****DRAFT****

Fire Regime Condition Class (FRCC) Interagency Handbook
Reference Conditions

Modeler: Cecil Frost **Date:** 12/27/2004 **PNVG Code:** OAKF

Potential Natural Vegetation Group: Oak Flats

Geographic Area: Atlantic Coastal Plain, from New Jersey, the northern limit of swamp chestnut oak, south to northern Florida, west to eastern Texas, and north through the Mississippi River bottomlands, to southern Indiana and Illinois. Oak flats are especially well-developed in southeastern Virginia and eastern North Carolina. This model represents the Atlantic and Gulf Coastal Plain oak flats type.

Description: The most extensive occurrences of oak flats appear on the lower coastal plain terraces, particularly the Wicomico, Talbot and Pamlico surfaces in the mid Atlantic area. Elevations range from about 80 feet to only 3 feet above sea level. Moist, flat-lying fine-textured mineral soils define the habitat. These are mostly light colored soils ranging from silty to clayey Ochraquults, Ochraqualfs and Fluvaquents. Typical soil series include Meggett, Grifton, Invershiel, Yonges, Argent, Roanoke, Tawcaw, Toccoa and Shellbluff. Adjacent vegetation types upslope include white oak (*Quercus alba*) in the northern part of the range, and slightly drier longleaf pine savannas and flatwoods in the southern part. Downslope along the moisture gradient are gum flats, canebrakes and bottomland hardwoods.

Four species dominate these stands: swamp chestnut oak (*Quercus michauxii*), cherrybark oak (*Quercus pagodifolia*), laurel oak (*Quercus laurifolia*) and beech (*Fagus grandifolia*). Shrubs are sparse but may include horse sugar (*Symplocos tinctoria*), patches of low fetterbush (*Leucothoe axillaris*) on the wetter soils, cane (*Arundinaria gigantea*) on the margins, and dwarf palmetto (*Sabal minor*) in the southern part of the range from North Carolina south. As a consequence of the deep forest shade, herbs are typically sparse but several rare species such as white rattlesnake root (*Prenanthes alba*) may be found. Typical forest community types include swamp chestnut oak-cherrybark oak; cherrybark oak-swamp chestnut oak-beech, and laurel oak-swamp chestnut oak-beech/*Leucothoe axillaris*. In the most fire-sheltered sites stands dominated by beech—the most fire-sensitive tree species of the region—can be found. Beech flats sometimes shelter other fire refugial hardwoods such as pignut hickory (*Carya glabra*) and nutmeg hickory (*Carya myristiciformis*). Other common tree species, particularly on the fire-influenced margins, include tulip poplar (*Liriodendron tulipifera*), sweetgum (*Liquidambar styraciflua*), swamp black gum (*Nyssa biflora*), water oak (*Quercus nigra*) and loblolly pine (*Pinus taeda)*.

Uncharacteristic succession. Weedy species such as sweetgum and loblolly pine may take over repeatedly logged sites. Since virtually all coastal plain uplands were cleared and in agriculture by the Civil War, there are few intact remnants except in river bottoms. Most of the once extensive upland oak flats have been ditched to improve drainage and converted to agriculture or, in the vicinity of large cities such as Virginia Beach, to housing and other urban development. Since they are naturally resistant to spread of fire, the practice of fire suppression in the region has had little impact. A few small remnants are true second growth, dating as far back as the Civil War, and older single tree remnants of the virgin forest can occasionally be found scattered among younger trees.

Fire Regime Description: Fire regime group I, 7-30 years. For the most part this type is little influenced by fire. If pressed to assign a fire regime this would have to be considered fire regime group I, with very light surface fires, ranging from 7 to 30 years, carried only by thin hardwood leaf litter. Presettlement Mean Fire-Return Interval (MFI) in adjacent fire vegetation was mostly 2-8 years in canebrakes and longleaf pine flats (Frost 1998, 2000) and fire in these more extensive types was the ignition source for litter fires in the oak flats. Natural fire regimes in the coastal plain consisted of frequent but light surface fires. The fire regime was driven by lightning with little influence by Native Americans. Most fires occurred in the March-April fire season, in contrast with the seasonally bimodal

distribution of spring and fall fires to the west on the Piedmont, where Native American importance as an ignition source increased inland from the coastal plain to the mountains. Lightning ignitions occurred any time from March to October but in the mid-Atlantic region were most frequent and extensive during the spring fire season which varies by latitude. Lightning fires peak in March in Florida, in April in the mid-Atlantic coastal plain and piedmont, and in May in the Southern Appalachians (Barden and Woods 1973).

