

Backyards & Beyond

Summer 2007

RURAL LIVING IN ARIZONA

Volume 1, Issue 2



Featured Plant

Common Name: Desert Willow
Scientific Name: *Chilopsis linearis*



Jeff Schalaus



Jeff Schalaus

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

The desert willow (*Chilopsis linearis*) is an excellent drought tolerant tree for many areas of Arizona. Desert willow is not a willow at all, but a close relative of the catalpa tree and a member of the trumpet vine family (*Bignoniaceae*). This deciduous, native tree/shrub can be found along dry washes and seasonal creeks in desert, chaparral, and grassland habitats between 1,500 and 5,000 foot elevations. High elevation populations are hardy to 0 degrees F and require little water once established.

The desert willow is very graceful with an airy, open canopy. Hence, it does not make dense shade or a highly effective windbreak, but does make an attractive, multi-trunked specimen in a low water use landscape. In the wild, they can grow to 20 feet tall by 20 feet wide. With irrigation, they can get slightly larger.

The narrow, curving leaves are between 3 and 5 inches long and 1/4 to 1 inch wide. They look very graceful but have a surprisingly tough, leathery texture. Desert willows are best known for their showy flowers. These appear in clusters on branch tips from late spring to early summer and can vary in color from white to pink to deep purple. Flowers of native populations are often pale lavender with yellow spots or stripes in the throat of the trumpet-shaped blossoms. With some additional irrigation, they can bloom through September. In addition, the flowers have a sweet fragrance that attracts bees, butterflies, and hummingbirds.

Long, narrow seedpods form after blooms have died. These persist on the tree through the winter and split open to release hundreds of fuzzy seeds. The seeds are viable and may germinate in a moist seedbed. I suppose, if there is a downside to desert willow, it is the pods and seeds. Excessively orderly gardeners may think them untidy.

Commercial growers have selected individuals from the wild, cloned them, and market these cultivars as named varieties that have showier flowers or smaller stature. Some of the newer varieties are Barranco, Burgundy Lace, White Star, Pink Star, Lucretia Hamilton, Warren Jones, and Lois Adams (a podless variety). There is also a Chitalpa (*Chitalpa tashkentensis*): a hybrid between the desert willow and the catalpa (*Catalpa bignonioides*).

Featured Bird

Common Name: Loggerhead Shrike
Scientific Name: *Lanius Ludovicianus*



Arizona Game and Fish Department

Kim McReynolds, Area Extension Agent, Natural Resources, University of Arizona Cooperative Extension, Cochise, Graham and Greenlee Counties

Have you ever been out on a hike and found a grasshopper impaled to a barbed wire fence or a mesquite thorn? The responsible party was most likely a hungry Loggerhead Shrike. These birds are year-round residents of Arizona and, unlike other shrike species, only inhabit North America. Their preferred habitat includes semi-open areas. Approximately 8-10 inches in size, the Loggerhead Shrike has a gray back, white throat, whitish chest and a distinguishing black mask that wraps around over the bill. The wings are black with a white patch and the black tail has white outer feathers. Birds with similar coloration that may be confused with the Loggerhead Shrike are the Northern Shrike and Northern Mockingbird. The name "loggerhead" comes from a disproportionately large head to smaller body size. The bill of the loggerhead shrike is stout with a hook at the end. This feature makes it an accomplished predator. Interestingly, the Loggerhead Shrike is a song bird, but displays hawk-like behavior. Their main source of food is large insects such as grasshoppers and locusts. During the winter they will survive on small rodents and birds. Loggerhead Shrikes use lookout perches to scan the country and then swoop down to catch their prey. Because they do not have the strong legs and talons that raptors do, Loggerhead Shrikes impale their prey on thorns or barbed wire before eating it. This can also serve as a means of food storage when hunting is good. Impaling their prey on thorns earned them the nick name of "butcher bird."

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Gene Twaronite



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Cover Photo: Jack Kelly

Susan Pater



Landscaping with Succulents

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Jeff Schlatau

Agaves and cacti are among some of the most beautiful plants that can be grown in our desert environment.

