Demystifying LANDFIRE’s Biophysical Settings in the Great Plains

Presented by

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The Nature Conservancy LANDFIRE Team

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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.
- partner on LANDFIRE
- education, outreach, bps models

TNC-LANDFIRE Team

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Today’s Agenda

BpS Models 101

Using the BpS Models

Improving the BpS Models
Take-Home Message

BpS models are important because they:

- Help us to understand complex ecological processes and relationships
- Provide a framework for exploring management actions

- focus on disturbance and succession dynamics
- help us understand complex ecological processes and relationships
- management, scenario testing, analyzing affects of alternative approaches to mgmt
- looking at restoration opportunities
• LANDFIRE not the only data
  • NW is data rich

• Other STSM efforts: ILAP, FS NW research station, FS Eastside restoration strategy, Interior Columbia Basin

• LANDFIRE’s role:
  • Coarser resolution – geography and detail in the model
  • Easier to map, links well to FRCC
  • Provide reference conditions (e.g. ILAP models do not)
  • All lands, forest and rangelands
  • Link to spatial data

• recognize that LF is not the only player in the data biz; we hope to educate about appropriate use so users can make informed decisions and choose the best data for their specific needs
Major Biophysical Settings
Models have 2 parts: description and quantitative state-and-transition model
Together they describe basic ecology of the bps prior to Euro-American settlement

SHOW DESCRIPTION
Picture: Griffith Prairie north of Aurora, Nebraska. Mixed-grass prairie on a storm spring evening. Owned by Prairie Plains Resource Institute. Photo credit: © Chris Helzer/TNC
Mixed Grass Prairie

11320
Central Mixedgrass Prairie
Model Date: 10/12/06
Report Date: 8/21/14

<table>
<thead>
<tr>
<th>Models</th>
<th>Email</th>
<th>Reviews</th>
<th>Email</th>
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Vegetation Type
Upland Grassland/Herbaceous

Map Zones:
- 33

Model Species or Lumps
This ByP is lumped with 1148, 1150

Geographic Range
This type historically occurs in western KS, western NE, eastern CO and northeastern NM. This becomes more common proceeding east. This ByP comprisesthe majority of acres in MZ30. It occurs in every ECOMAP subregion of MS30 and CO portion of MZ27. See map of Central Shortgrass Ecoregional Plan (The Nature Conservancy 1999) for mixedgrass and shortgrass prairie potential. In NM, this type would be most prevalent along the eastern boundary of the prairies.

Biophysical Site Description
This type occurs on sandy loam, loamy or clayey upland sites of the southern Great Plains.

In NM and CO, elevations range from 1500-2000m. In KS, elevations can be 1000m.

Precipitation ranges from 14-22in, and occurs predominantly during the summer. Precipitation can go down to 10in.

Midgrasses and shortgrasses would be on steeper slopes and rockier sites - but these are isolated occurrences. Away from the eastern edge of the prairies, this is the most common situation for this type in NM, i.e. on rocky breaks and mesa slopes.

Vegetation Description
Historically, vegetation was co-dominant with tallgrasses, midgrasses, short grass, and shrubs. (Species are in order of dominance in boxes.) Dominant species include meadow foxtail, sandbromes, little bluestem, yellow indiangrass, big bluestem, switchgrass, blue grama and western wheatgrass (most dominant in CO and KS), with unimanged forbs - American vetch.
Mixed Grass Prairie

counts and Bouteloua gracilis and Bouteloua hirsuta can also be found within this system. Shrubs
species include 1-3% Western sycamore, Prunus pumila L., var. b carrying, not as ShC. Yucca
glance is present. Also present - switchgrass, little bluestem, yellow indiana grass and more rarely
- western wheatsgrass. Further east, tallgrass prairie. Sand bluestem occurs on sandy range
sites in eastern portion whereas blue bluestem occurs sandy foothills sites. However, a reviewer
felt that ANGE by bluestem should either be part of 1147 WGP Foothills and Piedmont
Grassland, therefore, ANGE was removed from the dominant species list.

