



The Nature Conservancy
Protecting nature. Preserving life.



LANDFIRE Update and Biophysical Settings Review: Why You Should Care

Presented by

Jim Smith

TNC-LANDFIRE Project Lead

May 12, 2016



LANDFIRE's mission is to provide agency leaders and managers with a common "all-lands" data set of vegetation and wildland fire/fuels information for strategic fire and resource management planning and analysis.

Who We Are

The Nature Conservancy  **LANDFIRE Team**

					
<p>Jim Smith Jim_Smith@tnc.org Project Lead</p>	<p>Kori Blankenship kblankenship@tnc.org Fire Ecologist</p>	<p>Randy Swaty rswaty@tnc.org Ecologist</p>	<p>Sarah Hagen shagen@tnc.org Spatial Ecologist</p>	<p>Kim Hall Kimberley.Hall@tnc.org Climate Ecologist</p>	<p>Jeannie Patton ipatton@tnc.org Communications</p>



- partner on LANDFIRE
- education, outreach, bps models
- small part of the overall LF team

Today's Agenda



A bit about the models

How models are used



Help us improve!

Ariane Babcock

Introduction to LANDFIRE

LANDFIRE

Landscape Fire and Resource Management Planning Tools Project

Think.....

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



LANDFIRE is an innovative program designed to create and update vegetation, fire and fuel data for the entire United States. Leading partners are Department of the Interior, US Forest Service and The Nature Conservancy, along with collaborators in the natural resources world who contribute knowledge, data and technical expertise. LANDFIRE supports resource management activities across the country, with spatial data, vegetation models, and powerful user tools.

LANDFIRE Products

Spatial Data Sets

- Historic vegetation type (Ecological System)
- Current Vegetation
 - Type (ES), height class, cover %
- Fire Regime information (Historic)
- Plot/Event Data Bases (LFRDB)
- Fire Behavior
- Disturbances
- Topographic



Biophysical Settings Models and Descriptions

Tools and Support

Native Application Scale: National, Regional, and Large Landscape



LANDFIRE uses peer-reviewed scientific methods, and delivers datasets of vegetation, fire, and fuels information for all land ownership types. Products include more than 20 geo-spatial layers and relational databases that support a wide range of analysis and modeling applications – whether fire-focused or not. And you can combine datasets to assess conditions on your own landscape.

Illustration ...comprehensive/compatible

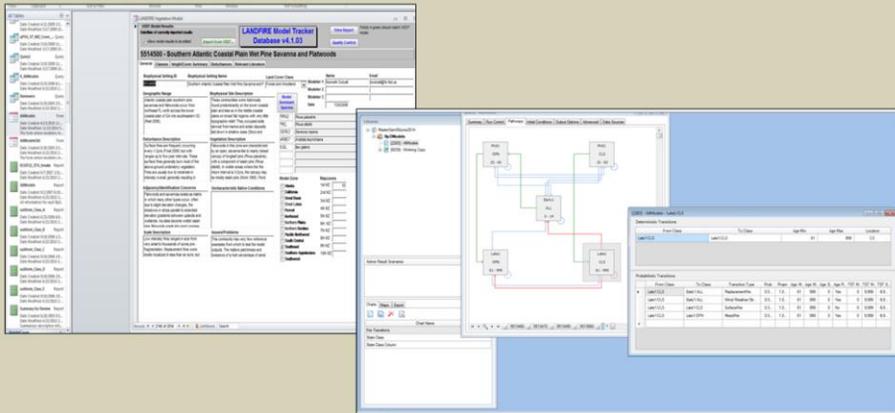
- Biophysical Settings (BpS) spatial data



- BpS Models and Descriptions-linked by BpS Code

BpS Models and Descriptions

Two-part bundle



As we progress through the presentation today I will talk about BPS models and BPS descriptions. These are separate but linked items.

