Fire Regime Condition Class (FRCC) Interagency Handbook
Reference Conditions

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Potential Natural Vegetation Group: Oak-hickory-pine forests

Geographic Area: Southern Missouri, northern Arkansas, southern Illinois.

Description: Upland forests dominated by white oak (Quercus alba, post oak (Quercus stellata, red oaks, and shortleaf pine (Pinus echenata). Dogwood, small oaks, grasses, blueberries, and dominate the understory. Small stand replacement fires, oak decline, and wind throw are the major large scale stand replacement agents. Shortleaf pine is restricted to sites with acid soils within the oak-hickory-pine forests. Historically, forest types with a shortleaf pine component within this region included more than about 50 percent of the landscape, about 20% I scrub forests, 30 percent in open condition (Batek et al. 1999). Wind and mortality maintain gaps over about 0.7 percent of the landscape. Shortleaf pine however, is only able to capture about half of these gaps (Stambuagh et al. 2002). Shortleaf pine is drought and low temperature sensitive (Stambaugh and Guyette 2004). On a pre-European landscape basis shortleaf pine was positively associated with fire frequency (Batek et al. 1999) and negatively associated with topographic roughness (Guyette and Kabrick 2003, Guyette and Stambaugh, in press).

Fire Regime Description: Fire Regime Group I. Frequent surface fires maintain stands as either open woodlands or closed forests with little undergrowth. In absence of fire, shade intolerant shortleaf pine does not regenerate and eventually dies out of all but the most xeric sites.

Fire regime is characterized by frequent surface fires and infrequent stand replacement fires (Guyette and Kabrick 2003) as were many oak and pine forests in eastern North American (Dey and Guyette 2000, Guyette et al. 2002). This anthropogenic fire regime (Guyette and Cutter 1997, Guyette and Spetich 2003) has a high frequency of human (98%) and a low (2%) frequency of lightning ignitions. Fires maintained about 20 percent of the landscape in scrub oak-pine forests. Fires and ignitions are highly variable in both time and space and are controlled by human population density, topographic roughness, and culture (Guyette et al. 2002, Jenkins et al. 1997) Fires are primarily dormant season fires (Guyette and Cutter 1997). Historic fire regimes are associated with diversity, species abundance, and species spatial distribution (Guyette and Dey 2004, Guyette et al. 2004, Guyette and Kabrick 2003, Jenkins et al. 1997).

Vegetation Type and Structure

Class*	Percent of Landscape	Description
A: post replacement	5	Young (1-12) mixed oak-hickory-pine forest
B: mid-seral closed	15	Mid aged (11-70) closed canopy oak-hickory-pine forest
C: mid- seral open	30	Mid aged (> 10 years) open canopy oak-hickory-pine forest (canopy <55%). Frequent surface fires can maintain this woodland savannah almost indefinitely.
D: late- seral 2 closed	20	Late seral (> 70 years; >55% canopy) closed canopy oak-hickory forest (< 2% shortleaf pine)
E: late- seral1 closed	30	Late seral (> 70 years; > 55% canopy) closed canopy oak-hickory-pine forest
Total	100	

***Formal codes for classes A-E are: AE1P, BM1C, CM1O, DL2C, and EL1C**

Fire Severity	Fire Frequency (yrs)	Probability	Percent, All Fires	Description
Replacement Fire	150	0.005	5	Rare crown fires occur mostly in young stages (AESP; BMSC)
Non-Replacement Fire	10	0.1	95	Mostly surface fires
All Fire Frequency*	9.5	0.105	100	

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

References

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VDDT File Documentation

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

Model OKPN2 located in C:/FCCC/OKPN2: VDDT text files must be loaded into C:/FRCC for project file to work. The diagram shows succession only.

