

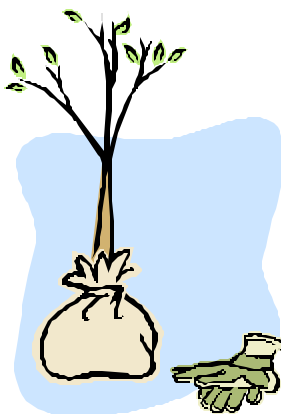


The Virtual Gardener—Some Like it Cold

Spring is the time bare root fruit trees begin appearing in the stores. The other day I stopped by a big box store and looked at a large display of bare root fruit trees—apples, cherries, peaches, pears, *etc.* There were many different kinds, their wrappers covered with pictures of sugary sweet, delicious fruits. As I read the descriptions on the wrappers, I noticed one thing about many of them. They had low chill requirements—200-400 hours. Since we live in an area with relatively mild winters—at least as compared to more northern states—that seems like a good thing...right?

Not necessarily! If you plant those trees, there's a good chance you will never see those luscious fruits pictured on the plastic wrappers. Here's why.

Fruit trees begin to bud in the fall but go into dormancy during the coldest portions of the winter to protect themselves and their buds from cold damage. They resume growing again when the weather warms up in the



spring. Cooler temperatures and shorter days in the fall provide the signal it's time to begin the winter nap, and an internal "alarm clock" tells them when it's time to begin waking up.

The tree's internal alarm clock keeps track of the number of hours the tree is exposed to temperatures lying within a certain range. When the requisite number of hours have passed, the alarm "rings" and the tree knows it's getting close to time to start growing again.

When our alarms ring in the morning, many of us don't immediately leap out of bed but prefer to doze a bit longer. We may finally be motivated to actually crawl out by the smell of brewing coffee, sunlight streaming through the bedroom window, or some other stimulus. Trees act the same way.

For a tree, the signal to stop dozing and actually start growing again comes from lengthening daylight hours, warmer temperatures, and perhaps other

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environmental stimuli. But suppose the tree gets the signal to wake up too early and there is a brief warm spell followed by a cold snap as frequently happens here in Cochise County. The tree will begin to bud out in response to the early warm temperatures, and the buds will die during the subsequent cold snap. The end result: no fruit that year.

The number of hours of chill that need to be accumulated before a tree will wake from dormancy depends on the climate that it's adapted to. Trees that are adapted to colder climates will take a long winter's nap and only wake up when all danger of late spring cold snaps have passed, that is, after accumulating lots of chill hours. Trees adapted to warmer climates can wake up and begin growing earlier after accumulating fewer chill hours.

Of course it's still a game of chance. Trees don't have the ability to forecast short winters or late spring cold snaps any better than we do, so they must operate on the principle that the past is key to the future. Over time their chill-hour requirements evolve to match the average conditions of their environments, but like us, they can still be caught by surprise by an abnormally cold or warm winter.

In order to improve your chances of getting good crops of fruit, you need to balance the number of chill hours required by your fruit trees with the number of chill hours you can expect to accrue in your area. You can find the required number of chill hours for a given type and variety of fruit tree in many places—on the package of a bare root tree, from vendors online, or from reference books. But where can you find the

number of chill hours that typically accrue for your location?

If you have access to hourly temperature readings for the four month period from say November through February at a location near your home, you can compute the chill-hours directly for the previous winter. (Note: every winter will be a little different so whatever you compute for the latest winter will only be an estimate of what can be expected at your location for any given year.)

A rule of thumb is that each hour below 45°F and above 32°F counts as one chill-hour. But each hour above 68°F subtracts a chill-hour from the above total. Since you will have almost 3000 temperature readings to work with, this represents a lot of calculating. If you are adept at using a spreadsheet, it's not too onerous, but if you have to do the calculations by hand, it would be a lot of work. But there is a simpler way.

