

Fall Leaf Color Change - The Waves

Fall leaf color change starts very subtly late in September and early October in temperate North America. Trees respond to such factors as autumn drying conditions, temperature change, altered sun position, and light. It takes approximately two weeks to begin and complete the fall color change so timing and a little luck are essential for the "perfect" view.

Fall color change and flow takes place as three primary waves in mixed hardwood forests. A simple flow and wave model was designed at the University of Georgia to illustrate what leaf experts call the fall color wave. This [Leaf Wave Model](#) is used to explain the movement of autumn leaf color change.

Leaf Wave Model

An autumn leaf color flow and wave model was designed at the University of Georgia to illustrate what leaf experts call the fall color wave. Fall foliage color changes begin at high altitudes and latitudes and for all practical purposes move down-slopes and southward through North America.

This fall color change and flow takes place as three primary waves in mixed hardwood forests. The first wave is yellow dominated and you can expect to see yellow-poplar, birch, some maples and hickory, sassafras, sweetgum and aspens kick the season off. One exception here is sourwood where you can see it's red leaf in mid-September.

The second fall color wave is in orange. Some of the above species transition from yellow into orange but trees most noted for orange are silver maples and white oaks. Many people consider peak color occurring when this orange wave transitions into the third and final red wave.

This autumn color red wave of black tupelo, sumac, tallow tree, some oaks and maples signals the end of the fall display. After the red wave hits, the landscape slowly fades to brown.

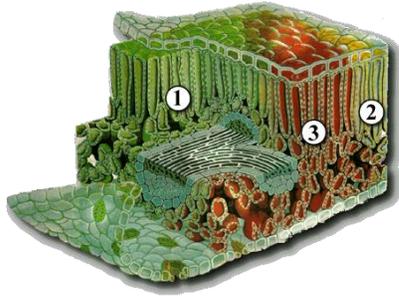
On a single tree such as sugar maple, leaves of several colors can appear at the same time. Other tree leaves, like sweetgum, can actually change colors at different times depending on soil and weather conditions. Leaves of some species such as some elms simply shrivel up and fall off, exhibiting little color other than brown.

Fall Leaf Color Change - The Leaf Anatomy

The major factor influencing autumn leaf color change is the lack of water. Not a lack of water to the entire tree, but a purposeful weaning of water from each leaf. Every leaf is affected by colder, drier, and breezy conditions and begins a process which results in its own demise and removal from the tree. The ultimate sacrifice of a leaf-bearing tree is the ultimate in visual pleasure for us.

The [broadleaf tree](#) goes through a process of sealing off the leaves from the stem (called abscission). This halts the flow of all internal water to the leaf and causes a color change. It also seals the spot of leaf attachment and prevents precious moisture from escaping during

winter dormancy. You just might want to view [An Autumn Leaf Cross Section](#) for more graphic details.



There are three major components for pigment change in leaves. Plastids (1) are minute leaf structures that carry green chlorophyll and color the summer forest. Carotenoids (2), stored in plastids, and anthocyanins (3) in sap are the leaf paints (pigments) that color the forest of autumn.

Fall Leaf Color Change - The Chemistry

This lack of water to each leaf causes a very important chemical reaction to stop. Photosynthesis, or the food-producing combination of sunlight, water, and carbon dioxide, is eliminated. Chlorophyll must be renewed (by photosynthesis) or be taken in by the tree along with photosynthetic sugar. Thus chlorophyll disappears from the leaves. Chlorophyll is the green you see in the leaf.

Once the overwhelming chlorophyll color is removed, true leaf colors will dominate over the receding green pigment. True leaf pigments vary with the species of tree and thus the different characteristic leaf colors. And because true leaf colors are water soluble, that makes the color disappear very quickly after drying out.

Carotene (the pigment found in carrots and corn) causes maples, birches, and poplars to turn yellow. The brilliant reds and oranges in this fall landscape are due to anthocyanins. Tannins give the oak a distinctively brown color and is the final persistent color most leaves turn before becoming part of the forest floor. Review [Leaf Color by Tree Species](#).

All leaves start out the summer as green. This is because of the presence of a group of green pigments known as chlorophyll. When these green pigments are abundant in the leaf's cells during the growing season, they mask out the color of any other pigments that may be present in the leaf.

But with autumn comes a destruction of chlorophyll. This demise of green pigments allows other masked colors to be expressed. Those unmasked fall colors quickly become markers for individual deciduous tree species.

So, let me introduce you to trees according to leaf color. I have prepared a list of tree species by their primary colors.

Trees With Red Leaf Color

Red is produced by warm, sunny fall days and cool fall nights. Leftover food in the leaf is transformed into red or anthocyanin pigments. These red pigments also color cranberries, red apples, blueberries, cherries, strawberries, and plums. [Some Maples](#) | [Some Oaks \(red, pin, scarlet and black\)](#) | [Some Sweetgum](#) | [Dogwood](#) | [Black Tupelo](#) | [Sourwood](#) | [Persimmon](#) | [Some Sassafras](#) |

Trees With Yellow and Orange Leaf Color

Chlorophyll is destroyed with the onset of autumnal conditions. This demise of green pigment unmasks the orange and yellow leaf colors. Deep orange is a combining of the red and yellow color making process. These yellow and orange pigments also color carrots, corn, canaries, and daffodils, as well as egg yolks, rutabagas, buttercups, and bananas. [Hickory](#) | [Ash](#) | [Some Maples](#) | [Yellow-poplar \(tulip tree\)](#) | [Some Oaks \(white, chestnut, bear\)](#) | [Some Sassafras](#) | [Some Sweetgum](#) | [Beech](#) | [Birch](#) | [Sycamore](#) |