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## Fact Sheet

### Commercial Horticulture – Citrus: *“Care of Freeze Damaged Trees”*

Tree dormancy at the time of a freeze is probably the most important factor influencing the susceptibility of citrus to freezing temperatures. Citrus trees are evergreen, never become fully dormant, and cannot withstand temperatures as low as those tolerated by deciduous trees. Cold weather preconditioning induces a degree of dormancy in citrus - if it comes gradually. Trees in active growth are more severely injured by cold than those which are somewhat dormant.

One of the best ways to lessen cold injury and hasten cold damage recovery is to maintain healthy trees. Follow cultural practices to induce dormancy in the early winter; strive to maintain this dormancy until all cold weather has passed. Ability to recover from cold damage depends largely on tree vigor. Weak trees showing disease, insect damage, or nutrient deficiency symptoms usually are the ones most severely damaged and slowest to recover.

Citrus trees which were exposed to freezing weather should be given careful attention during the next six months. To prevent further damage, several recommendations should be followed.

1. Examine trees individually for regrowth on the lower trunk. Trees that were banked or protected in some fashion probably will have a zone of living tissue on the lower trunk. Do not, under any circumstance, prune the tree for the next four months. It is impossible to tell the exact region where regrowth might occur. Any premature pruning may cut off living tissue.

2. Select the most upright and vigorous shoot that arises from the lower trunk. A stake should be placed alongside, and the shoot tied to it for support. Other shoots on the lower trunk can remain, but should be pinched back to eight to ten inches in length. Although lower shoots are allowed to remain, they are kept subordinated (pinched back) to force as much growth as possible into the "central leader" or replacement shoot. Leaves on the remaining shoots will provide added food to the damaged tree.

3. Once the central leader shoot reaches 36 inches in height, it can be pinched out or the tip cut back to encourage lateral growth from which scaffold branches can be selected.

4. Do not fertilize freeze-damaged trees for one year. However, trees should be watered regularly in the absence of regular rainfalls.

5. Check insect and mite populations carefully to make sure that no additional stresses occur.

6. After the central leader has become established (usually by mid-summer), freeze-damaged parts of the plant - dead limbs and upper trunk - can be cut away.

7. Lower shoots can usually be removed during the next growing season, providing the central leader has been sufficiently established.

**Symptoms of Cold Damage:** Citrus leaves commonly assume a drooping or wilted appearance during periods of low temperatures, but remain firm and brittle if frozen. The leaves first become slightly flaccid as they thaw, and if the injury is not too severe, they gradually regain normal turgidity and recover. Seriously frozen leaves, however, gradually collapse and dry out. This is accelerated by warm, sunny days immediately following a freeze.

The youngest leaves are most easily injured, but all leaves may be killed in a severe freeze. If twigs are seriously frozen, the leaves dry out and remain attached for several weeks. However, the damaged leaves are shed rather promptly if the twigs and larger wood are not seriously injured.

Cold damage on the trunks and larger branches may appear as splitting or loosening of the bark. Certain areas, especially at or near crotches, are particularly sensitive. Localized damage to patches of bark on the trunk and larger limbs (cold cankers) are often mistaken for gummosis, since these may exude gum at a later date.

**Care of Bearing Groves:** Rules for the care of citrus trees that have been injured by cold must be flexible and varied. Time of year at which the cold occurs, condition of the trees at time of injury, and weather conditions immediately following injury will influence to a marked degree the type of treatment to use.

The natural reaction after a freeze is to do something right away. Actually, there is very little that can be done at that time, as it is impossible to determine the full extent of injury. Twigs and branches may continue to die for a period of several months to as long as two years following a severe freeze, due to latent damage to the bark and wood which may not be apparent soon after a freeze. Citrus trees on which twigs and branches have been killed by cold should receive extra care during the following season. Thus, a "wait and see" attitude is best.

**Fertilization:** Running north and south throughout the central portion of Florida's peninsula is the Lake Wales Ridge. This ridge is composed of primarily deep, well-drained sandy soils. Consequently, these soils permit a very rapid

infiltration of rain and irrigation water, setting the scene for leaching of nutrient movement out of the citrus root zone. The leaching process depletes the nutrients in the plant's root zone, and therefore, will no longer be available to the plant. This process also is an environmental concern as well.

In commercial citrus production, fertilizers are important and commercially viable in both the ridge and flatwood areas of Florida. Based upon Florida's fertilizer use in the 2002 through 2003 production season, nitrogen (N) is by far the most used nutrient in citrus production. The traditional water-soluble nitrogen sources are made up of dry granular fertilizers and solution fertilizers. Two of the most popular dry granular fertilizers sources include: ammonium nitrate and ammonium sulfate. Urea is by far the most popular solution fertilizer. The relatively newcomer in the fertilization process is the use of controlled-release fertilizers (CRF). Although these products have been available since the 1950s and were strictly nitrogen source, advancements in the 1980s and 1990s have made significant improvements where the CRF technology has expanded to include potassium, phosphorus, and other nutrients including micronutrients. There are several CRFs to choose from, and each one has its own features of releasing and nutrient content.