Shrubs included few-wing saltbush, waterfern, with lesser amounts of ribbontail, broom
underwood, fringed sage, reed grass and also plants prickly pear.

<table>
<thead>
<tr>
<th>Key</th>
<th>Dominant and Indicator Species</th>
<th>Common Name</th>
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<tbody>
<tr>
<td>PASM</td>
<td>Puccinellia crispis</td>
<td>Western wheatgrass</td>
</tr>
<tr>
<td>SAGC</td>
<td>Schizachyrium scoparium</td>
<td>Little bluestem</td>
</tr>
<tr>
<td>HEC2</td>
<td>Hesperis montana</td>
<td>Needle-and-thread</td>
</tr>
<tr>
<td>BRR2</td>
<td>Bouteloua gracilis</td>
<td>Blue grama</td>
</tr>
<tr>
<td>BRR3</td>
<td>Bouteloua curtipendula</td>
<td>Schreins grama</td>
</tr>
<tr>
<td>SORM</td>
<td>Sorghastrum nutans</td>
<td>Indiangrass</td>
</tr>
<tr>
<td>DAV2</td>
<td>Panicum virgatum</td>
<td>Switchgrass</td>
</tr>
</tbody>
</table>

**Disturbance Description**

Historically, fire return intervals were probably approximately 20-25yrs (Dou Noss, Rich Story, 
Terry Schuel, pers comm) - slightly shorter return interval (more frequent fire) and probably too
variable than shortgrass prairie due to higher fuel loads, at least in eastern Colorado/western
Kansas area. However, shortgrass prairie interval was changed to approx 20-25yr post-recover,
therefore, once it is thought that maximum interval should be shorter than shortgrass, but
because original shortgrass model had a 20-25yr interval, XL changed the MFRI for maximum
approximately 15-20yrs. Also - RA model for BURPMO - Maximum Prairie south, was
modulated with an interval of 15yrs. All modellers/reviewers informed of changes.

We are uncertain about MFRI in general for the prairie ecosystems. We have few consistent
records on fires and their extent and frequency, particularly in good condition sites. However,
fires on the landscape level occur frequently and generally born in a mosaic pattern. They do not
return to the same acreage that frequently, however.

Going east out of MEZ 27 and 33, MFRI gets shorter. Return interval for fire could be extended
by irregular grazing. Few return intervals are now occurring more infrequently - over 50yrs
(based on years of personal observation, Spruyt et al).

Prairie dogs would have occurred extensively. There were some very large towns, but there were
also areas without any towns. When present, they would likely extend the MFRI.
Large bands of zones went through this system, as well as elk, deer, pronghorns. The dynamics of the herbivore populations is key to the MFREI, because it creates a mosaic pattern of heavier and lighter grazed areas.

However, currently, there is overgrazing/overstocking and continuous grazing, creating more shortgrass and increasing fire intervals (less fire).

This is a drought tolerant system. However, extended drought (over 3–4yr) will reduce cover.

Drought and grazing were probably most important disturbances historically.

<table>
<thead>
<tr>
<th>Severity</th>
<th>Avg FI</th>
<th>Min FI</th>
<th>Max FI</th>
<th>Percent of All FI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replacement</td>
<td>15</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate (Mixed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (Surplus)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All FI</td>
<td>15</td>
<td>100</td>
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</table>

Scale Description
This is a matrix community in areas to the east. In CO and western KS – the Central Shortgrass Prairie Ecosystem - it is considered a large patch system. Mixedgrass prairie can occur as small to large patches. Disturbances are also variable in size – small to large, large patches. Driving variables are climate (drought, low rainfall, etc), grazing, and to a lesser extent fire.