BpS Descriptions: the Basics

The screenshot displays the 'LANDFIRE Model Tracker Database v4.1.03' interface. At the top, there are buttons for 'View Report' and 'Quality Control', and a note: 'Fields in green should match VDDT model.'. Below this, the title bar reads '5514500 - Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods'. The 'General' tab is selected, showing a form with several sections:

- Biophysical Setting ID:** 5514500
- Biophysical Setting Name:** Southern Atlantic Coastal Plain Wet Pine Savanna and F
- Land Cover Class:** Forest and Woodland
- Name:** Kenneth Outcat
- Email:** koutcat@fs.fed.us
- Modeler 1:** Kenneth Outcat
- Modeler 2:**
- Modeler 3:**
- Date:** 7/20/2006

There are also sections for 'Geographic Range', 'Biophysical Site Description', 'Disturbance Description', 'Vegetation Description', 'Adjacency/Identification Concerns', and 'Uncharacteristic Native Conditions'. A 'Model Dominant Species' list includes PIPA2 (Pinus palustris), PIEL (Pinus elliotti), SERE2 (Serenoa repens), ARBE7 (Aristida beyrichiana), and ILGL (Ilex glabra). A 'Model Zone' section has checkboxes for Alaska, California, Great Basin, Great Lakes, and Hawaii. A 'Mapzones' table shows 1st MZ as 55. There are also checkboxes for 'This BpS is lumped with:' and 'This BpS is split into multiple models (explain differences)'. At the bottom, there is a search bar with the text 'cord: H 4 1748 of 2054' and 'Unfiltered Search'.

Originally captured in an Access tool: "Model Tracker Database"

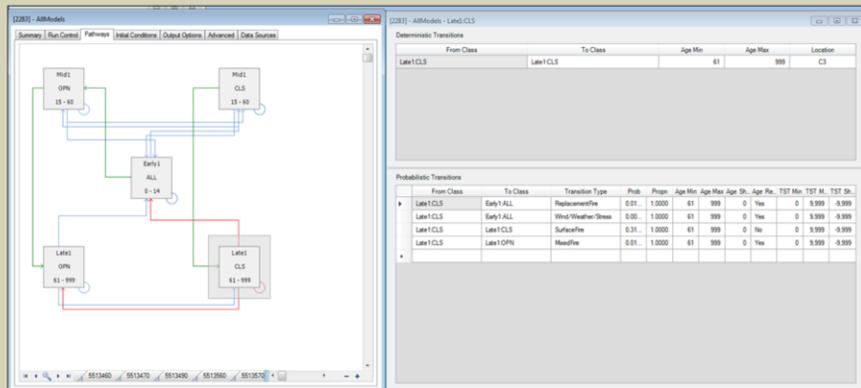
The description has multiple sections - I'll give you a quick tour of some of them today. In the "General" section or tab we find the basic information about a BPS - where it occurs, what the natural disturbance regimes were, a vegetation description and information on where the BPS would have occurred based on soils, surficial geology, climate, etc. This information was typed in by experts, Dr. Greg Nowacki in this case, often backed up by literature. These descriptions were originally developed in an Access database. That database and PDF documents of the descriptions are available on the Vegetation Tab of LANDFIRE.gov.

Description: Succession Classes

The screenshot displays the LANDFIRE Model Tracker Database v4.1.03 interface. The main window shows the '5514500 - Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods' model. The 'Succession Classes' tab is active, showing three classes: Class A, Class B, and Class C. Each class has a detailed description and a set of parameters for fire fuel behavior modeling. Two red circles highlight specific parameters: the 'Fire Fuel Behavior Model' and 'Structural Data (for upper layer lifeform)' for Class A, and the 'Fire Fuel Behavior Model' and 'Structural Data (for upper layer lifeform)' for Class B. The interface also includes a sidebar with a list of tables and a top navigation bar with 'View Report' and 'Quality Control' buttons.

While the general information is interesting to me, the real value added in my mind is on the succession classes tab. For each LANDFIRE model and description we developed 5 or fewer succession classes or seral stages. We described them in terms of species, disturbance, canopy characteristics and percent of the landscape that would have been occupied by the succession classes under natural disturbance regimes. I've circled a couple of items here. While these succession classes shifted around the landscape historically due to disturbance so we did not develop a historic s-class map, but we do map these today. The canopy characteristic are important for that. Also, I wanted to point out that the percentages come from the modeling we'll discuss next.

