

Land, Water and People

## Why Leaves Change Color

By Dean Erhard

Perhaps you have noticed that the daylight seems a little shorter now than it was a month ago. Each day, sunrise is about a minute or so later in the morning and sunset is about a minute or two sooner in the evening. You probably have begun to sense that the air is a little cooler in the morning when you get up now. The weather is changing and it relates to why leaves change color.

Every year at this time, we witness a dramatic color change with a new palette of color splashed on the landscape. Greenish hues are replaced with vivid red, yellow, purple, and orange. We are in awe of this beauty, knowing well that it is a fleeting pleasure because soon the leaves, and the vivid color, will flicker away in the wind.

According to an Indian legend, celestial hunters slew the Great Bear in the autumn, and his blood, dripping on the forests, changed many leaves to red. Other trees were turned yellow by the fat that splattered out of the kettle as the hunters cooked the meat. There are many other legends, but we now know that the change in leaf color is actually the result of chemical processes that take place in plants as the season transitions between summer and winter—the autumnal equinox.

Leaves may be thought of as the workers in a large factory where the production of food necessary for plant growth takes place from spring through summer. This food-making process takes place in each leaf in numerous cells containing the pigment called chlorophyll—which gives a leaf its green color.

Chlorophyll is really astounding and it's worth briefly telling you what it does. It can absorb energy from sunlight and use it in transforming carbon dioxide (a gas in our atmosphere) and water (extracted by roots from the ground) to form carbohydrates, such as sugars and starch. Essentially, radiant sunlight energy is converted to chemical energy and it's stored in the molecules of carbohydrates—a process called photosynthesis.

So, we know chlorophyll makes leaves green, but leaves also contain yellow and orange pigments called carotenoids. Carrots are a familiar example. Most of the time, these yellow and orange colors are simply masked by the very dominant green color of chlorophyll we see in leaves during the spring and summer months.

But, as fall approaches, the daylight period continually shortens and temperatures progressively cool, and this slows down the food-making process in leaves. Chlorophyll breaks down, the green color we normally see disappears, and the yellowish to orange colors (carotenoids) become visible.

At the same time, other chemical changes may occur and cause the formation of additional pigments that vary from yellow to red to blue. In the fall, warm days favor leaves making sugars, but cool nights prevent the movement of these sugars from the leaves. Sugars trapped in the leaves cause the formation of a red pigment called anthocyanin.

Since weather conditions vary each year, the leaf colors we see each fall vary to some degree. For example, if the fall weather is relatively warm, cloudy, and rainy, the leaves will have less red coloration. The reason for this is because reduced sunlight leads to a smaller

amount of sugar in the leaves and the sugar that is formed tends to move out of the leaves during warm evenings. So, less sugar remaining in the leaves means less red pigment formed.

The combination of weather conditions and changing leaf pigment creates the incredible and stunning display of color on the landscape. We are fortunate that the Rio Grande National Forest has large expanses of quaking aspen that exhibit a brilliant tapestry of color in late September. Enjoy this time of year. It is truly nature's gift to us. Like the commercial on TV might have said, "...time spent enjoying your national forest, priceless."

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