Welcome to LANDFIRE and Southwest Fire Science Network's webinar about Biophysical Settings review & update. I'm Jeannie Patton, Communications Lead for The Nature Conservancy's LANDFIRE Program. This is one in a series of collaborations with JFSP members, and we're inviting you to participate in a significant ecosystem review and update project that affects the Southwest.

Leading the conversation is Randy Swaty of The Nature Conservancy's LANDFIRE team. He is one of the ecologists leading this complex, important contribution to ecological knowledge.

Randy joined the TNC Michigan Chapter in 2002 and the LANDFIRE program in 2007. His scientific specialties span spatial scales from community genetics to mycorrhizal ecology and landscape-scale planning. Randy has worked with federal partners and a large landowners to promote sustainable management and was the Great Lakes LANDFIRE modeling lead. He lives in Evanston, IL.

Today's Agenda

- The what and how about LANDFIRE BpS models
- A bit about BpS review: why it's necessary, and how it will work
- How you can be involved
- Where to go for more information and help

Randy Swaty
rswaty@tnc.org

BpS = Biophysical Settings

BpS Review website: http://www.landfirereview.org/

I'm Randy Swaty, ecologist on The Nature Conservancy's LANDFIRE team. In the next half hour, I'll introduce LANDFIRE to you, talk about how we developed Biophysical Settings vegetation – BpS – descriptions and models, and try to set the stage for the upcoming BpS review.

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.

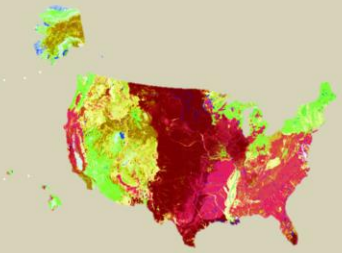
Spatial Datasets

LANDFIRE

- Uses peer-reviewed, consistent, repeatable scientific methods
- Delivers an "all-lands" spatial dataset of vegetation

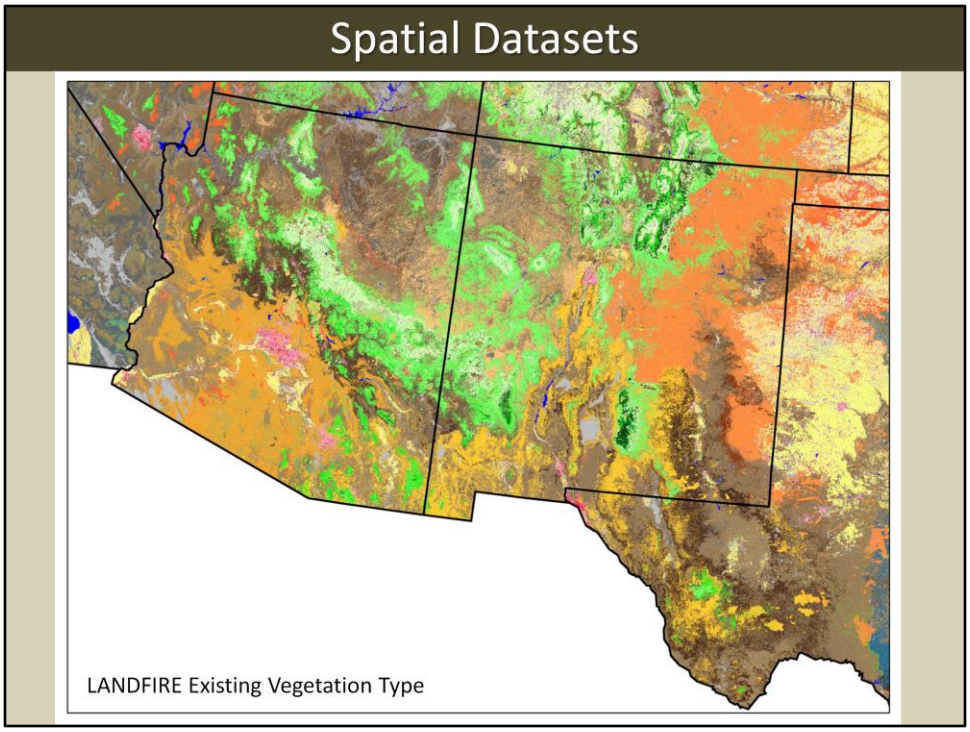
LANDFIRE Products

- Vegetation-not just fire
- Fire Regimes
- References and Baselines
- Fuels (Models and Measurements)
- Disturbance Characteristics
- Topographic and GIS Spatial Analysis

