High on the Desert Cochise County Master Gardener Newsletter

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The University of Arizona and U.S. Department of Agriculture Cooperating

The Virtual Gardener—Drought and Disappearing Forests

I recently read a paper published in the December 2015 issue of *Nature Climate Change* that predicts nearly three quarters of the needle-leaved evergreen forests in the Southwest will disappear in 35 years and by the turn of the next century will be totally gone. The culprit: global warming.

The study was produced by a team of researchers from the University of Delaware led by Nate McDowell, an ecologist at the Los Alamos National Laboratory. The multi-faceted study combined observational and experimental data with computer simulations to generate the predictions. A key element of the study was a field experiment conducted near Los Alamos in which piñon pines and junipers in three 1,600 square-meter plots were deprived of about 50 percent of natural rainfall over a five year period. Approximately 80 percent of the piñons, which are highly drought-tolerant trees, died over the five-year period. The observations and experimental results data were incorporated into pessimistic climate simulation models to arrive at the grim prediction of forest mortality. Should we be alarmed? Well… maybe. Then again…maybe not. Let's see why I'm equivocating.

I could, of course, critically examine the methodology of the study by asking questions such as: Were the study plots representative of all forest areas in the Southwest? Will future drought periods create conditions at least as severe and long-lasting as those used in the field experiments? Do the computer models used in the study accurately simulate future conditions? But I want to look at the problem in a different way—from an historical perspective—reflecting my educational background in geology.

The pessimist view

Although "global warming" is considered by many to be a modern phenomenon, it's really been going on for a very long time. Pleistocene glaciation reached a maximum in North America over 25,000 years ago when average global temperatures were 40˚ to 50˚F below what they are today. The glaciers began shrinking in North America about 19,000 years ago. As a result of the warming trend, sea levels rose about 300 feet and weather and vegetation patterns changed dramatically [see the following maps from a **USGS study**]. The conifer and alpine forests that covered much of the then cooler and moister Southwest retreated to higher elevations, ultimately consolidating themselves in mountain "sky

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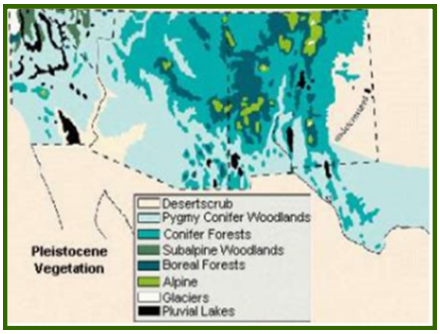

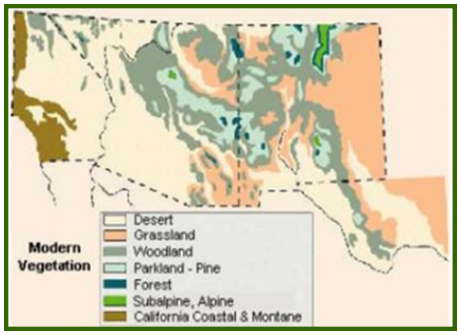

islands." Considering that our southwestern forests have now been shrinking for at least the last 19,000 years, why shouldn't they continue to shrink? There's no sign the glaciers are about to return.

On top of this, the natural fire cycles that cleared our forests of highly combustible undergrowth and reduced the density of forest trees have been artificially interrupted by well-meaning but ill-informed forest managers. The result has been extremely large, very hot, and highly destructive fires that have caused severe damage to forest areas and retarded their regrowth, especially during periods of drought.

The optimist view

Alternating periods of drought and abundant moisture have characterized our climate in the Southwest for centuries—if not millennia, and our forests have managed to survive despite a shortage of rainfall. Tree ring data allows us to accurately measure rainfall conditions year by year from at least the beginning of the millennium [see the annual maps in the ***North American Drought Atlas***]. Plant materials incorporated into fossilized packrat middens allow us to look back even further—to at least 50,000 years ago—to see what plants were growing. These data show us that the Southwest suffered from extreme drought conditions—the so-called "mega-droughts"—many times in the past. Mega-droughts of the 1100s and 1200s are used to explain why the Ancestral Pueblo Indians abandoned their settlements and disappeared from history. Yet despite these periods of extreme drought, the forests survived. If they outlasted those difficult times, they can survive now.