Oak flats, however, were nearly fire-free islands in a sea of fire vegetation. These stands appear to be self-fireproofing in the same way as the "asbestos forest" (beech-sugar maple) of the northeastern US, but differed in that small, isolated oak flats appear to have acted as fire suppressors in an otherwise frequent-fire landscape. There seem to be at least three factors contributing to the damping effects that this community seems to have had on fire. First, the dense, white clay soils seem to be impervious to invasion by rhizomatous shrubs, which contribute to the flammability of nearby communities on sandy soils. Second, the tree species here*, Quercus michauxii, Quercus laurifolia, Quercus pagoda*, tulip poplar and beech, seem to produce thin or poorly flammable leaf litter that decomposes more rapidly than that of other upland hardwoods. Third, the flat, silty or clayey soils hold moisture that appears to facilitate matting of the litter into a thin, compact layer. By spring, this layer consists of soft, partly decomposed leaves and is so compact that its ability to carry fire seems negligible. So, in this flat landscape, it appears that soil texture, through its effects on vegetation type and litter decomposition, is responsible for producing the fire-free islands of mesophytic oak forest in a landscape otherwise dominated by fire. See Frost (2000, chapter 6) for an illustration of a fire frequency gradient created by differences in soil texture.

Litter depth can serve as one indicator of the pyrogenicity of the vegetation type present. Of litter depth measurements on several hundred sites in NC, SC and GA, accumulations in oak flats were the thinnest of any upland vegetation type (Frost unpub. data). Where the dominant species are beech and swamp chestnut oak, there is considerable leaf retention on the tree over winter, with complete leaf fall often not occurring until February. After falling, the etiolated leaves flatten readily against the moist, clayey surface which retains moisture all winter. By the March-April fire season the litter is often only 1-3 cm deep and partially decomposed. The mean of 60 litter depth measurements in three stands was only 2.7 cm over moist clayey soils. Because of rapid decomposition there was no duff layer. This thin, compacted layer can support only the lightest of creeping surface fires, with flame lengths of only about 1-10 cm. In such areas fire has no noticeable effect other than a reduction in small diameter shrub stems. In places where there is a little more leaf accumulation the frequent, light fires have enough influence to exclude beech from the mix. Fire effect increases in the transition areas between the oak flats and adjacent fire vegetation.

Variants. In some areas on moist soils transitional to fire vegetation types, oak flats were replaced by gum flats characterized by species such as sweetgum, swamp black gum and tulip poplar all of which are prolific sprouters and recover quickly on these moist sites after fire. The presence of tulip poplar in gum flats appears to be related to fire. The poplar occurs in zones toward the less fire-exposed side of fire-tension zones, but in situations that are reached by mosaic fires at intervals around 13-25 years, creating canopy openings large enough for the species to colonize under a chronic, hot but non-catastrophic fire regime. Another variant may be found in bottomlands of the major rivers draining into the Atlantic Ocean and Gulf of Mexico where oak flats dominated by swamp chestnut oak, cherrybark oak, laurel oak and water oak remain on fluvial islands where they are naturally isolated from fire (Frost 1997). Along northern rivers Pin oak (*Quercus palustris*) flats occur on clayey soils, and pin oak—cherrybark oak flats can be found in the Mississippi River bottoms.

Rare species and vegetation types. At least one globally rare forest community type is found in this vegetation group. The Rocky Point wet marl forest is a G1 plant community (TNC), known only from one location in Pender County, NC Rare species at this site include *Carya myristiciformis* (Nutmeg hickory), state endangered in NC, G4/G5; *Carex cherokeensis* (Cherokee sedge), S1, G4G5; *Carex basiantha; Cornus asperifolia* (roughleaf dogwood) S1, G3G4; *Ruellia strepens* (Limestone wild-petunia) SR, G4G5; *Scirpus lineatus* (Drooping bulrush) S2, G4. Old growth stands may also serve as habitat for neotropical migrant warblers, including several rare species.

Related models. Northern Hardwoods are also little influenced by fire. With exception of beech however, floristics are almost completely different and, since they often occur in frequent fire landscapes, oak flats are fire-influenced on their margins and beech may be excluded from the interior by fire where sufficient hardwood litter and frequent light fire prevents regeneration.