These plants are part of a group called succulents and have developed adaptations to survive in the sometimes harsh desert environment.

Many of these species have a thick waxy coat called a cuticle that minimizes loss of water through their leaves and stems. The leaves of some cacti are modified to form spines, thereby conserving precious water and shading the stem. Some species have beautiful silvery colorations that reflect sunlight; others will literally close up their leaves when under drought or high temperature stress. Most have a vast network of fibrous surface roots that lie just under the soil and are capable of harvesting much of the rainwater that may come their way. For protection, agaves may be armed with spines. It is prudent to approach cacti and agaves carefully since the spines are coated with irritating substances such as steroids. Contact with skin can cause

swelling and numbness. To make matters worse, it's painful and the effect may last several days. It soon makes anyone who works with agaves take pause and be extremely careful. Luckily there are cacti and agaves that are without spines that do not pose a "gardening hazard."

Where do you begin to select from the hundreds of agaves and cacti in garden centers and specialty nurseries? A simple solution would be to choose plants that grow in your area. This simply means that plants that you've seen growing in Lake Havasu City or Yuma will not automatically do well in Tucson or Safford, or our northern towns and

cities. Conversely, species that do well in these northern locales, may struggle with the intense heat of the low deserts. In some locations, container growing of these plants is the most practical solution to avoid the danger of frost. Simply move the plants in containers into the garage or other room that does not freeze and then wait for milder weather to return the plants to your garden.

Driving or walking around your neighborhood will give you an opportunity to observe the 'tried and true' species. Take a visit to your local arboretum or local demonstration garden. Contact Cooperative Extension in your county for local information and informative bulletins on these plants and lastly, visit and talk to your local nurseries.

Now that you've narrowed your choice of species, locate the ideal location for that plant. Observe where that particular species does well. Is it against a west-facing wall? Is it in the dappled shade of a finely leaved tree such as Palo Verde or a Mimosa? Will it interfere with pedestrian access? Does it have spines that are dangerous to adults, children and pets and those who may come in contact with the plant? Will the plant soon out-grow its location? Choose the plant location carefully because once the plants are established, they are not easy to move.

After choosing the physical location, make sure the soil drains quickly and does not remain water-logged or drain poorly. Cactus and agaves will not tolerate such conditions which eventually may pre-dispose the plant to soil-borne pathogens. Heavy clay soil may limit the location of the planting. You may want to consider mounding a rapidly draining soil mix over clay soil to provide a satisfactory environment. Take the time to incorporate some of the soil into the clay soil so there will not be an abrupt change in soil texture which may result in poor drainage.

Planting is a simple operation. Place the plants no more than ¼ inch deeper than they were in their original container or nursery bed. If you plan on mulching the plants, allow for this additional depth. Since cacti, agaves and other succulents do not do well when organic material is placed on their stems, resist the temptation to use compost, ground bark or other organic materials. The best mulch is either crushed rock or decomposed granite. Using these materials will give a clean, neat appearance to your garden, help suppress weeds, decrease water evaporation and help moderate soil temperatures.

One of the toughest decisions for agave and cactus aficionados is "how much water do I give my plants?" Let's think of the plants and how they are irrigated in the wild. A rainstorm may come through and soon after the soil dries out. Then another rain may come along several days later and repeat the process. When watering we are attempting to have the plant dry out between waterings, but also to receive a thorough watering each time we irrigate. Since many of the water absorbing roots of cacti, agaves and other succulents are located just below the soil surface, deep watering is not necessary. As the daytime temperatures cool down and nighttime temperatures



Jack Kelly — Parry's agave (Agave parryi)

Jack Kelly — Golden barrel cactus (*Echinocactus grusonii*)



become chilly, watering may be reduced to once every two weeks and eventually once a month for most varieties of these wonderful plants. If we are fortunate enough to get winter rain, no supplemental irrigation is necessary during the winter months.

