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# Fire Regime Condition Class (FRCC) Interagency Handbook Reference Conditions

**Modeler**: Kevin Robertson **Date: 11/09/04** **PNVG Code: SOFP**

**Potential Natural Vegetation Group:** Southern floodplain forest

**Geographic Area:** East Texas to Virginia within the Coastal Plain and lower Piedmont, and up the Mississippi River basin to southern Illinois.

**Description**: Hardwood-dominated forest associated with river floodplains that are inundated or saturated by surface or groundwater during some period of the year. This PNVG includes bottomland hardwood forests with relatively short hydroperiods and deepwater alluvial swamps that are flooded most or all of a given year. These variations often coexist at small scales within the floodplain reflecting topography and hydrology. For example, mixed hardwoods often dominate flat portions of the floodplain while cypress and gum dominate abandoned channels and depressions with longer hydroperiods. Synonyms for this PNVG and its subdivisions include alluvial forest, southern bottomland hardwood forest, deepwater alluvial swamp, and alluvial cypress-gum swamp.

Apart from treefall gaps, they have a continuous canopy of mostly deciduous broad-leaved species in areas with shorter hydroperiods and deciduous needle-leaved trees (cypress) and evergreen broad-leaved species in areas with long hydroperiods. The tree canopy ranges from approximately 80-150 feet tall. The understory is less than 80 feet tall and is usually composed of the canopy species and mostly evergreen and deciduous broad-leaved understory species. Understory shrub density is generally low. The herbaceous layer is sparse due to shade and/or frequent inundation, although there may be relatively thick herbaceous vegetation in treefall gaps. Except in deepwater areas, there are usually more than ten species of canopy trees and over thirty tree and shrub species total. Canopy tree density is within 15-30 trees per acre and canopy tree basal area is within 100-210 $ft^2$ per acre. Many canopy trees exceed 20 inches in diameter.

Relative dominance of canopy tree species may vary according to regional location and hydrology. The lowest areas with the longest hydroperiods (usually abandoned channels or sloughs carrying water during floods) are dominated by *Taxodium distichum* (bald cypress), *Nyssa sylvatica* (black gum), *Nyssa aquatica* (Tupelo gum), *Planera aquatica* (water elm), *Salix nigra* (black willow), *Salix caroliniana* (Carolina willow), *Fraxinus profunda* (pumpkin ash), and *Acer rubrum* (red maple). River banks and flat, poorly drained areas within the floodplain are often dominated by *Populus deltoides* (cottonwood), *Betula nigra* (river birch), *Acer rubrum* (red maple), *Acer saccharinum* (silver maple), *Acer negundo* (box elder), *Platanus occidentalis* (sycamore), *Ulmus americana* (American elm), *Fraxinus pennsylvanica* (green ash), *Fraxinus caroliniana* (Carolina ash), *Celtis laevigata* (sugarberry), *Celtis occidentalis* (hackberry), *Carya aquatica* (water hickory), *Diospyros virginiana* (persimmon), *Magnolia virginiana* (sweet bay), *Quercus laurifolia* (diamond leaf oak), and *Quercus lyrata* (overcup oak). Ridges and levees in low areas and higher areas near the edges of floodplains may be dominated by *Liquidambar styraciflua* (sweet gum), *Quercus nigra* (water oak), *Quercus phellos* (willow oak), *Quercus phellos* (swamp chestnut oak), *Quercus nuttallii* (Nuttall's red oak), *Quercus shumardii* (Shumard's red oak), *Quercus virginiana* (live oak), *Prunus serotina* (black cherry), *Ulmus alata* (winged elm), *Tilia americana* (basswood), *Pinus taeda* (loblolly pine), *Pinus glabra* (spruce pine), *Liriodendron tulipifera* (yellow poplar), *Carya illinoensis* (pecan), *Carya glabra* (pignut hickory), *Carya cordiformis* (bitternut hickory), and *Carya ovata* (shagbark hickory).

