

First Frost on the Horizon— CHILL OUT

How to predict frost in your garden and what you can do to delay its arrival. Eliot Tozer

ONE DAY SOON, THE METEOROLOGIST at my local television station will utter the chilling words, "Possible frost tonight." I'm not worried.

The simple reason for this is that most broadcast meteorologists make their forecasts for a huge area—in my case, for several hundred square miles—but all weather is local. My garden survives the first couple of frosts while my neighbor's garden almost always suffers damage. As a former navy pilot with training in meteorology and as a gardener with 50 years of experience in watching the weather and its effects, I've learned how to predict the likelihood of frost in my garden by reading the clouds, the wind, the dew, and by analyzing the garden itself.

Taking Your Site's Temperature

First, I look at the sky. If the sky is clear and afternoon temperatures are falling fast—50°F at 6 P.M., say, and dropping—I know that frost is likely. Indeed, if the wind is also out of the northwest and the atmospheric pressure is rising, both of which indicate the

approach of cooler, denser air, referred to as a High, chances are very good that we'll have fried green tomatoes for supper tomorrow. But if there are plenty of clouds in the sky and they are lowering and thickening, then I'm willing to take a chance that frost isn't going to hit my garden.

Here's what these different conditions tell me. During the day, short-wavelength solar radiation warms the earth, and during the night the earth radiates that heat back into the atmosphere. But the clouds act as an insulating reflector, trapping the heat and sending it back to earth. (I'm also easy during the first frosts because my garden is surrounded by trees, mostly *Quercus alba*, and they, too, act as a blanket. Any tree will provide a measure of insulation, especially if it is in leaf.)

The wind also plays a beneficial role. If there is no wind, cold air settles around plants. But a gentle breeze will mix warm air that is well above the ground with the cold lower layers, raising the ambient temperature enough to protect the plants. My garden is on a slope, so cold air, which is dense and flows like



COLD WEATHER COMFORT

According to Purdue University's publication, *Effects of Cold Weather on Horticultural Plants*, collards, leeks, lettuces, onions, peas, and potatoes are very hardy and can withstand temperatures down to the upper 20s for short periods of time. Beets, broccoli, cabbage, and squash can withstand light frosts. Beans, cucumbers, peppers, and tomatoes are injured or killed by light

frost. Among flowers, cornflowers, pansies, violets, and zinnias are very hardy, while calendulas, coreopsis, snapdragons, and sweet peas are frost-tolerant. Tender plants include begonias, cosmos, impatiens, petunias, salvias, and sweet alyssum.

water, drains away. Like water, it will collect in depressions, forming frost pockets. The temperature in a valley may be as much as 18 degrees lower than the temperature on nearby slopes.

Frost pockets can also form on the uphill side of stone walls and hedges that run across slopes, so such walls and hedges should be broken to allow cold air to flow through. On the other hand, a stone wall acts as a heat sink, collecting the heat of the sun during the day and radiating it at night. That's why the crocuses planted near the foundation on the south side of a house or walls appear first. Woody plants in such a situation enjoy another advantage: They receive more heat in the mellow days of late summer and can produce stronger, more frost-tolerant wood.

Water, whether a lake, a river, or a pond, can moderate falling nighttime temperatures up to five miles away. Because of the warming effects of the Gulf Stream, for example, western Great Britain enjoys 200 to 250 days without frost, while Northern New

Hampshire, which is actually well south of England, gets barely 100 such days.

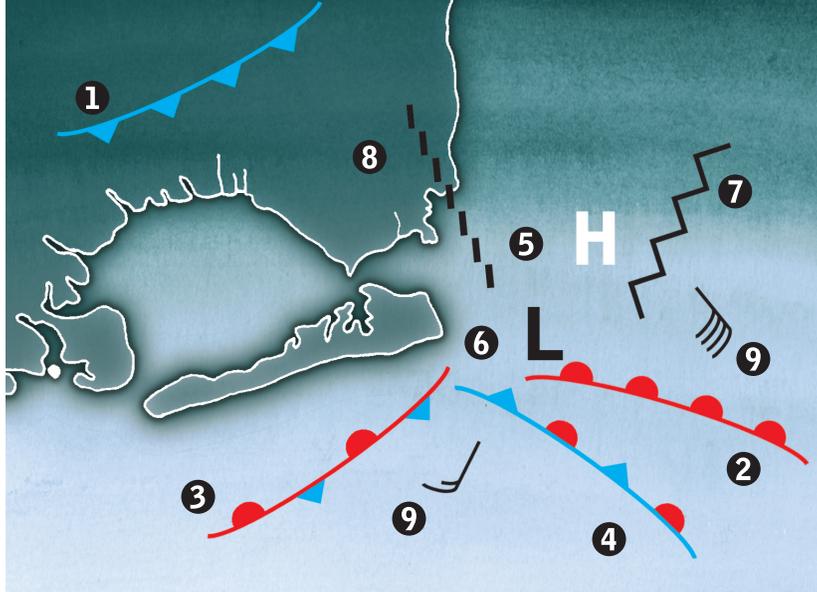
Though I don't live within the protective reach of a body of water, I still enjoy the benefits of the moisture in the air and, especially, in the soil. If the air is dry, soil moisture evaporates, absorbing heat that could have held temperatures above the freezing mark.