State-and-Transition Models



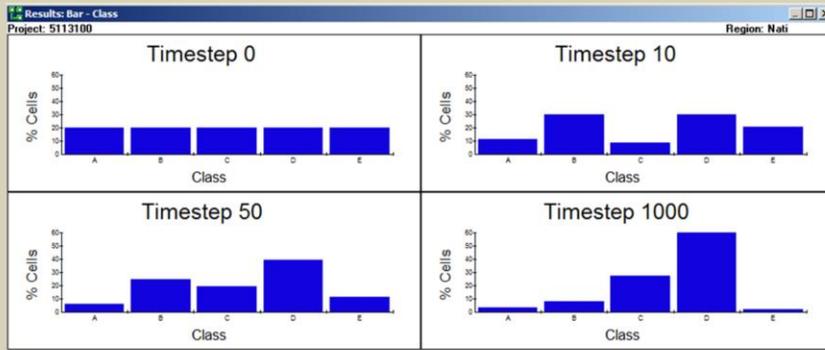
Boxes = Succession classes. Lines = disturbances or succession

Originally developed in VDDT, now called ST-Sim

To get an estimate of how much of each succession class would have been on the landscape we used state and transition models developed in Vegetation Dynamics Development Tool by ESSA technologies. While the modeling platform has evolved- we now use ST-Sim, the concepts are the same. Each box represents a succession class, the green lines that come out of the sides of the boxes succession and the blue lines coming out of the tops and bottoms disturbance. You'll also see the age ranges (such as 0-5), a box label (such as "A") and a broad structure label (such as "Open").

Historic Succession Class Percents

Models were run 10 times for 1,000 cells, 1,000 years to generate *Natural Range of Variability* estimates, or *Reference Conditions*



The experts looked to literature, personal experience and other data to come up with information to parameterize the models. The succession classes typically represent some sort of break in development of the BpS such as when shrubs start to fill in if there is no fire, when a dominant tree starts to bear cones or when the broad structural characteristics stabilize. The model is probabilistic so we entered an annual probability of a disturbance affecting a cell in a particular succession class and what happens to that cell. When a cell is not affected by a disturbance it succeeds to the next succession class. The models were run 10 times for a thousand years, which is long enough for them to stabilize.

Description: Succession Classes

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Class	Landscape	Cover type	Structure	Class Indicator	Species	Indicator	Canopy Position	Fire Fuel Behavior Model	Structural Data (for upper layer lifeform):
Class A	Open	Early Development	Open	PAPA	Pinus palustris	Open	Upper	2	Max Canopy Closure: 20%, Max Canopy Closure: 20%, Max Height: 20m, Max Height: 20m, Max tree size class: Medium 0.25-1.0m
Class B	Open	Closed	Closed	HERF	Quercus nigra	Open	Upper	7	Max Canopy Closure: 20%, Max Canopy Closure: 20%, Max Height: 20m, Max Height: 20m, Max tree size class: Medium 0.25-1.0m
Class C	Open	Open	Open	PAPA	Pinus palustris	Open	Upper	2	Max Canopy Closure: 20%, Max Canopy Closure: 20%, Max Height: 20m, Max Height: 20m, Max tree size class: Medium 0.25-1.0m

While the general information is interesting to me, the real value added in my mind is on the succession classes tab. For each LANDFIRE model and description we developed 5 or fewer succession classes or seral stages. We described them in terms of species, disturbance, canopy characteristics and percent of the landscape that would have been occupied by the succession classes under natural disturbance regimes. I've circled a couple of items here. While these succession classes shifted around the landscape historically due to disturbance so we did not develop a historic s-class map, but we do map these today. The canopy characteristic are important for that. Also, I wanted to point out that the percentages come from the modeling we'll discuss next.

Find the BpS models/descriptions here....

<http://www.landfire.gov/NationalProductDescriptions24.php>

Biophysical Settings Description and Quantitative Models

LANDFIRE calls historic (pre-European settlement) ecosystems "Biophysical Settings," or BpS. To better understand how BpS functioned across the United States, LANDFIRE worked with hundreds of experts to develop descriptions and models. The results are combined into "sets" or bundles that are available to anyone for free online.

The What and the How of BpS Models

LANDFIRE used an expert-based development process to create state-and-transition models that describe pre-settlement ecosystem structure and function for every [Ecological System](#) present in the current LANDFIRE BpS. Each ecosystem, which LANDFIRE calls a **Biophysical Setting** (BpS), has a description document and a quantitative state-and-transition model including succession/growth and disturbance that can be viewed and manipulated in either the Vegetation Dynamics Development Tool (VDDT) or ST-Sim. LANDFIRE BpS quantitative models were first developed in an early version of VDDT, but now can be examined and modified in the latest incarnation of VDDT called ST-Sim. ST-Sim represents a significant advance in state-and-transition modeling and its use is strongly encouraged.