Common understory tree species in areas with relatively long hydroperiods include *Cephalanthus occidentalis* (buttonbush), *Itea virginica* (Virginia willow), *Myrica cerifera* (wax myrtle), *Cyrilla racemiflora* (titi), *Lyonia* spp, and *Forestiera acuminata* (swamp privet). In areas

with shorter hydroperiods, understory species include *Ilex opaca* (American holly), *Ilex vomitoria* (yaupon), *Ilex decidua* (deciduous holly), *Morus rubra* (red mulberry), *Callicarpa americana* (beautyberry), *Cornus foemina* (stiff dogwood), *Sambucus canadensis* (elderberry), *Carpinus caroliniana* (blue beech), *Ostrya virginiana* (hop hornbeam), *Symplocos tinctoria* (horse sugar), *Cercis canadensis* (redbud), and *Halesia diptera* (silverbell), *Styrax americana* (American snowbell), *Persea borbonia* (red bay), *Sabal minor* (palmetto), and *Asimina parviflora* (paw paw).

Regeneration of most canopy tree species is dependent on treefall gaps or formation of new land in association with lateral river migration. Hurricanes, which occur with an average 20-year interval in most parts of the Coastal Plain, are especially important in creating gaps and allowing regeneration. Gap regeneration is largely from "advance recruits" existing as seedlings at the time of disturbance. Gap regeneration includes both understory species and canopy species.

**Fire Regime Description:**

Fire regime group I. Fire return interval is relatively low compared to most other southeastern natural communities. No fire return interval has been recorded or estimated for this community, in part due to the land management tradition of protecting it from fire. However, there are a sufficient number of accounts of fire in this community to indicate that it is flammable, at least under drought conditions. Presumably, when dry enough, some portion of the frequent fires in adjoining pine-dominated habitats entered into this community. Fires generally have flame lengths of less than one foot and "creep" slowly along the ground consuming hardwood litter. Nearly all accounts of fires describe them as non-catastrophic, killing seedlings and saplings but not adult trees. However, under exceptionally dry conditions, the burning of the duff surrounding the base of hardwood trees may result in trees being killed by girdling. More often, trees are partially girdled, allowing wood rot to progress up the tree without killing it, having an unknown effect on the lifespan of the tree. Crown fires do not occur in this community type. Based on early descriptions of Mississippi River upper floodplain forests occupying similar conditions and containing many of the same species as southern mixed hardwood forest, the natural fire return interval for non-catastrophic surface fires is estimated at 30 years. Some small portion of the area of these fires in particularly dry years results in mortality of canopy trees. Historical accounts also indicate a portion of this type was originally occupied by canebrake, a flammable and frequent fire vegetation type.

**Assumptions**

Pixels represent the area of a single very mature canopy tree or a treefall gap.

Surface fires occur on average once every 30 years. Surface fires effect about the youngest ten percent of the canopy tree species (1-2 yrs old) in treefall gaps (stage A), although rarely are all individuals in stage A killed by a fire.

Replacement fires occur in places within the stand where relatively deep duff and drought conditions result in girdling and killing of canopy trees. Mortality is usually patchy rather than “stand-replacing”, thus the given probability is for a gap-sized patch rather than the occurrence of a replacement fire somewhere within the stand. For mid and late-succession trees, recurrence of a replacement fire at the pixel scale is approximately once every 1000 years.

Major wind disturbances (hurricanes, tornadoes) occur within the stand on average once every 20 years, affecting a subset of trees within the stand. The "wind-weather stress" probability is also considered to include loss of trees to erosion by the meandering river channel. Early-development trees are considered not to be susceptible to wind disturbance. Mid-development trees are less susceptible to wind disturbance (annual frequency = 0.002) than late-development trees (annual frequency = 0.008), which are very susceptible to wind-throw in wet or saturated soils. For late-development trees, a portion of the treefall probability is that the pixel will go from

the late-development to mid-development stage, since trees of shade-tolerant species may obtain mid-development size beneath the canopy of late-development trees.