Non-Fire Disturbances
Wind/Weather Stress
Native Grazing
Other 1: grama dogs
Other 2: continual grazing

Adjacency or Identification Concerns
This system could be confused with shortgrass prairie. Production is less in shortgrass versus mixedgrass prairie. These two systems are intermixed, with the shorter grasses further west with less precipitation (other than the foothills areas).

Mixedgrass and shortgrass can be distinguished by a higher occurrence of blue gramma, which would indicate shortgrass. If there is more mixedgrass (i.e. 50% or more mixedgrass), the system should be considered mixedgrass prairie.

Much of the historic mixedgrass in Colorado has been converted to row crops/vegetation/algae/soil, transportation corridors and some shortgrass prairie in a result of continuous grazing. Agricultural conversion is the primary threat to this system today, in NM as well. These were uses for extensive dryland cropping. Abandoned fields are now in a different process of real land succession with some of the native species.
Mixed Grass Prairie

Issues or Problems
The successional class model used for this system was adopted from a draft version of a shortgrass system.

Native Characteristic Conditions
When mixedgrass appears like shortgrass with shortgrass species, it is uncharacteristic.

Cautions
This model for MG 27 and 33 was adopted from the draft model for BMP 1149 shortgrass prairie for MG 77 and 33 created by Terry Schultz, Harvey Speck, Rick Sheely, Dan Wool and Keith Schultz, who were also the modelers for 1132. Other modelers for MG 27 and 33 for 1132 were Keith Schultz, Randy Rechert. Other reviewers for MG 27 and 33 was Harvey Speck.

Succession Classes
Class A 9 Early Development 1 - Open

Class A 9 is in the successional stage. Species include...
Model in ST-Sim (3311320)

5 states
ages
Replacement fire
Native grazing probability

Late2
CLS
16 - 999

Late1
CLS
16 - 999

Early1
OPN
0 - 15

0.05

0.7
Continuous grazing
Drought probability

- Late2
  CLS
  16 - 999

- Late1
  CLS
  16 - 999

- Early1
  OPN
  0 - 15

0.025

drought
Ref con can be compared to current con
See variability in fire frequency over time – model is stochastic
- collaborative process facilitated by TNC-LF
- represent collective ecological knowledge of hundreds of people around the country
- >700 contributors to the models, >40 expert workshops plus individual meetings
Support – tutorials, guides online
Documentation – state assumptions in the description, numbers in model are explained in the description

Constraints – 5 boxes
Non-spatial – st-sim has spatial functionality
Difficult to validate – little hx data
LANDFIRE use of model info
- quality of spatial products depends on quality of BpS models
Conceptual model use
-Historic condition is not necessarily desired condition
-hx information provides important context when evaluated w/ current and expected future conditions
• Reid and Fuhlendorf 2011
• examined the fire regime of the Charles M. Russell National Wildlife Refuge (CMR) over the previous 28 years and compared it to historical fire regime reconstructions using LANDFIRE National Fire Regime Condition Class, Fire Regime Group, and Mean Fire Return Interval layers. By comparing the refuge records to what was available through LANDFIRE, they determined that a large majority of the refuge was moderately or highly departed from the historic fire regime. The average mean fire return interval for the refuge based on LANDFIRE reconstructions was 48 years compared to 134 years as calculated based on refuge records from 1980-2008.
Case Study

Pictures and maps from Reid & Fuhlendorf 2011
Case Study

Figure from Reid & Fuhlendorf 2011
Case Study

Figure from Reid & Fuhlerdorf 2011
• TNC-LANDFIRE team can help too
- No review since the models were delivered
- Review offers chance to improve models
  - incorporate new science, correct errors and inconsistencies
1. Multiply your impact

2. Improve the data used to manage land

3. “Fun”

1. translate your knowledge into vital products that are used in all sorts of applied and research settings
2. Models have been used in dozens of land management applications and we want to make sure that we have the best data available to support these efforts
3. Think about ecology and disturbance and succession

1. Please help if you can and if you are not sure how to get started contact me
Take-Home Message

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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/