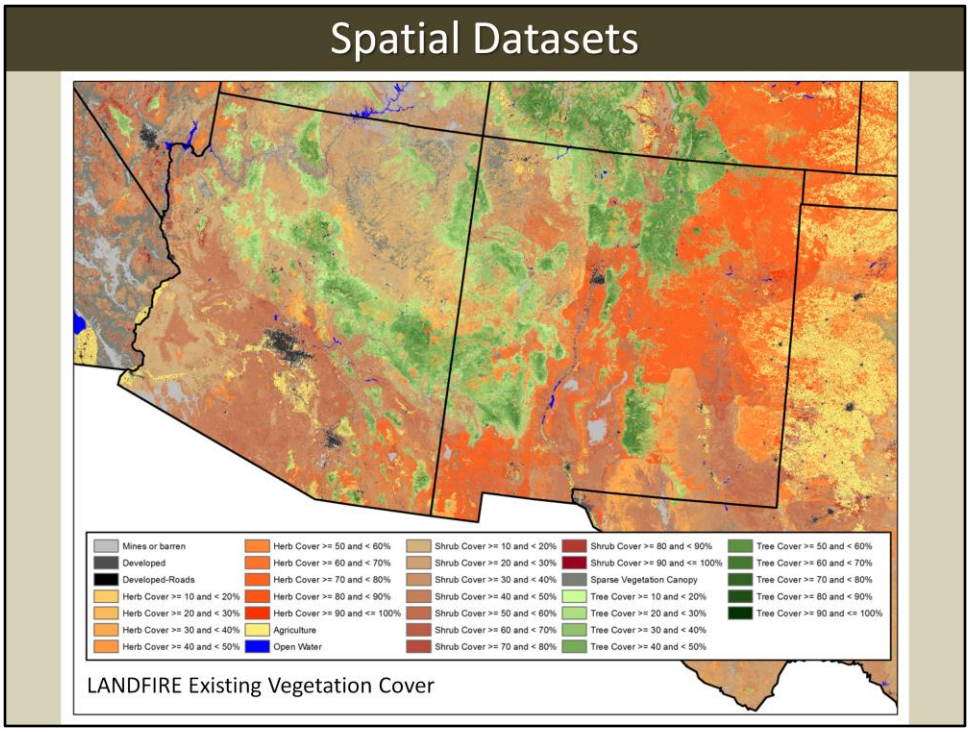


BpS Review website: http://www.landfirereview.org/

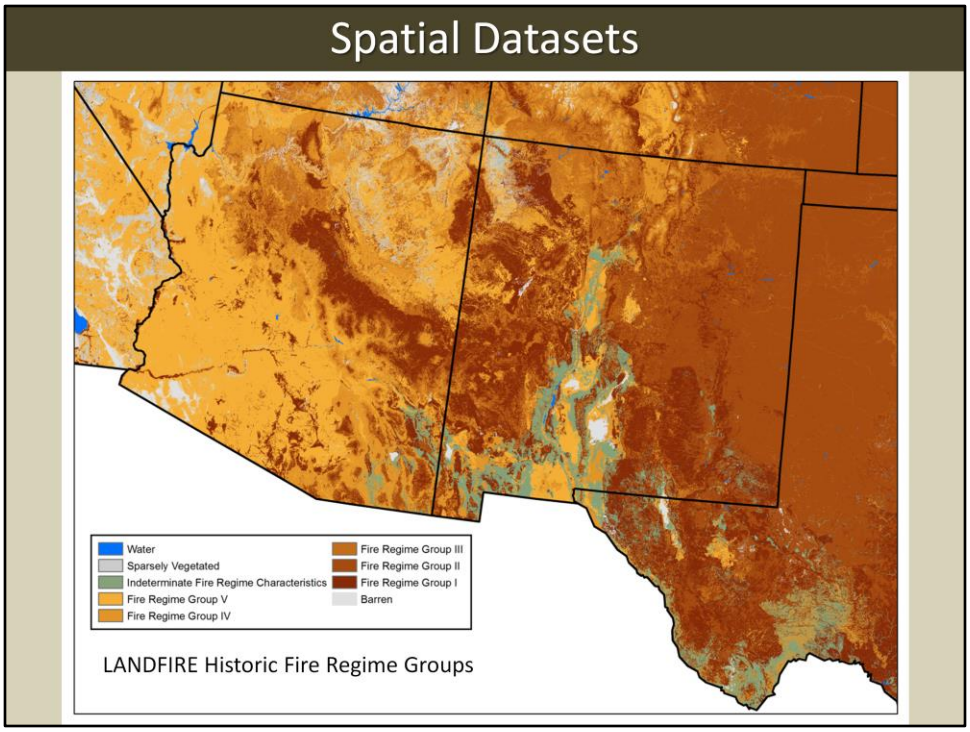
LANDFIRE uses peer-reviewed scientific methods, and delivers datasets of vegetation, fire, and fuels information for all land ownership types. Products include more than 20 geo-spatial layers and relational databases that support a wide range of analysis and modeling applications – whether fire-focused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



