

Fire Regime Condition Class (FRCC) Interagency Handbook Reference Conditions

Modeler: C. Emanuel, S. Hickey, D. Minney, C Ruffner

Date: 1/26/05

PNVG Code: BLST2

Potential Natural Vegetation Group: Bluestem Prairie-Oak Hickory Mosaic

Geographic Area: Largest expanse (11-13 million ha)¹ across Central Midwestern states with typical Prairie Border forests and Prairie Peninsula region of eastern states Indiana, Kentucky, and Ohio.

Description: Within the area of the Prairie Border forests (Abrams 1992), prairie vegetation dominated the landscape with oak-hickory forests existing within fire protected ravines or along stream corridors forming gallery forests (Abrams 1992). While the region is strongly influenced by dry continental air flow patterns and periodic drought, historic fire frequency determined the prairie-forest boundary with much variation based on topography, fuel breaks, ignition sources, and climate (Whitney 1994, Anderson and Bowles 1999). Over time, forest edges expanded and contracted based on topographic variability and fire frequency and intensity exhibiting a continuum of grassland, "grub", open savanna woodlands, or canopied forests. Much has been written concerning these systems and excellent reviews can be found in Whitney (1994) and Anderson Fralish and Baskin (1999).

Grasses formed the matrix of the prairie with big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), prairie cordgrass (*Spartina pectinata*) and switchgrass (*Panicum virgatum*) dominating many tallgrass prairies (Whitney 1994). Numerous forbs were present as well such as *Helianthus* spp. (sunflower genus), prairie clovers (*Petalostemum* spp.), and coneflowers (*Echinacea pallida* and *Ratibida pinnata*) amongst many others. Fuel complexes consisted of short- or tall-grass prairie forbs and shrubs with little or no tree regeneration.

Oak grubs characterize that portion of this vegetation sequence that experienced recurring fires in advanced oak regeneration which stimulates the resprouting response evidenced by the 'grubs' or multi-stemmed stump sprouts of shingle oak (*Quercus imbricaria*), black oak (*Q. velutina*), blacjkjack oak (*Q. marilandica*), and others (Abrams 1992). Over a period of years, massive root systems developed and the term 'grub' is from the German *gruben*, to dig, referencing the laborious method of removing these root wads in clearing areas for planting (Anderson and Bowles 1999). Fuel complexes were characterized as "stunted brush prairie" comprised of mixed prairie grasses and forbs with coppicing oak stems about 1-1.5 m in height (Curtis 1959, Anderson and Bowles 1999).

Savannas and woodlands represent relatively open forest systems along the prairie-forest continuum (for extreme variety see Anderson et al. 1999). Generally, these systems have example species from true open prairies, woodlands, and closed canopy forests with oak species dominating the arboreal layer (Abrams 1992). Again, species composition and structure was dependent on local factors such as topography, soil conditions, fire regime, plant competition, and plant-animal interactions (Anderson and Bowles 1999). Because of the wide variation found across this vegetation type, strict definitions of savanna and woodland characteristics are equivocal (Curtis 1959, Nuzzo 1986). For the purposes of FRCC we have adopted fairly average canopy closure values of 10-25% closure to indicate savanna while woodlands exhibited 25-60% canopy closure (see discussion in Anderson and Bowles 1999 for variation across range). Fuel complexes for savanna areas were largely prairie grasses and forbs in the understory with widely scattered fire resistant oak stems frming the overstory. In woodland areas, tree density would have been higher (47-99 trees/ha) but canopy closure rarely exceeded 50-60%. Fuel complexes in these open woodlands probably consisted of flashy prairie fuels as well as some accumulated hardwood leaf litter.

Mature oak hickory forest represented a small portion of this vegetation group and has been discussed in the Oak-Hickory PNVG.

Fire Regime Description: (Prairie= Fire Regime II, Woodland/Forest= Fire Regime I)

Frequent fires impacted prairie systems every 2-5 years maintaining grass and forb vegetation. However, as oak-hickory regeneration becomes established, these species become largely fire resistant with age. Surface fires within woodland and forest types occurred every 12-15 years reducing duff layers and allowing recruitment of oak hickory stems.

Vegetation Type and Structure

| Class* | Percent of Landscape | Description |
|--------------|----------------------|---|
| A: grassland | 65 | Open prairie w/ Andropogon spp. |
| B: oak grub | 1 | Prairie w/ scattered seedling sprout or grubs |
| C: savanna | 10 | Savanna with 10-25% canopy cover |
| D: woodland | 20 | Woodland with 25-60% cover |
| E: forest | 4 | Forest w/>60% cover |
| Total | 100 | |

*Formal codes for classes A-E are: AESP, BMSC, CMSO, DLSO, and ELSC, respectively.

Fire Frequency and Severity

| Fire Severity | Fire Frequency (yrs) | Probability | Percent, All Fires | Description |
|----------------------|----------------------|-------------|--------------------|-----------------------------|
| Replacement Fire | 3 | .33 | 80 | Primarily class A |
| Non-Replacement Fire | 12 | .083 | 20 | Primarily mosaic, class B-D |
| All Fire Frequency* | 2 | .413 | 100 | |

*All Fire Probability = sum of replacement fire and non-replacement fire probabilities. All Fire Fire Frequency = inverse of all fire probability (previous calculation).

References

Abrams, M.D. 1992. Fire and the development of oak forests. *Bioscience* 42: 346-353.

Anderson, R.C. and M. L. Bowles. 1999. Deep-soil savanna and barrens of the Midwestern United States. Pp 155-170. IN: R.C. Anderson, J.S Fralish, and J. M. Baskin, eds. *Savanna, Barrens, and Rock Outcrop Communities of North America*. Cambridge University Press.

Anderson, R.C., J.S. Fralish, and J.M. Baskin, editors. 1999. *Savanna, Barrens, and Rock Outcrop Communities of North America*. Cambridge University Press.

Curtis, J.T. 1959. *The Vegetation of Wisconsin*. Madison, WI. University of Wisconsin.

Nuzzo, V. 1986. Extent and status of Midwest oak savanna: presettlement and 1985. *Natural Areas Journal* 6: 6-36.

Transeau, E.N. 1935. The prairie peninsula. *Ecology* 16: 423-437.

Whitney, G.G. 1994. From Coastal Wilderness to Fruited Plain: a history of environmental change in temperate North America from 1500 to the present. Cambridge University Press.

U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (2002, December). Fire Effects Information System, Kuchler Type: Mosaic of bluestem prairie and oak-hickory forest. Available @ <http://www.fs.fed.us/database/feis/>.

PERSONAL COMMUNICATION (if applicable):

Oak-Hickory modeling group

VDDT File Documentation

Include screen captures (print-screens) from any of the VDDT graphs that were used to develop reference conditions.

Modeling Assumptions:

Predominantly fire driven system, prairie fire is the determining factor for the extent of forest
Older oak-hickory trees are largely fire resistant
Replacement fires occur frequently in early successional sere A
Closed canopy greater than 60% @ > 99 trees/hectare
Woodland 10 – 60 % canopy cover @ 47 – 99 trees/ hectare

Fire frequency in prairie 2 – 5 yrs, mean 3 yrs

Fire regimes 1,2 : replacement fire and mosaic fire, low to mid severity, upper threshold of 10 years

Once trees are established they are NOT eliminated by a single fire

Dominant pathway A – A with frequent fire, alternate succession A-B-C-D-E