Model Assumptions: This is a three box model with no open path. With exception of single tree gaps and small group openings created in the canopy by wind throw, these were closed canopy forests. The model applies to the dominant vegetation type, not the fire-influenced margins. With exception of Atlantic white cedar (*Chamaecyparis thyoides*) and, in Florida, sand pine (*Pinus clausa*), no coastal plain types south of New Jersey fit the western seral models based on stand replacement. The dominant model was tree-by-tree replacement with mortality of long-lived individual canopy trees or small clusters resulting primarily from old age or wind throw. Occasional small patches were downed by tornadoes or hurricanes, with hurricane effects decreasing as distance from the coast increased. Stem breakage was rare, the primary effect of wind being complete blowdown, with the flat disk-like root system being ripped up and its attached soil leaving a tip-up mound for 100-200 years after decomposition of the root system. Mature oak stands near the coast sometimes show a pattern of such mounds beneath the existing canopy. Mounds are elliptic with the long axis oriented perpendicular to the direction of the wind that blew down the tree. In a wind-exposed oak flat on a coastal estuary in southeastern Virginia I found a 70 year-old stand with two distinct patterns of tip up mounds, oriented to two different compass directions, suggesting that most of the stand had blown down twice during hurricanes in the past 200 years. Hurricanes inland from the coast, however, usually affect only scattered individual trees.

Vegetation Type and Structure

Class*	Percent of Landscape	Description
A: post replacement	4	Seedlings and small saplings of the same species as in the canopy. 10-25% tree canopy cover with most cover the result of advance regeneration of canopy species. Suppressed saplings and subcanopy stems up to 50 years old and 8 inches dbh quickly close any canopy gaps created by wind throw.
B: mid-seral closed	16	Saplings and mid-sized subcanopy stems of the same species as in the canopy. > 80% canopy cover
C: late-seral closed	80	Late-seral, 50-300+ years, closed canopy dominated by oaks and beech. Multistoried woody vegetation consisting of mid and lower slopes. Scattered subcanopy trees such as dogwood, sourwood and sassafras and relatively sparse herb layer. Canopy gaps usually only constitute 1- 10%. >90% canopy cover
Total	100	

Fire Frequency and Severity

Fire Severity	Fire Frequency (yrs)	Probability	Percent, All Fires	Description
Replacement Fire	n/a	n/a	0	Neither crown fire nor other forms of replacement fire are known from oak flats.
Non-Replacement Fire	7-30	0.0575	100	Only very light litter fires are possible, with exception of margins where some mosaic fire does occur.
All Fire Frequency*	17	0.0575	100	

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

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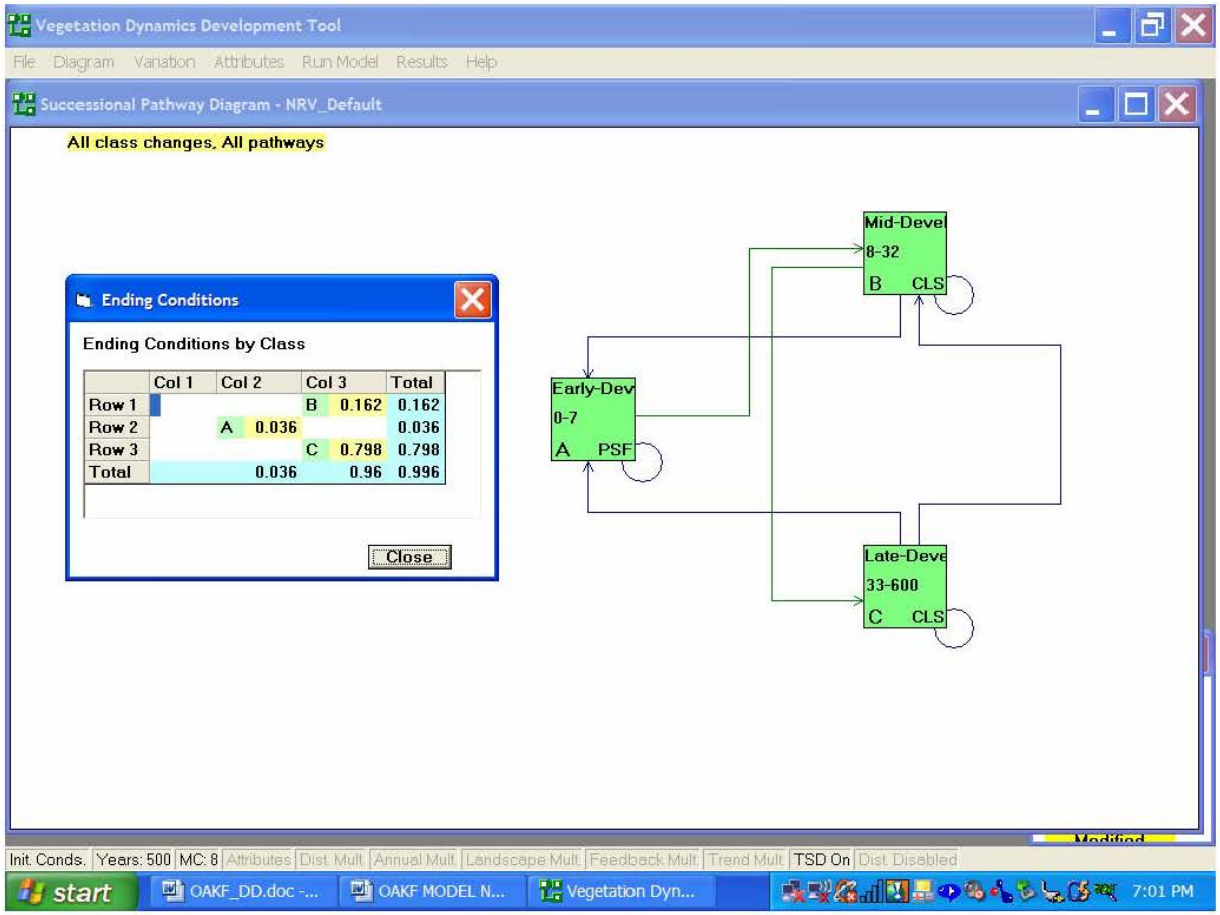
VDDT File Documentation