I want to give you a quick tour of a few of the LANDFIRE spatial datasets, current first. The Existing Vegetation Type map represents where Nature Serve's Ecosystems are currently. Again, legend left off due to number of items. That said the attribute table has a hierarchy based on the National Vegetation Classification Standards, and is also crosswalked to other classification systems such as one developed by the Society of American Foresters.



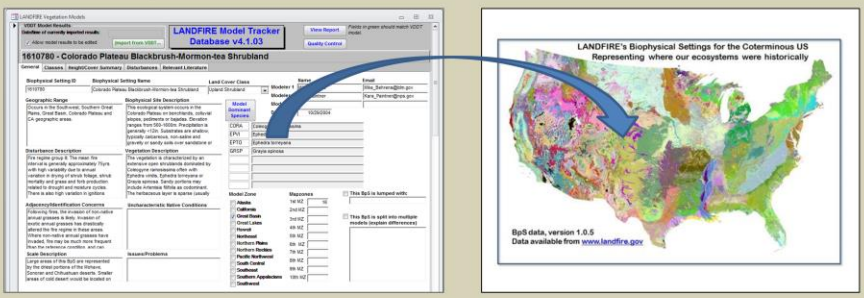
This map represents LANDFIRE Existing Vegetation Cover with a legend.



Here is one of the LANDFIRE datasets that represents historic conditions. Here we have the historic fire regime groups dataset that represents pre-settlement fire frequency and severity. It is built from the Biophysical Settings models that we'll explore next.

The link...

- The Biophysical Settings Model and Description bundles are linked to many spatial data sets
- Spatial datasets are not perfect-we are always working to improve
- Some areas for improvement are linked to the BpS descriptions



BpS Review website: http://www.landfirereview.org/

The Biophysical Settings models are stand alone products that link to LANDFIRE mapping. For example the values for the first map I showed you come from the BpS models. The Succession Classes that I will talk about in a moment are represented on today's landscape by taking the rulesets from the BPS models. In other words, some of the spatial datasets rely on the models...the better the models the better the maps in some cases.

Vegetation Model & Description Bundle

- **WHAT:** describe how ecosystems (Biophysical Settings) looked and functioned prior to major European Settlement
- **WHY:** to use as a reference to compare current conditions to (READ-not a prescription)
- **HOW:** worked with hundreds of experts to describe and model, followed by expert review, incorporation of feedback then QA/QC
- **WHEN: ~ 2,000** models and descriptions completed in 2008. TNC's LANDFIRE team submitted 200-400 pages of documentation and associated models every two weeks.

BpS Review website: http://www.landfirereview.org/

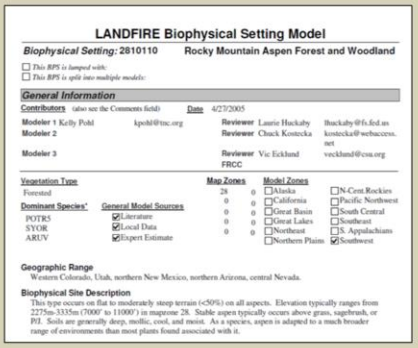
LANDFIRE model and description bundles represent how Biophysical Settings looked and worked prior to major European settlement. These the models and descriptions that accompany them play a part in national vegetation mapping and assessment, and on-the-ground management across the country.

