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 and 2005. For more information, please visit www.landfire.gov. Please direct questions to helpdesk@landfire.gov.

Potential Natural Vegetation Group (PNVG)

R4PRTGc **Tallgrass Prairie - Central**

General Information

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

Modelers

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Vegetation Type

Grassland

Dominant Species*

ANGE
SONU
PAVI2
SPPE

General Model Sources

- [x] Literature
- [ ] Local Data
- [x] Expert Estimate

LANDFIRE Mapping Zones

42 39
43
38

Rapid AssessmentModel Zones

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

Geographic Range

Central US including Iowa, eastern Nebraska, southwest Minnesota, northwest Missouri, southeast South Dakota, and northeast Kansas; interfaces and mingles on the east with the Oak Savanna and on the west with Mixed Grass Prairie

Biophysical Site Description

The area is primarily mollic grassland soils incorporating xeric mesic, and hydric prairie types (Curtis 1959). Xeric prairies were maintained by shallow soils on steep slopes, flat uplands, and ridges where rainwater runoff was greatest resulting in low water-holding capacity. Mesic prairies occurred on flat and rolling topography including some on glacial outwash with porous subsoil of sand and gravel. Rolling areas were characterized by glacial till of recessional moraines or on residual aeolian loess deposits. Soil profiles consist of a black surface layer rich in organic material with high water-holding capacity. Wet prairies were found on poorly drained soils in drainage ways and concave positions on uplands an din lowlands along waterways or in areas subject to inundation. Lowland prairies were in and along waterways or in areas subject to frequent inundation. Soils are rich in organic matter and show evidence of inundation in a gleying layer 3-4' below the surface. The region is strongly influenced by dry continental air flow patterns and periodic drought (Whitney 1994).

Vegetation Description

Dominated by big bluestem (Andropogon gerardii), Indiangrass (Sorghastrum nutans) and switchgrass (Panicum virgatum) on more mesic sites with prairie cordgrass (Spartina pectinata) dominating the wet sites. Secondary species such as little bluestem (Schizachyrium scoparium), sideoats grama (Bouteloua curtipendula), porcupine grass (Stipa spartea), and June grass (Koeleria macrantha) occupied the more xeric uplands and soil types and varied in importance. At the western extent of this type buffalo grass (Buchloe dactyloides), blue grama (Bouteloua gracilis) and Dicanthelium spp.increased with grazing. Conspicuous perennial forbs included the genera Asclepias, Aster, Echinacea, Helianthus, Solidago, Liatris, Dalea, and Viola. Prairie shrubs include the genera Amorpha, Rosa spp. and Ceanothus. The effect of large ungulates,

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

bison and elk, was less prominent than further west, but no doubt contributed to the patchiness of burns.

Disturbance Description

Fire played an important role in the maintenance of the tallgrass prairie especially in the eastern portion with climatic factors more important to the west (Curtis 1959, Vogl 1964, Anderson 1990). Fire could occur throughout the year with larger, less frequent fires occurring during the dormant season and smaller, more frequent fires occurring during the growing season. Native American burning, essential to maintaining the eastern tallgrass prairie, was bimodal in distribution, peaking in April and October with lightning ignition occurring primarily during July and August (Higgins 1986). Bison grazing as a major disturbance was likely much more limited than further west. Elk probably contributed to the impact of grazing and browsing as well but it is assumed that the total contributions of these two species was still considerably less than to the west. The elk may have contributed to the reduction of young woody saplings invading prairie adjacent to protected woody areas.

Adjacency or Identification Concerns

As indicated this system interfaces and mingles on the east with Oak Savanna and on the west with Mixed Grass Prairie. On the east there would be limited woody invasion from protected areas during periods of increased precipitation. The woody component would be limited to the edge the prairie and would not exhibit any appreciable effect overall. Since Mixed Grass Prairie is to the west, there would be little effect except in periods of extended drought the percentage of the mixed grass species would increase.

Scale Description

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

Most fires were stand replacement in nature. Once ignited, dormant season fires would have spread over a large area until reaching a major firebreak (e.g. previously burned area, major river, rugged terrain, etc.). Growing season fires may have been frequent but smaller in size than dormant season fires due to the greenness of the fuel and rain following lightning ignition. Growing season fires during drought years would have been much like dormant season fires. Mixed fires were probably limited to patchy grazed areas or areas where fuel was not uniformly cured.

Issues/Problems

Much of the literature on fire in the tallgrass prairie does not include interaction with herbivory (Engle and Bidwell 2001) thus interpreting effects must be qualified. In addition, little is know about native ungulate grazing in this area. It is generally accepted that bison grazing was less in this grassland than in grasslands to the west. Further, it has been recently suggested that elk populations may have been large enough to have an effect on vegetative composition. Some woody plant invasion may have occurred but it was limited to areas close to seed sources such as along the eastern interface with the savanna and around woody pockets and river valleys.