What are my favorite species of these plants? I'll share a few of my personal favorites. *Agave parryi huachuensis* (Huachuca agave) is a striking large blue-green plant with a beautifully formed rosette of leaves. *Agave parryi truncata* (Huntington's agave) with its perfectly formed rosette. *Agave Victoria reginae* and *Agave fernandi Regis* are small (up to 16 inches) plants that are strikingly marked and beautifully formed. Cactus that are 'hardy' include *Trichocereus terscheckii* (South American saguaro) which will thrive in cooler locations where our native Saguaro can't. It is a night-blooming cactus with fragrant large white flowers. *Trichocereus* hybrids are a group of plants that have been bred for their spectacular flowers and hardiness. Flowers can grow to 6-8 inches in diameter and come in stunning reds, white, yellow and pink.

Echinocactus grusonii (golden barrel cactus) is a beautiful cactus with pale yellow flowers. What makes the plant stand out are its golden spines. Their dramatic form and color can be the focal point of any garden. In the low desert, golden barrels may need some protection from the sun and a little more water than their neighbors to the north. Another group plants that should be included in your garden are our native agaves. *Agave parryi*, *A. murphyi*, *A. pariflora*, and *A. palmeri* all perform well in the low and mid desert areas.

If you really want something a little different in your garden, give these wonderful low-water desert plants a try. You'll not be disappointed.

Jack Kelly — *Trichocereus* hybrid 'First Light'



Outdoor Cooking: Basic Food Safety Principles



J. Helgason

Marta Elva Stuart, Extension Agent, Family and Consumer Sciences, University of Arizona Cooperative Extension, Yavapai County

Outdoor parties, picnics, hiking, camping and boating are activities we enjoy during the summer months. These types of activities are great fun and usually involve preparing food outdoors. To keep food safe it is important to follow basic food safety principles.

Wash Your Hands	Wash your hands with warm soapy water (100°F-110°F) for at least 20 seconds before handling food, cooking, and eating, and especially after using the bathroom. Always use gloves when you are preparing ready-to-eat foods (foods that are eaten raw). If outdoors, make sure you have soap, water and paper towels available to wash your hands. Use 1 Tablespoon of bleach to 1 gallon of water to sanitize your utensils and surfaces.
Keep Raw Food Separate From Cooked Food	Use a separate plate for raw foods and cooked foods to avoid cross-contamination. Always wash your plates in hot, soapy water before using them again. Keep all utensils and surfaces clean. Wash cutting boards after each use.
Cook Food Thoroughly	To kill harmful bacteria use a food thermometer to cook foods to proper temperature. Cook hamburgers to a minimum of 155°F, poultry to 165°F, and fish to 145°F. For more information on safe food temperatures, visit www.foodsafety.gov/~fsg/fs-cook.html . For information about food thermometers, visit www.fda.gov/fdac/features/1998/598_ther.html
Chill	Food should not be left out for more than two hours. Never leave food out more than one hour when the outside temperature is above 90°F. When bringing cooked foods to an outdoor event, keep the food on ice.

Keep Out of the "Danger Zone"	Bacteria grows rapidly if the food stays in the "Danger Zone" for too long. The "Danger Zone" is between 41°F and 135°F. Cold foods should be held at 41°F or below. Hot foods should be held at 135°F or above. All foods such as potato salad, chicken salad, and ready-to-eat foods should be kept on ice or eaten within two hours of purchase.
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Recommended Websites

Besafefood.gov

Be Food Safe - Clean, Separate, Cook, & Chill. Information for consumers about four basic practices to keep food safe.

www.fda.gov/consumer/updates/bbqbasics052207.html

Barbeque Basics: Tips to Prevent Foodborne Illness.

www.fsis.usda.gov/Fact_Sheets/Handling_Food_Safely_on_the_Road/index.asp
Handling Food Safely on the Road.

www.fsis.usda.gov/Fact_Sheets/Safe_Food_Handling_Fact_Sheets/index.asp
Food Safety Fact sheets for consumers.

www.fsis.usda.gov/Food_Safety_Education/Ask_Karen/index.asp

Have a question about food safety? Ask Karen, the food safety virtual representative. She can answer questions from the public about prevention of foodborne illness, as well as safe handling, preparation, and storage of meat, poultry, and egg products, from an extensive database of food safety information.

