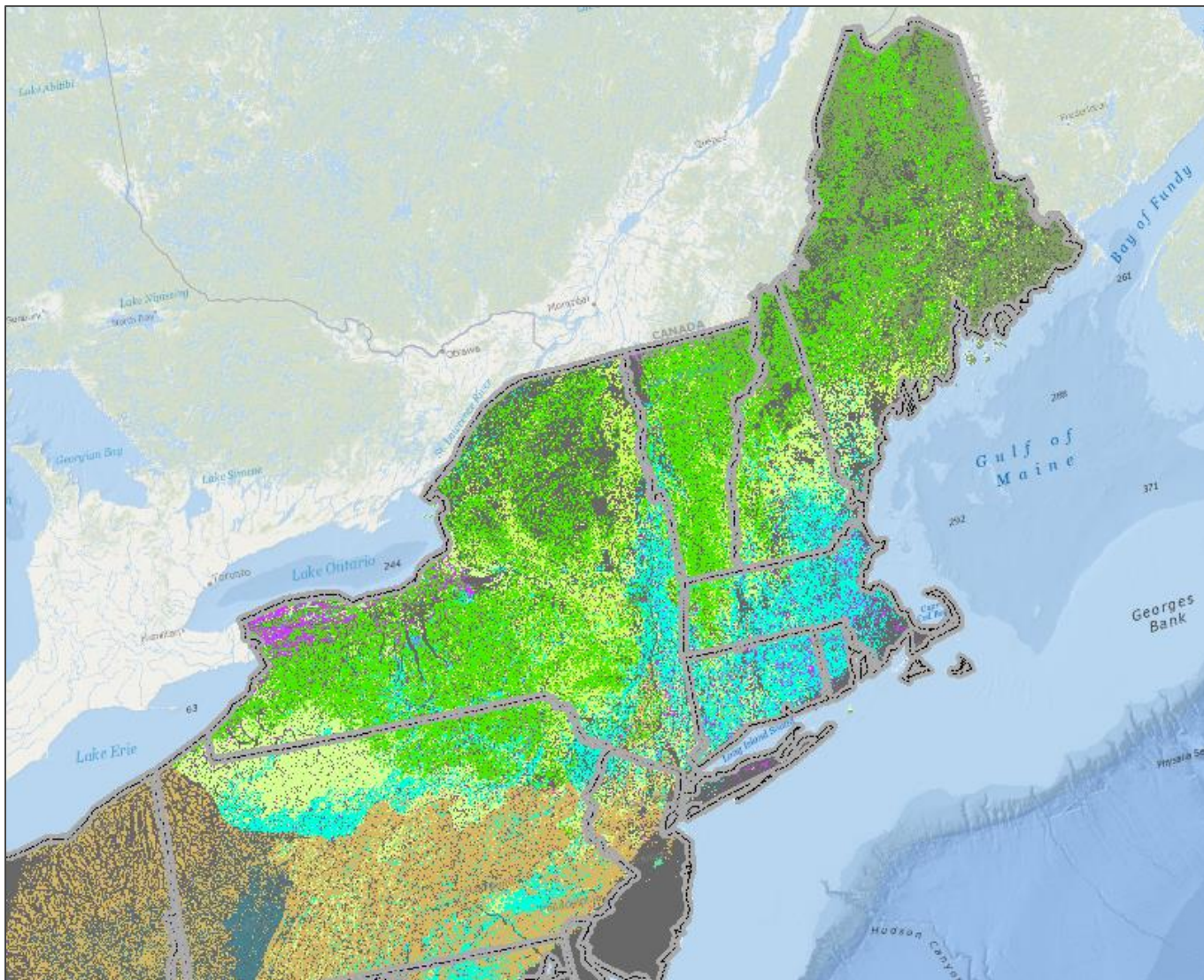
- BpS models/descriptions updated with new science
- Succession class mapping rules completed
- New more complete model description document
- User-friendly data access website



