

*"The Weather Outside is
Frightening.....Let it Snow,
Let it Snow, Let it Snow"*

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Susceptibility of a Plant to Frost Depends On:

- Temperature and duration (time period)
- Relative humidity (lower results in less loss)
- Health and vigor of the plants
- Individual species/cultivar tolerances
- Rootstock tolerances

Definition of Frost Damage

- Plant injury due to temperatures below freezing (32 F)
- 'Low temperature injury' can occur at even higher temperatures

Radiation Frost

- Radiation frost occurs most frequently on cold, cloud-free nights because heat accumulating during the day is lost to the atmosphere
- During the day, structures and plants themselves act as heat reservoirs by absorbing heat

Adjective Frost

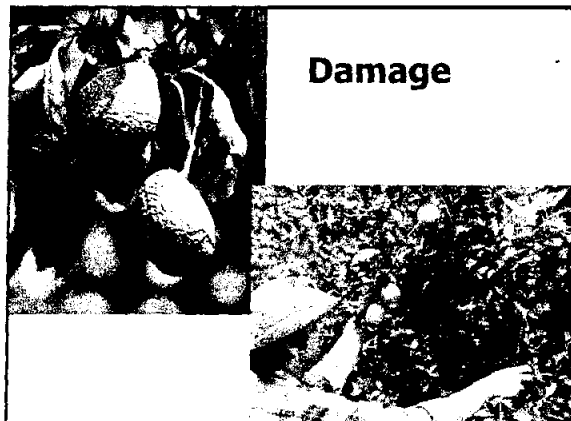
- Not as common
- Occurs when a mass of cold air displaces warmer air
- A layer of warm air creates a low ceiling that traps cold air close to the ground
- Also occurs when cold air rapidly moves into a warm climate

**Frost Injury occurs when ice
crystals form inside plant
cells, causing a loss of
available water**

Symptoms of Frost Damage

Young trees have more symptoms since they are more susceptible

- Dark brown or black withering leaves
- Water-soaked appearance



Savvy home gardeners (and especially UC Master Gardeners!) don't need to worry about their plants during a frosty night. They know which species should already be inside or protected by a suitable microclimate. Right????

- Jade plants, bougainvillea, hibiscus, mandevilla (pink-flowered forms) and interior plants that are frost sensitive that may have been transferred outside during the summer are already in by now.

Plants that are Generally Not Killed by Frost:

- Lantana, fuchsia, verbena, solanum (Potato vine), statice, most passifloras (passion flower vines) may be damaged by frost, but adequate roots and stem tissues survive.
- Most landscape plants need no winter protection, even in a hard freeze. Additionally, roses, azaleas, camellias and many flowering perennials will also survive.

What about Citrus Trees?

- Oranges, lemons, mandarins, and other citrus trees vary in their resistance to freezing temperatures.
- Potential cold damage is a combination of temperature and duration of that temperature. While short periods of temperature drops into the mid 20's will not damage most citrus, prolonged low temperatures can cause total loss of a crop.

Sensitivity of Citrus

- Most citrus fruit will be damaged when temperatures sustain 26-29 F for 30 minutes or more
- Tender new growth will be killed, which is not always harmful to the tree

Sensitivity of Citrus (con'd)

- In general, mandarins are the most cold hardy followed by sweet orange and grapefruit
- Lemons are very frost sensitive (Eureka is more sensitive than Lisbon)
- Hass avocado is as cold sensitive as lemons; Bacon is more cold tolerant
- Limes are the least cold hardy

Citrus Fruit Itself

- Can also be damaged by frost
- Ice crystals form inside, resulting in dry tissue and desiccation
- The fruit on the outside branches of the tree will be most vulnerable
- Frost-damaged fruit can be used right after a frost but they break down quickly

Planting Trees with Frost Sensitivity in Mind

- Avoid cold winds and low areas of your yard
- Plant on SW side of a structure or wall (but not too close due to the need for adequate space for root growth)

Follow Recommended Cultural Practices to Prevent and/or Reduce Frost Damage

- Water plants thoroughly and deeply before an expected frost (ground with water will freeze before plant cells)
- Fertilizing and pruning stimulates new growth. Sensitive plants should be fertilized and pruned during the spring and early summer and not after a frost

Recommended Cultural Practices to Prevent and/or Reduce Frost Damage (con'd)

- Consider placing a 100-watt outdoor lamp or holiday lights in the interior of the tree
- Consider running a sprinkler system through the night (water generates heat)
- Keep soil damp

Cultural Practices *After* Damage

- After damage, do not prune away dead wood in early spring.
- Wait several months to assess damage and recover during warm weather
- Postpone heavy pruning a full year

The Extent of Pruning Should be Dictated by the Extent of Damage:

- **Light Damage:** Where only the foliage and small twigs are injured, pruning is not required
- **Medium Damage:** Where a considerable part of the top has been killed but the trunk and main crown limbs show little damage, branches should be removed back to living wood above vigorous sprouts

Pruning Based on Damage (Con'd)

- **Severe Damage:** Where the top and crown limbs are severely damaged but there are sprouts above the bud union, the tree should be cut back to the uppermost sprout.
- **Extreme Damage:** Where trees are killed to the bud union or the rootstock has been girdled, the trees should be removed and replaced with new trees.

Whitewashing

- Should occur quickly after a freeze (paint or spray trunk with water-based latex paint)
- Often the most severe damage following a freeze results from sunburned twigs and branches after defoliation
- Temperatures do not have to be extremely high to cause sunburn
- Avocados and lemons are the most susceptible to sunburn and oranges are less sensitive. However, if any tree has been defoliated, applying whitewash is a recommended precaution