Credit: Jessica Price, Forest Scenarios Project, <http://faculty.nelson.uic.edu/~jbernage/scenarios/>

After review and QA/QC we delivered the bundles to the LANDFIRE mappers who ingested them into their mapping processes. In many ways it was an insane time of life for people in the LANDFIRE project.

Find the models here....

1. **Compiled databases** in the Lower 48 States and Hawaii OR Alaska extents using links in the table

Compiled BpS Databases	
Description Databases (Access)	Model Database (ST-Sim)
Lower 48 States and Hawaii Descriptions	Master ST-Sim Model Database
Alaska Descriptions	

2. **BpS model information** within individual map zones (click on the map below), including:
 - BpS description as a PDF
 - Reference condition summary table as a .csv file
 - Metadata
 - [Vegetation Dynamics Development Tool \(VDDT\)](#) model database
3. **Spatial data** - [learn more](#)



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BpS Models/Descriptions Uses--Internal

Source of fundamental ecological information for BpS mapping

Fire Regime Attributes: Historic fire return intervals, fire severity distributions, fire regime groups, etc.

One component of the Fire Behavior Fuel Model ruleset

Pre-European Settlement Succession Class % for departure calculations

In addition to the mapping I mentioned earlier, planners in multiple agencies are using them as “starter models.” They will take the basic LANDFIRE models, add in current management such as logging or fire suppression then develop optimization models to figure out land management strategies to get them to their desired future conditions. Also, I’ll note that programs such as FSC certification refer to LANDFIRE as a place to get historic ecological information.

LANDFIRE Uses -- External



Map created by The Nature Conservancy LANDFIRE Team

LANDFIRE Web-Hosted Applications Map (WHAM!)

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. It's easy as point-and-click! Hover over a "balloon," click on it, and learn how LANDFIRE products helped land managers meet their planning objectives.

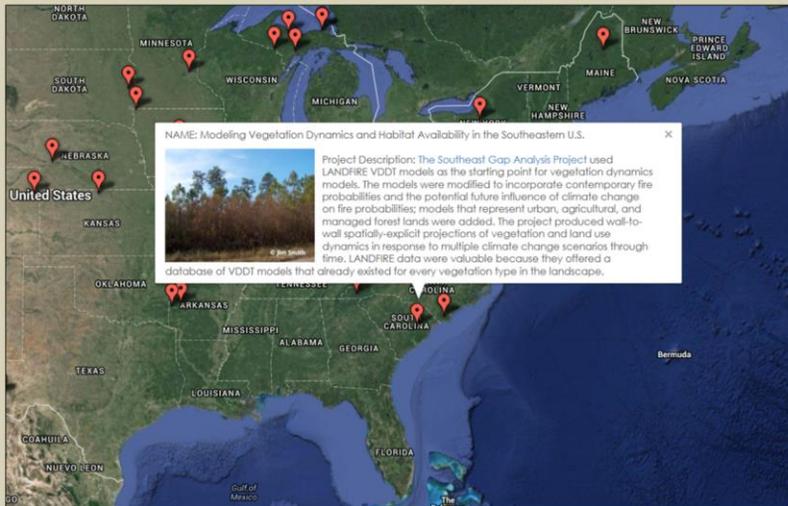
SOURCE

The Nature Conservancy's LANDFIRE team helps real people apply LANDFIRE products to solve real world problems. If you know of an application that should be added to the map, let us know! Visit us at: The LANDFIRE Program Site and TNC LANDFIRE or email us at: landfire@tnc.org

<http://maps.tnc.org/landfire>

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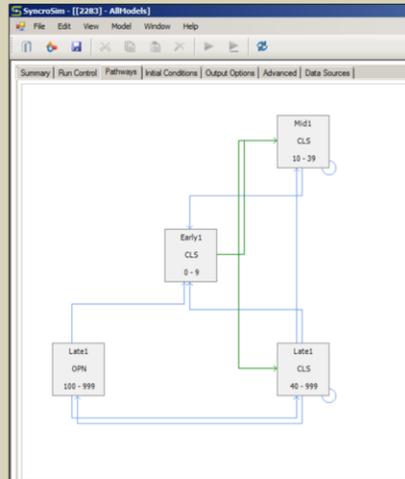
WHAM!-Southeastern Applications



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Why Review the BpS?

