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Eye on the Environment

Autumn Colors Fall Short

By Adam Lieberg

A couple of weeks ago, I had the good fortune to go flying with Dave Horner of Red Eagle Aviation in his Cessna 185. I joined Horner and Mark Ruby, the Swan Valley Bear Ranger, on a flight to try and find the locations of certain grizzly bears that had been fitted with radio collars for research and management purposes.

It was exhilarating to get a bird's eye view of the valley from thousands of feet in the air. While this was my first time in a small fixed-wing aircraft, Horner and Ruby were a seasoned team of mountain flying wildlife trackers. They scanned frequencies and triangulated locations of bears from the front seats, while I tried not to distract them with all the questions on my mind from the back.

For most of the ride I was glued to the window, mesmerized by the terrain. But it didn't take long before I started keying into the dull orange--almost red--color of the western larch trees. I found this somewhat peculiar, but consistent with what I had been seeing on the ground.

Not only did it seem like the deciduous needles of the Larch were late changing color this season, but it appeared to me that they never really developed into the magnificent golden yellow that normally peppers the eastern slopes of the Missions.

I decided to break the silence from the back seat and ask Horner what he thought about the Fall colors this season. He replied that he had only seen such poor colors once or twice before in his career. Considering Horner's keen eye and the number of hours that he has logged flying over this area, I knew something awry.

What is interesting about where we live in the Rocky Mountains is the distribution of both deciduous and evergreen vegetation. Because of our fairly cold climate, our landscape is largely dominated by evergreen and coniferous tree species, such as lodgepole pine, Douglas fir, and Englemann Spruce, but we also have a nice variety of deciduous broadleaf species, such as black cottonwood, quaking aspen, and paper birch.

Additionally, we are home to western larch, somewhat of an anomaly as it is both a deciduous and coniferous tree species (produces cones and drops its needles). It is this combination of the perpetual green, golden yellow, and array of reds, purples, and oranges that makes our fall colors both spectacular and unique.

So why was this year such a bust? As I have already heard many people surmise, an unusually early and extremely cold arctic front is mainly responsible for robbing us of the usual display of fall colors, and yellow needles that blanket the forest floor that allow us to sneak around quietly during hunting season. Temperatures hit the basement a number of nights in early October, bottoming out in the single

digits on several occasions between the 6th and 13th of that month.

While pretty much all of our plants and trees are able to tolerate cold temperatures, damage can occur when a sharp drop in temperature happens early and suddenly. Plants normally begin their gradual process of "hardening off" for the winter around the fall equinox September 22nd. The hardening occurs in response to the shortening length of daylight, as well as cooling temperatures.

"Hardening" is a seasonal change in the chemical make-up of the starches and soluble sugars that allows plants to handle colder and colder temperatures without experience tissue damage. During this process, deciduous plants start to cut off the exchange of nutrients between the plant and its leaves by developing a corky growth, called an abscission layer, between the stem and the leaf. We see the sign of this chemical change as brilliant fall colors.

Due to the severity of the frost events in early October, many plant species were not hardened off enough to withstand the cold. As a result, many of the deciduous leaves were damaged and essentially "freeze dried" to the stems. This explains why many of the leaves and needles of the larch have not dropped to the ground even as we approach the month of December.

Interestingly enough, plant species that evolved in more northern cold climates are better adapted to hardening off earlier than species from warmer regions of the world. This explains why paper birch, whose natural distribution occurs throughout the boreal forests of North America, was still able to turn color and drop its leaves early this year.

Conversely, we have an ornamental apple tree on the Beck

Homestead, which probably evolved somewhere near Turkey, and was not hardened off and therefore still holds a tree full of "freeze-dried" leaves. In fact, the city of Missoula actually had to delay the start of leaf collection this Fall because none of the leaves had come off the ornamental maple trees that line its streets.

While it may seem somewhat counter intuitive, it is the cold adapted species that turn color and drop their leaves first, and the warmer adapted species that hang onto their leaves the longest—therefore having the greatest chance of being damaged by an early frost event. So, if you are like me and enjoy paying attention to the natural history lessons associated with the changing of seasons, see if you can figure out the order in which the plants around your home will drop their leaves based on the climate they are from.

If you are interested in participating in a nationwide citizen science project that keeps track of phenological events (such as first leafing, first flowering, and first fruit ripening of local plants) to better understand environmental and climate change issues, check out Project Budburst on the web at http://www.windows.ucar.edu/citizen_science/budburst/.