

## Implications of the Spring Freeze of 2007<sup>®</sup>

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### INTRODUCTION

Spring 2007 in Tennessee was drier than normal, but otherwise plants in nurseries and landscapes were in very good shape. According to the Normalized Difference Vegetation Index (NDVI), a measure of the greening of the canopy of the forest collected by the National Oceanic and Atmospheric Administration (NOAA) at the Walker Branch Watershed in Oak Ridge, Tennessee — green-up of vegetation was 3 weeks earlier than in 2006. This was due to higher than normal temperatures. In most regions of the state, temperatures had reached temperatures of 21 to 27 °C (70 to 80 °F) by late March. During the first week of April, flowering dogwood (*Cornus florida*) was in full bloom.

Weather conditions were about to change drastically. In Murfreesboro, Tenn, the geographic center of Tennessee, the daily high on April 4 was 27 °C (80 °F) with a low of 10 °C (50 °F). By April 6, the daily high was 10 °C (50 °F) with a low of -1 °C (30 °F). On Easter morning, 8 April 2007, the temperature dropped to -7 °C (19 °F), this was repeated on 9 April when the low was again -7 °C (19 °F). Record low temperatures were reported at nearly all reporting stations in Tennessee. In Crossville, Tennessee on the Cumberland Plateau at nearly 610 m (2,000 ft) elevation, the record low was -11 °C (13 °F). In many of the areas where nursery stock is grown, lows ranged from the high teens to low twenties. In addition to record lows, other factors played a role in plant damage. Firstly, the mid-South region was already in a moderate to severe drought. Secondly, the duration of the cold temperatures undoubtedly added to the intensity of the damage. At Crossville, Tennessee, from April 4 to 10, temperatures below 0 °C (32 °F) were recorded for 70 h.

### PLANT DAMAGE AS A RESULT OF THE FREEZE

On Easter morning, a common sight on *Lagerstroemia* (crape myrtles) was ribbons of ice being extruded from twigs and branches. Once temperatures warmed, there was widespread damage to trees and shrubs in landscapes and nurseries. Foliar symptoms ranged from wilted leaves on sugar maple to scorched foliage on *Acer palmatum* and *Buxus*. New shoots on plants such as *Nandina*, *Mahonia*, and some *Ilex* species were killed by the freeze. Some of the more severe damage such as bark splitting on the trunk or main stem occurred on crape myrtle, azalea (*Rhododendron*), juniper (*Juniperus*), and arborvitae (*Thuja*). Many mature crape myrtles were killed back to the ground. Bark splitting on the lower trunk of some shade trees such as oak was also observed. Ginkgo and zelkova were especially hard hit by the freeze. Small specimens of each species were killed to the ground. Even mature ginkgo that lost their foliage to the freeze did not re-foliate until 5 to 6 weeks after the damage had occurred — whereas most tree species began producing shoots 3 to 4 weeks after the freeze. Fallout from the freeze continued in May, as many ornamental cherries that had appeared to be spared, began exhibiting shoot and branch dieback. A quick look at the cambial layer of the branches and trunks

showed discolored tissue — evidence of freeze injury. As of 3 May, NOAA reported that CO<sub>2</sub> levels in the mid-South were above normal as the forest canopy had not yet recovered.

Damage to flowering dogwood was especially significant. Dogwood seed planted in fields in the fall had germinated and seedlings were growing prior to the freeze. Nearly all of the seedlings that were unprotected were killed by the freeze. These would have been used for budding in late summer. Some growers were able to protect seedlings by covering them with sawdust or wheat straw. Also, many of the dogwoods that were budded in 2006 were killed by the freeze. To make matters worse, dogwood fruit set prior to the freeze was killed, making it more difficult to procure seed to plant for this fall (2007).

As the drought intensified, damage due to the freeze compounded the stress observed on certain plants. *Taxus* sp. in landscapes in Middle Tennessee showed widespread branch dieback. Wounds created by the freeze were colonized by opportunistic plant pathogens. Leyland cypress and other conifers showed branch dieback due to canker causing fungi such as *Botryosphaeria* and *Seiridium*. These fungi often live on their host plants as harmless endophytes and cause little damage unless the host is exposed to severe stress.

### **IMPLICATIONS TO THE NURSERY INDUSTRY**

The Spring Freeze of 2007 will no doubt play a significant role in the short-term of the nursery industry in the mid-South. Plants that had to be cut back to remove branches killed by the freeze will be smaller and a lower grade. No doubt, some budded dogwood cultivars will be more scarce and harder to find. Growers will have to network to find dogwood fruit (seed) to plant this fall for the 2008 crop. Losses of liners and small trees may be a final blow to some growers who may not be able to withstand such a catastrophic financial setback.