Texas Root Rot in Arizona

Mary Olsen, Ph.D., Plant Pathology Extension Specialist, Department of Plant Sciences, University of Arizona

What is Texas root rot?

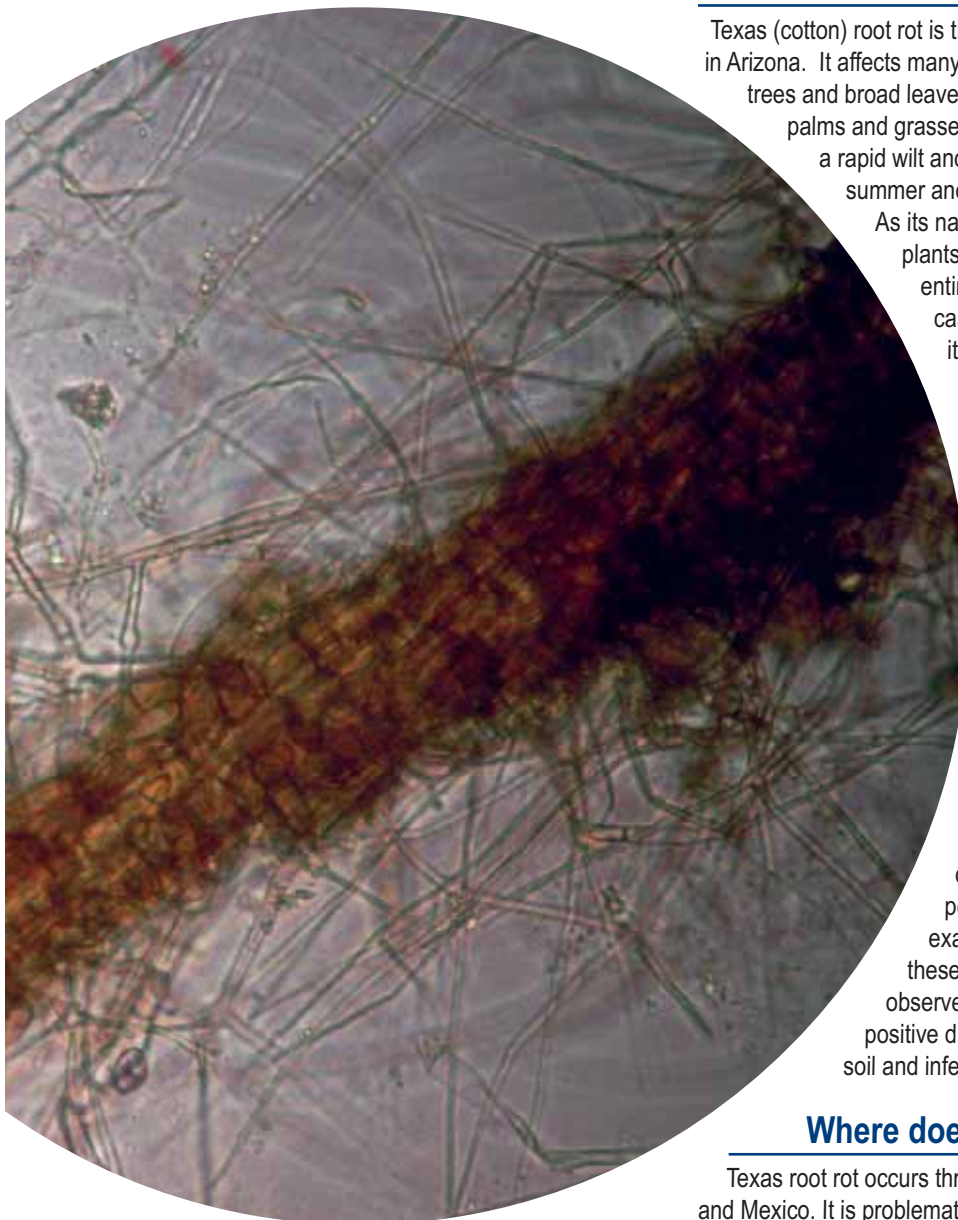
Texas (cotton) root rot is the most serious disease of landscape plants in Arizona. It affects many different dicotyledonous plants such as fruit trees and broad leaved trees and shrubs, but monocots such as palms and grasses are immune. The disease often causes a rapid wilt and death of susceptible plants in late spring, summer and early fall when temperatures are warm.