We are not looking at climate change, and we are not necessarily saying that reference conditions are the same as "Desired Future Conditions." However, we think this the reference information is helpful. In some ecosystems, departure from reference conditions means higher vulnerability to climate change, and we can look to the reference vs. current conditions to asses what we might need to do to adapt.

The bundles are used in LANDFIRE to
- Understand historic disturbance patterns
- Estimate proportions of succession classes
- Get overall return interval of surface, mixed and replacement fires
- Map spatial layers
- Engage experts

WHAT

Two-part bundle



LANDFIRE Biophysical Setting Model

Biophysical Setting: **2810110** **Rocky Mountain Aspen Forest and Woodland**

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 4/23/2005

Modeler 1	Kelly Pohl	kpohl@tnc.org	**Reviewer** Laurie Huckaby	lhuckaby@fs.fed.us
Modeler 2			**Reviewer** Chuck Kostecka	kostecka@webaccess.net
Modeler 3			**Reviewer** Vic Ecklund FRCC	veckland@csu.org

Vegetation Type
Forested

Map Zones 28

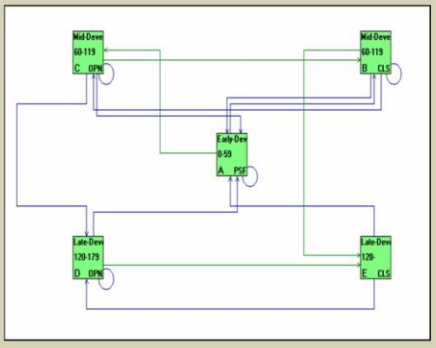
Model Zones
☐ Alaska ☐ N-Cent.Rockies
☐ California ☐ Pacific Northwest
☐ Great Basin ☐ South Central
☐ Great Lakes ☐ Southeast
☐ Northeast ☐ S. Appalachians
☐ Northern Plains ☑ Southwest

Dominant Species*
POTR5
SYOR
ARUV

General Model Sources
☑ Literature
☑ Local Data
☑ Expert Estimate

Geographic Range
Western Colorado, Utah, northern New Mexico, northern Arizona, central Nevada.

Biophysical Site Description
This type occurs on flat to moderately steep terrain (<50%) on all aspects. Elevation typically ranges from 2275m-3335m (7000' to 11000') in mapzone 28. Stable aspen typically occurs above grass, sagebrush, or PJ. Soils are generally deep, mollic, cool, and moist. As a species, aspen is adapted to a much broader range of environments than most plants found associated with it.



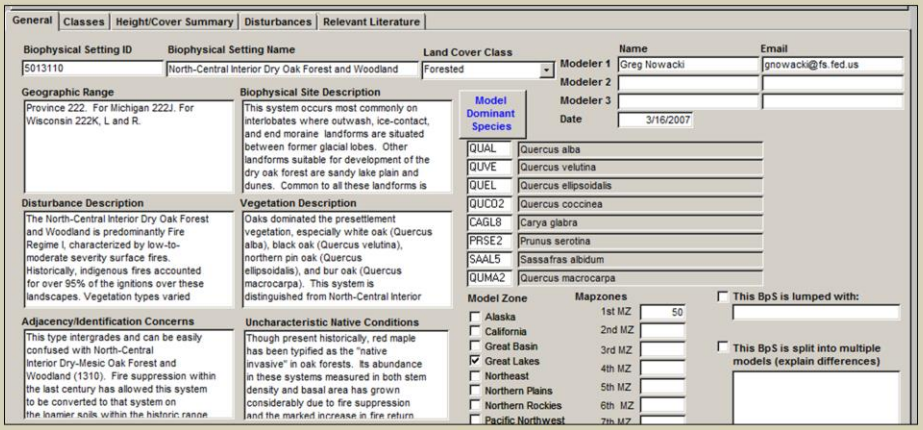
Textual description informed by ecological model