According to this model, the community is sustainable in the absence of fire through wind and geomorphic disturbance alone. Thus, it is not considered to be a fire-dependent community. However, the fire-free scenario results in a smaller percentage of the landscape being in early and mid-development.

“Subcanopy species” are listed above.

“Early development canopy species” may include *Acer rubrum, Quercus nigra, Liquidambar styraciflua, Fraxinus pennsylvanica, Diospyros virginiana, Tilia americana, Celtis laevigata, Acer rubrum*, *Planera aquatica, Ulmus americana, Liriodendron tulipifera, Prunus serotina, Platanus occidentalis, Salix nigra, Populus deltoides,* and *Betula nigra*. Although these tend to be the first species to occupy treefall gaps and early successional zones on stream sides, any of these, except for *Salix* and *Betula*, may be very long-lived and become part of the late-development stage in the model.

“Late development canopy species”, in addition to those listed under "early development" that may become late development species, *Taxodium distichum, Nyssa sylvatica, Magnolia virginiana*, *Quercus laurifolia, Quercus lyrata, Quercus phellos*, *Quercus phellos*, *Quercus nuttallii, Quercus shumardii, Quercus virginiana, Carya illinoensis*, *Carya aquatica*, *Carya glabra*, *Carya cordiformis,* and *Carya ovata*.

**Uncharacteristic vegetation**

In many areas, SOFL has been clearcut and allowed to return as second-growth forests. Where large areas were clearcut without leaving seed trees, the returning forest tends to be very species-poor relative to reference conditions. In deepwater areas, pure stands of *Nyssa sylvatica* mixed with *Acer rubrum* almost invariably indicate areas where *Taxodium distichum* was clearcut and failed to regenerate. In portions of floodplains with shorter hydroperiods, large clearcuts often result in stands dominated by only three or four canopy tree species, usually *Quercus nigra*, *Liquidambar styraciflua, Acer rubrum*, and/or exotic tree species.

Exotic woody species, especially *Ligustrum sinense* (Chinese privet) and *Sapium sebiferum* (Chinese tallow-tree), dominate large areas of SOFP throughout the southeast and preclude regeneration of native tree species. They are most problematic in the wake of logging, but also dominate early-successional zones of streamsides on several southeastern rivers. *Melia azadarach* (China ball tree) is also a dominant exotic in some areas.

Many other areas once supporting the reference community type are currently used as agricultural fields and loblolly pine plantations.

**Vegetation Type and Structure**

| Class* | Percent of Landscape | Description |
|---|---|---|
| **A**: post replacement | 8 | Canopy species trees in treefall gaps range from 0-20 years in age and up to about 15 cm dbh, depending on species. Potential canopy species are typically mixed with subcanopy species and herbs, although the model focuses on the canopy species component. Canopy species are dominated by a mixture of relatively “early successional” and “late successional” canopy species. |
| **B**: mid-seral closed | 35 | Overstory canopy is closed and consists of canopy tree species whose individuals range from 20-80 years in age, ranging up to about 40 cm dbh depending on species. Certain canopy |

| | | |
|---|---|---|
| | | species are shade-tolerant and have representatives in the understory. |
| **E**: late- seral closed | 57 | Overstory canopy is closed and consists of individuals ranging from 80-300 years in age with representatives in the subcanopy for certain species. |
| 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 | 1000 | .001 | 2 | Low-intensity surface fires, flame lengths ranging from a few inches to 3 ft, consuming ground fuels and girdling trees. |
| Non-Replacement Fire | 30 | .03 | 98 | Low-intensity surface fires, flame lengths ranging from a few inches to 3 ft, consuming only surface fuels and litter. |
| All Fire Frequency* | 32 | .031 | 100 | |

