

\*\*\*DRAFT\*\*\*

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

**Modeler:** Cecil Frost

**Date:** 12/8/04

**PNVG Code:** AWCF

**Potential Natural Vegetation Group:** Atlantic White Cedar Forest

(no Küchler type: portions included in his type 113, Southern floodplain forest; type 114, Pocosin and several other types). Dominant species, Atlantic White Cedar (*Chamaecyparis thyoides*)

**Geographic Area:** The largest stands occurred in peatlands of coastal North Carolina and southeastern Virginia, with the next largest in New Jersey. Other stands were found as far north as Appleton Bog, Maine, the northern limit of the species (Stockwell 1999). Small stands were sprinkled in sandy and mucky sloughs through the interior sandhills of the Carolinas and Georgia, south to coastal wetlands of the Florida Panhandle.

**Description:** The presettlement extent rangewide was at least 300,000-400,000 acres of which only 5-10% remains. In the Virginia/Carolina peatlands, however, where the largest stands occurred, only around 1% remains after 400 years of exploitation and wetland alteration. Primary habitat was peat soils which ranged in depth up to 2-3 meters in the Great Dismal Swamp of Virginia and North Carolina, the locale of the largest known stand at 112,000 acres (Akerman 1928). In addition to the peatland type, numerous smaller stands can be found on wet sands, mucky sands and organic substrates in southern sandhill sloughs from the Carolinas to Florida, and in glacial kettles and wet depressions in outwash plains left behind by melting glacial ice in the Northeast. The largest remaining stands are in NJ where there may be roughly 22,500 acres having >25% cedar cover. The highest stand is near 1500 feet in High Point Swamp, New Jersey.

The tree and its lumber were formerly known as “juniper” in the boatbuilding and timber industry and a few juniper fishing boats still ply the waters of the Chesapeake Bay. Stands regenerated from crown fire may have nearly pure cover of white cedar. The most common subcanopy species are red maple (*Acer rubrum*), red bay (*Persea palustris*) and sweet bay (*Magnolia virginiana*). Shrubs, in various parts of the range, include gallberry (*Ilex glabra*), Inkberry (*Ilex coriacea*), *Leucothoe racemosa*, *Itea virginica* and many others. Herbs, chiefly ferns and sedges, are typically sparse but mosses may be abundant.

In large coastal peatlands, white cedar occurs as one element of a landscape scale patch mosaic with the patch type dependent upon the depth of the water table at time of the fire that regenerated the stand. Other patch elements are swamp blackgum (*Nyssa biflora*), pond pine (*Pinus serotina*), and cypress (*Taxodium distichum* and *Taxodium ascendens*). The existence of a patch of any particular species at any time is stochastic (Frost 1996). If the water table is near enough to the surface at time of burn so that the seed bank is undisturbed, a dense, pure stand is likely to regenerate. If a few centimeters of the surface peat are burned away, destroying the seed bank, species in nearby stands may seed in creating patches of red maple, swamp black gum or pond pine. If the water table has been drawn down by evapotranspiration to ½ to 1 meter below the surface—as often happens in the summertime—peat may burn out to depth sufficient to pool water. In this case, a patch of cypress can be created (see photo below).

**Niche:** White cedar occupies a rather narrow hydrologic position toward the wet end of the moisture gradient, intermediate between that of non-pyrophytic cypress-gum swamp in the South, or maple swamp in the Northeast, and various drier or more fire-exposed wetland vegetation types. In the great peatlands, it requires periodic replacement fire for establishment of new stands or expansion of existing stands into adjacent communities. Stand replacement may occur by catastrophic crown fire under extreme burning conditions, or by consumption of peat by ground fire. In coastal stands, rising sea level appears to prevent stand replacement on the seaward side, while the stand may expand upslope on the inland side.

**Uncharacteristic succession.** While seed dispersal occasionally produces a cedar tree or two in other forest types, most sites with *Chamaecyparis* scattered among other wetland species can be shown to be post-logging remnants of preexisting dense stands rather than natural mixed species community types. In the peatlands, logging usually leads to capture of the site by understory species such as red maple, red bay and sweet bay because white cedar regeneration is prevented by shading from logging slash.