State-and-transition ecological model

BpS Review website: http://www.landfirereview.org/

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

Description: the Basics

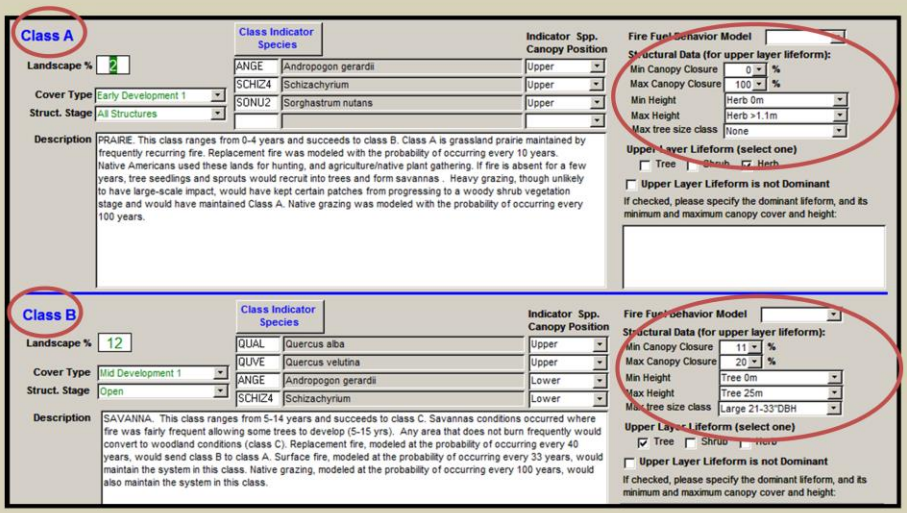


Originally captured in the "Model Tracker Database"

BpS Review website: http://www.landfirereview.org/

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.

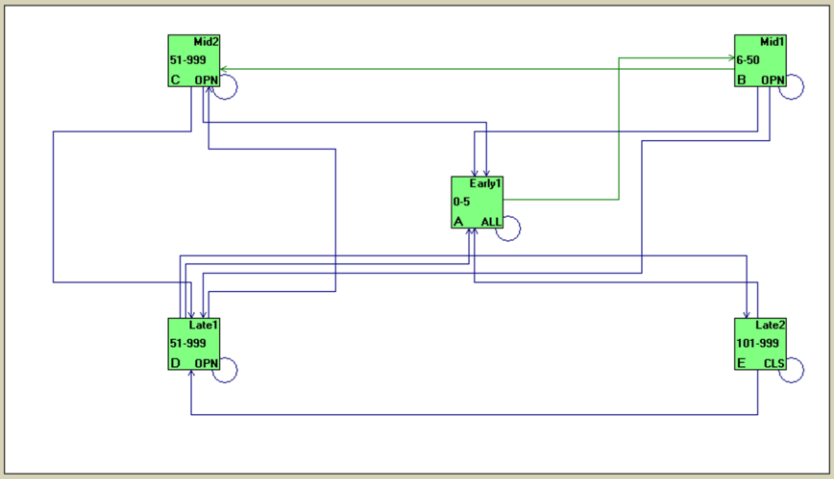
Description: Succession Classes



BpS Review website: http://www.landfirereview.org/

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.

Modeling: Succession Class Percent



Boxes = Succession classes. Lines = disturbances or succession

BpS Review website: http://www.landfirereview.org/

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").

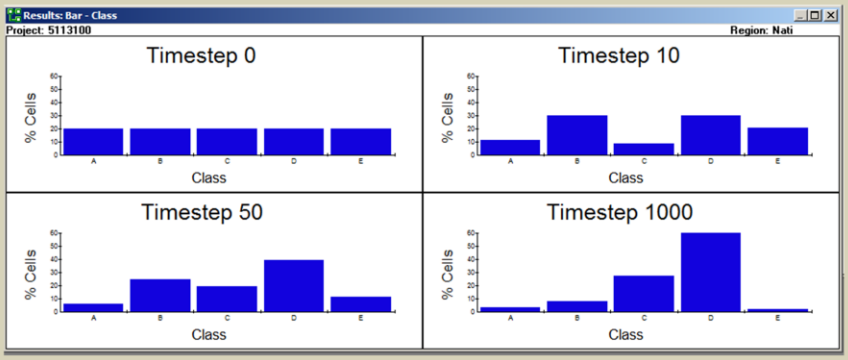
Modeling: Succession Class Percent

Inputs for VDDT modeling included:

- basic parameters for each Succession Class (structure, start and end age)
- types and annual probability of disturbances
- what happens when there is not a disturbance

Models were run:

- 10 times for 1,000 cells, 1,000 years



BpS Review website: http://www.landfirereview.org/

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.