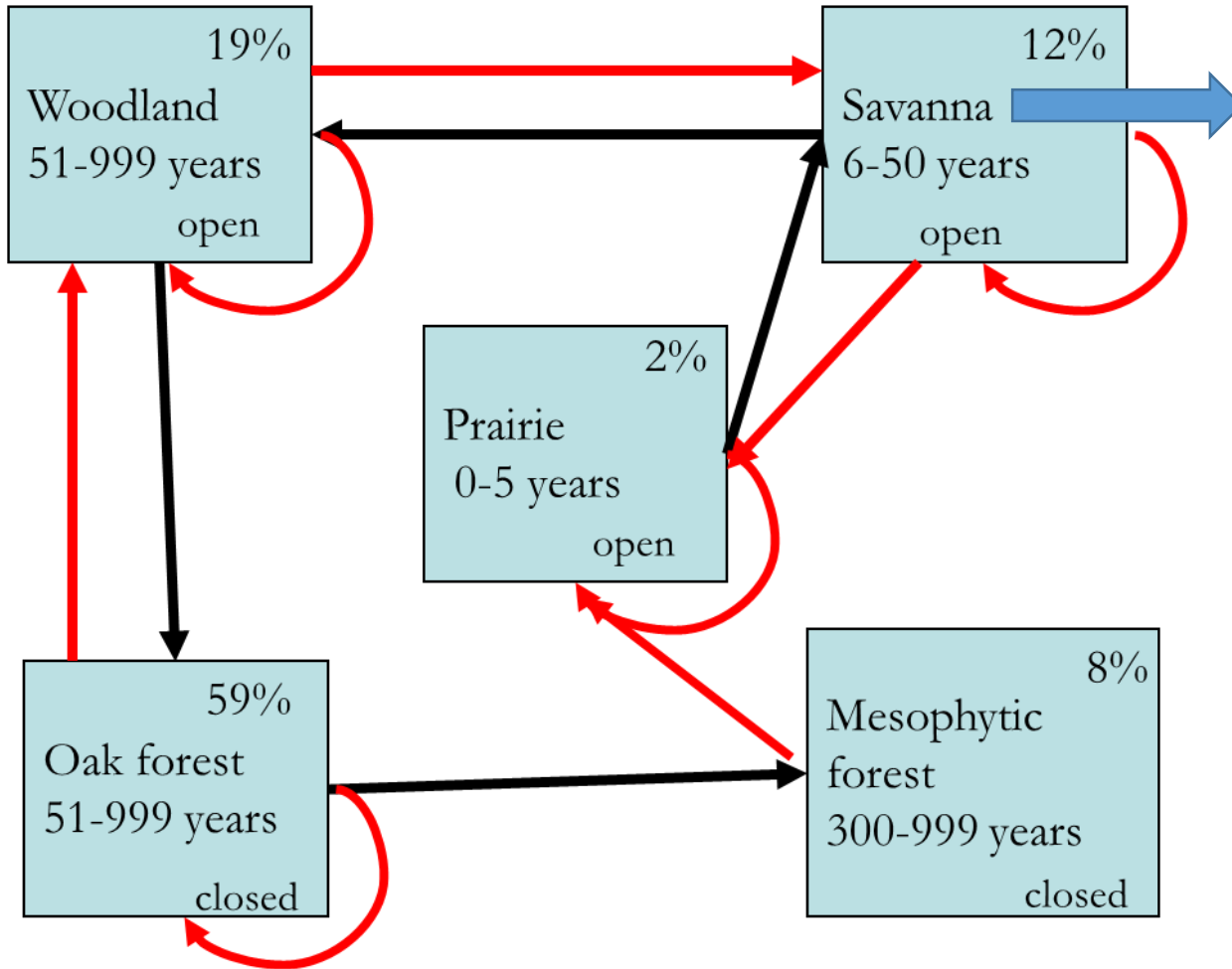
The Northeast-Review Results



The Northeast-Review Results



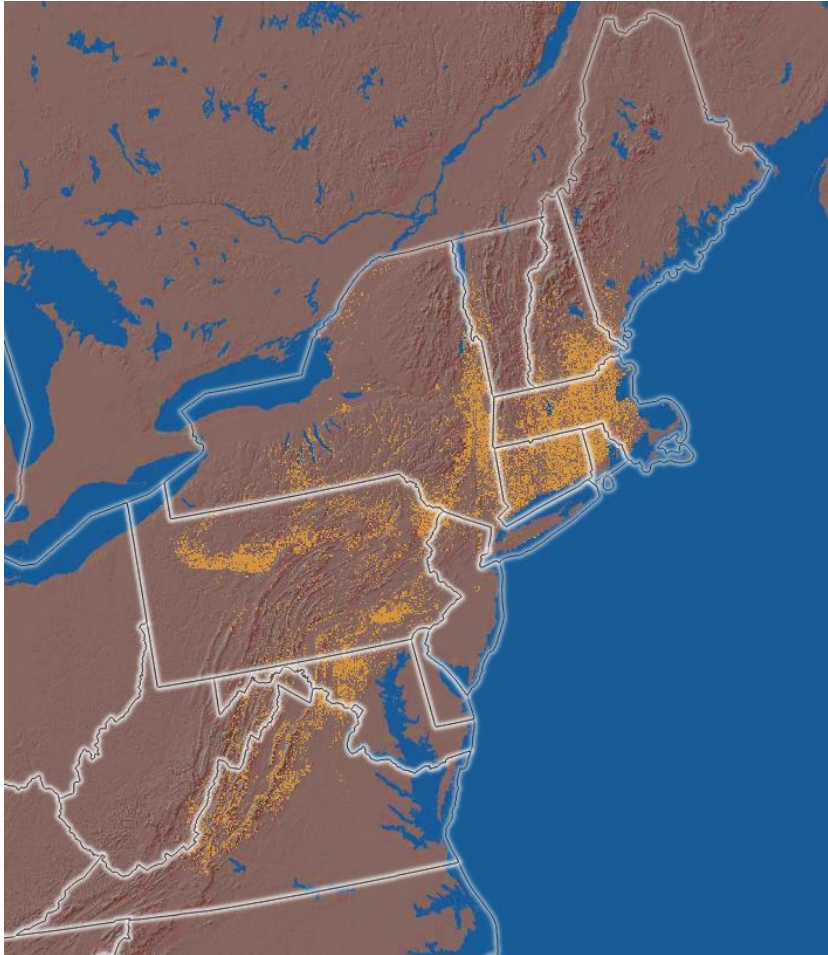
The Northeast-Succession Class Rules