The College of Agriculture and Life Sciences of the University of Arizona operates The Arizona Meteorological Network (AZMET) which provides agriculture-related weather data from 28 stations scattered around the state. Four of those stations are located in south-east Arizona: [Bonita](#), [Bowie](#), [San Simon](#), and [Kansas Settlement](#). The station at Bonita is in southern Graham County and the other three are in eastern Cochise County. Using the rule stated above, the number of chill-units accumulated for each of these AZMET stations this winter is:

Bonita	1036
Bowie	816
Kansas Settlement	814
San Simon	735

Another option to get an estimate of the number of chill-hours for your location is to locate a [Weather Underground weather station](#) near

your property, get its ID number, and use that as the station name in the [Get Chill Hours](#) website. There is a lot of calculation to be done by the Get Chill program, so there is a lag of a few seconds before the answer appears, but a progress bar on the website lets you see the progress of the calculation process. You will see three answers.

The first answer shows the number of hours below 45°F; the second answer shows the number of hours between 45°F and 32°F; and the third answer shows the number of hours as calculated by the "Utah model." Although the Utah model does not simply subtract the hours above 68°F from the total hours between 45°F and 32°F, it does compensate for chill-hours above 60°F in a more complicated way so it gives the best estimate to use. Using data from the Weather Underground station near my home (KAZSIERR11), the Utah model shows 511 chill-hours accumulated for 2012-2013.

So depending upon exactly where you live, buying a tree with a chill-hour requirement of less than about 500-800 hours might not be such a good idea.

If you are interested in learning more about chill requirements for fruit trees and how they are calculated, check out these websites:

<http://informedfarmers.com/do-you-know-your-chill-hours/>

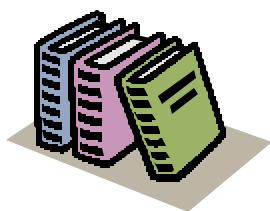
<http://aggiehorticulture.tamu.edu/stonefruit/chillacc.html>

http://www.davewilson.com/homegrown/gardencompass/gc14_jan_07.html

Until next time, happy surfing!

Gary Gruenhagen, Master Gardener
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The Wild Life of Our Bodies: A Book Review



SORRY, the subject book is not a nostalgic look at Grateful Dead concerts of 1967, nor is it about the disco craze of the 1970s (a craze I'm proud I avoided). And, despite the fact that this newsletter is about gardening, the book isn't about gardening, either. *The Wild Life of Our Bodies* is instead a book about us and our environment. It's a book about us and the myriad species we evolved alongside, species both large and small, some large enough to eat us, some so small as to be microscopic. It's a book about inter-connectedness, the diversity inherent in our world, diversity, and how we can't escape the consequences of our long past in a few short generations.

The Wild Life of Our Bodies was written by Rob Dunn, a professor in the Department of Biology at North Carolina State University. Copyrighted in 2011, the book is wide ranging, exploring some of the cutting edge ideas in evolutionary thinking, some of which may be proven wrong, others of which may become well established.

Specific subjects investigated include pronghorns and why they are so much speedier than any beast that preys on them, a seeming conflict with evolutionary theory. A controversial concept of how and why agriculture developed is explored. The role of the human appendix is exam-

ined. The ability of some humans to digest milk is looked at, as is our general lack of fur, a characteristic which is almost unique among mammals. There is even an interesting discussion of a new idea that credits snakes for our color vision—shades of the Garden of Eden!

Perhaps the most fascinating, not to mention disturbing, section of the book deals with Crohn's disease. Crohn's disease is a very debilitating condition that is thought to be a consequence of a malfunctioning immune system. There is presently no cure and victims of this disease suffer a wide ranging host of problems, many of them associated with inflammation of the gastro-intestinal system (including extreme vomiting and diarrhea), but also severe skin rashes, tiredness, and arthritis. My choice of the word "disturbing" to describe this section arises not only from the description of Crohn's disease symptom themselves, but also because one means of relief from Crohn's disease (for at least some people with the condition) involves the intentional infection of Crohn's sufferers with hook worms! Apparently, having the worms gives the immune system a target to fight, a target that our immune system evolved to cope with. It is a strange world!

An early working title for this book was *Clean Living Is Bad for You (and Other Consequences of Having Evolved in the Wild)*. I think the title that was finally selected was a better choice, because this book is definitely not anti-science or anti-civilization, nor is it "pro-hook worm" or pro back-to-

nature. It is simply an exploration of our origins and how we came to be as we are.

