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):

R5PIBS **Pine Bluestem**

General Information

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

Modelers		Reviewers	
Ron Masters	rmasters@ttrs.org	Roger D. Fryar	rfryar@fs.fed.us
Susan Hooks	shooks@fs.fed.us	Paul Nelson	pwnelson@fs.fed.us
Doug Zollner	dzollner@tnc.org	Doug Zollner	dzollner@tnc.org

Vegetation Type

Woodland

Dominant Species*

PIEC2
ANDRO2

General Model Sources

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

LANDFIRE Mapping Zones

44
37

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

This PNVG lies in the Interior highlands and uplands of Arkansas, eastern Oklahoma, southern Missouri.

Biophysical Site Description

This potential natural vegetation group is common to the Interior Highlands and xeric upland sites to the south and west of the Mississippi River. In Highlands it occupies all but steep north slopes at all elevations. This vegetation type is found along sandstone ridges. Moisture regime is xeric to dry-mesic. This group also occurs on gently dissected upland cherty plains in Missouri (in addition to sandstone ridges). In the Missouri Ozarks, this type is primarily confined to gently to moderately sloping, upland plains and is distinguished from R5OAHIdy, which occurs on more steeply dissected ridges and steep southwest facing slopes.

Vegetation Description

In the northern part of this geographic area shortleaf pine (Pinus echinata), xeric oaks and some hickory dominate the overstory with a high percentage of oak on steep north slopes and on post oak (Quercus stellata) flats. Associated species include post oak, blackjack oak (Quercus marylandica), mockernut hickory (Carya alba) on drier sites and to the west black hickory (Carya texana). Pine is often emergent on upper slopes. Stand density increases with available moisture. Various bluestems often dominate the understory.

Disturbance Description

This PNVG is fire regime group I, with frequent surface fires. Area fire frequency is 3-4 year mean fire interval (range=1-12 years) (Masters et al. 1995). Replacement and mixed severity fires are infrequent, every 100 to 1000 years. Stand replacement fires occurred mostly under extreme drought conditions during the growing season. Other disturbance factors that played a smaller role included ice storms, wind events, insect infestations, and species competition for resources. Native ungulate grazing may have played a

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

small role in replacement where buffalo and elk concentrated, but fire generally maintained systems. Drought and moist cycles play a strong role interacting with both fire and native grazing.

Adjacency or Identification Concerns

This group was listed as Xeric Pine-Oak Woodland, Western under the FRCC PNVG group. The name has been modified to better describe this PNVG group to include those sites in Missouri which do not fit within the xeric condition. In the Ouachita Mountains the adjacent community would be oak dominated north slope forests. Outside the Ouachita Mountains the adjacent community would be oak-hickory-pine forest.

Scale Description

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

Landscape adequate in size to contain natural variation in vegetation and disturbance regime. Topographically uniform areas can be relatively large (> 1000 acres).

Issues/Problems

Model Evolution and Comments

Paul Nelson: pwnelson@fs.fed.us. Site description was expanded upon review.

Succession Classes

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

Class A 15 %

Early1 All Structures

Description

post replacement: Pine and oak reproduction to 15' tall. Herbaceous community dominated by bluestems and forbs. More persistent on shallow soils. Openings may be small to extensive and have scattered live trees.

Indicator Species* and Canopy Position

PIEC2 Upper
ANDRO2 Upper

Upper Layer Lifeform

☐ Herbaceous
☑ Shrub
☐ Tree

Fuel Model 3

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	70 %
Height	Herb Short <0.5m	Tree Regen <5m
Tree Size Class	Seedling <4.5ft	

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

Class B 5 %

Mid1 Closed

Description

mid-seral closed :Mid-seral with closed canopy (>70%; on mountainous sites >60%) shortleaf and loblolly pine and pole-sized oak with little or no herbaceous understory.

Indicator Species* and Canopy Position

PIEC2 Upper

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model 9

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	60 %	100 %
Height	Tree Regen <5m	Tree Short 5-9m
Tree Size Class	Pole 5-9" DBH	

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

Class C 40 %

Mid1 Open

Description

mid- seral open: Mid-seral open woodland/savanna pine and oak overstory with bluestem grasses and forbs. Shrub layer may be prevalent on some sites and dominated by various oak sprouts and a few shrub species. Prevalence highly dependant on time since burned. Cover <70%; on mountainous sites cover <60%.