***Made up example
Rules for mapping:***

- Height 5-10m
- Tree Canopy
- Cover 30-60%

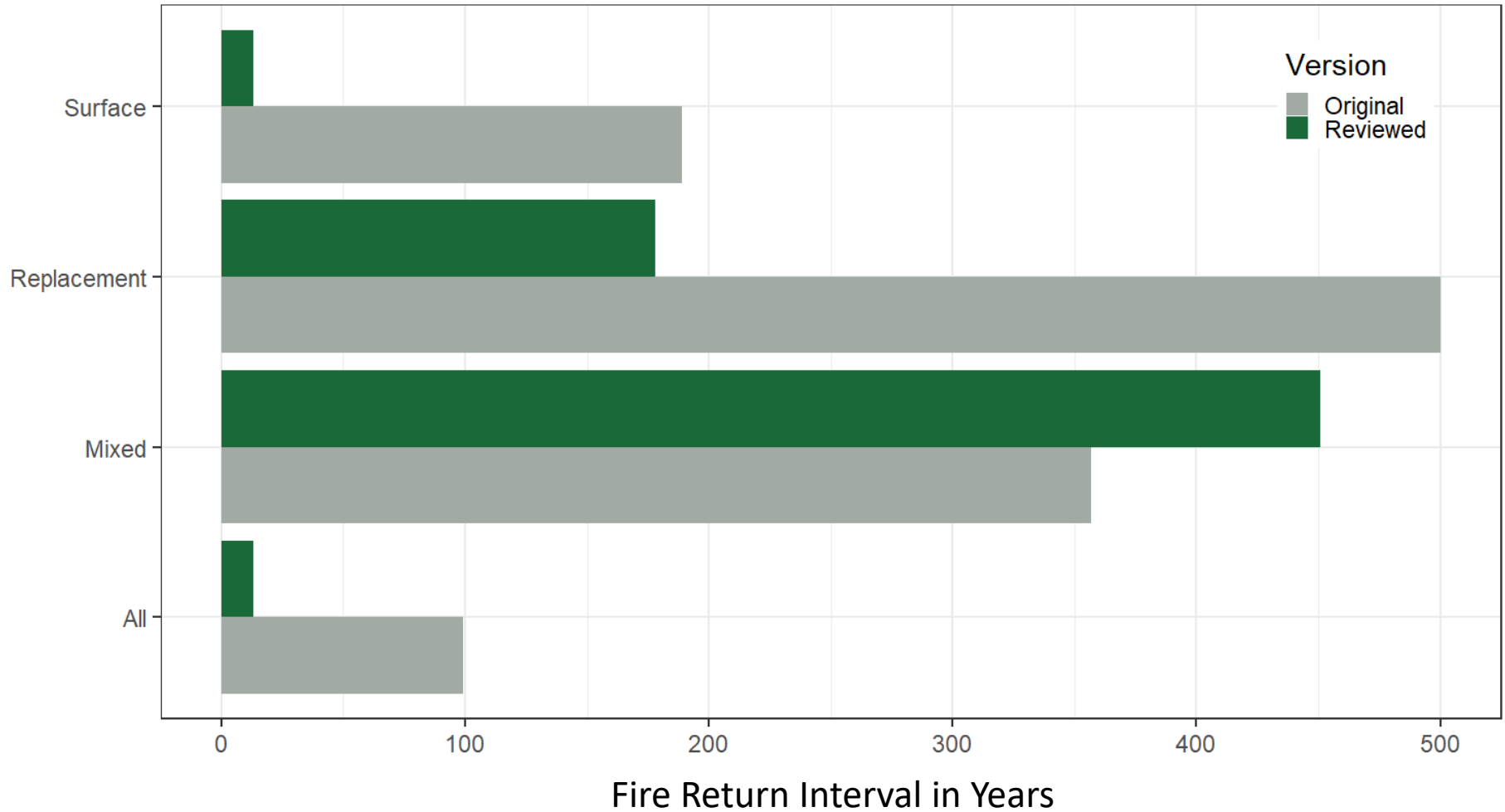
BpS Review Example



- Central Appalachian Dry Oak-Pine Forest
- ~14,000,000 acres
- Well drained and infertile soils
- Trees include:
 - Chestnut oak
 - Virginia pine
 - Scarlet oak
 - White oak
 - Eastern white pine

