

The Rimrock Report



The University of Arizona,
School of Natural Resources and the Environment



Volume 4, Issue 4

October 2011

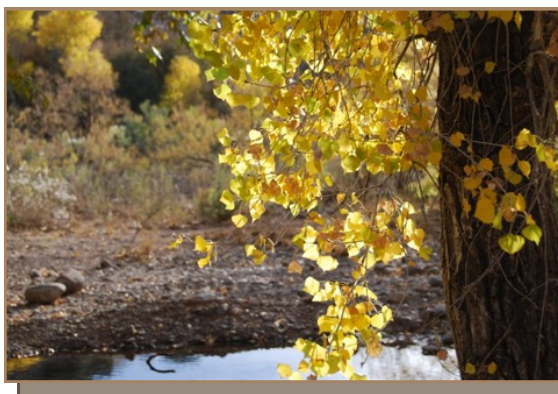
To Every Thing There is a Season

To every thing there is a season, and a time to every purpose under the heaven.

King Solomon

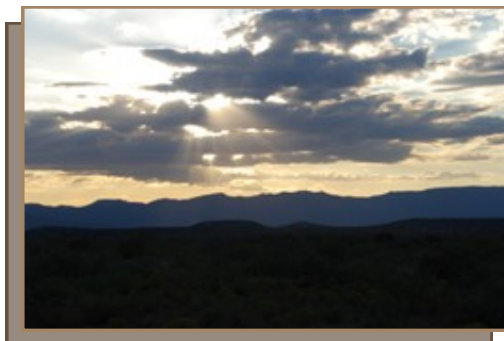
Most of us have heard this quote before.

Maybe it was from the Bible (*Ecclesiastes 3*), maybe from a popular song by the Byrds in the 60's (*Turn, Turn, Turn. Pete Seeger 1962*), or maybe it was just something somebody said. No matter where we heard it, we can probably all identify with it. Fall is in the air in central Arizona. Nights are cooling off, kids are back in school, calves are being weaned, and hunters are out in force. A time to



Fall foliage from a cottonwood on West Clear Creek.

every purpose... One of the most interesting videos I have seen lately is that of a whole year in time-lapse format which records the [seasons changing](#) in a park in Norway. It is kind of like watching your kids grow up I guess; we know it is happening and we all talk about it happening “*so fast*”, but it is amazing to watch a year go by in a minute. Here in Arizona our seasons are a little different than in much of the US. We have a fairly typical autumn, winter, and spring, but our summer is divided into an early hot and dry period and a later rainy period or “[monsoon](#)”. The traditional definition of monsoon is “*a seasonal reversing wind accompanied by corresponding changes in precipitation*”. Since we are finishing up the monsoon season in the state now I thought it would be a good time to talk about seasons and what causes them, how plants and animals react to them and how all of this ties in with the management of rangelands.



Summer afternoon storms make for great sunsets over Mingus Mountain

Have you ever watched the TV show “*Are You Smarter Than a 5th grader?*” It turns out most of us are not and in my limited times of watching the show, it seems to me that the more famous we are, the more likely we are not... smarter. Some of us apparently think New Mexico is a country, Ben Franklin was a US

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“...a lot of us also think that the distance between the Earth and Sun is what causes seasons...”

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To Every Thing There is a Season...continued

president, and the capital of Connecticut is “C”... not really on that last one but, you get the picture. Some of these folks can hide their own Easter eggs. So it is not too surprising that a lot of us also think that the distance between the Earth and Sun is what causes seasons. But isn't the Earth's orbit around the Sun elliptical? So wouldn't that mean we are closer to the Sun at a certain time of the year than others? Technically the answer is yes to both questions, but contrary to many of our grade school science book illustrations, the Earth's orbit is only very slightly “out of round” and since the distance to the Sun is so large, this slight ellipse is insignificant. Ok, so if it is not the overall distance, it must be the tilt. Yes, but again contrary to a popular misconception, the Earth does not actually “tilt” toward the Sun during summer and away during winter (regardless of hemisphere). At least it does not “flip-flop”. The Earth is tilted at ~23 degrees off of vertical all the time. This occurrence results in a given pole being pointed more toward the Sun for part of the orbit and away at the opposite part of the orbit (Figure 1).

