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):

R5SHNT **Shinnery Tallgrass**

General Information

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

Modelers

Gary P Bell gbell@tnc.org

Reviewers

In workshop review

Doug Zollner dzollner@tnc.org

Vegetation Type

Shrubland

Dominant Species*

QUHA3 SPCR

ANHA

ARFI2

SCHIZ4

General Model Sources

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

LANDFIRE Mapping Zones

34

26

Rapid Assessment Model Zones

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

Geographic Range

Geographic Area: This PNVG ranges throughout the Southern High Plains in parts of the Texas Panhandle, and
southwest New Mexico. Estimates of the original extent and current acreages vary widely. Estimates of the original extent vary from 6 to 15 million acres and current estimates vary from 5.8 to 7.4 million acres (Peterson and Boyd 1998, Dhillion and Mills 1999). Mapping sand system extent yields 8.4 million acres of shinnery system in OK, TX, and NM. Of this, 5.3 million acres are the western tallgrass dominated system.

Biophysical Site Description

This PNVG is characterized by deep to shallow, well sorted, and very well to well drained sands. Sand source in Oklahoma and adjacent Texas tends to be riverine from the Canadian, Arkansas, and tributaries. In SE New Mexico and adjacent Texas sand grains are very uniform in size and source is paleo sands eroded from caprock sandstones of the Llano Estacado (Muhs and Holliday 2001) known as the Mescalero Sandsheet.

Vegetation Description

The vegetation is dominated by sand shinnery oak (Quercus havardii) occuring on sandy soils, including shallow sandsheet and dunes, usually associated with sand sagebrush (Artemesia filifolia), sand dropseed (Sporobolus cryptandrus) and little bluestem (Schizachyrium scoparium). Shin oak may form near monotypic stands without disturbance. These stands are often interspersed with lenses of shortgrass on sandy loams or clays. Sand shinnery oak is a clonal species occurring in mottes of varying area. Above-ground growth averages 3 feet in height with occasional mottes up to 12 feet that may be hybrids with Mohr's oak (Q. mohriana) and possibly with Q. gambelii and Q. undulata. (Pettit 1994, Peterson and Boyd 1998, Dhillion et al 1999, Hoagland 2000). Rhizomes several thousand years of age have been reported while above ground portions of the stems may live up to 15 years without disturbance. May be either well interspersed with tallgrasses or as contiguous dense shrubland without a significant grass component. Under

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

these conditions tallgrass seed may persist in the sandy soil for years or decades. Woody associates may include sand sagebrush (Artemesia filifolia), sand plum (Prunus gracilis), and fragrant sumac (Rhus aromatica). Mesquite (Prosopis glandulosa) occurs in areas of tighter soils in resonse to grazing and a lack of fire.

Defoliation by grasshoppers may be significant during drought conditions. Bison (Bos bison) may have had significant influence on this community but were effectively extirpated from the region by the 1870s. The shinnery community influenced by fire is very important for lesser prairie chickens (Tympanuchus pallidicinctus) (Peterson and Boyd 1998).

Disturbance Description

This system likely had frequent stand replacement fires associated with productive grass fuels and cycles of moisture and drought. Bison probably played a significant role in creating localized disturbances, especially in places with recent burns that would provide more local forage during migration. Fire would be more likely to occur in younger stands with a larger grass component than in older stands, although even monotypic stands of shinnery will burn well under the right conditions. Drought and moist cycles play a strong role interacting with both fire and native grazing. When fuels loads were reduced, mixed intensity fires would occur. Wind events and disturbance from grazing could also drive the system to open sand dunes which might take years to recover vegetation and stabilize.

Adjacency or Identification Concerns

Is there actual differentiation between tallgrass and shortgrass shinnery systems? Should shinnery be lumped in a deep sand shrubland model that includes sandsage-bluestem types?

Scale Description

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

Landscape scales in the deep sand shrubland system defined by TNC through fragmentation as being on the order of 250,000 acres with patch size exceeding 5,000 acres.

Issues/Problems

There are no real fire data in this western system, although research on this is beginning in FY05. Much of the inference about vegetation dynamics and fire comes from treatments with tebuthiuron herbicide.

Model Evolution and Comments

Terry Bidwell of OK State, Dave Haukos (USFWS Lubbock)

Succession Classes

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

Class A 15 %

Early2 Open

Description

All sites; postfire resprout by bluestems and dropseeds.