Indicator Species* and Canopy Position

PIEC2 Upper
ANDRO2 Lower

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	Max
Cover	40 %	60 %
Height	Tree Regen <5m	Tree Medium 10-24m
Tree Size Class	Medium 9-21"DBH	

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

Class D 39 %

Late1 Open

Description

late- seral open: Late-seral woodland/savanna pine and oak overstory with bluestem grasses and forbs. Shrub layer may be prevalent on some sites and dominated by various oak sprouts and a few shrub species. Prevalence highly dependant on time since burned. Shrub layer may be absent on other sites, particularly on shallow soils. Cover <70%; on mountainous sites cover <60%.

Indicator Species* and Canopy Position

PIEC2 Upper
ANDRO2 Lower

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	Max
Cover	40 %	60 %
Height	Tree Short 5-9m	Tree Tall 25-49m
Tree Size Class	Large 21-33"DBH	

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

Class E 1 %

Late1 Closed

Description

Late-seral, closed canopy (>70%; on mountainous sites >60%) pine-oak dominated overstory community. No herbaceous cover and few shrubs.

Indicator Species* and Canopy Position

PIEC2 Upper
ANDRO2 Lower

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 9

Structure Data (for upper layer lifeform)

	Min	Max
Cover	60 %	100 %
Height	Tree Tall 25-49m	Tree Tall 25-49m
Tree Size Class	Large 21-33"DBH	

☐ 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.

Disturbances

Non-Fire Disturbances Modeled

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

Fire Regime Group: 1

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: 2000
Min: 200
Max: 10000

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	100			0.01	4
Mixed	1000			0.001	0
Surface	4			0.25	96
All Fires	4			0.261	

Sources of Fire Regime Data

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

References

Albert, Lois E. 1981. Five Thousand Years of Environmental Change in Southeastern Oklahoma. Okla. Arch. Survey, No. 7;.

Bragg, D. C. 2002. Reference conditions for old-growth pine forests in the Upper West Gulf Coastal Plain. Journal of the Torrey Botanical Society 129(4):261-288.

Brissette, J. C. and J. P. Barnett (eds). 1992. Proceedings: Shortleaf Pine Regeneration Workshop. So. For. Exp. Sta., GTR-SO-90.

Brown, J. K. and J. K. Smith editors. Wildland Fire in Ecosystems: effects of fire on flora. Gen, Tech. Rep. RMRS-GTR-42-vol. 1-2. USDA, Forest Service, Rocky Mountain Research Station. 2000.

Burger, George V., et al. (eds). Proceedings of the Oak Woods Management Workshop. E. Ill. Univ.; 1991.

Cain, M. D. and M. G. Shelton. 2003. Effects of Alternative Thinning Regimes and Prescribed Burning in Natural, Even-aged Loblolly-Shortleaf Pine Stands: 25 year results. Southern Journal of Applied Forestry 27(1):

Cain, M. D. and M. G. Shelton. 2000. Survival and growth of Pinus and Quercus seedlings in response to simulated summer and winter prescribed burns. Canadian Journal of Forest Resources 30:.

Campbell, J.J.N., et al. 1991. Floristic and Historical Evidence of Fire Maintained, Grassy Pine-oak Barrens before Settlement in Southeastern Kentucky. In Proc: Fire and the Environment:

Ecological and Cultural Perspectives. SE For. Exp. Sta.

Cram, D. S., R. E. Masters, F. S. Guthery, D. M. Engle, and W. G. Montague. 2002. Northern Bobwhite Population and Habitat Response to Pine-grassland Restoration. Journal of Wildlife Management 66:1031-1039.

Delcourt, H. R. and P. A. Delcourt. 1991. Late Quaternary Vegetation History of the Interior Highlands of Missouri, Arkansas, and Oklahoma. In D. Henderson and L. D. Hedrick, editors. Proc: Restoration of Old Growth Forests of the Interior Highlands of Arkansas and Oklahoma. Winrock International. Morrilton, Ark.

Foti, T. and S. Glenn. 1991. The Ouachita Mountains Landscape at the Time of Settlement. In D. Henderson and L. D. Hedrick, editors. Proc.: Conference on Restoring Old Growth Forest in the Interior Highlands of Arkansas and Oklahoma. Winrock International, Morrilton, Ark.

Fryar, Roger D. 1991. Old Growth Stands of the Ouachita National Forest. In D. Henderson and L. D. Hedrick, editors. Proc: Restoration of Old Growth Forest in the Interior Highlands of Arkansas and Oklahoma. Winrock International. Morrilton, Ark.

Glitzenstein, J. S., P. A. Harcomb, and D. R. Streng. 1986. Disturbances, succession, and maintenance of species diversity in an east Texas forest. Ecological Monographs 56:243-258.