The Conclusion

So…should we be alarmed? Maybe yes and maybe no.

On one hand, the long-term trends suggest that forests may well disappear, as the warming trend that began 19,000 years ago continues and perhaps even grows more severe. In the past, forests retreated to higher and higher elevations to escape the heat and dryness, but now there is no place else to go except away. But on the other hand, trees are tough and adaptable. Just as the forests have weathered severe droughts in the past and survived, they are likely to weather them in the future as well. I think I'll put my money on their survival—at least for some time to come.

Until next time, happy surfing!

Gary Gruenhagen, Master Gardener
virtualgardener@cox.net

Cuttings 'N' Clippings

❄ The 23rd High Desert Gardening & Landscaping Conference will be held March 10 & 11 at Cochise College, Sierra Vista. For more information and registration go to the Cochise County Master Gardeners web site at:
http://cals.arizona.edu/cochise/mg/

For more information contact Valerie at:
valeriedavidson@email.arizona.edu
You can also follow them on Facebook at: **www.Facebook.com/CochiseCountyMasterGardeners**

❄ The Master Gardeners are at the Sierra Vista Farmers Market on the **first Thursday of each month** to answer questions and offer resources for common garden and landscape problems.

❄ The next free Water Wise event will take place **Saturday, March 12 from 9:00—11:30 AM** starting in the Public Meeting Room at the UA Sierra Vista Campus, 1140 N. Colombo. The workshop will be a talk on the pruning maintenance of woody plants, *Make the Right Cut!* by DeForest Lewis, Cochise County Master Gardener and Certified Arborist—WCISA. An outdoor demonstration will be included. Check out the Water Wise web site to see what else is happening in 2016 at:
http://waterwise.arizona.edu/

❄ The Cochise Chapter of the Arizona Native Plant Society holds monthly programs in the Cochise County Community Development Office Conference Room**,** 4001 Foothills Dr. (corner of Highway 92 and Foothills), Sierra Vista at **5:00 PM.** On **March 18** the speaker will be Frank Rose, naturalist, botanical author, artist, and photographer. The title of his presentation is: *From Soup to Nuts – Making a Feast of Nature's Bounty*. He is the author of several excellent books on Southern Arizona botany (*Mountain Wildflowers of Southern Arizona* and *Mountain Trees of Southern Arizona*). Frank is also an enormously talented artist and photographer. In this program he will illustrate and describe the individual courses of a meal composed entirely of native plants.

Cochise County Master Gardener Newsletter Editor
Carolyn Gruenhagen

Ready, Set . . . Grow!

One of my second most favorite times of the year, early spring! It is an exciting time because the days are getting longer and warmer and the excitement of sowing seed and planting is on the horizon. Plus, so much is happening within the dormant plants! Hormones are breaking down and sap will soon start to move in preparation for leafing and flowering for another growing season. (Friendly reminder) Winter pruning should be completed by now. With the excitement, some of you may be planning the installation of fruit and/or nut trees. So this might be good time to discuss chill hours and its relation to breaking dormancy.

First and foremost, it is important when selecting a particular fruit or nut tree from a nursery to be sure and ask what the chilling requirement is of that particular tree. Chilling requirements vary widely among species and is an important characteristic to know for the selection of most varieties of fruit crops. Some nurseries, especially in the lower elevations (such as those in Phoenix and even Tucson) could be selecting and selling "low-chill" varieties of fruit and/or nut trees since their winter temperatures do not get as low as compared to the winters for some of us in the higher elevations of Arizona. Therefore, if one were to select a fruit tree (just by mere excitement of the variety description, I understand) without realizing its chill requirement and went back to their higher elevation home to plant it, this could be one reason why they rarely fruit, never fruit at all, or struggle to survive.