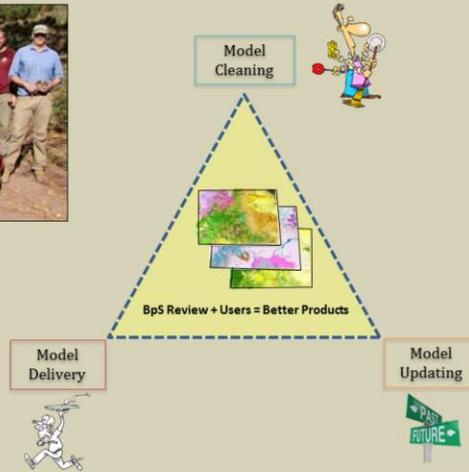
- Reduce duplication
- Fix “blunders” e.g. typos, inconsistencies, etc.
- Integrate new science and new experts. *Ten years is a long time!*
- Potential for creating a more useful delivery system
- Updated modeling software



There has been no comprehensive review of the LANDFIRE National model set since their original delivery from 2005 through 2009, only sporadic, ad hoc, inconsistent review based upon immediate opportunity. Since then, errors and inconsistencies have been discovered, and missing information identified. There is reason to believe that supporting science may have improved. Thus, the time is right to review and potentially revise LANDFIRE National BpS models. Leading the review process is The Nature Conservancy's (TNC) LANDFIRE team.

Our Philosophy

BpS Review + Users = Better Products



We are certain we can improve the BpS descriptions and bundles with your help, though not everyone agrees. Some feel that we will only make them different...We also know that there will be conflicting views. We will do our best to reconcile differences. We will try to make this process as painless and interesting as possible.

BpS Review Process

- We have “cleaned” the BpS list by identifying and noting duplicates
- The documents are posted on the dedicated BpS Review website
- Contributors may review the Word document/description, the model, or both
- Most review is conducted in contributors’ locations, e.g. office desk, laptop, etc., though the LANDFIRE team will hold WebEx training sessions and are available to help onsite in some cases

BpS review website: <http://www.landfirereview.org/>



The BpS review involves three steps: model cleaning, model updating, and model delivery. If you know how vegetation systems function, or have ideas how we can better deliver the information, we want your expertise and input. Start at the BpS review website where you'll find information on how to join the effort

The screenshot shows the website interface for the LANDFIRE Biophysical Settings Review Site. At the top, the URL 'www.landfirereview.org' is displayed. The header includes the logos for 'The Nature Conservancy' and 'LANDFIRE Biophysical Settings Review Site'. A navigation menu contains links for 'Home', 'About', 'Review', 'Resources', and 'Contacts'. The main content area is titled 'The BpS Review' and provides instructions for reviewing BpS descriptions. It includes a section for 'Review Instructions' with four numbered steps: 1. Watch a short video overview, 2. Get your BpS description(s), 3. Review and edit the description in your word processing program, and 4. Submit your review document via email. A 'What happens next?' section explains the review process. On the right, an 'Additional Resources' sidebar lists links for 'How to decipher the BpS Code', 'Map Zone Boundaries', 'Succession Class Mapping Guidelines—CONUS and HI', 'Succession Class Mapping Guidelines—AK', and 'NatureServe Explorer'. Social media icons for Twitter, Facebook, and YouTube are also present.

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use [this spreadsheet](#) to find the BpS(s) of interest to you.

You can search and select by these fields:

1. BpS Name
2. Geography (Region or Map Zone)
3. Vegetation Type (e.g. tree, shrub, or grassland)
4. Fire Regime Group

Once you find the BpS(s) of interest, click on the BpS Code(s) and download it to your computer.

1	MapZone	Code	BpS Code	BpS Name	Region	Map Zone	Vegetation Type
1821	55	14500	5514500	Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods	Southeast	55	Forest and Woodland
1822	58	14500	5814500	Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods	Southeast	58	Forest and Woodland
1811							
1812							
1813							
1814							
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Review Guidance for LANDFIRE Biophysical Settings Models and Descriptions
 Please note that we pledge to review and consider every comment we receive. We cannot, however, guarantee that all comments will be incorporated into the revised model or description. Major revisions will need to be corroborated with data, peer-reviewed literature and/or additional opinions.