**Factors implicated in decline of white cedar (Frost 1995):**

- Ditching and road building, causing large scale disruption of hydrology, leading to flooding or drainage, deep peat burns, peat subsidence, oxidation and exposure of mineral soil.
- Conversion of peat lands to agriculture.
- Post logging site preemption by understory or stump sprouting species.
- Shading of seed bed by logging slash.
- Destruction of saplings by post logging fires in slash.
- Fire suppression, eliminating opportunity for white cedar to invade patches occupied by other species.
- Long-term succession in the absence of fire. There is no evidence that white cedar can succeed itself without fire.
- The tendency to log only cedar patches, leaving adjacent noncommercial swamp forest and pocosin communities intact. This eliminates the possibility for expansion of the cedar stand: at best a new stand could reoccupy 100% of the original site). Historical and field evidence show a stepwise reduction in stand area, with a large portion of the site lost to other species each time a stand was logged.

**Fire Regime Description:** Fire regime type IV (with some II and V) 25-300 years, with frequency driven by where the stand occurs in the fire landscape. In the southern sandhills, fires may sweep through bottomland sloughs as often as every two years but white cedar is rarely affected, occurring as it does in pockets inaccessible to fire because of steep side slopes. While sensitive to fire, trees on the stand margins have charred bark from the frequent light fires but are not killed. In wetlands accessible to fire from one side but protected on the other, there may be a fire frequency gradient. In the Great Dismal Swamp of Virginia and North Carolina, there was historically a conspicuous fire frequency gradient with canebrake (a frequent-fire type) on the east side, which carried fire into the eastern margins of white cedar, maintaining a patchwork of young stands. No fire could approach from the west side which was guarded by a zone of wet swamp at the toe of the Suffolk Scarp. Under severe burning conditions, however, fires carried into the center of the Dismal from canebrakes on the south and east at intervals of 100-300 years. Between these extremes there were areas burned at intermediate intervals, giving a fire frequency gradient with stands 25 to 300 years old dating to past fires.

**Model assumptions:** This model covers peatland, sandhill slough and northern bog and Atlantic white cedar. The glacial kettle variant may require a separate model. There is no D class (late-seral-open).

