

# Spring Freeze, Summer Drought and Our Woodlands' Future

By Jeff Stringer

This year's spring freeze was arguably the most dramatic and widespread disturbance to Kentucky's woodlands that has occurred in the last 20 years. While the effects were most severe in the southern tier of the state, the entire state was effected. The counties along the Tennessee border and those in far western Kentucky were hit the hardest. The unseasonably warm weather in early April caused most of our species to break bud early and at almost the same time. Even oaks that normally never get fooled by a burst of warmth in the spring were affected by the extended and significantly high temperatures this spring. This set the stage for serious damage to occur to many of our species when the temperatures dropped to the low and mid-20s. Many hickories had six to 12 inches of new growth and flowers when the freeze hit (Figure 1). Oaks, both red and white, had flowers and leaves showing (Figure 2). Yellow-poplar had two to eight leaves exposed. Even black walnut, normally one of the last species to leaf out, had some leaves exposed in southern Kentucky. Regardless of species, the young, succulent growth was not capable of holding up to the extreme prolonged cold. In some cases, the buds were also susceptible to freezing and were killed. Once buds on a branch are killed, the branch will eventually die, and these trees will experience top and lateral branch dieback. Some species such as yellow-poplar were very slow to refoliate. In some instances, it took up to a month for them to start to recover. This indicates how significant this freeze was for many species.

Unfortunately, the effects of this freeze were not simply branch dieback, brown hillsides, and delayed refo- liation. Reduction in acorn and nut production over the next two years will be a reality as well as the potential for tree mortality.

*Freeze damage. Photo courtesy: Edward L. Barnard, Florida Department of Agriculture and Consumer Services, Bugwood.org*

## Acorn and Nut Production

The freeze killed not only newly formed leaves but also the flowers of many oaks and hickories. Observations after refo- liation found that white oaks had also created new flowers (Figure 3). However, this flowering was late and this coupled with the drought may reduce viable white oak acorn production this fall. White oak acorns are preferred wildlife food for many species, and the loss of this impor- tant food source will have ramifications for some wildlife populations. Barring a similar situation next year, we can expect a return to normal for white oak acorn produc- tion in 2008. The opposite is true for red oaks. The red oak acorn crop will be normal this year (Figure 4) and a potential reduction in 2008. This is because red oak acorns take two years to develop after flowering, whereas white

oak acorns take just one. White oak flowers are pollinated in the spring. Immature acorns (acornets) slowly develop over the summer with acorns developing quickly in late summer. Red oaks flower and lie dormant for a full year. They finally develop into acorns during mid to late summer of their second year. Red oaks were not suscep- tible to the cold temperatures, and the red oak acorn crop this year will be unaffected by the freeze. Initial observations indicated a significant loss of hickory flowers. However, there have been observa- tions of reflowering and hickory nuts occurring on some trees in the southern tier of Kentucky. Howev-

er, the loss of flowers coupled with the drought conditions may well lead to reductions in both white oak acorns and hickory nuts in the areas where the defoliation was severe.

The effect on acorn and hickory production will be most noticeable in the southern and western regions of the state. The effects will be less noticeable in the northern portions of the state. Species that flower later such as our native black walnut and American beech will be affected to a

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*Figure 1. Hickory leaves killed by the freeze along with new foliage. Hickory loss was more notable than those of other species. Photo courtesy: Jeff Stringer*



*Figure 2. Dead white oak shoots and newly produced foliage. All photos courtesy: Jeff Stringer*

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lesser degree. The reduction in nut production will have an effect on wildlife for the next several years but will be the most severe this fall.

### *The Combination of Freeze and Drought*

Unfortunately, this year's spring freeze and summer drought has set the stage for significant effects to our woodlands. The combination of the freeze and the drought is causing a hidden but significant problem through the reduction in vigor of many of our tree species, particularly oaks. We know from past experience that when oaks lose leaves early in the growing season, they are weakened. Most woodland trees are capable of withstanding one disturbance and can generally regain vigor. However, when trees are subjected to several in the same year, they may reach a point where they are so weakened that normal levels of attack by native insects and diseases can lead to their death. Unfortunately, this year the freeze was followed by drought, and the combination may eventually be lethal to some trees. Nut, acorn, and fruit production in woodland trees will also be severely impacted. In severe drought cases, acorns do not fully develop and will fall early, walnuts can be half full of nut meat, and fruits can abort.

Along with reduced acorn and nut production, there is a real possibility of tree death from the combined effects of the drought and freeze. While there is little that woodland owners can do to change the ultimate outcome of the freeze, owners should be alert to the effects. Be prepared to salvage oak and other species, especially where the freeze was severe and the drought prolonged. Tree death will be apparent this year as the leaves will turn brown over the entire crown. Also, there will be trees that will appear totally healthy going into the winter but never leaf out in the spring. The effects may also be felt for the next several years. If trees are weakened enough they may succumb to unseen insects living in the forest canopy. These small native insects seek out weakened trees and their larva tunnel



*Figure 3. White oak acornets in late June that were produced on shoots that sprouted after the freeze.*

under the bark of the branches of the tree ultimately killing the tree. This is typically what causes an oak tree to turn brown in the middle of the growing season. In all cases, this year's weather was not beneficial to the health of many of our woodland trees. Woodland owners should pay special attention to their oaks. If large upper branches of an oak tree die this signals that the tree is under attack and in all likelihood will eventually die within several years. The wood of oak will remain solid for one or two years but eventually the trees that perish will start to rot. Regardless, be vigilant and contact a local forester with the Kentucky Division of Forestry or a consulting forester to seek advice if a number of trees start to die in your woodlands.



*Figure 4. Normal northern red oak acorn development in June.*

# Effect of Freeze on Major Hardwood Species

Tree	Short-Term Effects	Long-Term Effects	Area Affected
White oaks	Reduction of acorn crop this fall	Potential mortality the next several years	Lower one-third of Kentucky and Western Kentucky
Red oaks	Reduction of acorn crop in 2008	Potential mortality this year	Lower one-half of Kentucky
Hickory	Reduction of nut crop this fall	Little long-term effect	Lower one-half of Kentucky
Beech	Relatively untouched	Little long-term effect	_____
Black walnut	Localized reduction in nut production	Little long-term effect	Every southern county and extreme southwest Kentucky

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