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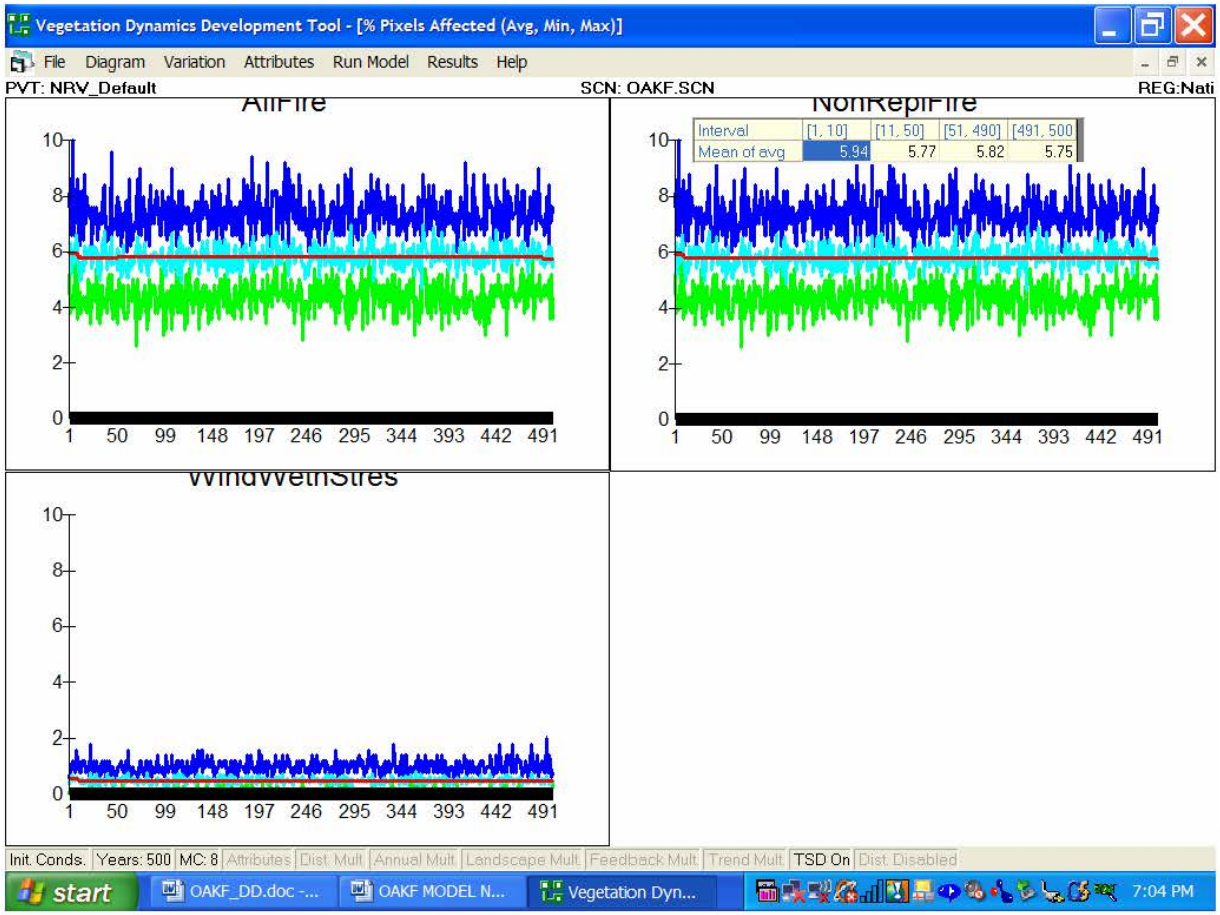
