****DRAFT****

Fire Regime Condition Class (FRCC) Interagency Handbook Reference Conditions

Modeler: Cecil Frost **Date:** 3/1/05 **PNVG Code:** NMAR

Potential Natural Vegetation Group: Tidal saline, brackish and oligohaline marshes (replaces the Küchler type "Northern Cordgrass Prairie")

Geographic Area: Coastal and inland tidewater areas from the Chesapeake Bay and the northeastern coast of Virginia north to Maine

Description: Shallow water and diurnally flooded flats along edges of estuaries, and tidal rivers. Some areas of high marsh are also flooded irregularly by lunar and wind tides. The attached 3 box model covers the brackish (5 to 30 PPT salinity) and oligohaline (0.5 to 5 PPT) salinity ranges. Marshes within this range can be strongly influenced by fire. Marshes beyond either end of this range (riverine emergent fresh marshes and coastal salt marshes) tend to be nonpyrophytic.

This attached model excludes nonpyrophytic salt marshes—those dominated by pure stands of salt marsh cordgrass (*Spartina alterniflora*) and having > 3% salinity, as well as salt flats dominated by nonflammable species such as *Salicornia*. Neither of these saline or hypersaline types is known to burn except on margins where mixed with more flammable species. On the other end of the salinity gradient, freshwater marshes (salinity <0.5 PPT) tend to be dominated by nonpyrophytic, emergent broadleaf species such as *Pontederia cordata, Peltanda virginica, Hydrocotyle* spp. and *Polygonum* spp., and floating-leaved aquatics such as fragrant water lily (*Nymphaea odorata),* none of which support fire. These marshes, while still at sea level, represent the most upstream version of the long-attenuated salinity gradient along the margins of small streams and rivers, far removed from the nearest outlet to the sea.

True salt marshes in full strength sea water consist of pure stands of saltmarsh cordgrass with no other vascular plant species. Sea lettuce (*Ulva* sp.), a marine alga, may be found beneath the *Spartina*, either floating or stranded at low tide on temporarily exposed mud. Such marshes do not burn on the Atlantic part of the range, but rare fires in *Spartina alterniflora* have been reported on the Gulf Coast under extreme burning conditions (Hackney, pers. Comm.). *Spartina alterniflora* marshes diurnally flooded with seawater constitute a one box model in which nothing happens! There is no fire and this type is unaffected by even the strongest hurricanes. Occupying the lowest point in the marsh landscape they are flooded by storm surge early in the storm cycle and remain safely under water until the storm passes, when they emerged unscathed.

Vegetation in brackish marshes consists of dense fine-textured herbaceous species, usually dominated by low graminoids such as salt meadow cordgrass (*Spartina patens)*, and saltgrass (*Distichlis spicata*) toward the saline end of the salinity gradient or by tall species such as cattail (*Typha latifolia* and *Typha angustifolia*), giant cordgrass (*Spartina cynosuroides*), and sedges such as three-square (*Scirpus americanus*) toward the oligohaline end. These species may occur as monospecific patches, zones, or diverse mixtures. Species diversity increases as fire frequency increases and as salinity decreases. Toward the southern end of the range in Virginia, oligohaline marshes that have burned around every 5 years may have up to 60 species of plants, while fire suppressed or naturally fire-infrequent marshes tend to become dominated one or two species (Frost 1993).

Succession. Within the region, no woody species can tolerate the dual stresses of frequent flooding and high salinity. In the salinity mid-range, brackish marshes resist woody invasion but in the absence of fire those with salinity less than 1% (10 PPT) may succeed after 30 years to nearly closed shrub cover with species such as wax myrtle (*Myrica cerifera*), silverling (*Baccharis halimifolia*), sea elder (*Iva frutescens*) and small red cedar (Juniperus virginiana), while the margins may develop closed cover of trees such as red cedar, loblolly pine, pitch pine and red maple. Succession to tree cover is most rapid on marsh/upland margins where there is dilution of salinity by adjacent upland groundwater. Even in the absence of fire, however, undisturbed closed woody cover is unlikely to persist longer than about 30-50 years since saltwater input during major storms often kills some portion of the trees (Conner and Askew 1993). In the freshwater to oligohaline range, marsh flora usually contain, at least on their margins, mildly salt-tolerant shrubs and tree saplings whose cover may increase dramatically in the absence of fire. Red maple is often conspicuous in succession.