Guyette, R. P. and E. A. McGinnes, Jr. 1982. Fire History of an Ozark Glade in Missouri. Trans. Mo. Acad. Sci.16:85-93.

Guyette, R. P and B. E. Cutter. 1991. Tree-ring analysis of fire history of a post-oak savanna in the Missouri Ozarks. Natural Areas Journal 11(2): 93-99.

Guyette, R. P. and M. A. Spetich 2003. Fire history in oak-pine forests in the Lower Boston Mountains, Arkansas, USA. Forest and Ecology Management 180:463-474.
Henderson, D. and L. D. Hedricks (eds). 1991. Restoration of Old Growth Forests in the Interior Highlands of Arkansas and Oklahoma. Conf. Proc., Winrock International. Morrilton, Ark.

Hessl, A. and S. Spackman. 1995. Effects of Fire on Threatened and Endangered Plants: An annotated Bibliography. USDOI, National biological Service.

Honess, C. W. 1923. Geology of the southern Ouachita Mountains of Oklahoma. Bulletin 32, Parts I and II. Oklahoma Geological Survey. Norman Okla. 354 pp.

Jansma, J. and H. H, Jansma. George Engelmann in Arkansas Territory. Ark. Hist. Quart., pp. 225-248.

Johnson, F. L. and G. D. Schnell. 1985. Wildland Fire History and the Effects of Fire on Vegetative Communities at Hot Springs National Park, Arkansas. Rep. To NPS, Santa Fe, NM., Okla. Biological Survey., University of Oklahoma, Norman, Okla. 49 pp.

Jurney, D. R. Evans, J. Ippolito, and V. Bergstrom. 2004. The role of Wildland fire in portions of southeastern North America. Pages IN PRESS in R. T. Engstrom and W. J. de Groot (eds). 22nd Tall Timbers Fire Ecology Conf. Proceedings. Kanaskas, Alberta.

Kreiter, S. D. 1994. Dynamics and Spatial Patterns of a Virgin Old-growth Hardwood-pine Forest in the Ouachita Mountains, Oklahoma, from 1896-1994. M.S. Thesis. Oklahoma State University, Stillwater.

Langevede, F. V., C. A. D. M. Vande Vijver, L. Kumar, H. Van De Koppel, N. De Ridder, J. Van Andel, A. K. Skidmore, J. W. Hearne, L. Stroosnijder, W. J. Bond, H. H. T. Prins, and M. Rietkerk. 2003. Effects of Fire and Herbivory on the Stability of Savanna Ecosystems. Ecology 84(2):337-350.

Lewis, A. 1924. La Harpe's first expedition in Oklahoma, 1718-1719. Chron. Oklahoma 2(4):331-349.

MacCleery, D. 1994. Understanding the Role the Human Dimension Played in Shaping America's Forest and Grassland Landscapes: Is there a landscape archaeologist in the house?Eco-watch 2.

Masters, R. E. 1991. Effects of timber harvest and prescribed fire on wildlife habitat and use in the Ouachita Mountains of eastern Oklahoma. Ph.D. Thesis, Oklahoma State Univ. Stillwater. 351 pp.

Masters, R. E., J. E. Skeen, and J. A. Garner. 1989. Red-cockaded woodpecker in Oklahoma; an update of Wood's 1974-77 Study. Proc. Okla. Acad. Sci. 69:27-31.

Masters, R. E., J. E. Skeen, and J. Whitehead. 1995. Preliminary fire history of McCurtain County Wilderness Area and implications for red-cockaded woodpecker management. Pages 290-302 in D. L. Kulhavy, R. G. Hooper, and R. Costa. (eds.). Red-cockaded woodpecker: Species recovery, ecology and management. Center for Applied Studies, Stephen F. Austin University, Nacogdoches, TX.

Masters, R. E. 1991. Effects of fire and timber harvest on vegetation and cervid use on oak -pine sites in Oklahoma Ouachita Mountains. Pages 168-176. In S. C. Nodvin and T. A. Waldrop, (eds.). Fire and the environment: ecological and cultural perspectives. Proc. Of an international symposium. USDA For. Serv. Gen. Tech. Rep. SE-69. Southeast For. Exp. Sta., Asheville, N.C.

Masters, R. E., and D. M. Engle. 1994. BEHAVE-evaluated for prescribed fire planning in mountainous oak-shortleaf pine habitats. Wildlife Society Bulletin 22:184-191.
Masters, R. E., D. M. Engle, and R. Robinson. 1993. Effects of timber harvest and periodic fire on soil chemical properties in the Ouachita Mountains. Southern Journal of Applied Forestry 17:139-145.