**Vegetation Type and Structure**

| Class*                | Percent of Landscape | Description  |
|-----------------------|----------------------|--|
| A: post replacement   | 11                   | 0-7 Dense seedlings on peat, quickly forming a closed layer.   |
| B: mid-seral closed   | 42                   | 8-50 Tall, even-aged, closed canopy stands.  |
| C: mid- seral open    | 13                   | 8-300 Multi-aged stands in stream bottom swamps where fire can reach the edge of the stand and support occasional mosaic fires. Forms small patches of white cedar and mixed species stands with pines ( <i>Pinus rigida</i> , <i>Pinus taeda</i> , <i>Pinus serotina</i> ) and bottomland hardwoods |
| D: late- seral closed | 34                   | 30-300 See photo below, virgin white cedar.  |
| 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 (in any yr) | Percent, All Fires | Description                |
|----------------------|----------------------|-------------------------|--------------------|----------------------------|
| Replacement Fire     | 67                   | .015                    | 70                 | Crown + ground (peat) fire |
| Non-Replacement Fire | 154                  | .0065                   | 30                 | Mosaic fire on margins     |
| All Fire Frequency*  | 47                   | .0215                   | 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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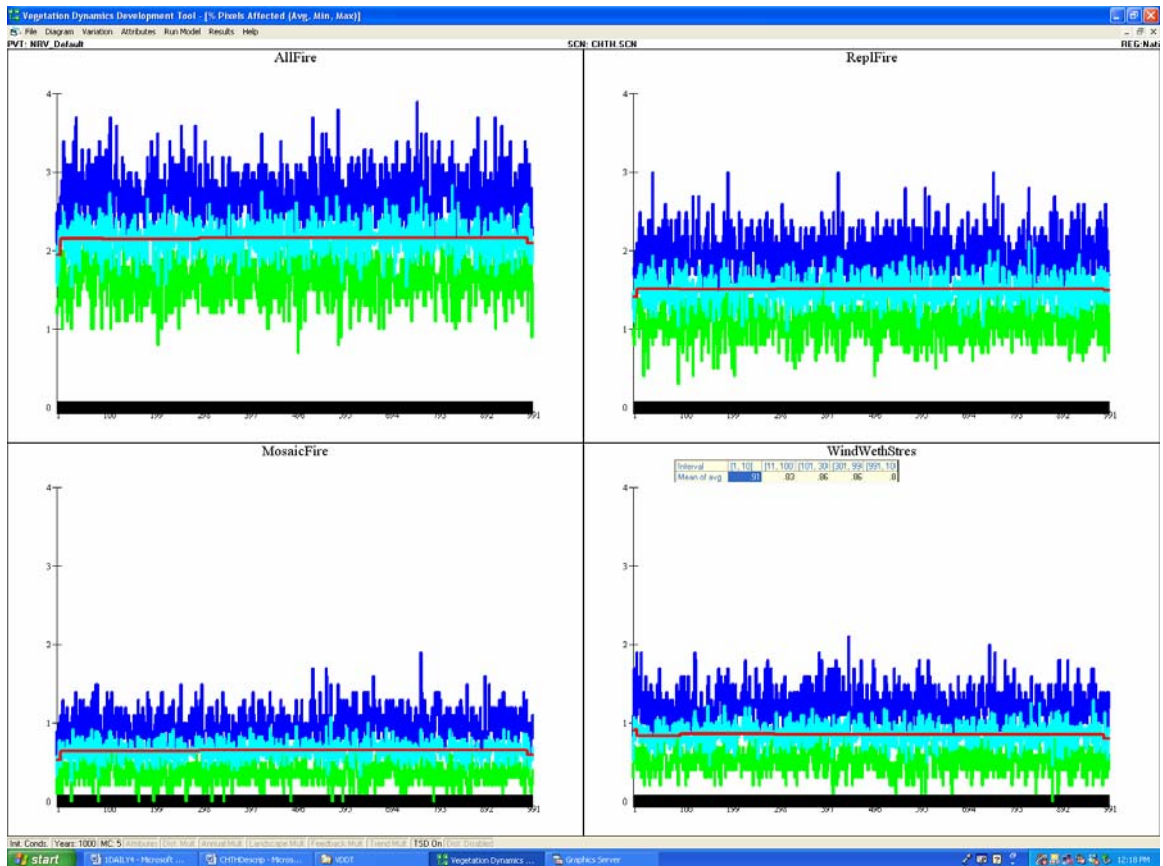
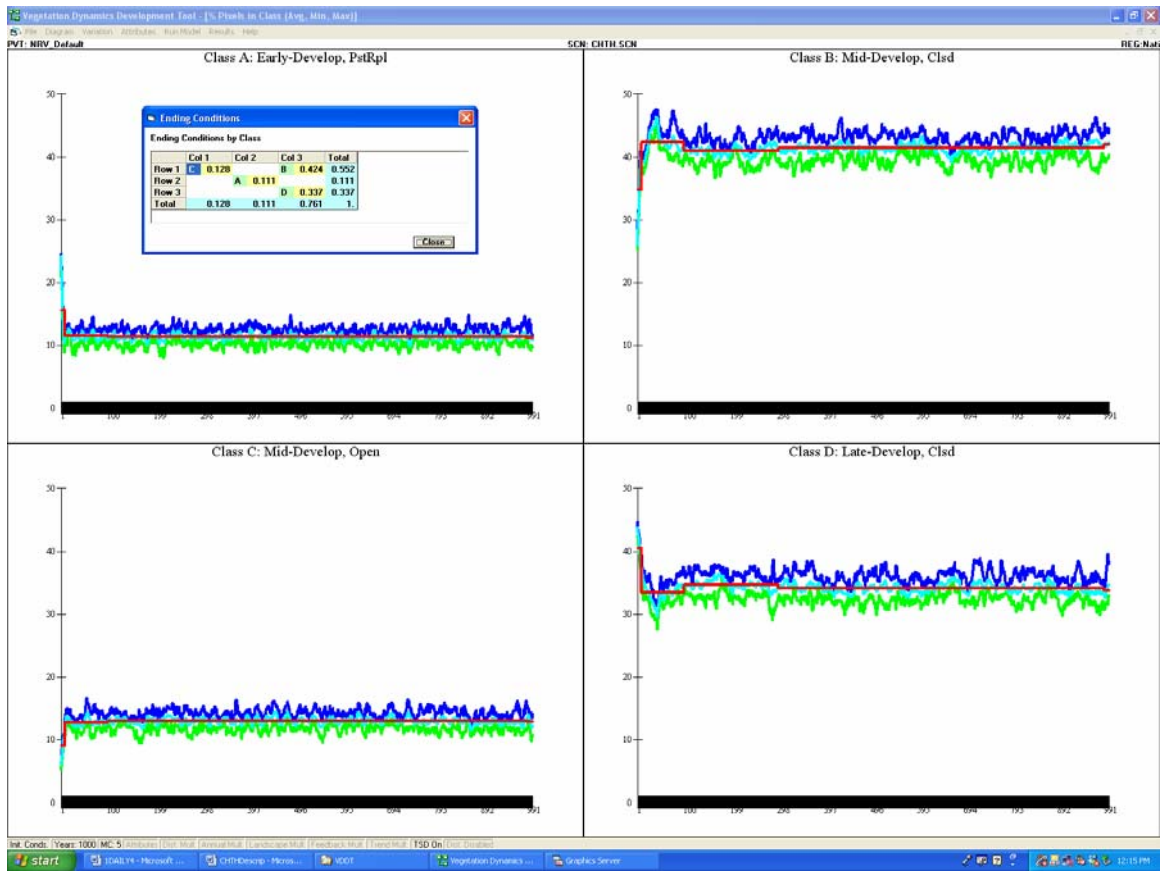
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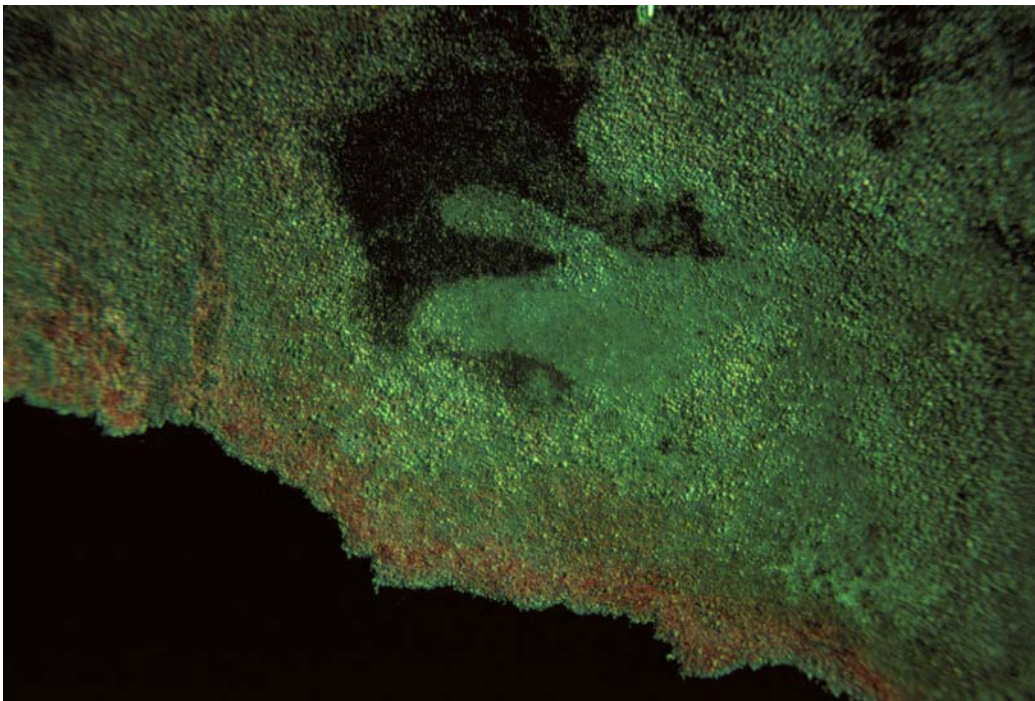
**VDDT File Documentation:**

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





Virgin white cedar, up to 300 years old in the central, most fire-sheltered region of the Great Dismal Swamp, North Carolina and Virginia in 1907. An 8000 acre remnant of the original 112,000 acres.



Color infrared aerial photo of a virgin landscape-scale peatland patch mosaic on the north side of the Alligator River, NC. Dark signature is an even-aged Atlantic white cedar stand dating to a crown fire around 90 years ago. Top of photo is east. The "mitten" shape in center of photo is the footprint of a crown fire that blew in from the southwest about 50 years ago replacing the older white cedar with swamp black gum and red maple. The light area just above and to the right of the "mitten" is a 330 year old stand of cypress resulting from a peat burnout at time when the water table was unusually low (from Frost 1995).