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

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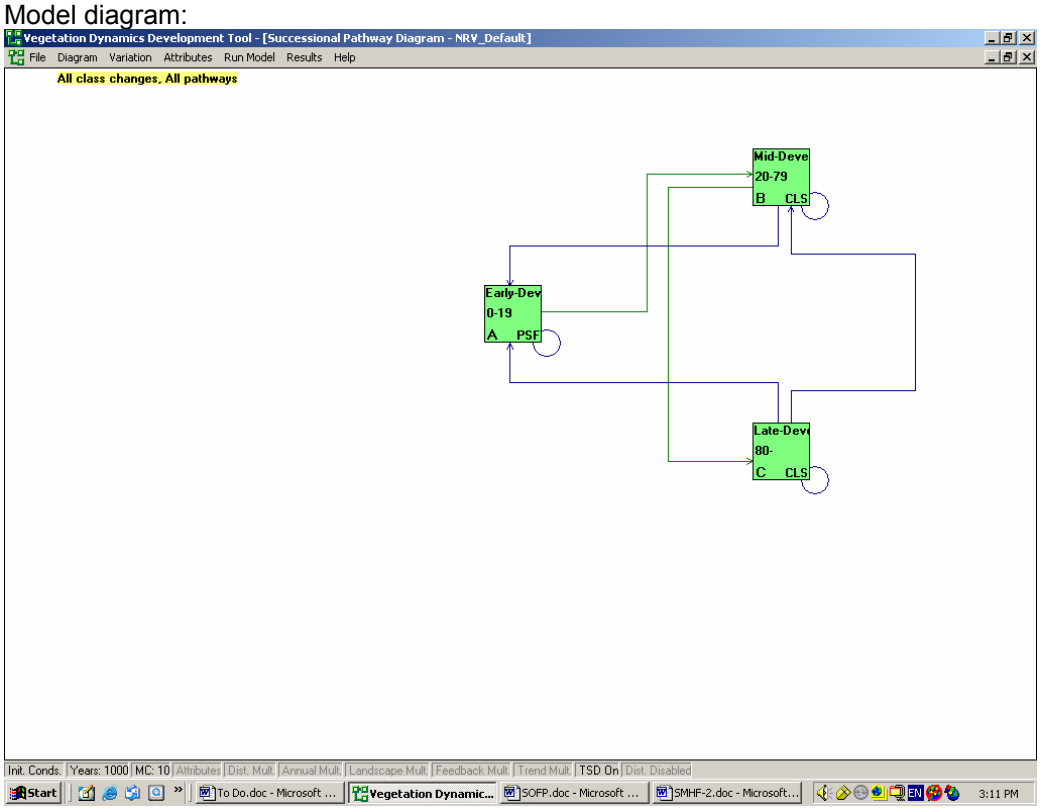
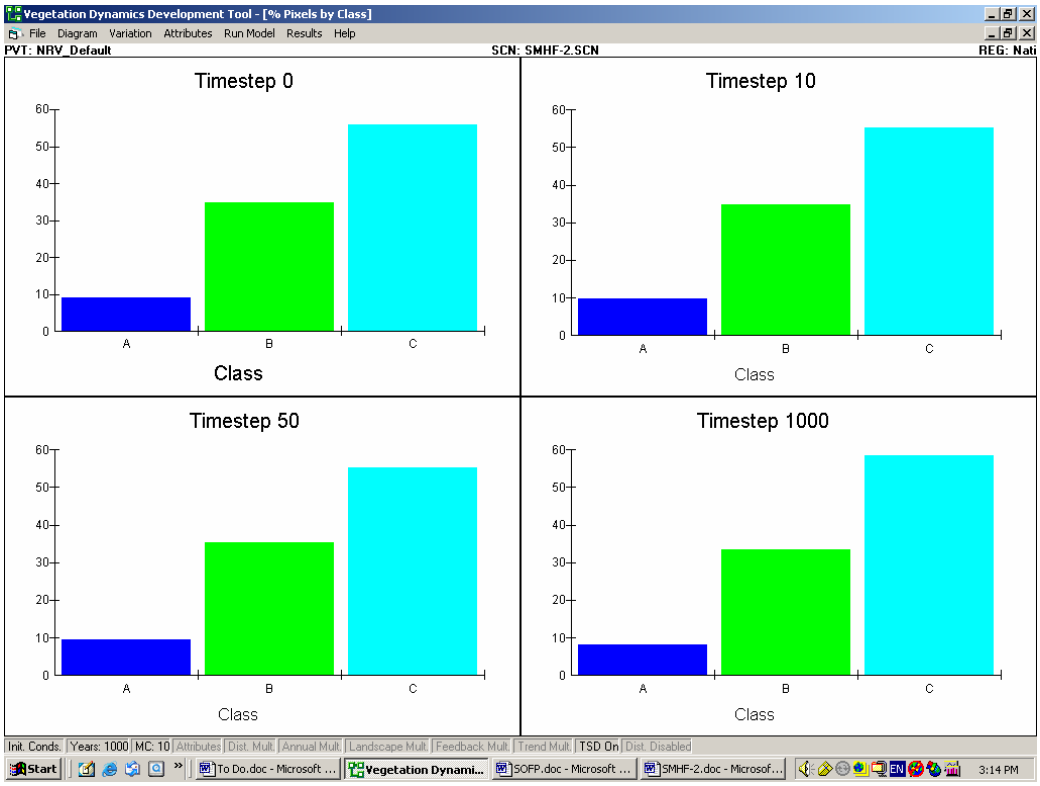