I think it's relevant here to remind us what is actually happening within the plant tissues as a growing season is coming to an end. We know growth rate declines in a tree when the fall day length and temperatures begin to decrease. Internally though, hormones are being produced in reaction to this. Plant hormones are responsible for a vast array of actions and reactions. Everything from cell division, cell enlargement, root initiation, abscission, callus formation (for our pruning cuts), dormancy, senescence, seed germination, flower initiation, and even sex determination. These hormones are also known as plant growth regulators (PGR's) and are organic compounds that even in low concentrations can promote, inhibit, or modify physiological processes in the plant. There are six classes of these PGR's and include auxins, gibberellins, cytokinins, growth inhibitors, ethylene, and polyamines.

It is the growth inhibitors that are being synthesized in the fall which are responsible for preventing further growth of our trees and putting them to rest for the winter. The most predominant growth inhibitor produced is abscisic acid (also known as ABA), and is found throughout the plant. Other growth inhibitors include synthetic compounds that act as antiauxins, antigibberellins, or anticytokinins that can close stomates and lower photosynthesis which conserves the plants moisture reserves, or they can cause leaf abscission (which we get to rake up and add to our compost). And yet even other secondary products of plant metabolism are natural growth inhibitors, which include your alkaloids, phenolics, and lactones. These are the compounds that act as allelochemicals which are either autotoxic (inhibit the growth of the same plant) or allelopathic (inhibit the growth of other plants). However, it is because of the concentrations of ABA that growth will not occur even under ideal temperature conditions. This is what prevents the trees from beginning to grow when we have the unusual warm days in the winter that could be damaging if followed by a freeze event in early spring.

You may be wondering how does this relate to chill requirement. Simple answer: dormancy is broken when sufficient cold temperature (or chill requirement) breaks down these growth inhibitors. So, without the right amount of accumulated chill hours these hormones will not be broken down which is why some species or varieties planted in the wrong location have delayed foliation (late leafing out), prolonged blossoming, bud drop or deterioration, and few if any flowers develop. We all know without the flowers there will be no fruit.

Specifically, chill requirement is defined as the specific number of cumulative hours of chilling where temperatures are lower than 45°C required to break dormancy. It is only after the particular tree species receives the required chill hours before growth inhibitors are broken down and natural growth processes resume (of course, only after exposure to

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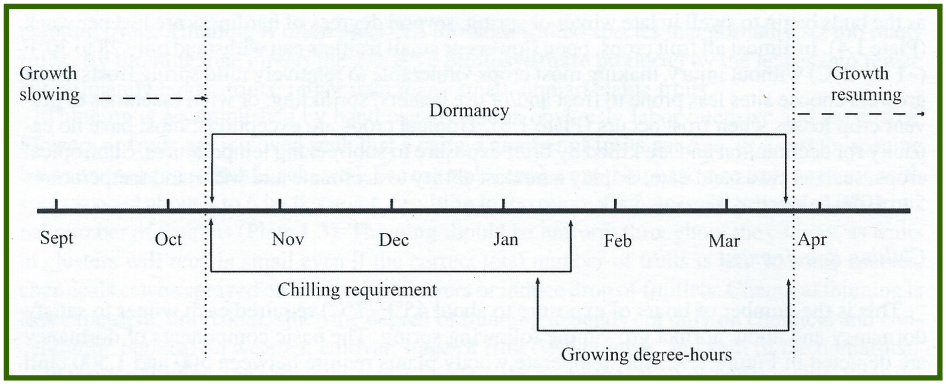

(Source: *Introduction to Fruit Crops*, Dr. Mark Rieger)

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enough warm temperatures). Some species of trees only get even more complicated after the chilling requirement is met. For instance, the pistachio nut tree (*Pistacia vera*, not *Pistacia chinensis*) requires about 800-900 chilling hours before breaking dormancy, but following this it requires a certain amount of "heat units" before flowering initiates. That is another topic entirely.

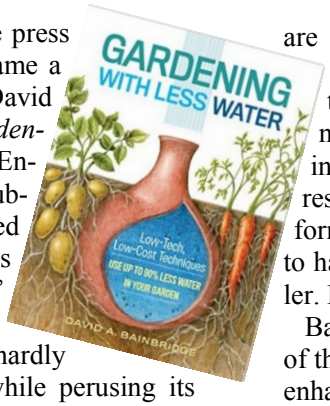
To determine the amount of chill hours already accumulated for your particular area of Arizona I would have to suggest using the data from the closest AZMET station to you. The University of Arizona, and our very own Dr. Paul Brown has made this easy by developing a web site specifically dedicated to collecting temperature and other parameters. The website for this is the Arizona Meteorological Network located at **http://ag.arizona.edu/azmet/az-data.htm**. Of course, if one wanted to be as accurate as possible for their particular location, especially in relation to mountains, valleys, and cold drainage then a simple home weather station that had ability to record temperature minimum and maximum would be best in figuring the proper fruit tree with the right chill requirement.