My take-away from the book is this: For eons, humans and our ancestors evolved as a part of our natural environment, interacting with other species in ways both good and bad for our ancestors as individuals, but beneficial for the species. We were shaped by predators, parasites, and prey into what we are today. We even "learned" to coexist with some species for mutual benefit; the bacteria in our guts that help us digest our food is a great example of this type of relationship. In recent times; however, a few short centuries or less, humans, at least those in developed countries, are more and more separated from interactions with much of the rest of the "natural" environment. We are certainly much cleaner than we have ever been before. Have you ever thought of how nice it is to live in a world where itching and scratching aren't a daily part of living? Nonetheless, our lives and the ways in which we lead them are much different in some aspects than those lives of the past that shaped us into what we are now.

This book is thought provoking. And the gardening connection? Gardening is good for us on many levels—raising our own food, seeing and interacting with Mother Nature in ways that many people don't experience anymore. This book made me want to get my hands dirty and be glad for it! I recommend it to you. The Sierra Vista Public Library has a copy on its shelves—check it out.

Bill Schulze, Master Gardener
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Phosphorus—Why Worry?

Phosphorus is an essential nutrient for all living organisms including the food crops we grow. It's part of DNA used in energy transfer in living cells, and contributes to the structure of cell membranes. Moreover, phosphorus fertilizers have been instrumental in boosting crop yields to feed the Earth's burgeoning population. Backyard gardeners may think of phosphorus as the middle number on the fertilizer package or as the bone meal they use to amend planting holes. Understanding a little more about global phosphorus supplies, fertilizer manufacturing, and phosphorus availability in our soils should help backyard gardeners make informed decisions related to its use.

Phosphorus exists primarily in sediments and rock. When marine organisms die or are eaten and excreted by other animals, some of the phosphorus in their bodies sinks to the ocean floor and gets buried in sediment, eventually becoming rock. Over millions of years, that rock shifts and lifts back up to Earth's surface. The rocks weather and break down, forming new soil containing phosphorus that can nourish plant growth. Phosphorus from dead plants and the carcasses or excrement of animals is also released to the environment where it can be taken up by plants. Otherwise, it too eventually makes its way to the ocean.

Phosphate rock is the main source of phosphorus for fertilizers. The Earth holds a limited amount of easily accessible, high quality phosphate rock. The United States (mainly Florida) produced 14% of the world's



phosphorus in 2012. China is the largest producer at 42% with Morocco, Russia, and Jordan producing 13%, 5%, and 3% respectively (from USGS Reference included below). As high-quality deposits become depleted, remaining untapped reserves generally contain less phosphorus. Some researchers predict that the annual amount of phosphorus retrieved from mined phosphate rock could peak sometime this century. As you might expect, this has sparked conversations about food security.

The plant available phosphorus in rock phosphate is very low. This combined with high transportation costs has resulted in the industrial manufacture of phosphorus fertilizers. Briefly, rock phosphate is treated with acid to produce orthophosphoric acid—the phosphate form that is taken up by plants. One phosphorus fertilizer, triple super phosphate, contains 45% by weight plant available phosphate (0-45-0). Certified organic producers are not allowed to use these fertilizers and must rely on rock phosphate, manure, animal byproducts, or compost to supply phosphorus. These materials have lower amounts of plant available phosphorus than inorganic fertilizers (60-80%) and generally have much higher costs to achieve similar results.

To further complicate our gardening efforts, maximum phosphorus availability occurs between soil pH 6.0 to 7.0. In Yavapai County,

as well as in Cochise County, our soils tend to be alkaline and have a pH of 7.0 to 7.8 and greater. Soils with a pH of 7.5 and higher typically have a high calcium concentration that binds phosphorus as calcium-phosphate creating an insoluble compound that is not available to plants (this is called P fixation).

Vegetable and annual flower gardeners can amend soils with soil sulfur and organic matter to temporarily decrease the soil pH. Where soil pH is 8 or higher, add elemental sulfur annually at a rate of 6 to 10 pounds per 1,000 square feet of area. Elemental sulfur slowly oxidizes in soil to form sulfuric acid. Test the soil occasionally and stop adding sulfur when pH has reached desirable levels. All vegetable and flower gardeners should amend soils with composted organic matter prior to planting. After following the above recommendations, phosphorus fertilizers can be placed 6-8" deep (called banding) where roots will grow into the fertilized soil.