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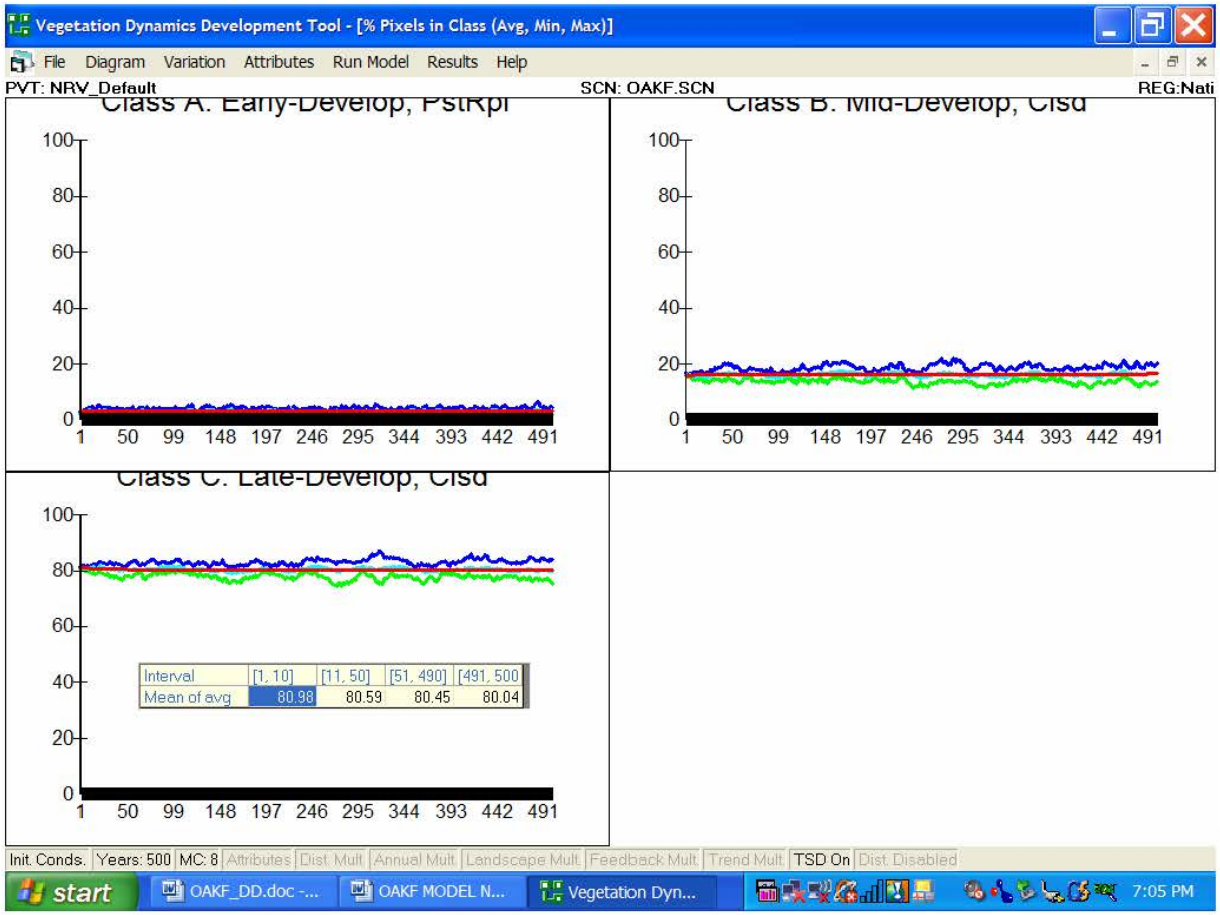
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