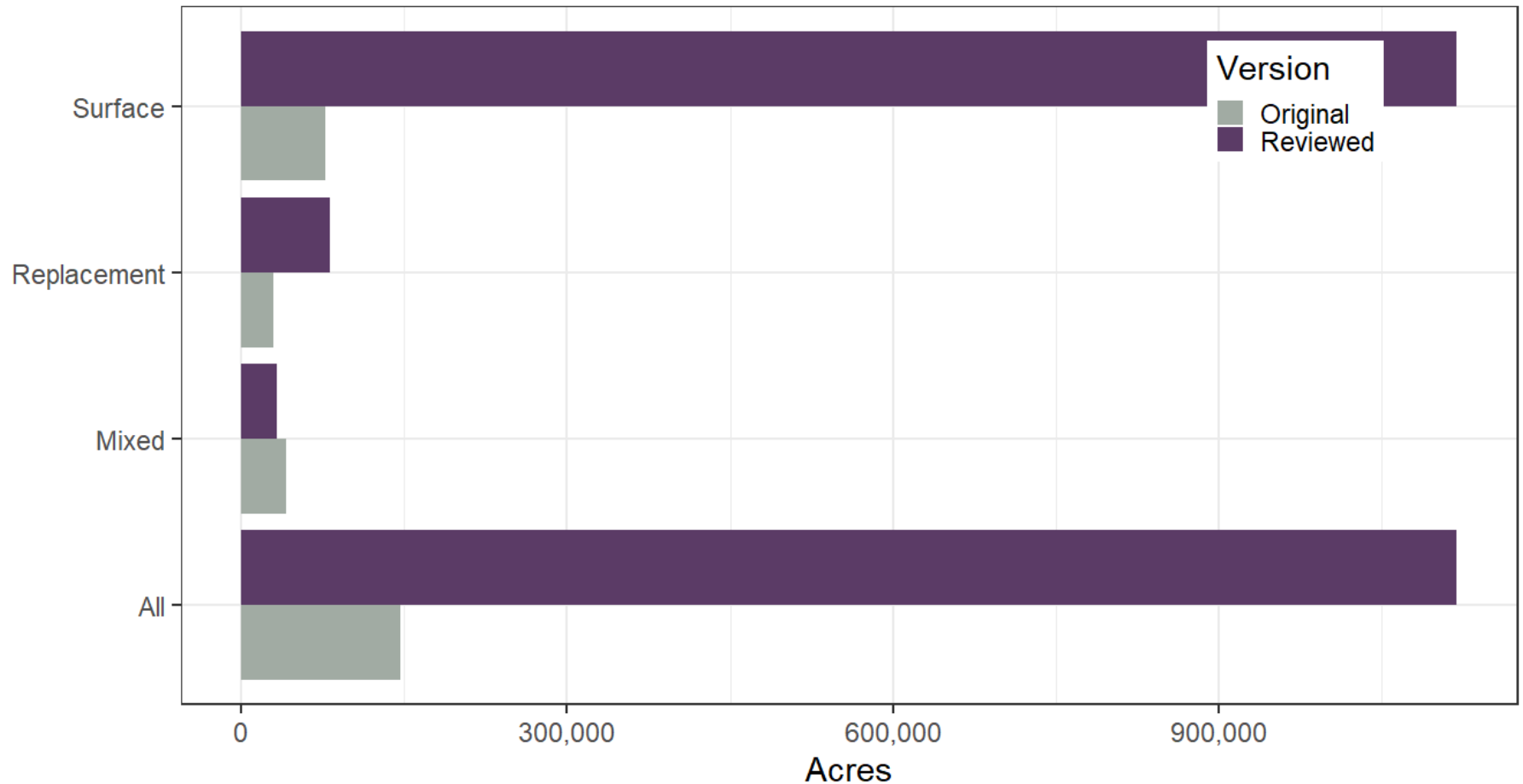
BpS Review Example

Central Appalachian Dry Oak-Pine Forest



BpS Review Example

Central Appalachian Dry Oak-Pine Forest



BpS Review



LANDFIRE

Biophysical Settings Review Site



[Home](#) [BpS Search](#) [About](#) [Review](#) [Resources](#) [Progress](#) [Contacts](#)

Vegetation Types

- Forest and Woodland (330)
- Shrubland (139)
- Herbaceous (104)
- Steppe/Savanna (82)
- Woody Wetland (82)
- Mixed Upland and Wetland (56)
- Herbaceous Wetland (26)

Map Zones

- 7 (63)
- 16 (44)
- 25 (44)
- 6 (43)
- 15 (42)
- 1 (40)
- 28 (39)
- 9 (38)
- 23 (37)
- 24 (37)
- 10 (35)
- 19 (35)
- 4 (35)
- 13 (34)
- 17 (34)
- 29 (32)
- 21 (31)
- 27 (31)
- 3 (31)

[View map of LANDFIRE Map Zones](#)

819 results found in 2ms

- Hawai'i Subalpine Mesic Shrubland**
Model Number: 18280 Map Zone(s): 79
Vegetation Type: Shrubland
- Hawai'i Wet-Mesic Coastal Strand**
Model Number: 18270 Map Zone(s): 79
Vegetation Type: Shrubland
- Hawai'i Dry Coastal Strand**
Model Number: 18260 Map Zone(s): 79
Vegetation Type: Shrubland
- Hawai'i Dry Cliff**
Model Number: 18250 Map Zone(s): 79
Vegetation Type: Shrubland

Documents selected for download:
No documents selected for download.

[Download All Search Results Documents](#)