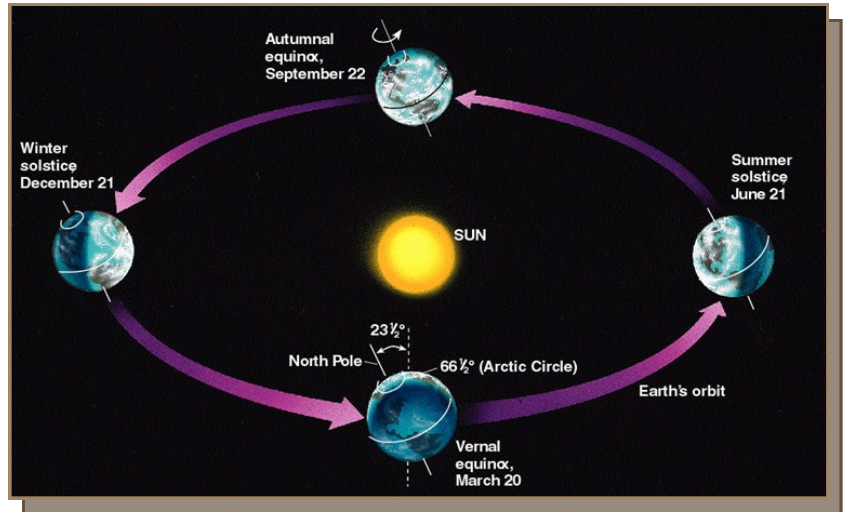
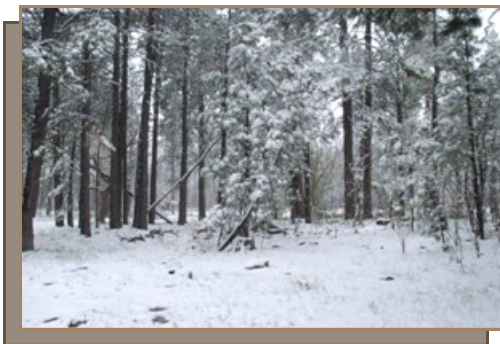


Figure 1. Illustration of the effect of Earth's axial tilt upon changing seasons.



Winter snow on the east side of the V Bar V Ranch.

A solstice is the point at which the greatest relative tilt of the Earth to the Sun occurs. Thus in the northern hemisphere, we have winter in December and summer in June. Doesn't that get us right back to the distance question then? Summer is warmer because we are closer to the Sun. Not really, again we are talking minor changes in the total distance to the Sun. The important number has to do with angle. When we are tilted toward the Sun, we receive a more direct hit from solar rays and when we are tilted away, this is more of a glancing blow. In the summer, more surface area of a particular hemisphere is exposed to the Sun during the Earth's rotation and thus the days are longer than in the winter. The curvature of the Earth also contributes to the angle of solar radiation so the equator always receives more direct sunlight than either pole. So, are you smarter than a 5th grader now? Ready for prime time? Fourth grade Earth science, no problem. You won't even have to use your “cheats”. You might even try Cash Cab, maybe even Jeopardy.

Let's switch gears now and talk about plants. Specifically, plants that grow during different seasons, i.e. cool versus warm season. Depending on the reference used it is estimated that ~80 to 90 % of plant life uses the C₃ photosynthetic pathway, including trees and most shrubs. Saltbush (*Atriplex spp*) is a notable exception,



To Every Thing There is a Season...continued

being a C₄ shrub. Ok, C₃, C₄... what does that mean? It means that plants either use a 3 or 4 carbon molecule in the first step of photosynthesis. The 4 carbon molecule then enters the C₃ cycle. And why is this important for range management? Because these biochemical differences that we can't see are manifest in physical characteristics that we can see, measure, and manage. For instance, due to the C₄ step, these plants are more efficient at low CO₂ concentrations, and can survive and function in high light and temperature, i.e. they are the "warm" season plants. They are also more easily killed by frost. Perennial range grasses such as Sideoats Grama (*Bouteloua curtipendula*) or Tobosagrass (*Pleuraphis mutica*) are C₄ plants, most of their growth occurs in late spring and summer.



Spring green-up provides a little change in the diet for grazing animals.