Uncharacteristic vegetation now includes marshes that have undergone succession to woody vegetation where they would have been kept open by Native American burning, and also oligohaline marshes invaded by *Phragmites australis*.

Fire Regime Description: Fire regime type II, frequent replacement, mostly 2-10 years, occurred where marshes were contiguous with uplands burned by Native Americans living in coastal environments. Fires are moderate in intensity, consuming the above-ground herbaceous vegetation and top-killing most woody plants when present. This model represents an average of widely varying fire regimes, because probability of ignition is affected strongly by the presence of open water channels, the presence or absence of connection to uplands, and the natural fire regime of adjacent upland vegetation. Marsh islands would have been fire free unless ignited by Native Americans. In contrast, marsh fires from southeastern Virginia and south were more influenced by lightning ignited fires on flammable uplands which spread into adjacent marshes (see SMAR model by Schafale), with a lesser component of Native American ignition (Frost 1993, 1998). In the northern regions covered by this model, Native Americans were the primary ignition source (Patterson, pers. comm.).

Model Assumptions. Although occasional large diameter stems of woody plants such as red cedar often survive fires, all marsh fires are considered replacement fires for above-ground vegetation, except for a small percentage of class C that occurs in the lowest salinity situations of water and soil. The model represents an average behavior of marshes that are well connected to mainland vegetation and hence have some probability of ignition. The Optional1 disturbance represents irregular salinization during storm surge that inundates woody root systems with higher salinity than that to which they are adapted, for a long enough time to kill some or all.

Vegetation Type and Structure

Class*	Percent of Landscape	Description
A: early seral	34	Recently burned marshes (0-4 years). More diverse herb layer when burned frequently and with lower salinity. Flammable litter sufficient to carry fire accumulates after only 1 or 2 years depending upon the dominant species.
B: mid-seral	47	4-15 years since fire. Dense herb layer dominated by medium and tall species, with heavy litter buildup except where removed by storms. Invading shrubs and trees where salinity less than 1%
C: late- seral	19	16 years + since fire. Herb layer dominated by tall species, with deep, loose litter buildup with dense shrubs and young trees where salinity permits. Age and structure of woody vegetation depends more upon irregular salinization events during storm surge rather than fire.
Total	100	

Fire Frequency and Severity

Fire Severity	Fire Frequency (yrs)	Probability	Percent, All Fires	Description
Replacement Fire	7 years	0.15	83	Light to moderate surface fires
Non-replacement fire	Never except in stage C: 35 yrs	0.03	17	Light to moderate surface fires
All Fire Frequency*	5.6	0.18	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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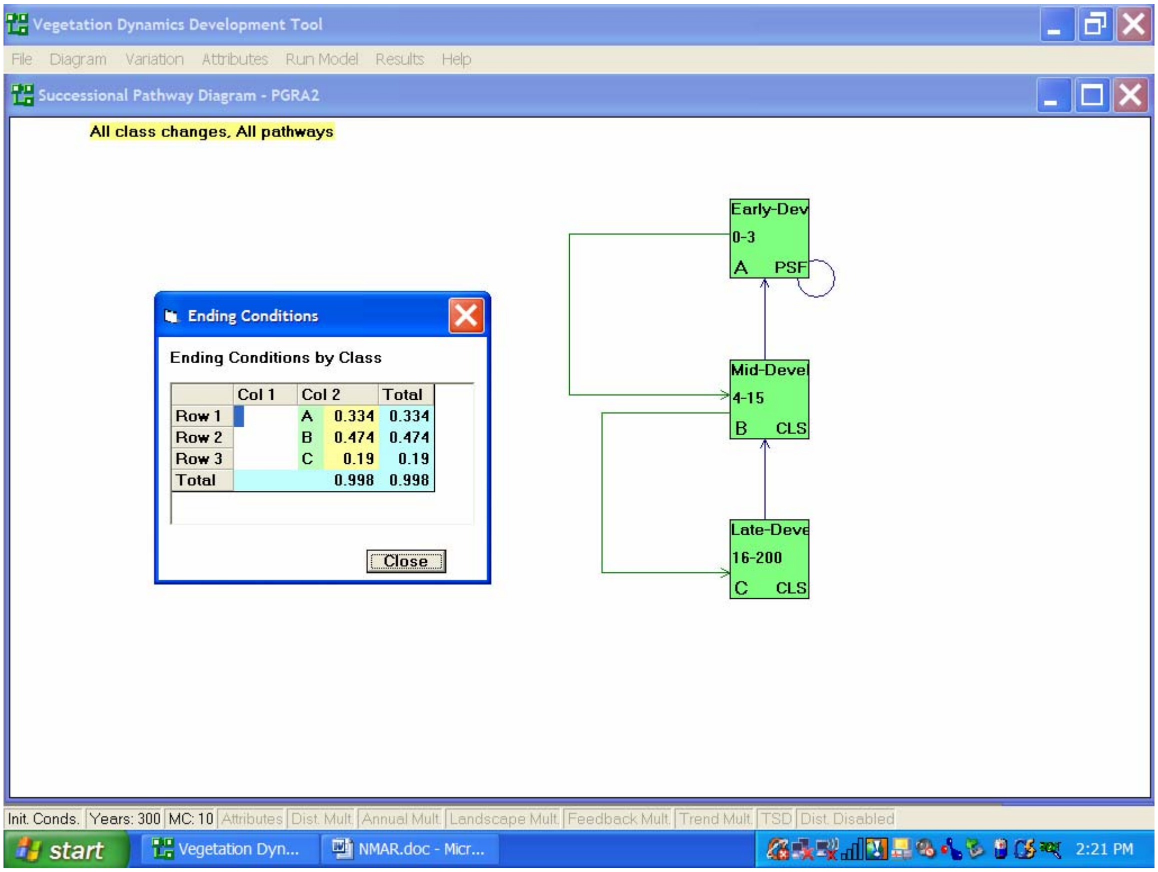
PERSONAL COMMUNICATION:
Patterson, William, III. 2004. pers. comm.