On the other hand, when ambient vapor condenses into water as the temperature declines, heat is released. I know that if it rains during the day, it is less likely that air temperature will drop below the freezing mark.

My soil contributes another protective element. Deep, dark, fertile soil not only stimulates strong plant growth, it also helps reduce the likelihood of frost. Dark soils absorb more daytime heat and fertile soils stay warm longer. Deep soil stays moist longer.

Mulch, a benefit in many facets of gardening, unfortunately prevents solar radiation from penetrating and warming the soil, so there is little heat to radi-





WEATHER MAP BASICS

- ❶ **Cold front** — leading edge of a cold air mass, which usually moves south-eastwards.
- ❷ **Warm front** — leading edge of a warm air mass, which usually moves northeastwards.
- ❸ **Stationary front** — warm or cold, not moving.
- ❹ **Occluded front** — a front that has pulled away from its associated low pressure center.
- ❺ **Center of high pressure** — associated with fair weather.
- ❻ **Center of low pressure** — associated with poor weather.
- ❼ **Ridge of high pressure** — an elongated region of higher pressure.
- ❽ **Trough of low pressure** — a long region of lower pressure.
- ❾ **Wind speed flags** — the arrow shafts indicate the wind direction; the number of barbs indicates wind speed (more barbs=higher speed).

ate at night and raise the temperature of the air around plants. Light-colored mulches reflect more solar radiation than dark-colored ones.

The plants help determine their own fate. They create ambient humidity and alter soil structure.

Compact plants like bush beans expose a smaller proportion of their leaves to cold, drying winds, and closely spaced plants protect each other by emitting heat. Succulent new growth is more susceptible to frost damage, so I refrain from fertilizing plants late in the season and also withhold pruning, which encourages vulnerable new growth.

What to Do if Frost is Coming

So you've scanned the sky and studied your garden and decided that there will be frost tonight in your garden. To protect your plants, cover them, partly to fend off cold winds, but mostly to retain the heat and moisture, which will warm the air around them. You can use anything as cover. I've seen marigolds draped with bed sheets and begonias swathed in newspaper. Inverted flower pots and bushel baskets provide good protection and they won't blow away. Floating row covers are probably easiest to apply, but they provide only two to three degrees of protection, as opposed to perhaps five degrees for a bed sheet. Polyethylene tunnels provide a similar measure of help. Whatever you use, make sure the whole plant is covered and get the cover on before sunset. Also, water your plants. As noted, condensation releases heat.

If you get behind the curve and can't or don't cover or water before nightfall, and you suddenly realize at 4:00 in the morning that frost has invaded your garden, unreel the hoses, and turn on the sprinklers. As water freezes, it releases heat, possibly enough to save your plants. The sprinklers must run continuously until the air temperature rises above freezing. So go back to bed, and sleep tight. ♡

WHAT A DIFFERENCE A DEW POINT MAKES

As the temperature falls, the air holds less and less moisture until it reaches the temperature where it is saturated and cannot hold any more moisture. That temperature is called the dew point, and if the air is cooled below this point its saturation mixing ratio is exceeded and the excess water vapor condenses as dew or fog or clouds. When this occurs, latent heat is released. The more moisture the air contains the higher the temperature at which vapor starts to condense. Obviously, the higher the

ambient temperature the less likely that frost will form. A dew point of 43°F almost certainly means no frost. A dew point below 32°F means frost. Some television and radio forecasters give the dew point in their evening reports. If not, call the National Weather Service or visit the service at www.nws.noaa.gov. But remember that that is not the dew point of the air in your garden.