As its name indicates, the roots of dying or declining plants are rotted. Once symptoms appear, the entire root system is often affected. In most cases the dried leaves remain on the plant after it has died. Rapid wilting and death occurs in hot weather due to the inability of the host plant to take up enough water through its rotted roots. Host plants die rapidly in warm weather as demand for water increases.

The pathogen that causes Texas root rot, *Phymatotrichum omnivorum*, is an indigenous soil borne fungus that is found deep in soils. *P. omnivorum* produces fuzzy thread-like structures called strands that colonize the roots. The strands are made up of hyphae, the "body" of the fungus. *P. omnivorum* utilizes the plant roots as substrate, its sources of nutrients, and causes rot of the entire root system. A dense web of the strands and hyphae often covers the root once the fungus has penetrated and caused decay. With careful examination under at least 10X magnification, these light brown strands or hyphal webs can be observed on the root surface and used to make a positive diagnosis. The strands can grow through the soil and infect healthy roots nearby.

Where does Texas root rot occur?

Texas root rot occurs throughout the southwestern United States and Mexico. It is problematic throughout different areas in Arizona including low elevation deserts such as Phoenix and surrounding areas



Mary Olsen

in Maricopa County; the entire Gila River watershed from Duncan to Yuma; much of Tucson and Pima County; hills and valleys around Benson and into the higher elevation grasslands around Sonoita; and throughout Cochise and Santa Cruz Counties, including Sierra Vista and Nogales. It does not occur above the Mogollon Rim, in the high, cold deserts of northern Arizona, nor in the Flagstaff area, but does occur near Sedona, the Verde Valley and Cottonwood, and near Kingman.

How do you know if Texas root rot has killed a plant?

Since other pathogens can cause root rots, and other factors such as termination of irrigation or chemical damage could result in similar symptoms, it is very important that a positive identification be made by an experienced person. Hyphae and strands of the fungus used for diagnosis are easiest to find on roots that still have their bark, and are at least as large as a pencil. If the plant is dead or dying, as much of the root system as possible should be salvaged when it is removed. At that time, samples of rotting and discolored roots on which the outer or cortical tissue still remains attached should be cut and stored in a plastic bag in the refrigerator until examined for signs of the *P. omnivorum* fungus.

Can Texas root rot be controlled in landscape trees and shrubs?

Attempts to control Texas root rot usually are not recommended. There are no treatments that give consistent results, especially in very susceptible hosts. Treatments with soil additives, such as manures and fertilizers, are rarely successful, especially for long term control. Chemical controls including fumigants have been successful in some cases, but are expensive, must be applied by a licensed applicator, and must be repeated every year or two in order to sustain disease control. Unfortunately, there is no way to test soils for presence of the fungus before planting.

The best control is avoidance

Susceptible plants should not be planted in areas where Texas root rot is known to occur. Fruit and nut trees such as wine grapes, figs, apples, loquat, peaches and apricots are extremely susceptible; landscape trees such as ash, elms, bottle tree, silk oak, pepper tree and African sumac are considered very susceptible. Many shrubs including pomegranate, xylosma, cassia, Mexican bird of paradise, oleander, and roses also are very susceptible. Citrus, eucalyptus, tamarisk, live oak and pine are considered more tolerant, but Texas root rot has been confirmed on all of these trees. Others, including evergreens such as Arizona and Italian cypress, mesquites, palo verde, Atriplex species, hackberry, jojoba, and cacti are very tolerant.