VDDT File Documentation

Include screen captures (print-screens) from any of the VDDT graphs.


Vegetation Dynamics Development Tool
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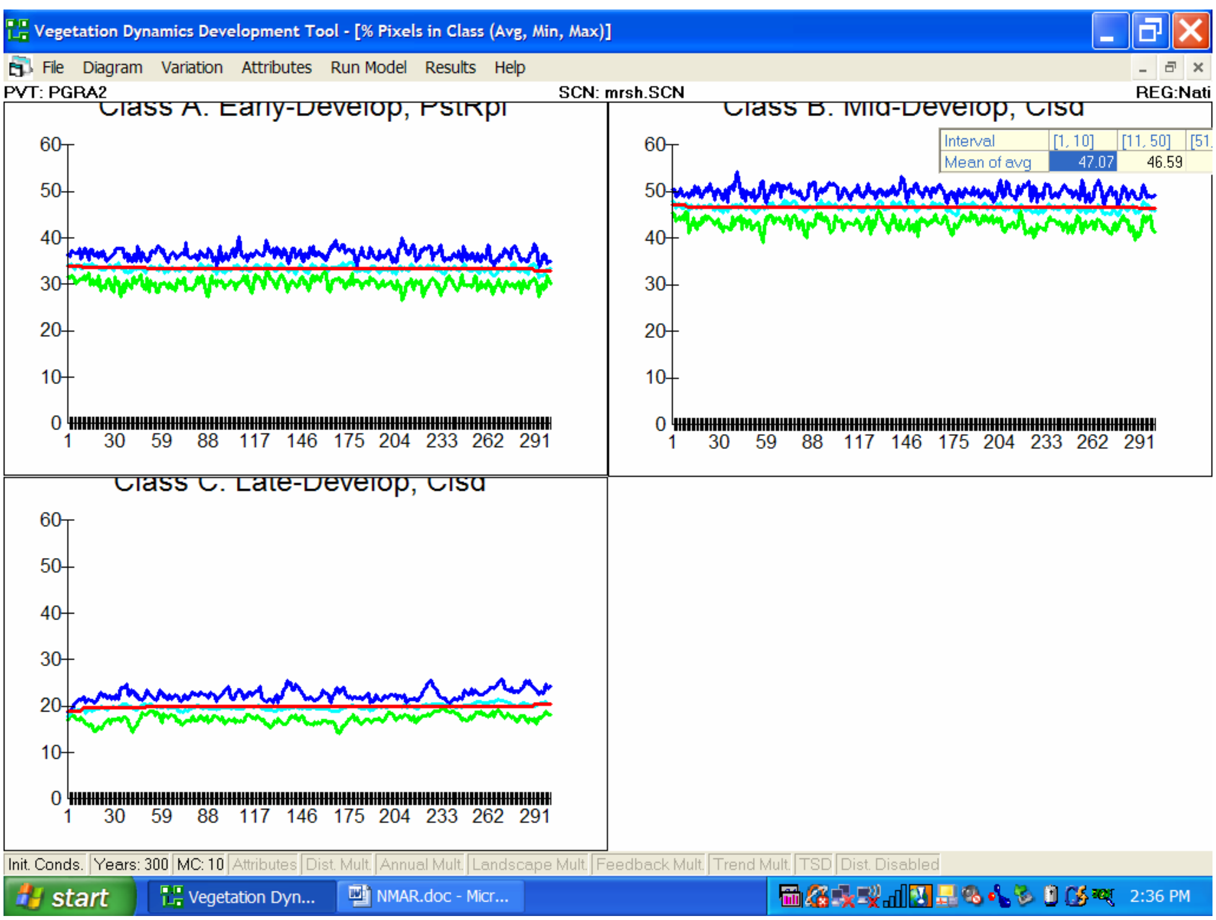
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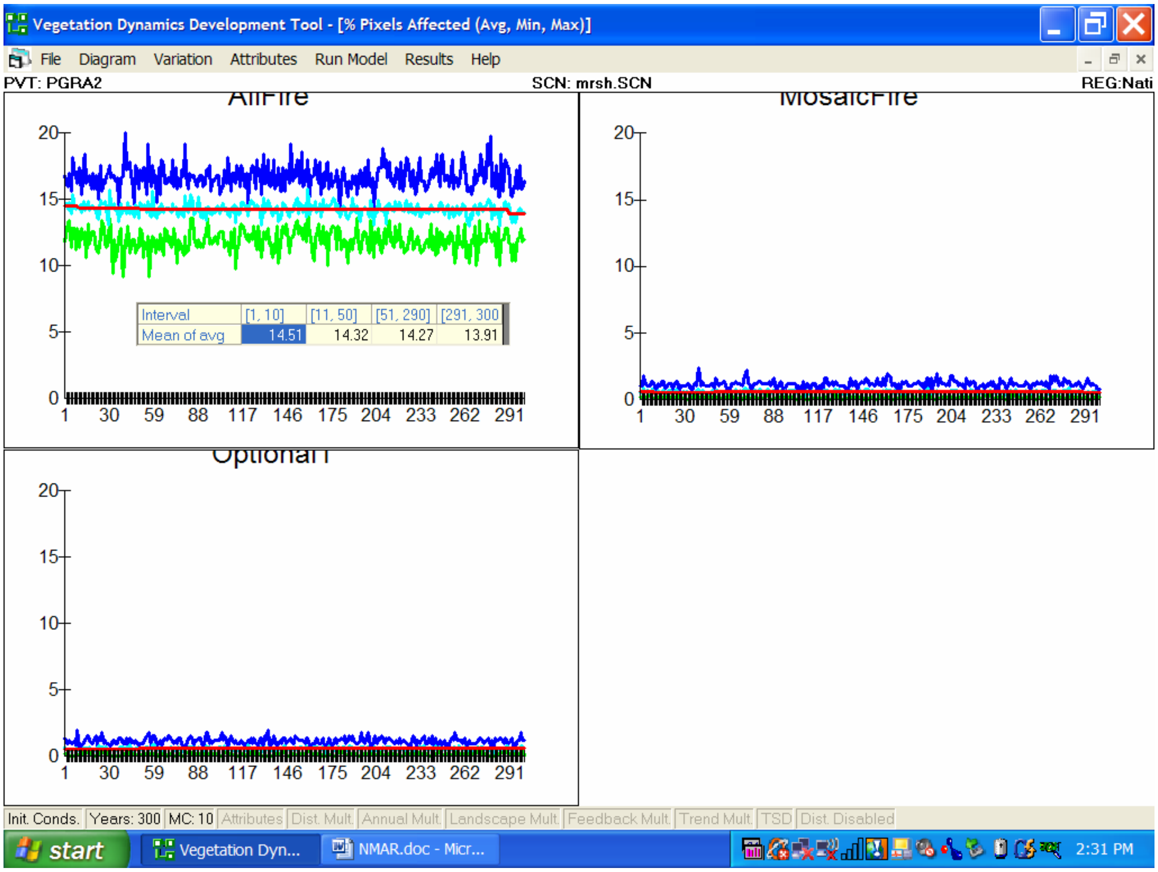
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