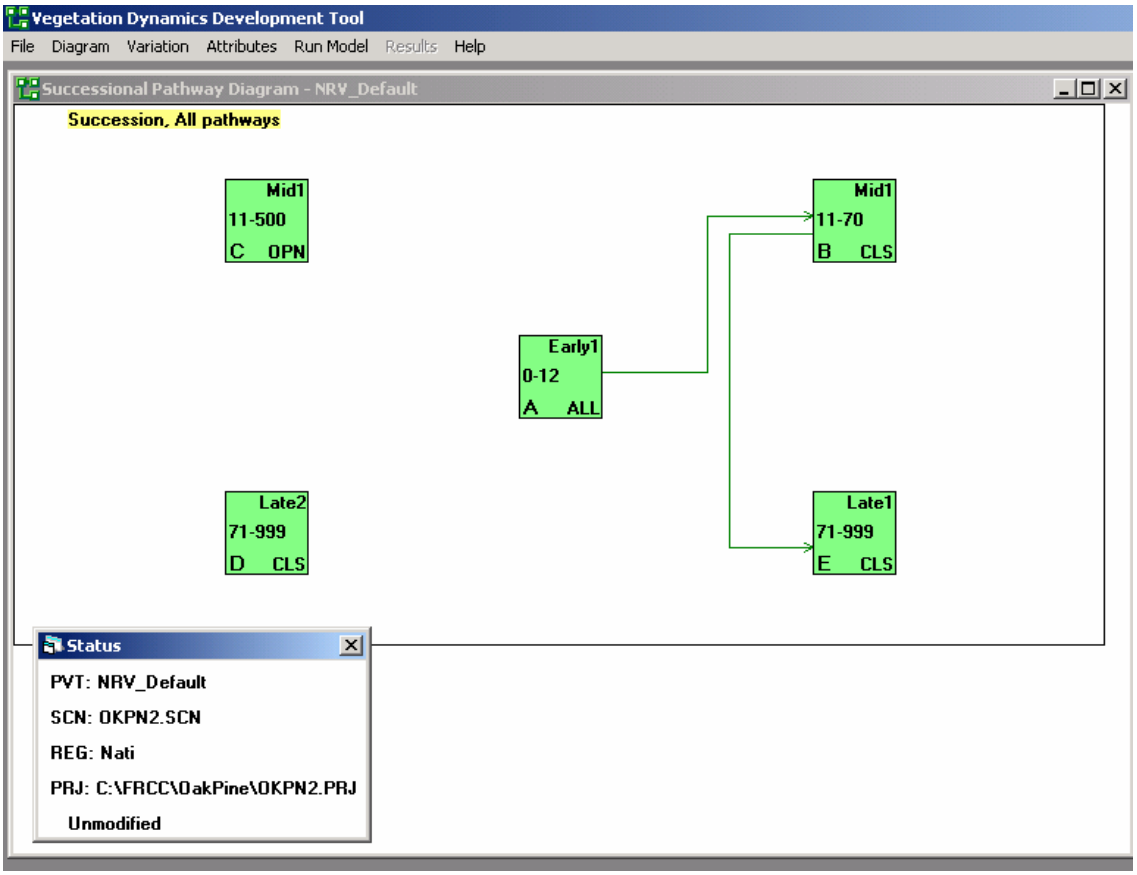


Figure 1. Five box model with paths for Oak-hickory-shortleaf pine. Box D is oak hickory forest without shortleaf pine. Box E is oak, hickory, shortleaf pine forests.

Disturbances by class: **Model OKPN2**

Class	To	Agent	Prob	TSD	Freq/ FRI	Rel Age
A	A	Replacement fire	.1	0	10	-12
B	A	Replacement fire	.005	0	200	0
B	C	Mixed	.006	0	167	0
B	B	Surface	.089	0	11	1
B	C	Wind/weather/stress	.002	0	500	0
B	D	AltSuccession**	.3	0	NA	0
C	C	Surface fire	.2	0	5	0
C	B	AltSuccession	1.0	18	NA	0
D	A	Replacement fire	.001	0	1000	0
D	C	Surface fire	.099	0	10	0
D	A	Wind/weather/stress	.002	0	500	0
E	A	Replacement fire	.002	0	500	0
E	E	Surface fire	.098	0	10	0
E	A	Wind/weather/stress	.002	0	500	0
E	D	AltSuccession	.01	50	NA	

*** Alternative succession is only applied at the last age of the class. On the VDDT disturbance (Pathways from) table select **Display,** then **Show Ages**, to apply.*

Class A: Young stands < 12 years old. All fires are replacement and occur at an average interval of 10 years.

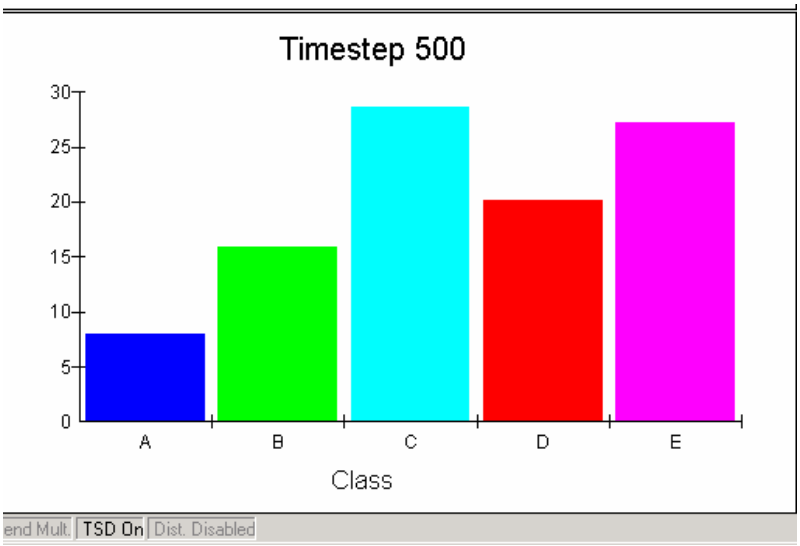
Class B – Mid development closed (11-70 years): Oak that survive to this stage are fire tolerant. The overall fire frequency is still 10 years. The percent of fires by intensity class are: (Replacement 5%; Mixed 6%; surface: 89%). Seventy percent of these stands succeed to late seral stands containing shortleaf pine (> 2%coverage of pine). Thirty percent succeed to stands not containing a significant pine component.