Joshua Sherman, M.S.,
Commercial Horticulture Area Agent

March Reminders

- Prune roses
- Start seeds indoors
- Check cactus for fungus
- Plant cool-season veggies
- Reconsider your water usage
- (Call Water Wise for a free audit—520-458-8278, Ext 2139)
- Remove and replace winter mulches

A Book Review: *Gardening with less Water* by David Bainbridge



Recently, hot off the press and into my hands, came a new book written by David Bainbridge called *Gardening with Less Water*. Enticed by the book's subtitle which declared "use up to 90% less water in your garden," a Water Wise junkie such as myself could hardly put the book down while perusing its pages. Luckily, I was not disappointed with its contents.

Bainbridge is no stranger to what he calls "super-efficient irrigation." He began research in this field over thirty years ago at the Dry Lands Research Institute at the University of California, Riverside. What impresses me most about his book is his ideas are backed up by actual field work, and he has shared much of his knowledge for free. (See **http://works.bepress.com/david_a_bainbridge**).

He begins his book by discussing water shortages in many parts of the world, including a chart from the U.S. Drought Monitor. He introduces facts, figures and research which should encourage anyone living in the Southwest to use water very wisely.

Interestingly, what precipitated his journey into this realm was a book he came across written 2,000 years ago by a man named Fan Shengzhi. Shengzhi had been commissioned "by the emperor of China to help increase the yields of farmers who had too little land and too little water." Bainbridge was intrigued with Shengzhi's ideas. He researched similar techniques used in modern, drought prone countries and ultimately discovered a variety of simple watering methods which can be used by home gardeners and small landowners.

Some of what he advocates includes the use of clay-based pots, pipes, or pitchers (ollas or oyas) which are buried in the ground. The best clay containers are "unfired" and as a result they slowly seep water into the soil at the root zone of the plant, which is not only the perfect spot for watering but also helps increase yield and restrict weed growth. Consider it a form of drip irrigation without having to hassle with programming a controller. How convenient is that?

Bainbridge cleverly modified some of the basic structures he researched to enhance opportunities for saving water. For example, he has detailed instructions and illustrations on how to create self-filling clay pot systems. This watering method combines buried clay pots with drip irrigation components and a reservoir for self-filling. Very creative indeed!

Other simple systems he describes and illustrates include buried porous capsules, deep pipes, wicks, buried clay pipe (for larger plots of land), and tree shelters.

In the second part of his book he encourages active rainwater harvesting in conjunction with many of the irrigation systems he describes. He also goes into detail and provides several illustrations on how to contour the landscape to promote water catchment, which is really passive water harvesting.

All in all, his book is a quick and easy read but jam packed with clever information. The illustrations and instructions used are concise yet simple to follow. I felt confident in my ability to construct any of the systems using the descriptions he offered. I would highly recommend this book to anyone interested in growing a more productive and water wise garden. The book was published by Storey – "America's Garden Publisher"® and is available on line in paperback or Kindle versions.

Sandra Hurlbut, MS, MA. Senior Instructional Specialist, Water Wise Program

It's a Bloomin' Cochise County Native Plant of the Month—Sumac

Sumac: Poison or Balm?

There's a hedge in my neighborhood that's composed of evergreen shrubs with pinnately compound leaves. The hedge plants thrive in spite of our temperature extremes, including the Big Chill of 2011 that killed native desert brooms. What a great landscape plant for our area! Wait a minute. Where had I seen something like that before, not in a yard? I asked my neighbor what they were. Turns out, they are *Rhus virens* var. *choriophylla*, evergreen or Mearns sumac. The plants were

Rhus virens var. *choriophylla*

obtained from the U. S. Forest Service over 20 years ago, and haven't received supplemental water for the past 8 years. Colleen Crowlie and Cado Daily include evergreen sumac in their book, *Step by Step: Beautiful Bisbee Plants*.