Modeling: Review

"High-touch" hands-on process

1. Experts reviewed models and descriptions
2. Reviews were incorporated into the descriptions & models
3. Automated and manual quality assurance and quality control.

Not perfect!

BpS Review website: http://www.landfirereview.org/

Once we had descriptions and models we begun the review process, which was intense and fast. As mentioned earlier we were submitting BpS bundles every 2 weeks so were not able to always incorporate feedback. This review will be different as we will have a long "open season" for review and incorporation. While the BPS bundles were our main focus for 2 years, we know there is room for improvement.

Delivered

- Description and Model bundles delivered every two weeks
- First cog in the machine of BpS, S-Class, Vegetation Departure and other mapping processes

BpS Review website: http://www.landfirereview.org/

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.

Uses

Journal of Arid Environments

Volume 124, January 2016, Pages 388–397

Precipitation regime classification for the Mojave Desert: Implications for fire occurrence

Jerry Tagestad[a], Matthew Brooks[b], Valerie Cullinan[a], Janelle Downs[a], Randy McKinley[b]

Contents lists available at ScienceDirect

Forest Ecology and Management

journal homepage: www.elsevier.com/locate/foreco

Post-fire forest dynamics and climate variability affect spatial and temporal properties of spruce beetle outbreaks on a Sky Island mountain range

Christopher D. O'Connor[a,c,*], Ann M. Lynch[b,c], Donald A. Falk[a,c], Thomas W. Swetnam[c]

Ecosystems

DOI: 10.1007/s10021-013-9704-x

ECOSYSTEMS

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Previous Fires Moderate Burn Severity of Subsequent Wildland Fires in Two Large Western US Wilderness Areas

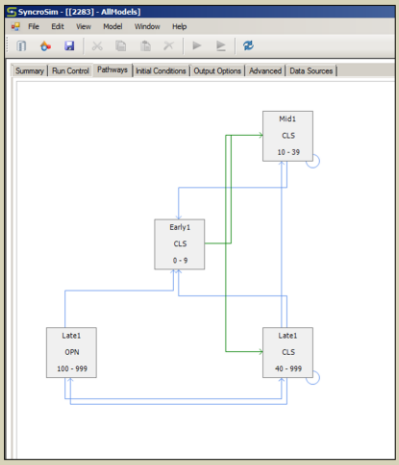
Sean A. Parks,[1,2]* Carol Miller,[1] Cara R. Nelson,[2] and Zachary A. Holden[3]

- Research
- Conservation planning
- Input for other models
- Fire management planning
- Ecological assessment

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.

Why Review?

- "Blunders" e.g. typos, inconsistencies, and so on
- New science
- Missed opportunities
- Potential for upgraded delivery system
- Updated modeling software

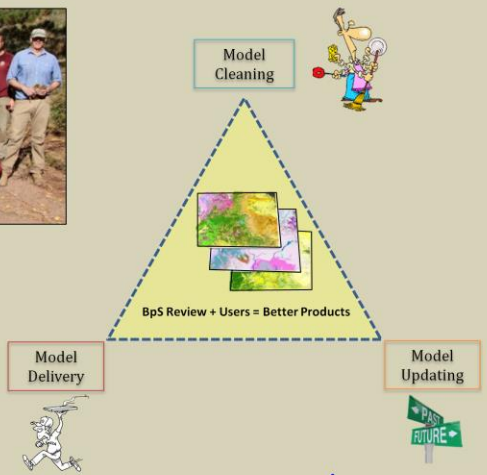


BpS Review website: http://www.landfirereview.org/

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



BpS Review website: http://www.landfirereview.org/

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 removing duplicates and near duplicates.
- The documents are posted on the dedicated BpS Review website.
- Contributors may review the Word document/description, or do both the document and the model.
- 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 as needed.

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

Online Connections

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

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

Twitter: @nature_LANDFIRE

YouTube: LANDFIREvideo

Bulletins/Post cards via e-mail

- Opt in: http://eepurl.com/baJ_BH

Email: LANDFIRE@tnc.org

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