Rapid Assessment Reference Condition Model

The Rapid Assessment is a component of the LANDFIRE project. Reference condition models for the Rapid Assessment were created through a series of expert workshops and a peer-review process in 2004-2005. For more information, please visit www.landfire.gov. Please direct questions to helpdesk@landfire.gov.

Potential Natural Vegetation Group (PNVG):

R4PRTGse **Southern Tallgrass Prairie East**

General Information

Contributors *(additional contributors may be listed under "Model Evolution and Comments")*

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Vegetation Type

Grassland

Dominant Species*

ANGE
SONU2
PAVI2
SCSCD

General Model Sources

☑ Literature
☑ Local Data
☑ Expert Estimate

LANDFIRE Mapping Zones

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Rapid Assessment Model Zones

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

Geographic Range

Central US from the Osage Plain of Missouri north to the Missouri River Valley and following the east side of the Platte River Valley of Missouri north into Iowa; east to the Mississippi River Valley.

Biophysical Site Description

Typical mollic grassland soils with relatively high levels of clay content. Precipitation gradient increases from west to east with precipitation adequate to allow tree and shrub seedling establishment in the absence of fire. Frequent large anthropogenic fire events maintained grass dominance. Grassland forms the matrix cover type with hardwood stands, imbedded in the matrix, positioned in favorable sites/along stream courses.

Vegetation Description

Tallgrass prairie, expansive in the west and less so in the east because of interspersion with oak savanna, R4OASA, and oak woodland, R4OKHK, on favorable sites related to topoedaphic conditions. Prairie dominant species are big bluestem (Andropogon gerardii), little bluestem (Schizachyrium scoparium), Indiangrass (Sorghastrum nutans) and switchgrass (Panicum virgatum). Secondary species vary in importance regionally depending on effective precipitation dictated by topoedpahic factors (topography, soil texture, and soil depth) but include sideoats grama (Bouteloua curtipendula), needlegrass (Achnatherum spartea), Junegrass (Koeleria macrantha), buffalo grass (Buchloe dactyloides), and blue grama (Bouteloua gracilis). Forb abundance and diversity increases to the northeast. Sideoats grama (Bouteloua curtipendula), buffalo grass (Buchloe dactyloides), and blue grama (Bouteloua gracilis) are more abundant to the southwest. Various Nassella spp. and Hesperostipa spp. become more important in the northern half. Several short stature grasses such as Dicanthelium spp. and Carex spp. are also important in the west, particularly following heavy grazing. Conspicuous perennial forbs include the genera Helianthus, Soladago, Liatris, Dalea, Viola, and Antennaria. Important shrubs include Rosa spp., Salix, Symphoricarpos, Rhus. Juniperus virginiana, a fire intolerant tree, was constrained to a

*Dominant and Indicator Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.

few sites producing too little fine fuel to support fire.   Bison disturbance historically may have been a locally important disturbance increasing the heterogeneity of patches on the landscape but contemporary sources of fire in prairies does not include interaction with herbivory (references?).

Disturbance Description

Frequent surface fire, primarily anthropogenic in origin (Wedel 1953, Nelson 2005, Ladd 1991, Schwartz 1997). The eastward cycle of fire became almost annual, and the proportion of anthropogenic fire was nearly total (Clamsey & Pemble 1986). Large portions of a landscape were kept open and repeatedly ignited by Native Americans to stimulate new growth to attract wildlife, clear vegetation, facilitate travel, as a tool of warfare or hunting, and reduce the likelihood of wildfire (MDC 2003, Clamsey & Pemble 1986, Ladd 1991). Natural fire was probable during the dormant season, largely autumnal (Guyette & Cutter 1991), but also through spring, and was unlikely during the growing season (Brown & Smith 2000, Nelson 2004, Bragg 1982). Summer fire events, primarily as lightning strikes, were infrequent, small, lower in intensity, and burnt less completely because green fuel conditions composed the largest percentage of combustible fuels. This may have been larger during late summer, August-September, during drought years. Fire return interval varied from 1 to 5 years (Schwartz 1997, Guyette & McGinnes 1982, Guyette & Cutter 1991, Pyne 1997) but likelihood of fire was less than 2 years (Nelson 2004, Ladd 1991, Clamsey & Pemble 1986). Spatial extent of individual fire events was limited by variables that include adjacent community types, fuel bed continuity, local landform, ignition source and location, season, proximity to human settlements and the presence of major firebreaks such as rivers (Nelson 2005). Fire on open prairie often spread fire into adjacent vegetation types (oak savanna R4OASA and/or oak woodland R4OKHK) where ignition from within was less likely. Rate of spread into these adjacent hardwood stands was often slowed or stopped, except in most extreme drought years, producing burn patterns that are closely related to fuel characteristics and its receptivity to burning. And in the absence of fire, transition to hardwoods occurred quite rapidly (Abrams 1992, Ladd 1991, Joern & Keeler 1995). Although bison exerted significant influence (McClain & Elzinga 1994), large bison herds found in the west were less frequent in the east and so fire interaction with herbivory (large ungulates) exerted less influence than in the tallgrass prairie to the west (R4PRTsw). Drought produces a wide range of direct responses in resident tallgrass prairie biota, from mortality of tree seedlings and reduced vigor of mesic species to increased fire return intervals because of changes in fuel characteristics. The drought like conditions that precipitate these effects can exist across all spatial configurations, continental to local, transcending all terrestrial boundaries. Direct links to the sun spot cycle (11-22 years) and moisture deficit exist (Clements 1921, Shantz 1927, Alberston & Tomanek 1965); however, the interaction of these solar cycles with the spatial extent of the waxing and waning of tallgrass prairie remains unclear.