Indicator Species* and Canopy Position

SPCR	Upper
SCHIZ4	Upper
ANHA	Upper

Upper Layer Lifeform

☑ Herbaceous
☐ Shrub
☐ Tree

Fuel Model 1

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	25 %
Height	no data	no data
Tree Size Class	no data	

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

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

Class B 30 %

Mid1 Open

Description

One to three years post-fire dominated by tallgrasses in shallower and more stable sandsheet areas. Grass cover dominant with rapid recovery of sand shin-oak resprouts.

Indicator Species* and Canopy Position

SPCR	Upper
SHIZ4	Upper
ANHA	Upper
QUHA3	Middle

Upper Layer Lifeform

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

Fuel Model 1

Structure Data (for upper layer lifeform)

	Min	Max
Cover	25 %	75 %
Height	no data	Shrub Medium 1.0-2.9m
Tree Size Class	Seedling <4.5ft	

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

Class C 30 %

Mid1 Closed

Description

Three to ten years post-fire shinnery cover recovers to become dominant, although grasses remain co-dominant. May also contain significant component of sand sagebrush.

Indicator Species* and Canopy Position

QUHA3	Upper
SHIZ4	Upper
ANHA	Upper
SPCR	Upper

Upper Layer Lifeform

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

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	Max
Cover	75 %	100 %
Height	Shrub Medium 1.0-2.9m	Shrub Medium 1.0-2.9m
Tree Size Class	Seedling <4.5ft	

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

Class D 10 %

Late1 Closed

Description

Ten or more years post-fire closure by shinnery and significant decline in grass component. May also contain significant component of sand sagebrush.

Indicator Species* and Canopy Position

QUHA3	Upper
ARFI2	Upper

Upper Layer Lifeform

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

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	Max
Cover	75 %	100 %
Height	Shrub Medium 1.0-2.9m	Shrub Medium 1.0-2.9m
Tree Size Class	Seedling <4.5ft	

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

Class E 15 %

Early1 Open

Description

Windblown sand and dunes, unstabilized

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

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:
- ☐ Other:

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

Historical Fire Size (acres)

Avg: 10000
Min:
Max:

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.

Sources of Fire Regime Data

- ☑ Literature
- ☐ Local Data
- ☑ Expert Estimate

	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	7			0.14286	93
Mixed	100			0.01	7
Surface					
All Fires	7			0.15287	

References

Allred, B. W. 1949. Distribution and control of several woody plants in Texas and Oklahoma. Journal of Range Management 2:17-29.1

Blair, W. F., and T. H. Hubbell. 1938. The biotic districts of Oklahoma. American Midland Naturalist 20:425-454.

Boyd, C. S. 1999. The effects of burning season and frequency on the vegetative character and insect abundance of Sand Shinnery Oak range in western Oklahoma. Ph.D. Thesis, Oklahoma State University, Stillwater, OK.

Boyd, C. S. L. T. Vermeire, T. G. Bidwell and R. L. Lochmiller. 2001. Nutritional quality of shinnery oak buds and catkins in response to burning or herbivory. Southwestern Naturalist 10:324-333.

Boyd, C. S. and T. G. Bidwell. 2002. Effects of prescribed fire on Shinnery Oak (Quercus havardii) communities in Western Oklahoma. Restoration Ecology 10:324-333.

Brown, James K.; Smith, Jane Kapler, eds. 2000. Wildland fire in ecosystems: effects of fire on flora. Gen. Tech. Rep. RMRS-GTR-42-vol. 2. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 257 p.

Bruner, W. E. 1931. The vegetation of Oklahoma. Ecological Monographs 1:99-188.

Dhillion, S. S. 1999. Environmental heterogeneity, animal disturbances, microsite characteristics, and seedling establishment in a Quercus havardii community. Restoration Ecology 7:399-406.

Dhillion, S. S., and M. H. Mills. 1999. The sand shinnery oak (Quercus havardii) communities of the Llano Estacado: history, structure, ecology and restoration. In: R. C. Anderson, J. S. Fralish, and J. M. Baskin (eds). Savannas, Barrens, and rock outcrop plant communities of North America. Cambridge University Press, New York.

Dhillion, S. S., M. A. McGinley, C. F. Friese, J. C. Zak. 1994. Construction of sand shinnery oak communities of the Llano Estacado: animal disturbances, plant community structure and restoration. Restoration Ecology 2:51-60.