All monocots, such as palms, yuccas, agaves and grasses are immune and are good choices to plant anywhere that Texas root rot has been observed. Annuals usually escape disease since they are in the ground such a short time. There is no evidence that Texas root rot kills native plants in their natural habitat, but it can occur on native plants that are used in landscapes. Examples are native oaks, cottonwood and sycamore that have died of Texas root rot when planted into yards, often near their native habitat. So beware! We still have a lot to learn about the susceptibility of native plants.



Jim Byrum

Open Range Laws



C. B. Lane, Executive Vice President for the Arizona Cattle Growers' Association and the Arizona Wool Producers Association

John Hays

The open range concept came about because there were large ranches with small parcels of land owned by someone else within the boundaries of the ranch. The ranch has boundary fences around the outside of the entire ranch, and internal fences to form pastures, but you cannot force the ranch to fence off each small parcel that is within the boundaries, as opposed to each landowner fencing his own land.

Open Range law is actually a misnomer. There is not a "law" that defines open range in Arizona. Instead, the Arizona Department of Agriculture's Arizona Revised Statutes (ARS) Title 3, Article 8 (No-Fence Districts) contains nine separate statutes that comprise the open range laws of the State. These "laws" say how you may collect damages for harm livestock do to your property. In other words, if you don't want livestock on your property, build a fence around your property.

There are two key statutes: ARS 3-1426 defines a "legal fence" and ARS 3-1428 tells you that if the livestock have broken through the "legal fence" you can collect damages. In common terms what this means is that if you do not want livestock on your property, outside of cities or towns, you must build and maintain a fence around your property. Actually, if the fence is constructed and maintained as defined in the law, you won't have livestock on your property.

This does not apply to "no fence districts," as defined in ARS 3-1421, 1422 and 1424. A "no fence district" is a designated area (usually an irrigation district adjacent to a city or town) that requires livestock owners to fence their livestock in to keep them off other people's property.

In general, the landowner who is concerned with livestock damaging plants and other private property has an obligation to fence his/her private land with a lawful fence to keep animals out.





Grazing Management 101

George Ruyle, Ph.D., Range Management Extension Specialist, School of Natural Resources, University of Arizona

Grazing management usually refers to controlling the amount and timing of livestock grazing to achieve a particular set of objectives related to both livestock production and aspects of the range vegetation, usually referred to as range condition. Grazing management is based on the general concept of resource sustainability where short term production should not be at the expense of long term potential. Goals and objectives of grazing management should involve consideration of ecological, social, and economic values.

Grazing management may be designed to maximize production efficiency in terms of the managers' aims (profit, security of income, etc.), stabilize animal production over time, and provide long term resource conservation from both ecological and economic perspectives. Over the short term, one or a few years, maximizing animal production may be contrary to maintaining or improving range conditions. However, over the long term continued high levels of animal production are possible if proper attention is paid to the production of the rangeland forage base.

There are many key decisions that must be made in the design and implementation of grazing management, but few are as important or controversial as stocking rate. Stocking rate is the total number of animals per unit area of land available for grazing (the management unit) for a specific period of time. In the Southwest we usually express stocking rate as animal units (AU) per section of land, but the concept applies generally to the amount of land allocated to each AU over a specified time

period. Stocking rate can be expressed several different ways. These include AU/Section/Year, AUM/Acre, Acres/AUM and Animal Days/Acre. For ease of interpretation the expression of animals/area is usually preferable. Expressions of stocking rate require specific definitions of additional terms with technical meanings. These include:

- Animal Unit (AU)
- Animal Unit Equivalents (AUE)
- Substitution Ratios (cattle, horses, sheep/ goats have different equivalents)
- Animal Unit Month (AUM)

Other technical terms with specific definitions that help describe grazing management are stocking density and grazing pressure. Stocking density is the number of animals per unit area at a given time. Grazing pressure is an instantaneous measure of the number of animals per unit of available forage (e.g., yearling days per 100 pounds of forage). These expressions are important because they each have a different relationship in terms of the response of the range to grazing and the response of the animals to the available forage.

