

Cypress Leaf-Out Sequences

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During aerial surveys conducted in the course of our research at Corkscrew Swamp Sanctuary, we noticed that all parts of a cypress strand do not put out spring foliage at the same time. At Corkscrew the trees leaf out in a three-stage sequence: first the intermediate trees, then the large ones towards the interior of the strand, and last the small trees along the strand's outer edges. At Sixmile Cypress, a strand east of Fort Myers, leaf-out begins at the center of the strand and progresses towards the edge in two phases.

Since timing of leaf-out affects both the functional growing season for cypress and light availability to understory vegetation, it has implications to strand productivity. Therefore, we decided to attempt to document and interpret this phenomenon.

We monitored leaf-out along three transects extending across the Corkscrew strand from the outer edge of the cypress forest to the interior Central Marsh. Two of these transects followed the boardwalk which loops through the strand near sanctuary headquarters. The Central Marsh Transect, where we have done intensive studies of soils, hydrology, and vegetation, served as a third transect until surveys there had to be discontinued because understory foliage blocked the observer's view of the cypress canopy. The raised boardwalk permitted a better view of the trees along the other two transects. The Central Marsh Transect survey was conducted on March 7, 1977. The

other two transects were surveyed every 4-10 days from February 26 to March 26.

We used a densiometer to measure percent canopy cover along the Central Marsh Transect and every 15 m along the boardwalk transects. Peat depths were probed at the same intervals. Along the Central Marsh Transect elevations were surveyed every 7.6 m. Water depth was measured every 15 m along the boardwalk and ground surface elevations were calculated from water levels.

The north boardwalk transect most clearly illustrates the three-stage leaf-out pattern (Fig. 13). On February 26 some foliage was appearing on trees beyond 75 m into the strand, and canopy cover was greatest from about 90 to 135 m from the strand edge. This pattern continued through March 12. Leaf-out was well advanced by March 22. Canopy cover measurements along the south boardwalk transect reflected a sporadic leaf-out pattern throughout the study period. The March 7 Central Marsh Transect survey showed a distinct canopy cover maximum between 90 and 150 m into the strand.

Peat depth, tree diameter (DBH), and tree age increase from the strand's outer edge towards the interior, and ground elevation and tree density decrease.

Peat depth, which ranged from zero at the edge to 2 m in the center, was about 30 cm in the early leaf-out area. The trees averaged approximately 100 years old and 25-30 cm in diameter and were slightly shorter than the mature 30-35 m cypress in the strand interior. Cypress density was between 1000 and 2000 stems per hectare.

The two-stage leaf-out pattern at Sixmile could easily be attributed to a number of factors, since peats are deepest, water levels highest,