Duck, L. G., and J. B. Fletcher. 1943. A game type map of Oklahoma. Oklahoma Game and Fish Comm., Oklahoma City. 1p.

Duck, L. G., and J. B. Fletcher. 1945. A survey of the game and furbearing animals of Oklahoma. Pittman-Robertson Series No. II, State Bulletin No. 3. Oklahoma Game and Fish Comm., Oklahoma City. 144p.

Harrell, W. C., S. D. Fuhlendorf and T. G. Bidwell. 2001. Effects of prescribed fire on sand shinnery oak communities. Journal of Range Management 54:685-690.

Hoagland, B. W. 2000. The vegetation of Oklahoma: a classification for landscape mapping and conservation planning. Southwestern Naturalist 45:385-420.

Kuchler, A. W. 1964. Potential natural vegetation of the conterminous United States. Special Publication 36. American Geographical Society, New York, New York.

Marcy, R. B. 1854. Explorations of the Red River of Louisiana in the year 1852. Pages 24-25 in 33rd Congress, 1st session, House Executive Document, A. O. P. Nicholson. Washinton,DC 286pp

McIlvain, E. H., and C. G. Armstrong. 1966. A summary of fire and forage research on shinnery oak rangelands. Proc. Tall Timbers Fire Ecology Conference 5:127-129.

Muhs, D.R. and V.T. Holliday. 2001. Origin of late Quaternary dune fields on the Southern High Plains of Texas and New Mexico. Geological Society of America Bulletin 113:75-87

Osborn, B. 1942. Prairie dogs in shinnery (oak scrub) savannah. Ecology 23:110-115.

Osborn, B. and W. H. Kellogg. 1943. Wildlife occurrence and habitat conditions in Roger Mills and Custer counties, Oklahoma. Proceedings of the Oklahoma Academy of Science 23:41-43.

Peterson, R. S. and C. S. Boyd. 1998. Ecology and management of sand shinnery communities: a literature review. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research

Station. Gen. Tech. Rep. RMRS-GTR-16. Fort Collins, CO. 44 p.

Pettit, R. D. 1977. The ecology and control of sand shin oak. Pages 6-11, In Proceedings of the 15th Range Management Conference, Lubbock, TX.

Pettit, R. D. 1979. Effects of picloram and tubuthiuron pellets on sand shinnery oak communities. Journal of range Management 32:196-200.

Pettit, R. 1994. Sand shinnery oak SRM 730. in T. N. Shiflet, ed. Rangeland cover types of the United States. Society for Range Management, Denver, CO. 152p.

Rice, E. L. and W. T. Penfound. 1959. The upland forests of Oklahoma. Ecology 40:593-608.

Schmidt, Kirsten M, Menakis, James P., Hardy, Colin C., Hann, Wendel J., Bunnell, David L. 2002. Development of coarse-scale spatial data for wildland fire and fuel management. Gen. Tech. Rep. RMRS-GTR-87. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 41 p. + CD.

Slosser, J. E., P. W. Jacoby, and J. R. Price. 1985. Management of sand shinnery oak for control of boll weevil (Coleoptra: Curculionidae) in Texas Rolling Plains. Journal of Economic Entomology 78:383-389.

U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (2002, December). Fire Effects Information System, [Online]. Available: http://www.fs.fed.us/database/feis/.

Welsh, S. L., N. D. Atwood, S. Goodrich, L. C. Higgins. 1993. A Utah flora. Monte L. Bean Life Science Museum, Brigham Young University, Provo, Utah. 986p.
Wiedman, V. E. 1960. Preliminary ecological study of the shinnery oak area of western Oklahoma. M.S. Thesis, University of Oklahoma, Norman, OK.

Wiedman, V. E., and W. T. Penfound. 1960. A preliminary ecological study of the shinnery in Oklahoma. Southwestern Naturalist 5:117-122.

Wright, H. A., and A. W. Bailey. 1982. Fire ecology: United States and southern Canada. John Wiley and Sons, New York. 501p.

PERSONAL COMMUNICATION (if applicable):
David M. Engle, Professor, Oklahoma State University
Terrance Bidwell, Professor, Oklahoma State University
Sam Fuhlendorf, Asst. Professor, Oklahoma State University
Jim Weaver, Rancher, Roosevelt County, NM
Tish McDaniel, Consultant, Clovis, NM
David Haukos, USFWS, Texas Tech, Lubbock