In the 1970s, Isobutylidene diurea (**IBDU**) was developed. It contained 31 percent nitrogen. This compound undergoes hydrolysis, not requiring microbial decomposition. The hydrolysis process splits the IBDU molecule to form urea. Another CRF product is Sulfur-coated urea (**SCU**, 30 to 40 percent nitrogen). This product is designed to allow water from the soil solution to slowly penetrate the sulfur coating, dissolving the encapsulated urea. To retard the fast release of urea, SCU sources contain a wax sealant. With this product (i.e. methylene urea, nitroform, and ureaform) microbes are required to degrade this wax sealant, releasing the nitrogen for plant uptake. Finally, one of the commonly known CRF products is the **polymer-coated** nitrogen sources, and goes by brand names such as Osmocote, Meister, Multicoat, and Polyon. This product is a water-soluble fertilizer that is encapsulated with a semi-permeable membrane. The mode of action is that water will pass through the outer membrane dissolving the fertilizer, which in turn, the dissolved nutrients will diffuse back into the soil

solution and subsequently is taken up by the plant. Bearing-tree fertilizer blends may contain some SCU to extend the period within which nitrogen is available to the trees. In some citrus-growing areas, polymer-coated materials are added to the planting hole during reset operations.<sup>i</sup>

Fertilizer should be applied at the regular time, but the amount of fertilizer should be reduced in proportion to the amount of tree damage. A reduction in the pounds of nutrients per acre may be in order where twigs and limbs have been damaged, especially if it is obvious that there will be a light crop. It may be advisable to make two or more frequent light applications to assure a steady supply of nutrients to the plant and promote rapid recovery.

A unique situation may occur where many leaves were lost, but little or no twig or limb damage was sustained. Such trees may temporarily need more fertilizer than before, due to a rapid depletion of nutrients within the tree.

Nutrient deficiency symptoms may be intensified in freeze-damaged trees due to the drain entailed by the large amount of growth necessary to replace lost foliage. Thus, a nutritional spray of copper, zinc, and manganese may be beneficial to new growth and tree condition.

**Irrigation:** Irrigation of damaged trees during warm periods in the winter is usually unnecessary and often ill-advised. If freeze damage occurs early in the winter and soil moisture is adequate, it will be well to delay irrigation in hopes of delaying tree growth until the danger of additional freezes has passed. On the other hand, trees that do put forth new growth should not be allowed to wilt for the lack of water.

**Pruning:** Cutting of dead wood from bearing trees which have suffered heavy damage should not be done until late spring or summer following the injury. This delay is desirable since it is difficult to determine the actual extent of injury until new growth commences.

It is well to remember when pruning that all cuts should be made into living wood, and where possible, at crotches, leaving no studs or uneven surfaces. The use of pruning paint is unnecessary. It is advisable to remove heavy brush from the grove immediately following the pruning operation.

**Weed Control:** Weed control will be essential to rapid recovery from freeze damage, as weeds will compete heavily with the trees for available moisture, nutrients, and in some cases, light. Weed populations should be at low levels following a freeze, which will provide growers with a good opportunity to get many troublesome species under control.

## Care of Young Trees

**With Slight Damage:** If damage is slight and there are some leaves and green twigs above the bank or wrap, no special steps need to be taken. Trees in such instances have sufficient living wood to develop new tops. Even so, the banks or wraps should be removed from a few trees and the trunks inspected to see that the bark is firm. This process should be repeated at weekly intervals, as damaged trees often "sweat" when covered, resulting in additional damage.

**With Heavy Damage:** If the tree has been killed to or into the bank or wrap, it may be a good practice to remove the entire bank or wrap, at least a portion of it (where possible), to expose live tissue to sunlight and air. Otherwise, the bark beneath the bank or wrap may soften and slough off - resulting in complete loss of the tree. The extent of this operation will depend upon the acreage involved and the manpower available. When trees are unbanked or unwrapped, it will be necessary to protect them when freezing temperatures are forecast. Banks or wraps should again be removed as soon as the danger of cold has passed. This process may need to be repeated several times before winter is over.

**Trees That Were Not Banked or Wrapped:** Damaged trees that were not banked or wrapped when the cold came should not be banked or wrapped until the next forecast of freezing temperatures. It is useless and often detrimental to bank or wrap such trees immediately following a freeze, as they are likely to "sweat" in the bank or wrap, and be more severely damaged than if unbanked or unwrapped. Wait until the forecast of additional freezing temperatures to bank or wrap.

**Cultural Practices:** If tree damage is slight, exert every effort to keep the young tree as dormant as possible. If heavy damage has occurred, in addition to removing the banks or wraps; it may be necessary (depending on conditions) to water the trees. Pruning, fertilization, and spraying should be delayed until the danger of subsequent freezes has passed.

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<sup>i</sup> T.A. Obreza, R. Rouse, and E.A. Hanlon, SL-243, Advancements with Controlled-Release Fertilizers for Florida Citrus Production: 1996 -200612, <http://edis.ifas.ufl.edu/pdffiles/SS/SS46300.pdf>