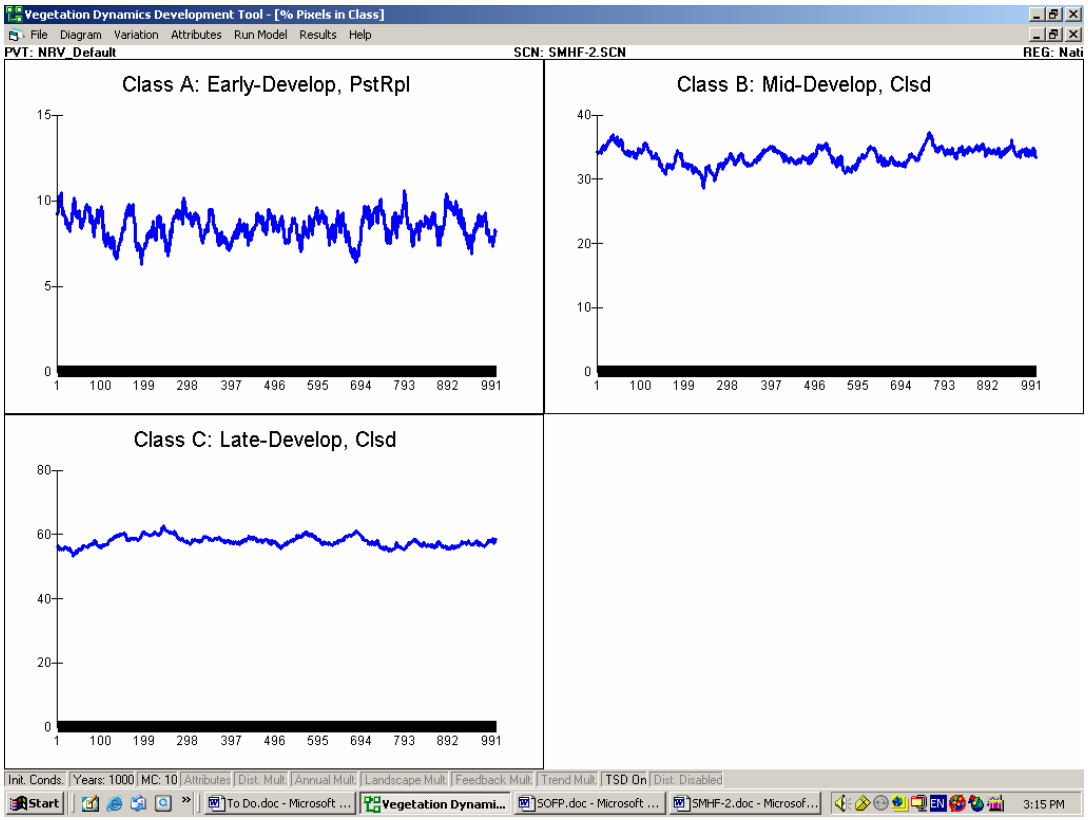
**VDDT File Documentation**
Include screen captures (print-screens) from any of the VDDT graphs that were used to develop reference conditions.