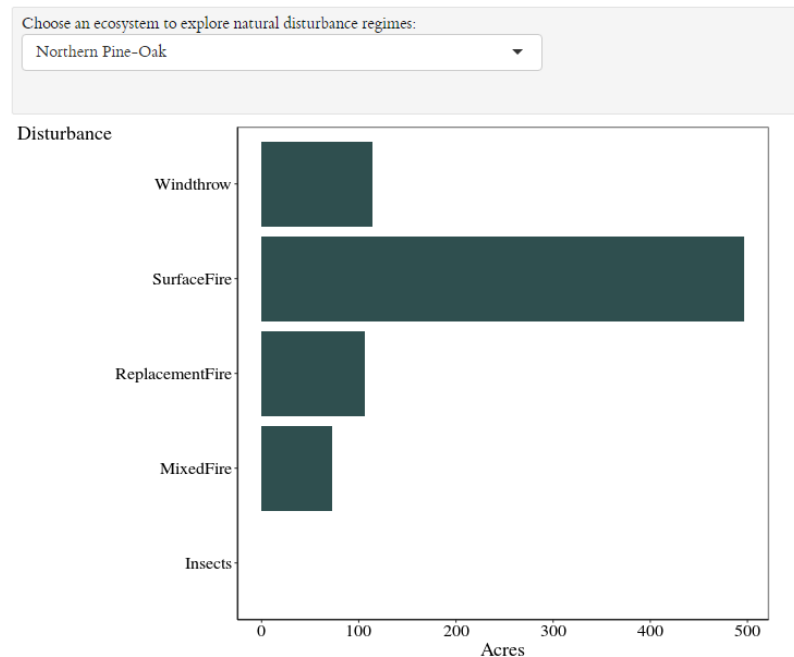


Example Applications

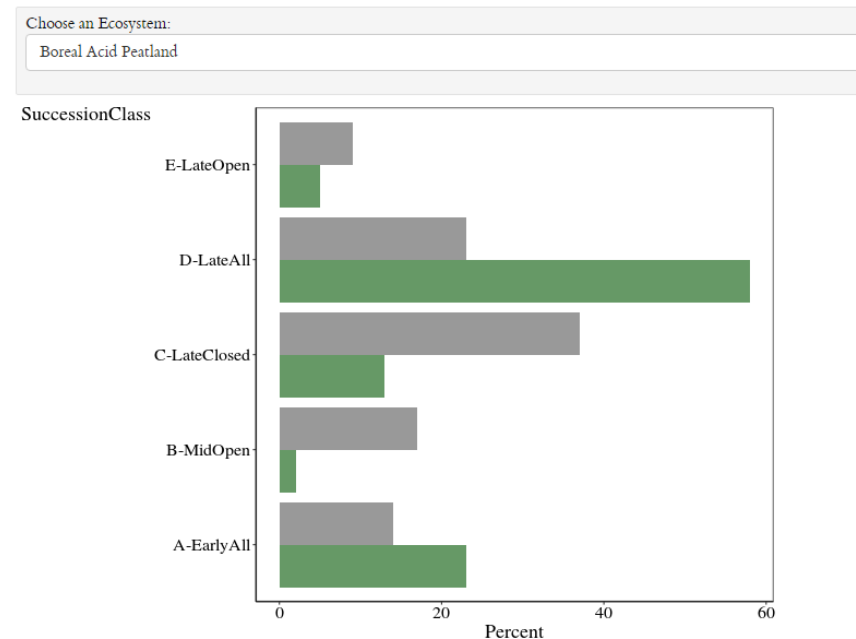
Forest Stewardship Council Certification, Indicator 6.1.a:

- 1) Forest community types and development, size class and/or successional stages, and associated natural disturbance regimes;
- 6) Historic conditions on the FMU related to forest community types and development, size class and/or successional stages, and a broad comparison of historic and current conditions.

Graph 2: Historical disturbance regimes



Graph 4: Difference between historical (GREY) and current (GREEN) succession classes



Example Applications

Terrestrial Ecosystems

Draft Assessment Supplemental Report Wayne National Forest



Ecological Landtypes

Three ecological Landtypes were used for finer-level data analyses, which include Dry Oak Forest, Dry-Mesic Mixed Oak Forest, and Rolling Bottomland Mixed Hardwood Forest. These ecological units were delineated and described for the 17-county study area by Iverson et al. (2019a). **LANDFIRE** (Landscape Fire and Resource Management Planning Tools) was used to document current land use, vegetation trends across time, and historical fire regimes. **LANDFIRE** is a shared program between the wildland fire management programs of the U.S. Department of Agriculture Forest Service and U.S. Department of the Interior, providing landscape scale geo-spatial products to support cross-boundary planning, management, and operations. This multi-partner program produces consistent, comprehensive, geospatial data and databases that describe vegetation, wildland fuel, and fire regimes across the United States and insular areas. **LANDFIRE** is a cornerstone of a fully integrated national data information framework developing and improving vegetation and fuels data products based on the best available authoritative data and science in an all lands landscape conservation approach based on inter-organizational collaboration and cooperation.



Example Applications

Rapid Assessment of the Forested Ecosystems of Michigan by Randy Swaty and Laura Slavsky

**THIS DASHBOARD IS FOR PROOF OF CONCEPT. MAPS HAVE NOT BEEN QA/QC'd, legends may not match. PATTERNS ARE INDICATIVE THOUGH.

