

Rainy Day Naturalist: The Autumn Color Show

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A human heart can never grow old if it takes a lively interest in the pairing of birds, the reproduction of flowers, and the changing tints of autumn leaves.

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Autumn is a season of change for the Great Lakes region. Temperatures slide from summer heat to winter chill. Atmospheric tussles between arctic cold and Gulf moisture trigger fall rains. One consequence of this change is particularly delightful: leaves of many species of trees and other woody plants change color from summer green to gaudy displays of yellow, orange, and red.

Unfortunately that decoration signals those leaves are dying. Soon branches will be stark and barren for the bleak winter season.

Summer leaves are green because of chlorophyll pigments in their cells. Chlorophyll absorbs sunlight, energy the cells use to produce simple sugars to feed the tree. One byproduct of this photosynthesis process is oxygen. Yes, the animal kingdom lives off the waste products from trees.

Why is chlorophyll green? Turns out, chlorophyll is picky about what colors of sunlight it uses. Higher energy blue light triggers most reactions in leaf cells, but certain red wavelengths are needed to drive others. Colors not used are reflected away, colors we see as green.

Leaf cells that nourish deciduous (leaf-dropper) trees in the summer can't survive cold temperatures in winter. When trees get ready to shed their leaves, the leaves get to show their true colors and decorate our fall with their fall. It starts with late summer's lower intensity sunlight and shorter days. The energy reduction slows the flow of water and other chemicals into the leaf. Chlorophyll pigments break down, and fading green reveals other colors. Colors like:

Carotenoids — orange-yellow-brown pigments found in carrots, egg yolks, bananas, and canary feathers. These compounds are in the leaves all summer, but chlorophyll's vibrance hides them. Hardwood trees like maples, cottonwoods, hickories, and sycamores show off their spectacular carotenoids in the fall.

Anthocyanins — another colorant, adds reds and purples into the mix. These pigments are different because they only develop in leaves during late summer's change in leaf chemistry. Cool and sunny fall days trap extra sugars in the leaves encouraging anthocyanin production.

Weather during the growing season determines the vividness and timing of autumnal displays. If summer ends with warm sunny days and cool (but frost-free!) nights, color displays are at their best (lots of anthocyanins). Drought, especially in late summer, forces leaves to give up early and cut their losses leaving mostly withered browns.

Whatever the extent of their color, leaves dropped onto forest floors are not wasted. They recycle back into useful nutrients. The sere white of a frozen landscape, the greens in a budding spring, and a riot of summer flowers work together to produce the warm tones in our autumn leaves. Living in this area we have the privilege of witnessing an unmatched variety of aesthetic drama at each stage of nature's seasonal cycle.