Native plants have adaptations (primarily mycorrhizal fungi infected roots) that allow them to acquire needed phosphorus without using fertilizers. These plants should not be fertilized with anything as this could compromise these desirable mycorrhizal associations. For fruit trees, lawns, roses and other permanent plantings requiring additional fertilizers, apply nitrogen containing fertilizers as recommended. Phosphorus fertilizers should not be applied to the soil surface because phosphorus would be fixed at the soil surface and made unavailable.

We should strive to keep the value and importance of phospho-

(Continued on page 8)

Water Gardens in Containers

Creating a pond or any water feature in your garden is the newest rage in landscaping. People stay closer to home, like to enjoy their backyards, to entertain, and to create their own little refuge. A water feature seems to be a wonderful way to give the feelings of nature—the calming effect of running water, the presence of nature, beautiful fish swimming, and birds that visit to take a drink. Homeowners enjoy butterfly and hummingbird gardens and anything else that invites wildlife. It doesn't always need to be big game. Insects, like dragonflies and damselflies, are exciting as well.

Not everybody can incorporate a pond into the landscape, whether it is because of lack of space or the cost of installing a pond. It takes time in maintenance and as we live in a xeric environment maybe not a good idea. There is always the possibility of installing a small tub garden. These little gardens are fun and beautiful to watch and attract all kinds of wildlife. We live in the desert—water is a great magnet.

For ponds, large or tiny, the basic rule of good water gardening remains the same: constructing, planting and stocking the pond to achieve a natural ecological balance which results in clear water.

A wonderful first choice for a miniature pond is a half whiskey barrel lined with a rubber liner or a plastic insert that is available in most hardware stores.

An oversized plastic flowerpot that has no hole or the hole blocked off will do as well. This size pond is perfect for a few plants

and even a few goldfish, no more than three, please, or a few mosquito fish. As the fish grow, they will have to be exchanged for smaller ones with a pond owner. There are now miniature goldfish available. Check with your local pet store.

If you choose a metal container and it is not galvanized, you will have to line it with a rubber liner because the metal can be toxic to fish. There are plastic tubs in all sizes available.

The plants could be planted directly into the tub, but I advise against it. Water plants grow quickly and in a small tub they need to be divided yearly. It just makes more sense to plant each one into its own container. The best containers are those that do not have any drainage holes. This way the soil and the fertilizer cannot drain out and spoil the water. Nursery containers are fine if the holes are closed off with a piece of liner. I prefer to invest in a container made for water plants that is squat, meaning wider than high, but not those containers that have tiny holes all over the pot. Those pots need to be lined with untreated burlap and when that decomposes it makes a mess.

The best planting media is heavy clay soil—that dark red stuff, most of us have in our gardens. The soil should not contain any compost because as soon as you set the pot into the water, the compost will float out of the pot. Never ever use potting soil. As a fertilizer, a special fertilizer tab can be bought, but a scoop of bone meal will do

just fine. It needs to go on the bottom of the pot. After the plant is potted up, top it off with small pea gravel.

For a small pond the size of a half whiskey barrel, a miniature water lily like “*Helvola*” is a good choice. This plant is very tiny but a strong bloomer with small light yellow flowers. The water lily goes on the bottom of the tub, while the other plants have to be set on bricks. Choose red bricks, as they are made from clay and not concrete. Now, I would choose a plant like the variegated cattail or umbrella palm or even better, *Lobelia cardinalis* (see

photo). Hummingbirds love this plant for the upright look. It is also a good idea to add an aquarium plant like anachris or hornwort which is sold bundled



and needs a lead weight or a metal washer attached to it to make it sink. This will oxidize the little water garden. Floating plants like water lettuce can be added. Little pumps that feed a spitting frog or other ornament can be added for the sound of running water. This will keep your water moving and keep the water from getting stagnant. It will also keep off mosquitoes as they don't like moving water for breeding. You will have to keep the tub filled up so that nothing dries out, and if you add fish, weekly ten to twenty percent

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WAM! April is Water Awareness Month

Warmer temperatures typically mean an increase in our daily water use, both indoors and outdoors. Living in the dry southwest, it's important to be aware of how much water we use every day to protect our area's most precious resource.

That's why Arizona celebrates April as Water Awareness Month (WAM) and encourages everyone to visit the Arizona Department of Water Resources WAM interactive website at <http://waterawarenessmonth.com> to learn more about how to make the most of our water use, not just in April, but every day.

