



HORTICULTURE: FROST REALITIES AND OPTIONS

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All forms of frost are ice crystals that develop when water in the air condenses onto a surface that is below 41 degrees F. Ice crystals have no color but when they build atop other crystals, the multi-layered effect scatters light in all directions, giving the appearance of whiteness.

According to Wikipedia there are a variety of frost forms.

- Hoar frost is ice crystals formed from the deposit of water vapor from air of low humidity.
- White frost develops from humid air [above 90%] and a temperature below 18 degrees F. forming needle-shaped crystals.
- Window frost (also called fern frost or ice flowers) forms when a glass pane is exposed to very cold air on the outside and warmer, moist air on the inside so that water vapor condenses on the glass forming frost patterns.
- Advection frost forms when cold, humid wind blows over cold surfaces.
- Black frost occurs without visible ice at low temperatures and very low humidity. The water source comes from plant tissue.
- Rime occurs under supercooled, wet conditions. It occurs quickly, often with heavily saturated air and steady wind. It looks like ice.

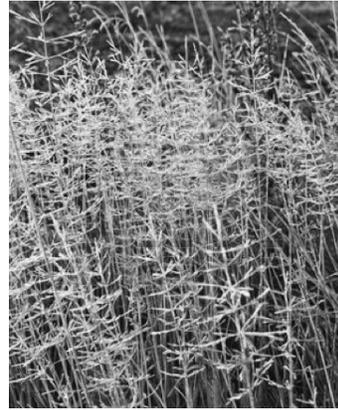
Causal Factors

Frost is the result of several factors: air temperature and movement, and water saturation.

So far this season, we've had a light and a medium frost and that always makes questions pop about what to do, what is hardy, and when to harvest what.

Air Temperature

Which is heavier, cold or warm air? Think about your



Rime frost.



A spider web covered in air hoar frost.



Window frost.



Tree coated in white frost.



A flower with advection frost on the tips of its petals.



Black frost kills leaf tissues.

attic in the summer as compared to the first floor of your home. Yep! Hot air rises. Cold air settles.

In our yards and gardens, we often find sections that are cooler than other areas. Since cold air settles, cooler temps develop at the bottom of a berm or hill, in a sunken area, in a dingle. At ground level, soil temperatures are often cooler than air temps because of the settling of the cooler air. This effect is less obvious in summer's heat. But even on a hot day, the grass feels cooler. So, as air temperature falls, so do ground temps.

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Plant Hardiness

The hardiness of plants defines their ability to grow and flower at different temperatures. Tender plants die because cold causes “organ” failure. Root, stem, and foliar processes halt so leaves can no longer make food. The more hardy a plant, the more cold they can endure but plants do not survive above ground below 32 degrees F in Zone 6.

Water Saturation

When rising air cools, moisture falls from it in the form of rain, dew, clouds, fog, or frost depending on the air and ground temperatures and the moisture saturation of the air. Since cold air can't hold water, we have precipitation.

Degrees of frost

1. A light frost can occur between 34-41 degrees F. While this is above freezing, dry, calm air causes moisture to settle. The least hardy plants are affected by a light frost. You can protect them with row covers or just draping them with a blanket overnight. Remove the covering once the air is warm enough to melt the frost. Susceptible plants are flowers in bloom, basil, squash, and pumpkins.
2. A denser frost occurs at 32–34 degrees. Cold sensitive plants are damaged as well as fruits like tomatoes, squashes, melons, eggplants, peppers, etc. Seeds are damaged by frosts so collect them beforehand.
3. Killing frost kills most everything above ground when temperature falls below 32 degrees. This marks the end of the growing season. Harvest winter hardy vegetables like broccoli, cabbage, winter greens, potatoes, dahlias, gladioli, agapanthus, etc. before a killing frost is predicted.

Since the ground doesn't freeze till January or so, you can cover hardy tubers and roots with mulch or row covers and continue to harvest until January. These include beets, carrots, fennel, celeriac, potatoes.

Determinates of Destruction

Hardy annuals frequently survive a light frost but vines like beans, grapes, eggplant, and squash are likely to be damaged. Same for tomatoes and peppers. Plants that benefit from a light frost include root vegetables, leafy greens, and cruciferous vegetables like cabbage, broccoli, and bok choy. Evergreen plants, such as pine trees, Mt. Laurel, and azaleas, withstand frost although all or most growth stops.

Once the temperatures dip even lower, these may be permanently damaged because of ice formation in tissue cells.

Tips to protect your garden

- Native plants and those recommended for your Temperate Zone will survive. Plant these perennials.
- Cold air settles, so plant less hardy material at the top of a slope.
- Stop garden fertilization in early September so no new growth occurs. Old foliage is hardier than lush, new leaves.
- Water the garden and lawn thoroughly before nightfall when a frost is anticipated. This provides humidity that keeps the air around the plant a little warmer. Degrees matter.
- Use row covers made from cardboard, bed sheets, newspaper to hold the heat generated from plants and the ground. Use cloches, overturned water bottles and pots. Remove once frost has melted.
- Provide a breeze [using a fan] to prevent ice crystals from settling.
- Remove container plants to the garage or indoors. Or wrap in newspaper, sheeting, etc.

Living in Zone 6, very little survives above ground intact and productive over our winter months. However, some plant materials still thrive in the cold, blooming very early in the spring. These include Witch Hazel shrubs, Hellebores, and skunk cabbage! —Sandra