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# Transitioning into the season of fall

Alan Betts The Weekly Planet

Fall is approaching, so let's take a look at what is happening to our climate.

I live in Pittsford at a low elevation of 450 feet, on a west-facing hillside overlooking the flood plain of the Otter Creek. My garden has seen only one killing frost before October in the past 12 years — on Sept. 29, 2000. During this period, the last spring frost has come in late April or the first week of May, earlier than in previous decades. So the growing season between frosts is now about 150 days long, several weeks longer than when I started gardening in Vermont 32 years ago. Our winters have also been getting significantly milder, so now I expect to have hardy crops like Brussels sprouts for Thanksgiving and Christmas. In recent winters, thanks to a covering of leaves, I have been able to harvest frozen sprouts even in February.

The fall transition that occurs with the first hard frost illustrates neatly how life and climate are linked together. The first hard frost kills some plants and tells maple trees to shut down photosynthesis for winter. But as long as plants are alive, their transpiration puts water vapor into the air. Water vapor is a powerful greenhouse gas, which traps heat radiation and prevents the ground from cooling rapidly to space at night. More water vapor in the air also produces more clouds, which also trap heat at night. So transpiration from our forests delays that first frost in the fall — until one night, cool dry air sinks down from the north and the temperature falls enough that frost forms by sunrise.

After a hard frost, transpiration from plants and trees is greatly reduced, and the skies become more clear and dry. October often brings some pleasantly warm and sunny days, with bigger drops of temperature at night. In fact, the daily range between maximum and minimum temperature increases as the atmosphere gets drier with less cloud cover.

It has been a very wet summer. Tropical weather has at times brought very heavy downpours, which flooded downtown Rutland for the second year in succession. Adapting to climate change means rebuilding our infrastructure to cope with a different climate — the past is no longer a reliable guide to the future. Our soils are wetter than usual going into the fall, so evaporation may continue for a little longer and delay the first frost.

Further north, the Arctic sea ice is near the end of its melt season. Once again a large area melted to open water, although not as much as the past two years. This open Arctic water in fall, where 10 years ago there used to be ice, along with warmer temperatures in Canada, contributes to our later frosts. Closer to home the Great Lakes have also been freezing later. This too means more evaporation from the lakes later into the fall, and stronger lake-effect snows in early winter.

Ice and water, life, CO<sub>2</sub>, weather and climate are all interconnected on this planet. This December in Copenhagen, the nations of the world will meet to draft a new global treaty to slow and then reverse the growth of CO<sub>2</sub> in the atmosphere. Every year that we delay will make it more difficult for us to adapt to a warming climate and rising seas. Yes, it is hard for us to face change, and we cannot do it alone. But it is time to think deeply about our shared common purpose — the preservation of this planet that is our home.

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