The WAM website is overflowing with water conservation tips, ideas and activities, including an interactive calendar listing workshops, events and resources for every day during the month of April. It's your one-stop-shop for everything water conservation. Here are just a few examples:

- "Hide and Seek: Find the Leak" includes tips and resources for finding and fixing leaks
 - "Grow Green Kids" has interactive games, puzzles and activities for children of all ages
- "Water Your Plants Automatically" takes the mystery out of programming irrigation/sprinkler timers

You can also "like" us on Facebook ([facebook.com/wamaz](https://www.facebook.com/wamaz)) and follow our Tweets ([link](#)) For more information on Water Awareness Month, visit www.waterawarenessmonth.com or UA Cochise County Cooperative Extension Water Wise program: waterwise.arizona.edu

April Water Events:

April 3: "When and How Much Should I Water?" Are you watering too much or too little? Come learn about the science and art of watering your plants. **Time:** 5:30-6:30 p.m. **Location:** Ecoasis, 54 Brewery Ave. Old Bisbee. **Presenter:** Cyndi Wilkins, UA Water Wise Program

April 13: Water Expo

Come to the Water Expo at The Mall in Sierra Vista. From 9 a.m. to 2 p.m. on April 13, over 25 local exhibitors will be showing off their water saving products, services or information. Demonstrations, talks, displays and activities for the kids! The Rolling River, the Leaky House and the Running Toilet Relay will be offered all day. Come on by! This event is sponsored by the Water Wise Program, the City of Sierra Vista, The Cochise Water Project, Liberty Utilities, Ecoblue Cube, The Sierra Vista Herald, Oasis Water Harvesting, Castle and Cooke Homes and Southern Arizona Rain Gutters.



WAM! Water Geocache

Do you like to geocache? Anyone with a smartphone or GPS device can! During WAM! there will be geocaches around the Sierra Vista area near something to do with water. Will you be able to find them all? For more information, visit waterwise.arizona.edu

Cado Daily, M.A.

Water Resources Coordinator, Water Wise Program. University of Arizona Cochise County Cooperative Extension

Earth Day

Earth Week runs from April 16 to Earth Day, April 22, and is a time to promote awareness and appreciation for the Earth's environment and sustainable living practices.

The Sierra Vista Farmers Market will celebrate Earth Week at the Thursday, April 18 market with a special celebration featuring earth friendly exhibits and information.

The theme of Earth Day this year will revolve around gardening and creating sustainability in our food supply. Having a garden and growing some of your own food reduces the environmental impact of transporting and warehousing food.

Look for the Cochise County Master Gardeners' information tent and stop by and say, "Hi." The market is located on the NW corner of Carmichael and Wilcox in Sierra Vista.



April Reminders

- ◆ Stake new trees
- ◆ Fertilize
- ◆ Prepare for pests

Cochise County Master Gardener
Newsletter Editor
Carolyn Gruenhagen

Did You Know . . . Cochise County has an Herbarium?

Herbaria are museums of dried plant specimens which house knowledge of plant species, including plant variation, plant names, ethnobotanical information, genetic information, and plant locations. They are an important tool used in teaching and research. While herbaria may be very large, housing millions of specimens from around the world, smaller, local herbaria play a very important role.

In 2001 the Cochise County Herbarium, located in the Plant Sciences Center on the University of Arizona Sierra Vista Campus, was founded by volunteers and is still maintained by volunteers as part of the University of Arizona Cochise County Cooperative Extension. It has multiple uses, including use by researchers (botanical, ecological), gardeners interested in native species, as well as being incorporated into plant, ecology,

and wild life courses at the college and even high school level. As it grows, the Herbarium has become a repository of the diversity and variation present in Cochise County and the surrounding areas. Computerizing the collection provides access to scientists within and outside the Cochise County area through our website. This makes it important for researchers and resource managers alike.

As a normal part of running the Herbarium we are in contact and cooperate closely with the herbarium at the University of Arizona in Tucson, and that of Arizona State University in Tempe, as well as SEINET. In the past we have exchanged duplicates with other herbaria. Additionally, our fine and easy to use website provides access to the herbarium via the internet at:

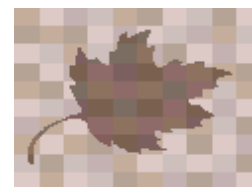
www.cochisecountyherbarium.org

Cecile Lumer, Ph.D.