Adjacency or Identification Concerns

Identifiers of tallgrass prairie are commonly accepted across agencies and experts. However, because of land use conversions and rates of woody invasion due to fire suppression, tallgrass prairie is limited currently in extent. Some components of tallgrass prairie are likely imbedded in other cover types (e.g., cattle pastures and woodlots) but are unrecognizable.

Scale Description

Sources of Scale Data ☐ Literature ☐ Local Data ☑ Expert Estimate

Fire events were spatially expansive interrupted only by natural barriers (i.e. major river drainages) or changes in fuel type.   Topoedaphically complex areas (e.g., claypan prairies) could be <100 acre, while anthropogenic fire events may have been as large as 600,000 acres; however, we really cannot begin to quantify scale and temporal patterns based on current knowledge.

Issues/Problems

Fire return intervals are frequent and occur independently of native ungulate grazing, so succession is largely a function of fire. Details of spatial extent and pattern as well as compositional characteristics are largely unknown because most of this type was cultivated shortly after European settlement. The remaining prairie occurs on sites (e.g., rocky and more xeric sites) less likely to be cultivated, which suggests that our knowledge of prairie is of those areas that were of lower productivity and compositionally poor.

Model Evolution and Comments

Comments were provided by one anonymous reviewer.

Succession Classes

Succession classes are the equivalent of "Vegetation Fuel Classes" as defined in the Interagency FRCC Guidebook (www.frcc.gov).

Class A 23 %

Early1 Open

Description

Post-fire vegetation; a short-lived (weeks to months depending on time of burn). Fire timing results in variation in the contribution of C3 and C4 species to composition with spring fire enhancing C4 dominance (Howe 1995). C3 composition dominated by forbs, but includes some perennial grasses. Succession leads rapidly to Class B as mass of tallgrass shades out shorter stature forbs. Probability of fire is low and is restricted to the following dormant season from fall through spring. Native grazing was probable following a fire.

Indicator Species* and Canopy Position

ANGE	Upper
SONU2	Upper
PAVI2	Upper
Forbs	Upper

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model 1

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	20 %	90 %
Height	Herb Short <0.5m	Herb Tall > 1m
Tree Size Class	no data	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class B 69 %

Mid1 Closed

Description

Recovering tallgrass vegetation with compositionally diverse forb component yet dominated by tallgrasses. Increasing levels of litter reduce forb diversity over time and increases probability of ignition and fire spread that transitions to Class A. Transitions to young-age woodland (Class C) under no fire, which carries a low probability. Late in this class (about 8 to 10 years), trees can invade as seedlings; invasion rate and density of seedlings depends

Indicator Species* and Canopy Position

ANGE	Upper
SONU2	Upper
PAVI2	Upper
Forbs	Middle

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model 3

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	80 %	100 %
Height	Herb Short <0.5m	Herb Tall > 1m
Tree Size Class	no data	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

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on proximity of sites to seed source.

Class C 8%

Late1 Closed

Description

Hardwood savanna/woodland resulting from absence of fire. Probability of transition to hardwoods begins to increase with 10 year absence of fire, and within 50 yrs, this class transitions to a young aged woodland, i.e. oak savanna or oak/hickory woodland (see oak savanna, R4OASA; oak woodland, R4OKHK). Overall probability of fire events declines only slightly (from 1 in 3 years to 1 in 4 years) from Class B to Class C, but replacement fire declines in probability to 1 in 10 years. Moreover, replacement fire is more likely to transition vegetation to Class A in the earlier years of this class. Surface fire and mixed fire kill too few trees to transition vegetation from Class C to Class A.

Indicator Species* and Canopy Position

Quercus	Upper
ANGE	Low-Mid
SONU	Low-Mid
PAVI2	Low-Mid

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	5 %	25 %
Height	Tree Regen <5m	Tree Short 5-9m
Tree Size Class	Sapling >4.5ft; <5"DBH	

- [x] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Grasses: Minimum canopy cover = 80%; Maximum canopy cover = 100%. Minimum height = <0.5m; maximum height = >1m.

Class D 0%

Late1 All Structures

Description

Indicator Species* and Canopy Position

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	0 %
Height	no data	no data
Tree Size Class	no data	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class E 0%

Late1 All Structures

Description

Indicator Species* and Canopy Position

Structure Data (for upper layer lifeform)

	Min	Max
Cover	%	%
Height	no data	no data
Tree Size Class	no data	

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Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Fuel Model no data

Disturbances

Non-Fire Disturbances Modeled

☐ Insects/Disease
☐ Wind/Weather/Stress
☑ Native Grazing
☐ Competition
☑ Other: drought
☐ Other:

Historical Fire Size (acres)

Avg: 100000
Min: 1
Max: 600000

Sources of Fire Regime Data

☑ Literature
☐ Local Data
☑ Expert Estimate

Fire Regime Group: 2

I: 0-35 year frequency, low and mixed severity
II: 0-35 year frequency, replacement severity
III: 35-200 year frequency, low and mixed severity
IV: 35-200 year frequency, replacement severity
V: 200+ year frequency, replacement severity

Fire Intervals (FI):
Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is the central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class. All values are estimates and not precise.

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	4	1	10	0.25	96
Mixed	277			0.00361	1
Surface	135			0.00741	3
All Fires	4			0.26102	

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