Conversely, the C₃ grasses are "cool" season plants, growing primarily in spring and fall. These grasses tend to green up earlier and produce forage of a higher quality than the warm season species. However, they will tend to be less drought-tolerant. Examples of these grasses include Indian Ricegrass (*Achnatherum hymenoides*) and Western Wheatgrass (*Pascopyrum smithii*).

The take home message is that in rangeland situations, a mixture of warm season and cool season plants will be more likely to provide a diverse nutritional environment throughout the year compared to a monoculture. This is important for both wild and domestic animals, large and small. The mixture of plants and the relative age structure is even important to the soil microbes. The amount, timing, and distribution of herbivory will determine the quality and quantity of nutrition provided to these organisms by way of plant litter, feces, and urine. Managing the removal of plant tissue by herbivores based on species or functional group, season, and stage of growth is vital to sustaining rangeland ecosystems. Diverse plant communities are more resilient and can be more opportunistic when reacting to variations in rain or temperature. Animals also have seasonal changes which must be factored in when trying to match their nutritional or reproductive requirements to the productive ability of their habitat. Some herbivores are more obligate grazers, designed to survive on grass. Others are best suited to browsing. Some can vary their basal metabolism to survive low nutritional environments. Within these physiological groups, reproductive cycles may vary with daylength, or certain hormones may respond to nutritional triggers, i.e. only function well when forage quality and quantity are adequate to support reproduction. Which I think brings us back to where we started:

To every thing there is a season, and a time to every purpose under the heaven. A time to monitor utilization of key species, a time to check rain gauges, a time to body condition score, a time to defer riparian areas, a time to feed, a time to stop feeding...

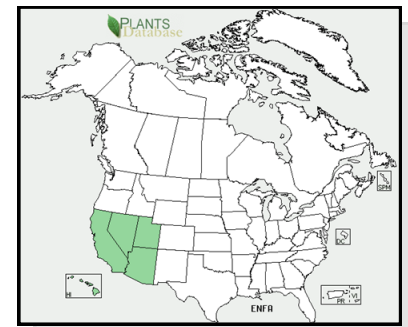


John’s Plant of the “week” by Guest writer Cameron Becker

Hello, my name is Cameron Becker and I am this editions student guest columnist! I am currently a Natural Resource student at the University of Arizona with a focus on Ecology and Management of Rangelands. I am a senior this year and plan on graduating in May and entering into the field as either an Ecologist or a Rangeland Management Specialist. I am also the current vice president of the U of A’s range club, Tierra Seca. The plants I chose for this editions plant of the week are two of the first species that popped into my mind when I was asked to write this column. I learned a good deal about these plants in my botany and plant community courses and I felt like they would be good to write about. Both species are rather common in the Southwestern United States and have some pretty interesting characteristics.

Brittle Bush

Brittle bush, or *Encelia farinosa*, is one of those plants that seems to be everywhere and tends to get taken for granted. This plant is also known by the common names Goldenhills or Incienso. *Encelia farinosa* can be found throughout California, Arizona, Southwestern Utah, Nevada and Northwestern Mexico. It is a perennial shrub that only grows below 1000 meters above sea level and usually grows to a height of between 30 and 150 cm. It is part of the sunflower family (*Asteraceae*) and actually has some pretty interesting attributes and history behind it. This plant is highly drought tolerant but does not do well with frost or temperatures below around 20 degrees F. It can easily grow in calcium carbonate (CaCO₃) rich soils and has rather low nutrient requirements. These characteristics make Brittle bush a tough plant that does well in hot dry environments. This means that this plant can be useful for re-vegetation, xeriscapes and medians. It does well on damaged or degraded soil, takes very minimal maintenance and propagates itself rather well. It has silvery leaves and bright yellow flowers when in bloom. Brittle bush is eaten by wildlife such as desert mule deer and bighorn sheep, but it has no real forage value for domestic livestock. This plant also has some pretty cool historical uses. The resin from the base of this plant was heated and used as a glue by the Seri as well as the Tohono O’odham. The Seri also used another resin from brittle bush as a pottery sealer. Another common use of this resin was as a chewing gum. The gum from brittle bush’s stem has a fragrance when burned and can be used to create incense. Brittle bush has also been used a medicine for treating toothaches. It is also said that some cowboys would use the brittle stems with some bark peeled back as a toothbrush.



Common names: Brittle Bush, Goldenhills, Incienso
Family: Asteraceae – Aster(sunflower) family
Genus: <i>Encelia</i> Adans.
Species: <i>Encelia farinosa</i> A. Gray ex Torr.