Note: Dr. Cecile Lumer, former curator of the Cochise County Herbarium, is moving to her new home in New York. She was the driver behind creating the Herbarium and we will sorely miss her. I will miss her unrelenting drive to make the Herbarium a respected part of the network of herbarias around the world - which she did. However, we are very fortunate to have Bob Ballard step forward to take over Cecile's job. In a recent brainstorming session, Bob came up with the idea of providing a monthly *Native Plant of the Month* contribution to the Master Gardener newsletter so watch for it in upcoming newsletters. We hope you will enjoy it.

Cado Daily, M.A.

Water Wise Program



Cuttings Clippings

✧ The **Thursday, April 4** CCMGA meeting speaker will be John Kraft, Ranger Biologist for the National Park Service, Coronado Forest who will discuss the unique ecology of the Sky Islands in Southeast Arizona. The meeting location is the Public Meeting Room at UASV and the time is 5:00 p.m. For information call (520) 458-8278, Ext 2141 or contact Joyce at: [jwilliam@ag.arizona.edu/](mailto:jwilliam@ag.arizona.edu)

✧ Ag Day at Elfrida Gardens, **Saturday, April 6.** Gates open at 7:30 a.m.

✧ **Saturday, April 13: "Water Expo"** Come see what products and services are available to you for landscaping, irrigation, plumbing, hot water, rain-


water collection and more! NEW LOCATION at The Mall at Sierra Vista. Time: 9:00 a.m. to 2:00 p.m. April "Mini Talks," 1/2 hour presentations at Lowes and ACE Hardware: *Instant hot Water on Demand* and *Rainwater Harvesting* with tank door prize. For information on Water Wise events, call (520) 458-8278, Ext 2141, contact Joyce at:

[jwilliam@ag.arizona.edu/](mailto:jwilliam@ag.arizona.edu) or visit the Water Wise web site at:

<http://ag.arizona.edu/cochise/waterwise/events.html>


✧ Remember! Earth Day celebration at the Sierra Vista Farmers Market on **Thursday, April 18.**

WAM! April is Water Awareness Month



Wettie sez...
BE Water Wise!

Fix drips. A slow steady drip can waste 15-20 gallons each day, a faster drip 100 gallons!



The U of A *Water Wise* Program
(520) 458-8278, Ext. 2141

(Phosphorus continued from page 4)

rus in mind as we make gardening and consumer choices. Also, check out the resources I've included below.

Find past Backyard Gardener columns or provide feedback at the Backyard Gardener web site

<http://cals.arizona.edu/yavapai/anr/hort/byg/>

Additional Resources
Phosphate Rock, U.S. Geological Survey, Mineral Commodity Summaries, January 2013

2013USGSphosphorusmineral-commoditysummary.pdf

Understanding Phosphorus Fertilizers, University of Minnesota Extension

<http://www.extension.umn.edu/distribution/cropsystems/dc6288.html>

Phosphorus Fertilizers for Organic Farming Systems, Colorado State University Extension
<http://www.ext.colostate.edu/publications/00569.html>

Managing Soil pH in Utah, Utah State University Extension
<http://extension.usu.edu/files/publications/publication/AG-SO-07.pdf>

Salvage Job: With Fertilizer Prices Skyrocketing, Scientists Scramble to Recover Phosphorus from Waste, Science News February 23, 2013; Vol.183 #4
http://www.sciencenews.org/view/feature/id/348109/description/Salvage_Job

Jeff Schalaus, Agent, Agriculture & Natural Resources
University of Arizona Cooperative Extension, Yavapai County

(Water Gardening continued from page 5)

water exchanges are important to keep everything healthy. The water is nutrient rich and your ornamental plants will love it. Remember water evaporates, but the impurities stay. Water gardens do great in full sun, but if the tub is really small it does best with afternoon shade. It needs at least 4 hours of direct sun.

Angel Rutherford, Master Gardener

Note: Angel will be presenting a talk on building a pond in your backyard at the May 2 CCMGA meeting. The public is invited to attend—5:00 p.m. at the Public Meeting Room at University of Arizona Sierra Vista.