1. Please use your valuable time to review and suggest modifications to the content of the descriptions or the parameters in the model, not on editorial or style issues or other nontechnical concerns. All sections are open to review, and please add in justification or literature source whenever possible.
2. Biophysical settings descriptions vary in specificity and completeness. Some descriptions are very thorough, some less so. Can you add any specifics to sections such as Geographic Range, Vegetation Description, etc. if needed?
3. A key focus of this review is to improve information about Succession Classes (S-Class). We outline specific needs below, although you are welcome to make any comments you wish.
 - In each S-Class description above, e.g., consider seed with no herbaceous group.
 - Do the cover and heights.
 - If a genus is mapped by L in all S-Classes within the "Uncharacteristic" in the S-Class suite for this BpS then lower or higher? If Cover 51-60% may be a solution may be to change.

14500

Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods

Model Date: 07/20/06

Report Date: 8/21/14

Modelers		Reviewers	
Kenneth Outcalt	koutcalt@fs.fed.us	Chris Szell	cszell@tnc.org
		Keith Fisher	kfisher@tnc.org
		None	None

Succession Pathways			
From Class	Begins at (yr)	Succeeds to	After (years)
Early:ALL	0	Med:CPN	15
Late1:CLS	61	Late1:CLS	999
Late1:CPN	61	Late1:CPN	999

Disturbance Type	Disturbance occurs in	Moves vegetation to	Disturbance Probability	Return Interval (yrs)	Reset Age to New Class Start Age After Disturbance?	Years Since Last Disturbance
ReplacementFire	Early1:ALL	Early1:ALL	0.0200	50	No	
SurfaceFire	Early1:ALL	Early1:ALL	0.3000	5	No	
AllSuccession	Early1:ALL	Med1:CLS	1.0000	1	Yes	10
ReplacementFire	Late1:CLS	Early1:ALL	0.0200	100	Yes	
WindThrow/Down	Late1:CLS	Early1:ALL	0.0001	10	Yes	

Savannas and flatwoods occur from northeast FL north to southeastern SC (Peet 2006).

found predominantly on the lower coastal plain and less so in flat regions with very little topographic relief. They are formed by eolian deposits laid down in shallow seas (Stout and others) and are periodically flooded on seasonally wet to flooded somewhat poorly to severely the most prevalent because of the large expanse on

The BpS review involves three steps: model cleaning, model updating, and model delivery. If you know how vegetation systems function, or have ideas how we can better deliver the information, we want your expertise and input. Start at the BpS review website where you'll find information on how to join the effort

Take-Home Messages

- WHAT: LANDFIRE BpS has three parts - spatial data, text description, and quantitative state-and-transition models - all explicitly linked.
- WHY: LANDFIRE BpS models/descriptions are important to the LANDFIRE Program and to external natural resource communities.
- HOW: LANDFIRE BpS models/descriptions are being reviewed....and **PLEASE** participate.

<http://www.landfirereview.org/>

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Brief LANDFIRE Update

- LF2014 update underway: complete for the entire AOI in 10-11 months. CONUS by end of January 2017.
- LF Remap planning and data collection is underway- production begins in early 2017 and will take 2 – 3 years or so (depending on some decisions)
- Engagement Opportunities
 - BpS Review
 - FBFM Guidebook webinars—interact with LANDFIRE FBFM mapping rules

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Online Connections



LANDFIRE Program Home <http://www.landfire.gov>



Conservation Gateway: <http://nature.ly/landfire>



Twitter: [@nature LANDFIRE](https://twitter.com/nature_LANDFIRE)



YouTube: [LANDFIREvideo](https://www.youtube.com/LANDFIREvideo)



Bulletins/Post cards via e-mail

– Opt in: <http://eepurl.com/baJ BH>



Email: LANDFIRE@tnc.org

BpS model review website: <http://www.landfirereview.org/>

Questions? Comments?



Jim_Smith@tnc.org



Kori Blankenship
kblankenship@tnc.org
Fire Ecologist



Randy Swaty
rswaty@tnc.org
Ecologist



Sarah Hagen
shagen@tnc.org
Spatial Ecologist



Kim Hall
Kimberley.Hall@tnc.org
Climate Ecologist



Jeannie Patton
ipatton@tnc.org
Communications