Class C – Open mid development oak stands. Open woodlands with < 55% canopy coverage. These stands are maintained by frequent fire with an average fire interval of 5 years. Stands that escape fire for 18 years (3 missed fire cycles) revert to a closed mid-development stand (class B).

Class D – late seral stands without pine component. These closed stands have little undergrowth due to frequent surface fires. Replacement fires are rare. Wind and drought related mortality replace stands on an average 500 year interval..

Class E – late seral stands with pine component. Similar to class D but with a pine component. If no fires occur for 50 years, stands revert to class D at a rate of 1% per year. On most sites fire is required for pine regeneration. On some xeric sites pine regenerates without fire and never disappears.

Figure 2. Results graphs: These graphs show the per cent of area in each class projected for 500 years.



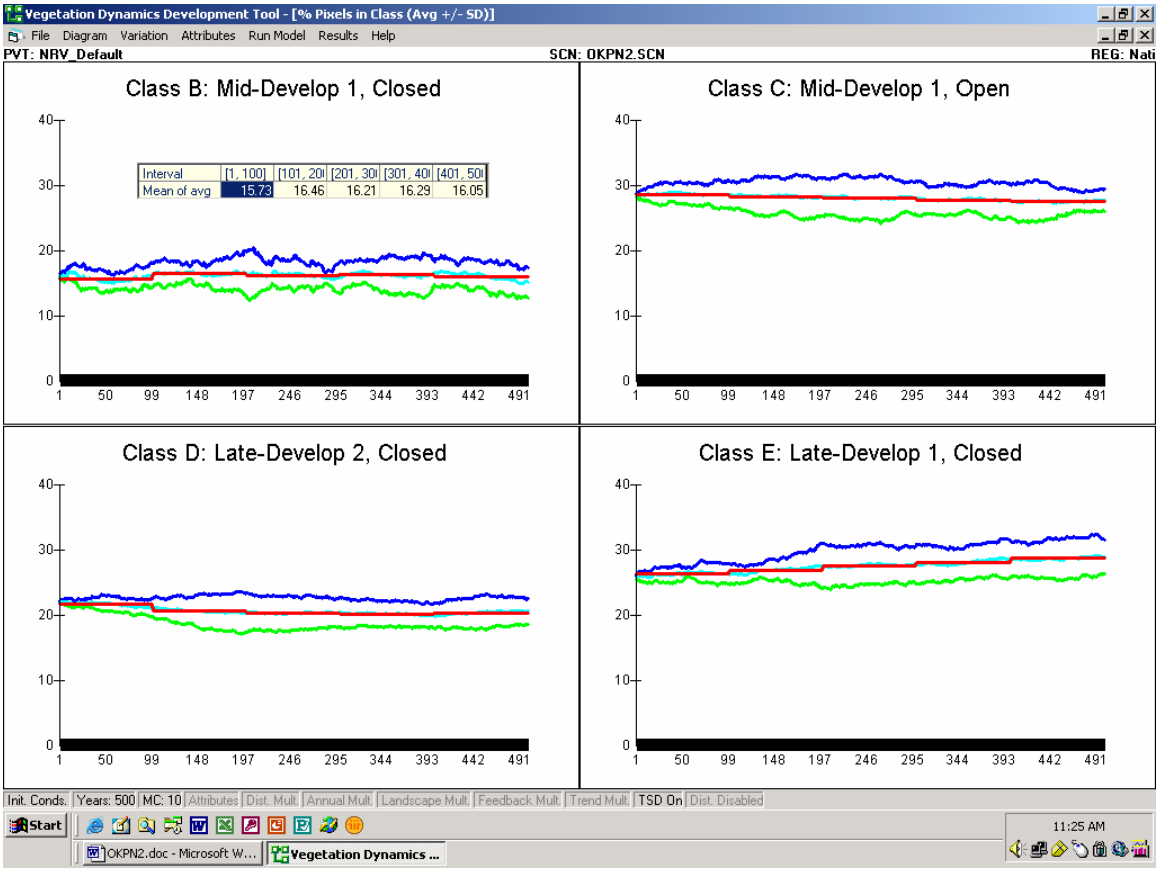


Figure 3. Model results for a run that excludes all types of fire. Without fire only a small proportion of the landscape on very xeric sites supports can support pine.