To understand how grazing management may affect range condition one must have knowledge of how individual plants are affected by grazing and how plants interact with each other in plant communities. How grazing influences a particular plant's ability to grow, survive stress periods and reproduce depends on the plant's life form, grazing intensity and frequency, and the season of use. Season of use is related to the phenological (active

growth, flowering, seeding, etc.) stage of a plant and the growing conditions when defoliation occurs. The interaction of all of these factors combined with competition from other plants, herbivory by different species of animals, and past and current weather contribute to current range condition.

In addition to stocking rate decisions, grazing management applies five basic tools to influence these processes. The use of these tools can influence how individual plants and plant communities respond to grazing which in turn influences the rangeland condition or health and the forage resource as a whole. These five tools of grazing management can be applied to influence the effects of grazing which in turn relates to range conditions and animal production.

- Intensity of grazing—the level of use on individual plants. This describes the amount of plant material removed when a grazing animal bites a plant.
- Frequency of grazing—how many times an individual plant is defoliated (or grazed) during a specific grazing period.
- Season of grazing—the time of year that animals graze a plant in relation to its phenological development.
- Animal distribution—how evenly distributed animals scatter themselves across the landscape and relates to the distribution of utilization.
- Kind or class of livestock—the species, sex, age, or breed of animals that are stocked on the range.



ATV Riding Tips for Safe Summer Fun

The weekend signals the start of outdoor fun for many people and a time for enjoyable activities such as riding ATVs (all-terrain vehicles). Unfortunately, national statistics indicate that ATV safety is often taken lightly. According to the United States Consumer Product Safety Commission, more than 125,500 people have been seriously injured in ATV-associated accidents since 1982, and more than 5,700 people have been killed. Children are at the highest risk, with the under-16 age group accounting for more than 31% of injuries in 2003.



The 4-H Community ATV Safety Program recommends these tips for ATV safety:



SELECT the right model ATV. Make sure it is right for age, size, strength and skill level. Kids under age 16 years should not be riding ATVs with an engine size over 90cc and under age 12 should not be riding an ATV with an engine size 70cc or greater.



PROTECT your body. At a minimum, always wear a helmet, face shield or goggles, long sleeved shirt, gloves, long pants and leather boots. The helmet should be designed for motorcycle use, properly fitted and comply with current US Department of Transportation safety standards.



RESPECT yourself, proper use of roads and trails, other people and laws. The top risk factors involving ATV accidents include riding double and riding on pavement. Never carry a passenger or hitch a ride. Ride only on designated trails, never on or alongside paved roads. Be courteous to hikers, bikers, cars and other ATV operators. Supervise children riding ATVs at all times. Learn and follow your state's ATV operation laws and read the manufacturer's warning label on every machine.



INSPECT your vehicle. Maintain recommended tire pressure, make sure your brakes are adjusted correctly, check that fuel and oil levels are sufficient, ensure that all connections and cables are secure and test your headlights and taillights.



PERFECT your skills. Learn proper handling of your ATV by reading the safety manual that came with your ATV when it was purchased new and taking an approved safety course from a certified instructor.

What is That Plant?

Take this quiz and see if you can identify these plants found in Arizona. While you are taking the quiz, determine if the plants are good, bad or harmless. The answers can be found on page 17.



Susan Pater

1

This plant is called _____
Is this plant good, bad, or harmless?



Kim McReynolds

2

This plant is called _____
Is this plant good, bad, or harmless?



Kim McReynolds

3

This plant is called _____
Is this plant good, bad, or harmless?



Ed Northam

4

This plant is called _____
Is this plant good, bad, or harmless?



Eddie Foster

5

This plant is called _____
Is this plant good, bad, or harmless?



Susan Pater

6

This plant is called _____
Is this plant good, bad, or harmless?