John's Plant of the "week" by Guest writer Cameron Becker

Jojoba

Jojoba is a fairly unique plant that is gaining in popularity. *Simmondsia chinensis* is a perennial shrub that grows in the Sonoran and Mojave deserts throughout Arizona, California and Mexico. It is a pretty tough plant that can grow in low fertility soils and has high drought, salinity and even fire tolerances. It can continue growing with a minimum of around 2 inches of precipitation and can survive temperatures down around -3 degrees F. What all this means is that Jojoba is a rather resilient plant! This is good because jojoba and its seeds in particular are very useful. Its evergreen foliage can be a good food source for wildlife such as deer, javelina, bighorn sheep as well as domestic sheep, as well as goats and cattle throughout the year. Its seeds can be often eaten by birds, squirrels, rabbits and other rodents. Jojoba's berries are also edible to humans but acts as a laxative and can be toxic in large amounts. The Seri people considered jojoba generally as inedible but would eat its berries in emergencies. The name 'Jojoba' actually came from the Tohono O'odham who made a paste out of the seeds to treat burns. Jojoba has been reported as a folk remedy for a wide variety of ailments including; cancer, colds, obesity, poison ivy, sores, sore throat and warts.

The real reason Jojoba has become such a popular plant is the commercial value of its fruit. *Simmondsia chinensis* has become the second most economically valuable plant in the Sonoran desert (second only to the Washingtonia palm). An oil can be made out of Jojoba seeds that is very similar to whale oil and can be used in a wide variety of products. For instance, it can be used in cosmetics, lubricants, waxes, candles, varnishes, rubber adhesives and has great potential for biodiesel. There are now plantations of Jojoba in Argentina, Australia, Israel, Mexico, Peru, Brazil, Costa Rica and Paraguay as well as in the United States.

Common names: Jojoba, goat nut, wild hazel, quinine nut, coffee berry, deer nut
Family: Simmondsiaceae – Jojoba family
Genus: <i>Simmondsia</i> Nutt.
Species: <i>Simmondsia chinensis</i> (Link) C.K. Schneid.





The view from the Rim

Cowboys may not have a language of their own, but they certainly have a unique way of putting things. I was traveling through Amarillo last week and while eating supper, I heard the man at the table next to me ask the waiter to come over and take his steak back to cook a little more. The waiter asked, “*did they not get it done enough for you?*” and the man replied, “*Son, I’ve seen cattle cooked longer than this get well...*”



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Just me talking...



October is a great time to be in Arizona. It is not as hot now, cattle are mostly in decent shape in our country but we could use a rain. Elk are bugling, lots of quail and doves. Fall range monitoring is underway. Hopefully your favorite football team is winning (mine isn't...). We are finishing up some research projects at the V Bar V. We took the last data on the landscape fire fuel/forage mapping project (Brass-G) in July. We will start working with the guys at TAMU this fall to analyze the data and determine how well the Phytrow model predicts our vegetation types. We took the last soil samples to compare grazed versus rested sites for carbon and nitrogen, with portable NIRS in September. We have an ongoing project this year to field validate the ability of fecal NIRS as an early pregnancy test under ranch conditions. I am working with a collaborative group to develop a research ranch on the north rim of the Grand Canyon. The National Park System has put together an outdoor educational group here in the Verde Valley, I am participating in that via our Range Rocks! program. Jeff Schalau, John Kava and I had the opportunity to help put on a range/natural resources camp for Hopi youth this past July. It was mostly young ladies who were interested in other careers, but they seemed to enjoy and appreciate learning about their land and resources. We also learned that one of our previous Range Rocks! participants, April Pavinyama, was named [Miss Hopi 2011-2012](#). She comes from a ranching background and her platform is promoting natural resources. Congrats to her Dad, Robert Adams who is with the range department on Hopi, I know he is proud. We had a great summer meeting of the Arizona Section, Society for Range Management at the ranch this past August. You can read the blog about it at <http://srmoutreach.blogspot.com/>. Plans are underway for our winter meeting to be held January 18-20 in Tucson. I thought you might enjoy this picture of my “buddy” who wanted a share a seat with me while I was scouting for deer last weekend...Other than that, not much is happening.



Till next time,
Doug