Home-Grounds & Community Gardens
CORNELL COOPERATIVE EXTENSION

Microclimates

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In the real world, we garden in microclimates, not hardiness zones.
--Charlie Mazza, Senior Horticulture Extension Associate, Cornell University

A microclimate is the climate of a small area that is different from the area around it. It may be warmer or colder, wetter or drier, or more or less prone to frosts.

Microclimates may be quite small - a protected courtyard next to a building, for example, that is warmer than an exposed field nearby. Or a microclimate may be extensive - a band extending several miles inland from a large body of water that moderates temperatures.

When you use USDA Hardiness Zone and spring and fall frost-date maps, you need to be aware that your microclimate may make where you garden very different from the information found on the maps. If you are in a cold valley, your minimum winter temperatures may be lower than what the map indicates. As a result, you may actually be in a hardiness zone that is colder than that shown on the map, and some marginal plants may not survive your winters.

Cold valleys may also be prone to late spring frosts and early fall frosts, making your growing season shorter than indicated by the frost-free season map. If you put out tender plants too early, you might lose them. If you plant long-season heat-loving plants, they may not mature before fall frost.

Large-scale microclimates

Some microclimates extend for miles because of the effects of:

Large bodies of water, such as the Great Lakes, the Finger Lakes, Lake Champlain, Long Island Sound and the Atlantic Ocean, tend to moderate air temperatures of adjacent inland areas. Low temperatures in winter are not as extreme, and these areas are less prone to late spring and early fall frosts. Smaller bodies of water also have the same effect, usually to a lesser extent.

Urban areas tend to have less extreme low temperatures than the surrounding countryside. Buildings and paved surfaces absorb heat during the day, then radiate it back into the air at night, reducing the chances of frost and moderating low temperatures during winter. Buildings also offer protection from wind in many places. Urban areas may be a full Hardiness Zone warmer than rural areas just a few miles away.

These warming effects carry over into summer, as well. Urban microclimates can trap heat, creating a scorching environment that can damage plants.

Topography has a profound effect on microclimates. Cold air is heavier than warm air. So on cold winter nights or nights when frost threatens, the cold air flows downhill and collects in low spots -- just like water flows down hill and collects in puddles. On winter nights,

some valleys may be 10 degrees or more colder than neighboring slopes. These valleys may also be more prone to frost.

Hilltops may not suffer as much from frost or cold temperatures. But if they are exposed, winter winds can often wreak havoc. Winds dry out plants, and are particularly hard on evergreens, which cannot replace moisture lost through their needles or leaves when the ground is frozen.

The slopes between cold valleys and windy hilltops can have different microclimates depending on their aspect (which direction they slope). North-facing slopes are slow to warm up in spring because they receive less direct sun, compared with south-facing slopes. But gardening on a south-facing slope can be a mixed blessing, especially when early spring warmth causes plants (fruit trees in particular) to begin flowering prematurely, only to have the blossoms killed by a sudden frost.

Microclimates in your yard

There is little that you can do to affect these large-scale microclimates, other than to be aware of them and let them guide your plant selection and timing. But you can find very similar microclimate effects at work even in the smallest yard, and you can take advantage of them and even modify them to a certain extent.

Your house and other buildings create many microclimates around your yard. Just like urban areas, your house absorbs heat during the day and radiates it back at night. If your prevailing winds are from the northwest, this creates a warmer, more sheltered microclimate on the south and east sides of your house.

While the north side of your house may receive harsh winds and no sun during the winter, keep in mind that in summer - when the sun rises north of east and sets north of west - these areas can be baked by heat and dried out by the same prevailing winds.

Keep in mind, too, that when wind hits your house, it creates turbulence and higher wind speeds along the wall and as the wind goes around the corners of the building. These areas may not be good places to plant broad-leaved evergreens or other plants that can be easily dried out by winds.

Bark on young trees planted on the south or southwest sides of buildings are more prone to cracking in winter.

Balconies and rooftops -- because they are above ground level -- may escape frosts that kill tender plants at ground level on nights with radiational cooling. But cold, drying winds may be an even bigger factor depending on the location, orientation and exposure of the balcony or rooftop..

Fences, walls and large rocks can protect plants from wind and radiate heat, creating sheltered spots. Sometimes, if fences block cold air drainage through your property, the cold air can puddle behind them causing very localized frost damage on near-freezing nights.

Raised beds and terraces -- like hillside slopes -- can warm and drain earlier in spring, especially if they are oriented toward the south.

Paved surfaces - such as patios, driveways and sidewalks - can absorb heat and reradiate it at night, moderating

night-time temperatures. Such impervious areas can't absorb water, and may create wet spots if the water that flows off of them is concentrated in one area. Watch for similar wet areas where water flows off roofs or out of downspouts. Buildings can also create "rain shadows" on the lee side of a house if rains are accompanied by winds.

Trees can also prevent rain from reaching the ground. That, coupled with competition for water and nutrients from the tree's roots, may make it difficult to grow less-competitive plants around the base of larger trees.

Soil types can also affect frost. Heavy clay soils can act much like paved surfaces, moderating the temperature near ground level. Lighter soils that have many air pockets in them can act as an insulating layer on top of warmer subsoils, trapping that heat below ground and are hence more prone to frosts at ground level.

Contact your county's Cornell Cooperative Extension staff for local advice on microclimates.

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