What is a sumac? "*Rhus*" comes from the Greek word for sumac, which in turn derives from an Assyrian word meaning "red." These woody plants, classified in the *Anacardiaceae* family along with *Anacardium* (cashew), *Mangifera* (mango) and *Pistacia* (pistachio), produce one-seeded fruits from regular flowers that may be perfect or imperfect. Several species are ornamental, prized for their red leaves (in deciduous species) and in some cases, bright red fruits, which are attractive to birds.

Four species of sumac are native to southeastern Arizona. Evergreen sumac is the only one that's not winter deciduous. Found between 4,000 and 6,000 feet in elevation on rocky slopes, often with Arizona cypress or alligator juniper, it tolerates shade, cold, and drought. There are 5—9, broadly lanceolate leaflets up to 2¼ in. long on each leaf. Clusters of small, white flowers that appear in summer ripen into reddish brown, fuzzy, ¼ in. long fruits. The seeds germinate after scarification, and cuttings will grow if given rooting hormones.

R. microphylla, desert or littleleaf

sumac, is found on dry mesas and slopes at 3,500 to 6,000 feet. Its 5—11 oval leaflets are usually less than an inch long. Blooming in spring, this species is dioecious and the female plants produce sticky orange-red fruits. Perhaps the stickiness is a back-up seed dispersal mechanism in case animals don't eat them. This spiny shrub usually doesn't exceed 8 ft. in height and is often as wide as tall. There's one in front of the San Pedro House at the San Pedro Riparian National Conservation Area.

R. glabra, smooth or scarlet sumac, prefers rich soil in canyons between 5,000 and 7,000 ft. The 11—23 dentate leaflets are lanceolate and up to 4 in. long. Female and male individuals of this dioecious species start blooming in late summer. The tallest of our local sumacs, it can grow up to 20 ft. in height.

Turkeys and quail use the berries of *R. glabra* in fall when the leaves turn bright to violet red. However, the berries aren't very nutritious. At least one study produced evidence that the red leaves may function as attractants to birds when the seeds are ready to be dispersed. The seeds germinate well after being soaked in acid, thus they may require a trip through an animal's gut to grow.

R. aromatica var. trilobata, once called squaw bush because its pliable branches were used by native Americans in basket weaving, now goes by the common name of skunkbush

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HURRY! HURRY! HURRY!

High on the Desert

Register now for the 23rd Annual High Desert Gardening & Landscaping Conference March 10 & 11 here!

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because of its pungent odor. An eastern variety of this species has a more pleasing fragrance. Found in a wide variety of habitats between 2,500 and 7,500 ft. in chaparral, on slopes, and in canyons this shrub's twigs and branches are browsed by pronghorn and deer. The three-lobed leaflets per leaf are not much longer than an inch each, and their brilliant yellow, orange, and red hues in fall rival those of maple and ash, though may be hidden under taller plants than the sumac's maximum height of about 6 ft. When disturbed, skunkbush can sprout from its root crown. Relatively shallow underground stems can form clusters of shrubs 20 or more feet long. This species is also planted close to the San Pedro House.

All 4 local sumac species are described in the 2012 *Western Garden Book* as landscape plants. The fruits of all are edible and can be made into what is described as a "refreshing" tea. Poison sumac, ivy and oak were formerly classified as *Rhus*, but are now in genus *Toxicodendron*, which contains an irritant called urushiol not found in *Rhus*, in case you're wondering whether or not to dare handle the foliage. Mimi Kamp reports that extracts of sumacs have been used medicinally, which she may elaborate on in a future article if we're lucky.

Virginia Bealer, Guest Author
Herbarium volunteer

What is this plant?

"What is that Plant?" ID service is available to the public by Herbarium volunteers. If you are wondering what that naturally growing or naturalized plant is, getting an identification is easy. All you need to do is visit the Cochise County Herbarium website: **www.cochisecountyherbarium.org** and click on the Plant IDs tab to learn how!