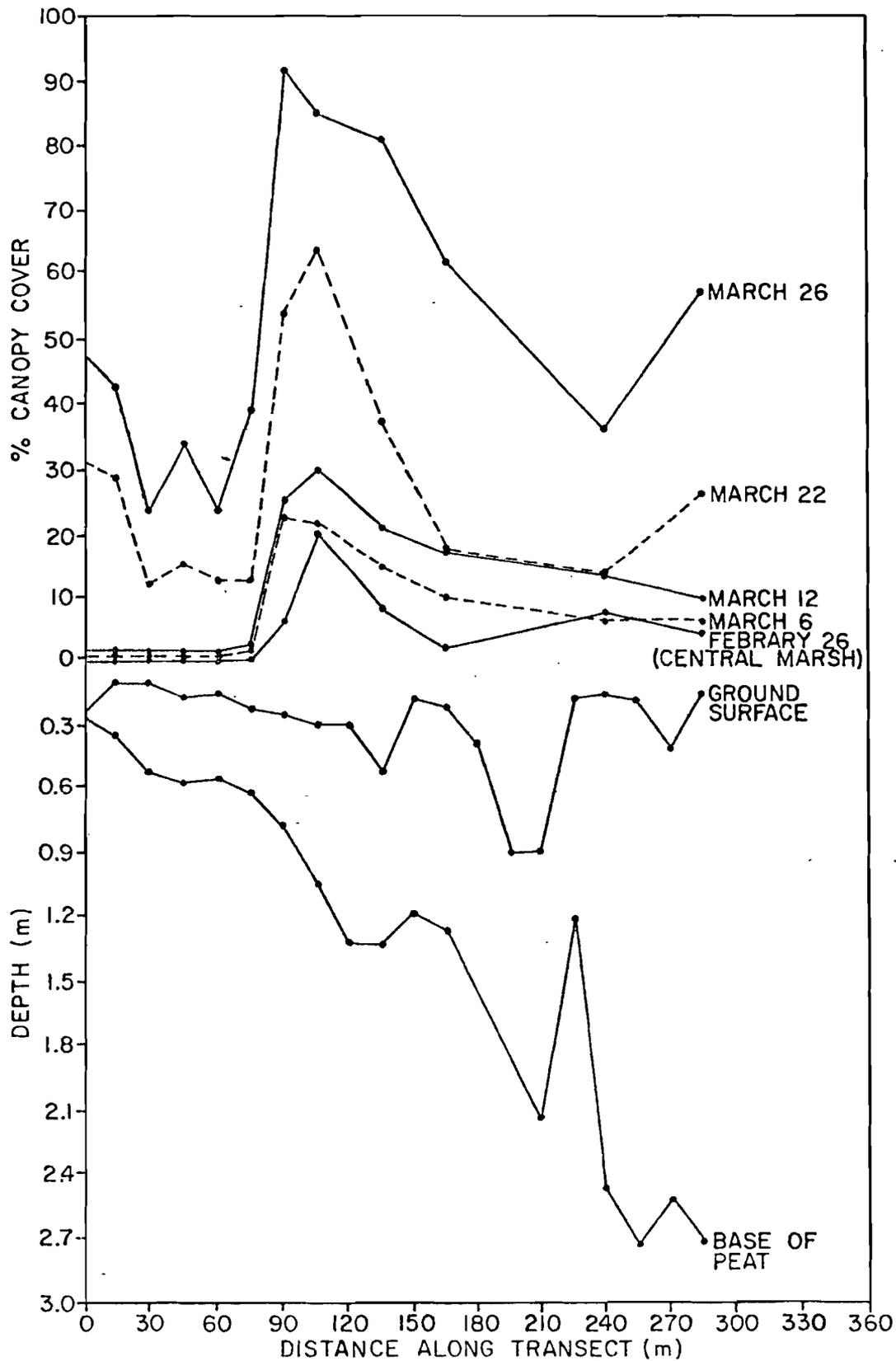


Fig. 13. Canopy cover and peat depth; North Boardwalk Transect.

and trees oldest in strand interiors. The center trees also have bald cypress characteristics whereas the exterior trees are pond cypress. Corkscrew's three-stage sequence is not so easy to explain. However, Corkscrew is a larger and probably, in successional terms, older strand, which suggests that the three-stage pattern might be related to long-term strand processes.

There are four possible explanations for this sequence. The simple explanation that the trees growing under optimum conditions leaf out first is unsatisfactory. Tree-ring studies along the Central Marsh Transect reveal that the fastest cypress growth rates occur on deep peat sites in the strand interior. Another possible interpretation involves hydrologic patterns caused by the shell stratum shallowly underlying the band of trees which puts on foliage first. However, the boundaries of the shell beds do not correspond closely with those of the early leaf-out area; further, since there was surface water at the time of our survey, water flows associated with the porous shell layer were probably not a factor. In fact, the leaf-out sequence does not appear to be related to water availability at all; we observed the same leaf-out pattern under drought conditions in 1975 and 1976. Taxonomic differences might be the basis for a third hypothesis, but this would suggest either three separate forms of cypress or hybridization (hybrid vigor). Although there is disagreement as to whether pond and bald cypress are one or two species, no third form has been proposed. Hybridization could not account for Sixmile's two-stage leaf-out sequence. Perhaps our best hypothesis is that the first trees to leaf out are the immature trees growing on the most nearly optimum sites. The several-hundred-year-old

trees in the center may be senescent and unable to respond vigorously to the excellent growing conditions of the strand interior. The trees in the strand periphery, although still in the rapid growth phase seen in cypress under about 90 years old, are limited by a marginal site.

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