Model diagram:




Fires included in model runs:

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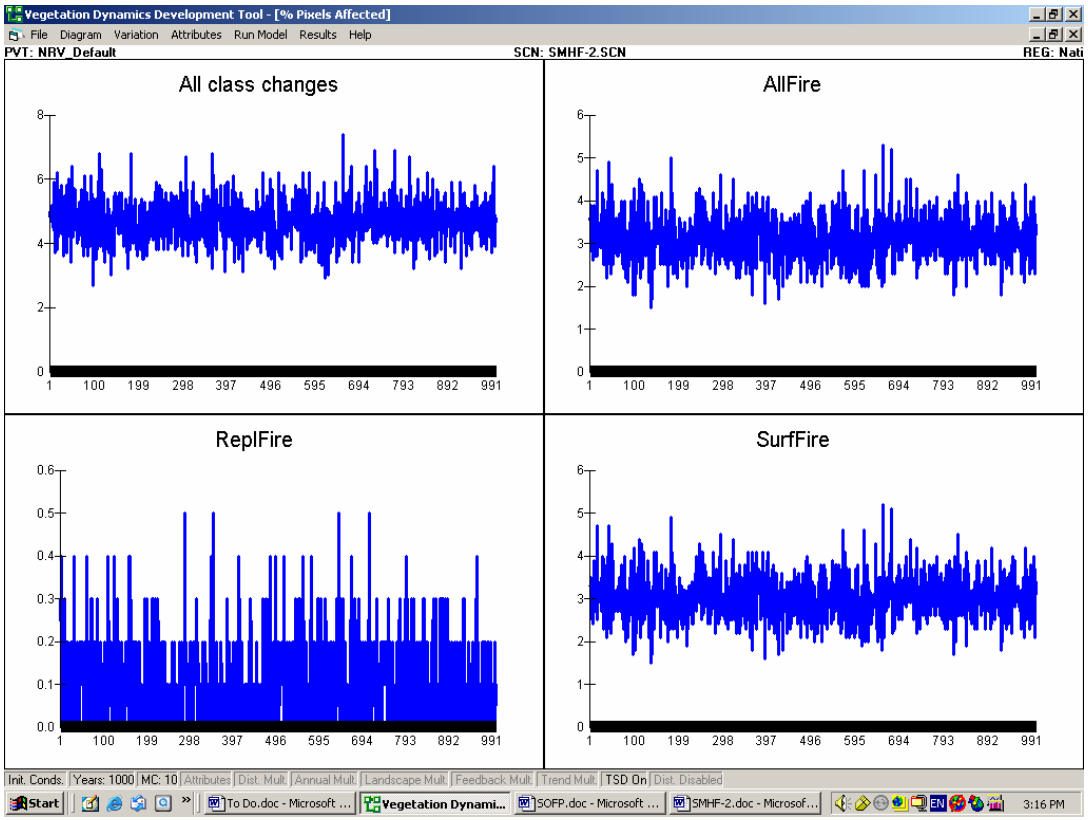
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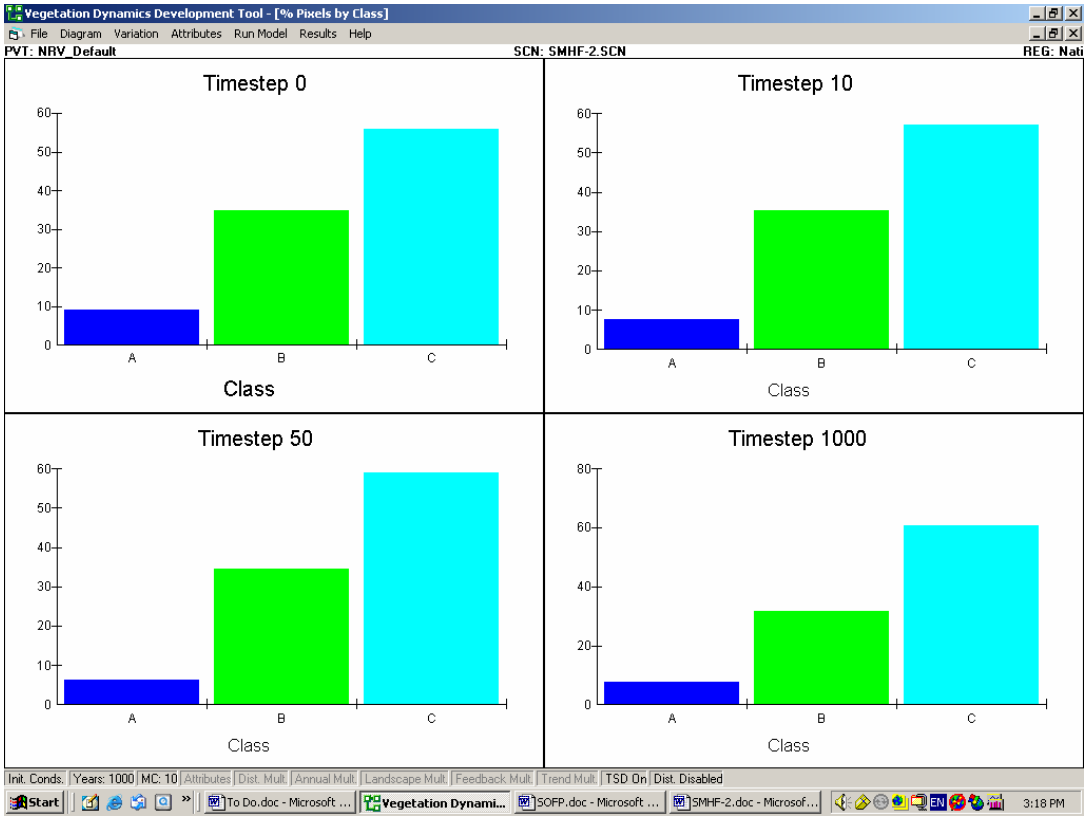