Model Evolution and Comments

Comments were provided by one anonymous reviewer suggesting that the percentage of Class D was likely higher in map zone 43 (northern Missouri and southern Iowa) - dictated by moisture cycles. Ortmann in his review suggested that in addition to fire, drought and grazing that insect outbreaks (Rocky Mountain locust) would have impacted all classes.

Succession Classes**

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

Class A 24 %

Early1 Open

Description

Post Fire Regrowth Stage - Duration: 1 year. From blackened state, rapid regrowth of fire positive and fire neutral perennial vegetation to maximum height by end of growing season. Warm season grasses and fire positive forbs display increased height, flowering and fruiting and appear to be more abundant depending on season of the burn. Annual, biennial and short-lived perennial species occupy space opened by litter removal. Fire neutral perennial forbs maintain pre-fire composition, but may appear to be reduced. Fire negative species are reduced. No litter accumulation in this class. Probability of a replacement fire is 0.10.

Dominant Species* and Canopy Position

ANGE Upper
SONU2 Upper
PAVI2 Upper
SPPE Upper

Upper Layer Lifeform

☑ Herbaceous
☐ Shrub
☐ Tree

Fuel Model 3

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	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 57 %

Mid1 Closed

Description

Ungrazed Stage - Duration: 1 - 5 years. This ungrazed stage continues to be dominated by big bluestem (Andropogon gerardii), Indiangrass (Sorghastrum nutans) and switchgrass (Panicum virgatum) on more mesic sites with prairie cordgrass (Spartina pectinata) dominating the wet sites. Secondary species such as little bluestem (Schizachyrium scoparium), sideoats grama (Bouteloua curtipendula), porcupine grass (Stipa spartea), and June grass (Koeleria macrantha) occupied the more xeric uplands and soil types and varied in importance. At the western extent of this type buffalo grass (Buchloe dactyloides), blue

Dominant Species* and Canopy Position

ANGE Upper
SONU2 Upper
PAVI2 Upper
SPPE Upper

Upper Layer Lifeform

☑ Herbaceous
☐ Shrub
☐ Tree

Fuel Model 3

Structure Data (for upper layer lifeform)

	Min	Max
Cover	90 %	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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grama (Bouteloua gracilis) and Dicanthelium spp increase with grazing. Perennial forbs include genera such as Asclepias, Aster, Echinacea, Helianthus, Solidago, Liatris, Dalea, and Viola. Noticeable scattered shrubs, Amorpha, Rosa spp and Coenothus, annually increase in size. Litter accumulates annually. Annuals, biennials and short lived perennials gradually become less abundant. Probability of a replacement fire is 0.33; surface fire = 0.05.

Class C **18 %**

Mid1 Open

Description

Grazed Stage - Duration: 1 - 8 years. Affected by grazing. Grazers preference for the younger, more succulent species in recently burned areas created patches with shorter vegetation and an increased forb composition. These patches were less likely to burn and may have changed the overall vegetation structure of this class. It can be inferred that the effect of large ungulates, bison and elk, was less prominent than further west, but their grazing and browsing no doubt affected the composition of the vegetation and burn regime. Probability of a replacement fire is 0.125; of a surface fire = 0.05; mixed fire = 0.25.

Dominant Species* and Canopy Position

ANGE	Upper
SONU2	Upper
PAVI2	Upper
SPPE	Upper

Upper Layer Lifeform

- ☑ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model 3

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	50 %	80 %
Height	Herb Short <0.5m	Herb Medium 0.5-0.9m
Tree Size Class	no data	

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

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Class D 1 %

Late1 Closed

Description

Ungrazed Thatch Accumulation Stage - Duration 6 - 1000 years. Continuation of ungrazed state from Class B, however, with lack of grazing for the long term, the prairie matrix weakens and it is succeeded by woody cover of shrubs and trees, depending on proximity of woody seed sources. Probability of a replacement fire = 0.5; surface fire = 0.05.

Dominant Species* and Canopy Position

ANGE Upper
SONU2 Upper
PAVI2 Upper
SPPE Upper

Upper Layer Lifeform

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

Fuel Model 3

Structure Data (for upper layer lifeform)

	Min	Max
Cover	90 %	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:

Class E 0 %

Late2 Closed

Description

Dominant Species* and Canopy Position

All
All
All
All

Upper Layer Lifeform

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

Fuel Model no data

Structure Data (for upper layer lifeform)

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

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

Disturbances

Disturbances Modeled

- [x] Fire
- [ ] Insects/Disease
- [ ] Wind/Weather/Stress
- [x] Native Grazing
- [ ] Competition
- [ ] Other:
- [ ] Other

Historical Fire Size (acres)

Avg: 10000
Min: 10
Max: 100000

Sources of Fire Regime Data

- [x] Literature
- [ ] Local Data
- [x] 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 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	5	3	5	0.2	75
Mixed	34	1	100	0.02941	11
Surface	28	1	50	0.03571	13
All Fires	4			0.26513	

References

Anderson, Roger. 1990. The Historic Role of Fire in the North American Grassland. In Fire in North

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