MI Forest Ecosystem Assessment Background | Historic Ecosystems Map | Chart of Historic Ecosystems | Current Ecosystems Map | Chart of Current Ecosystems | Change

The Nature Conservancy's Shared Conservation Agenda is guiding conservation change

internationally, leading to substantial amounts of planning Michigan Chapter is developing Narratives, One-Page Plans priorities including "Conserving Resilient Lands and Waters"

Rapid Assessment of the Forested Ecosystems of Michigan by Randy Swaty and Laura Slavsky

**THIS DASHBOARD IS FOR PROOF OF CONCEPT. MAPS HAVE NOT BEEN QA/QC'd, legends may not match. PATTERNS ARE INDICATIVE THOUGH.

Within these priorities forests are foundational, and mention Some example actions include:

- "We will identify additional protection opportunities to
 - Restoration and improved management of existing
 - Improved health of the 16M-acre forest ecosystem resilience and pest/disease resistance

From: CRLW Conserving Resilient Lands and Waters - MI Narrative

Within the Conserving Resilient Lands and Waters strategy (Michigan Chapter of The Nature Conservancy has a draft general forest ecosystem by increasing biodiversity, climate resilience. Additionally, there are forest-focused goals within the Narrative Fire strategies. The hope here is to conduct a general rapid specific strategies and/or future planning questions.

This regional map represents LANDFIRE's Vegetation Designation <https://fdoh.maps.arcgis.com/apps/opsdashboard/index.html#/8d0de33f26>

For this "rapid assessment" the main goals (in addition to the overarching ones above)

Current Ecosystems Map | Chart of Current Ecosystems | Change | More Change | Michigamme Highlands

Forested Ecosystems of Michigan-Current Amounts

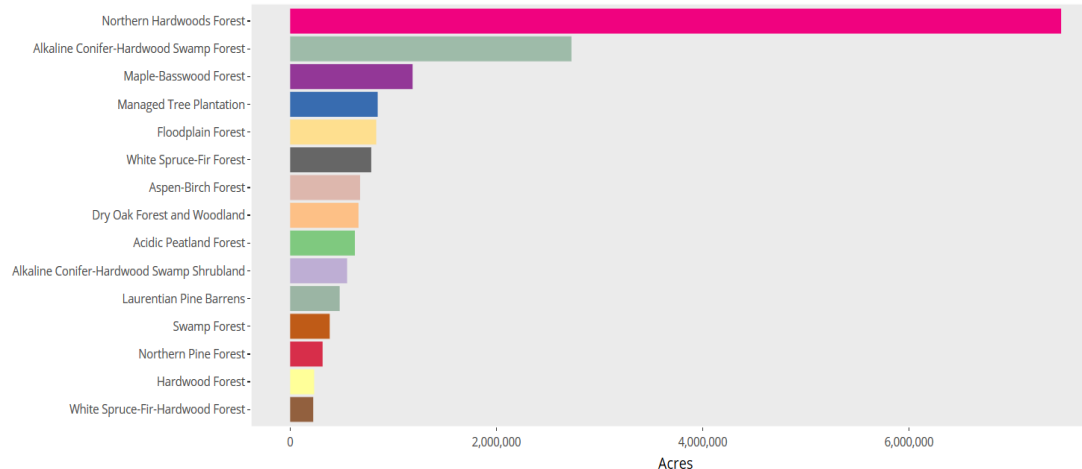


Chart made by taking the top 15 Forest (as defined in the attribute table) "natural" (i.e., not converted to agricultural or urban land uses) Existing Vegetation Types. This was done to "filter out" noise, i.e. EVT's with limited representation.



Take-home Messages

LANDFIRE products

- are comprehensive, compatible, *current* and *consistent*. (4 C's)
- are designed for use at large landscape, regional and national scales.
- can be modified for local use.

LF Remap incorporated new processes and data sets to improve usability of the products and represents conditions in 2016.

Users can help improve LANDFIRE products by providing plots and data + feedback.



Feedback

Website: www.landfire.gov/contactus.php

Help Desk: helpdesk@landfire.gov

Inga La Puma: ilapuma@contractor.usgs.gov

Randy Swaty: rswaty@tnc.org

Jim Smith: jim_smith@tnc.org



LANDFIRE ONLINE



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