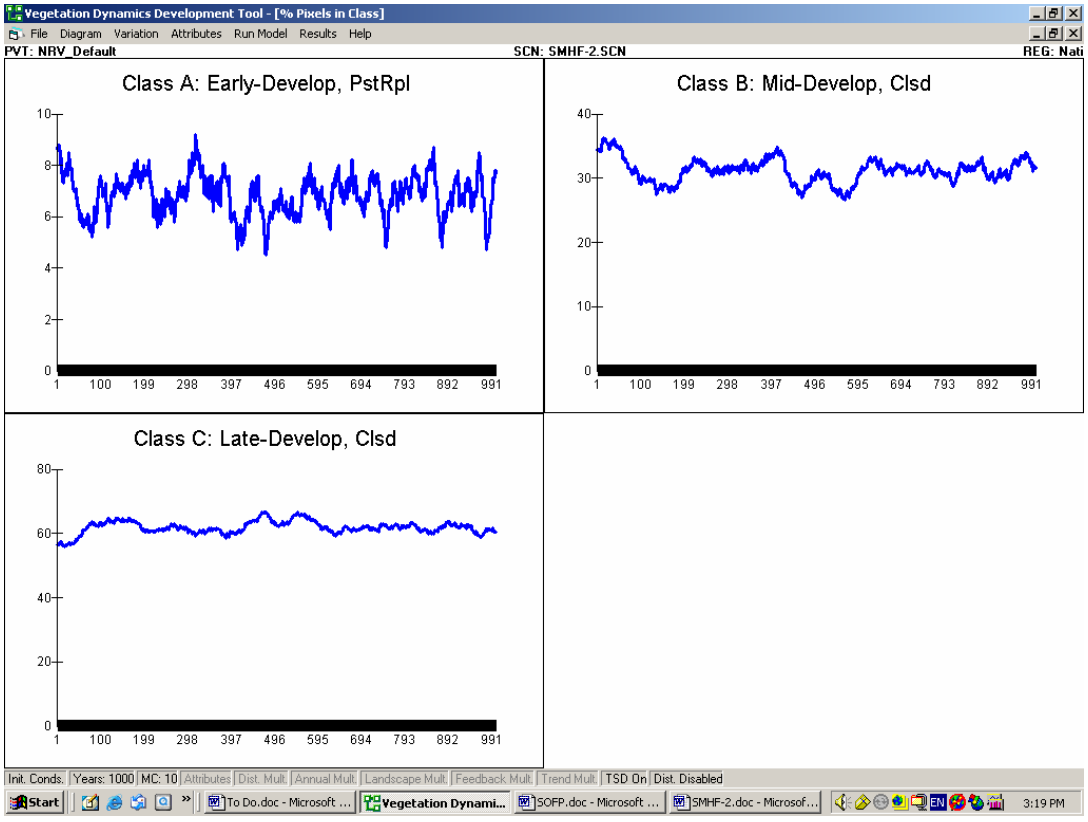

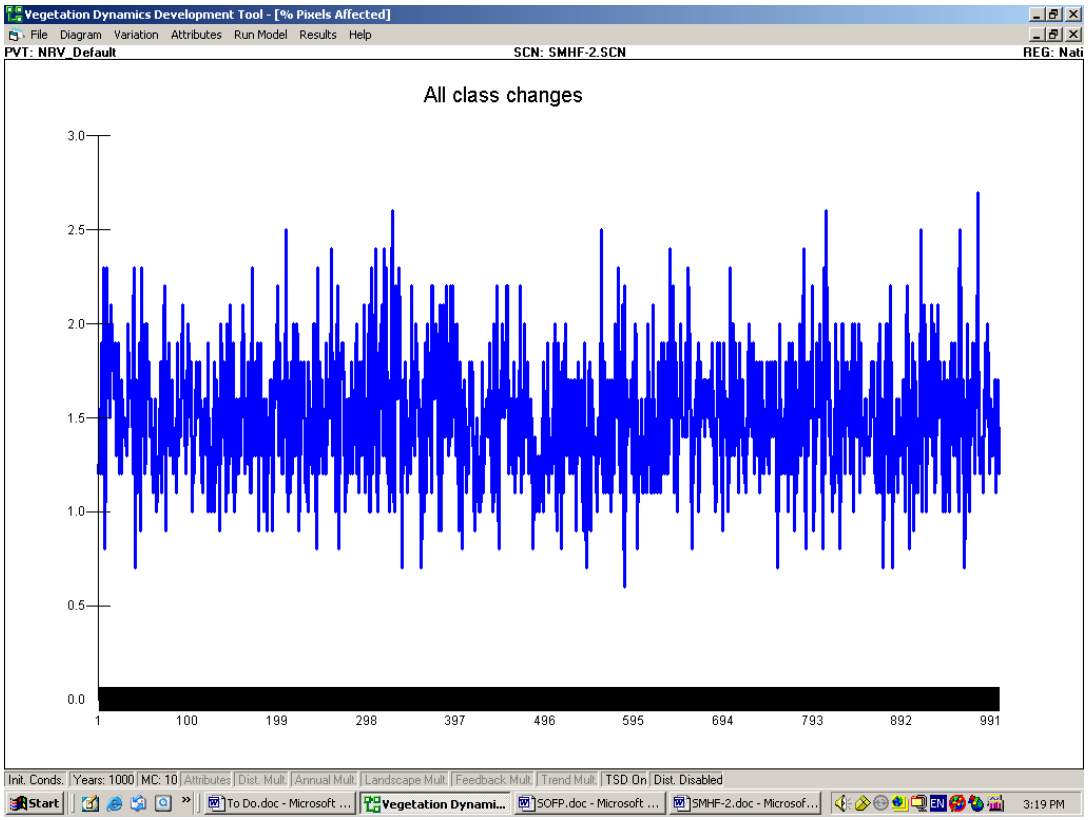
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