Masters, R. E., R. L. Lochmiller, and D. M. Engle. 1993. Effects of timber harvest and periodic fire on white-tailed deer forage production. Wildlife Society Bulletin 21:401-411.

Masters, R. E., R. L. Lochmiller, S. T. McMurry, and G. A. Bukenhofer. 1998. Small mammal response to pine-grassland restoration for red-cockaded woodpeckers. Wildlife Society Bulletin 28:148-158.

Masters, R. E., C. W. Wilson, G. A. Bukenhofer, and M. E. Payton. 1996. Effects of pine-grassland restoration for red-cockaded woodpeckers on white-tailed deer forage production. Wildlife Society Bulletin 24:77-84.

Masters, R. E., C. W. Wilson, D. S. Cram, G. A. Bukenhofer, and R. L. Lochmiller. 2002. Influence of ecosystem restoration for red-cockaded woodpeckers on breeding bird and small mammal communities. Pages 73-90 in W. M. Ford, K. R. Russell, and C. E. Moorman, editors. In The role of fire in non-game wildlife management and community restoration: traditional uses and new directions: proceedings of a special workshop. Annual Meeting of The Wildlife Society, Nashville, Tenn. USDA For. Ser. Northeast Research Station. General Technical Report NE-288.

Nelson, J. C. 1997. Presettlement Vegetation Patterns along the 5 th Principal Meridian, Missouri Territory, 1815. Am. Midl. Nat. 137:70-94.

Palmer, E. J. 1921. The Forest Flora of the Ozark Region. J. Arnold Arbor. 2:.

Palmer, E. J. 1924. The Ligneous Flora of Rich Mountain, Arkansas and Oklahoma. J. Arnold Arbor. 5:

Panzer, R.. Compatibility of Prescribed Burning with Conservation of Insects in Small, Isolated Prairie Preserves. Conservation Biology, Vol. 16, no. 5, 2002, pp1296-1307.

Perttula, T. K. 1993. The Long Term Consequences and Effects of the de Soto Entrada on Aboriginal Caddoan Populations. In Proc: De Soto Sym,1988 and 1990;

Rebertus, A. J. and B. R. Burns. 1997. The Importance of gap processes in the development and maintenance of oak savannas and dry forests. Journal of Ecology 85:633-645.

Rudis, Victor A. and Thomas V. Skinner. Fire's Importance in South Central U.S. Forests: distribution of fire evidence.

Smith, B. A., R. J. Tyrl, and R. E. Masters. 1997. Floristic inventory of the McCurtain County Wilderness Area (Oklahoma). Okla. Acad. Sci. 77:99-102.

Smith, K. L. 1986. Sawmill: The story of cutting the last great virgin forest east of the Rockies. Univ. Ark. Press.

Smith, K. G. and J. C. Neal. 1992. Pre-settlement Birds and Mammals of the Interior Highlands. In D. Henderson and L. D. Hedrick, editors. Proc.: Conference on Restoring Old Growth Forest in the Interior Highlands of Arkansas and Oklahoma. Winrock International, Morrilton, Ark.

Sparks, J. C. 1996. Growing-Season and Dormant-Season Fire Behavior and Effects on Vegetation in the Ouachita Mountains, Arkansas. M.S. Thesis. Oklahoma State University, Stillwater. 186 pp.

Sparks, J. C., and R. E. Masters. 1996. Fire seasonality effects on vegetation in mid-, tall-, and southeastern pine-grassland communities: a review. Trans. No. Am. Wildlife and Natur. Res. Conf. 61:230-239.

Sparks, J. C., R. E. Masters, D. M. Engle, and G. A. Bukenhofer. 2002. Season of burn influences fire behavior and fuel consumption in restored shortleaf pine-grassland communities. Restoration Ecology 10:714-722.

Sparks, J. C., R. E. Masters, D. M. Engle, M. Palmer and G. A. Bukenhofer. 1998. Effects of late growing-season and late dormant-season prescribed fire on herbaceous vegetation in restored pine-grassland communities. Journal of Vegetation Science 9: 133-142.

Williams, G. W. 2002. Aboriginal Use of Fire: are there any “natural “ plant communities?. Wilderness and Political Ecology: Aboriginal Land Management-Myths and Reality (Charles E. Kay and Randy T. Simmons (eds). Univ. of Utah Press.

Wilson, C. W., R. E. Masters, and G. A. Bukenhofer. 1995. Breeding bird response to pine-grassland community restoration for red-cockaded woodpeckers. Journal of Wildlife Manage. 59:56-67.