Assessing freeze damage

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The first step in managing freeze-damaged trees is to assess the extent of damage. It is very difficult to make an immediate assessment of damage. Some ice formation in the top one-quarter inch of the juice vesicles indicates mild damage, while solid ice formation in the center signifies severe damage and loss of a portion of the crop. Generally, four hours or more of temperatures 28°F or below will cause some mature fruit damage. If extensive fruit damage has occurred, some fruit abscission would occur within one to two weeks following a freeze. High daytime temperatures following a freeze will, in particular, accelerate fruit drop and segment drying. Fruit should be harvested as soon as possible after a freeze and processed quickly to minimize reduction in juice content and yield losses. After ice in the fruit has melted, water is transpired through the peel, thus decreasing juice content.

Leaf damage is difficult to assess during a freeze night. Water soaked or curled leaves may or may not be significantly damaged. The morning following a freeze, leaves may be rolled up and appear dry and dull green. These leaves will probably, but not always, abscise over the next week depending on temperature. Freeze-damaged leaves abscise between the petiole and the lamina (leaf blade) with the petiole dropping later. Within one week of a freeze, the extent of leaf damage should be quite apparent. Trees can recover even from total defoliation, and in some cases, flowers and fruit will be produced in the next season, depending on when a freeze occurs, whether flower buds have already been initiated and the extent of wood damage.

The consequences of freeze damage to twigs, stems and trunks are more difficult to assess than that to fruit or leaves. In general, small twigs will be damaged before larger limbs and trunks. Twig or limb dieback may not become visible for weeks after a freeze. It is common for large limbs to bud out in the spring following a freeze, only to die back in the summer due to latent freeze-damage to cambial tissues. Another indication of wood damage is when leaves turn brown, but do not abscise following a freeze. This indicates more severe freeze damage than defoliation alone, and usually indicates severe limb damage.

Because freeze damage to the wood is so difficult to assess, freeze-damaged trees should not be pruned until late spring or early summer. After the extent of freeze damage has been assessed by evaluating the extent of cambial discoloration, pruning should be done to minimize problems resulting from melanose (a fungus which is harbored in dead wood).

CULTURAL PRACTICES FOR FREEZE-DAMAGED TREES

Changes in cultural practices will probably have to be made depending on severity of the freeze damage. It is important to assess freeze damage accurately before altering cultural practices. In mild to moderate damage, partial or total defoliation with no wood damage, it is important to regrow the canopy as rapidly as possible. Trees should receive recommended fertilizer rates during the winter and spring and adequate but not excessive irrigation as new leaves develop. Most water loss is through the leaves and therefore it is unnecessary to apply heavy irrigation to defoliated trees. However, adequate soil moisture is important to promote uptake of nutrients and growth of new leaves. Weed control becomes a problem because the orchard floor receives more sunlight than a fully canopied orchard. Recommended rates of pre-emergence material should be applied.

Cultural practices should be modified when severe leaf and wood damage have occurred. In this case, the size of the canopy and roots has been reduced and the tree requires less water and nutrients. For example, if canopy size is reduced by one-third, fertilizer and irrigation rates should be reduced by that amount. Trees should receive more frequent light applications of water and fertilizer because of reduced tree size.

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