Kevin Fitzsimmons, Ph.D., Aquaculture Extension Specialist,
Department of Soil, Water and Environmental Science,
University of Arizona

Water Gardens

Water gardens and fish ponds have been popular for many years in deserts around the world. The soothing sounds of moving water, cooling breezes from the evaporation, and fragrances from blooming flowers have enchanted owners for centuries. However, maintaining a water garden and/or fish pond in the desert is not simple. Today, concerns over breeding of disease transmitting mosquitoes, importation of invasive plants and fish, and conservative use of water and electricity, all make things a bit more complicated. Nevertheless, with proper planning, design, construction and operation, an environmentally appropriate system can be achieved at a reasonable cost.

The critical concepts to be considered are that the system must have a sealed bottom or container, that the mix of plants and water will not evaporate so quickly that the plants become desiccated, and that any aquatic plants and animals in the system can be kept healthy and that they will not harm the environment if (when) they escape. A water garden can be assembled from something as simple as a whiskey or wine barrel cut in half or a plastic lined pool dug into a garden bed. Home improvement stores have fully formed plastic pools that can be placed into a hole in the ground. Some do-it-yourself-kits include: pumps, filters, waterfall features and instruction manuals. Fish and plants are available at some of these same home stores and most plant nurseries. Several water garden and koi clubs are active in Arizona and are great sources of experienced gardeners and sometimes cuttings of appropriate plants.

Arizona Department of Agriculture bans several species of aquatic plants as invasives that could, and do, cause significant harm to the environment and irrigation districts. Specifically, water hyacinth (*Eichornia crassipes*) and giant salvinia (*Salvinia molesta*) are considered noxious weeds. It is also illegal to collect wild aquatic animals (fish, frogs, turtles, salamanders, crayfish) and transfer them to private ponds without permits issued by the Arizona Game and Fish Department.

Getting started

First, determine how large a water garden you want to maintain. Very small systems (barrel or less than 50 gallons) and very large systems (swimming pool size fish ponds of 20,000 + gallons) will each require daily maintenance. Systems in between, can be maintenance free for several days even in the heat of summer. Small systems will evaporate so much from dry conditions, that the plants will be continually stressed. In winter, small systems may freeze solid. A barrel system will also only hold a couple of goldfish or a frog.

Second, determine if electricity will be available. Water motion will be necessary to support anything more than one or two fish and to reduce the opportunity for mosquitoes to breed. It is also obviously needed to run a fountain or water fall (unless you have a windmill handy).



If you decide that you want to try a system containing a couple of hundred gallons, you have the option of purchasing a pre-made pool, or water trough, digging the pool and lining with plastic or concrete, or building above ground with cement blocks, stones, and a liner. Many examples of each can be seen around the state or on the web, and each has advantages and disadvantages.

cals.arizona.edu/azaqua/extension/watergardens.html

Next step

Once you have decided on size and type of container, it is normally a good idea to fill and change the water in the container at least twice. Plastics, concrete, and galvanized metal all will leach compounds to some extent. A couple of water changes will remove at least the first flush of leachates, some of which may be toxic to aquatic plants and animals. This water will still be fine for irrigation of outdoor landscape plants which are better adapted. If you would like to have fish and plants, it is best that rooted plants be placed in pots with the soil covered by rocks so the fish will not pull the soil out looking for food or nest spots. Floating plants are fine in water gardens and pools, but fish will often eat the roots. This will limit their growth which may be fine as floating plants tend to grow rapidly in the desert sun and heat.

Pumps and filters

Water motion is important for water gardens for practical as well as aesthetic reasons. Moving water transfers oxygen, carbon dioxide, nitrogen and phosphorus, between the parts of the system that produce and need the compounds. For example, fish and bacteria produce carbon dioxide and nitrogen that plants need for photosynthesis and growth, while the plant produces oxygen and organic matter that the fish and bacteria need for respiration and growth. A submersible pump is typically the best to use, as it is less likely to run dry. A garden with just plants can be operated without a pump, but careful attention is required to ensure proper nutrition and control of mosquitoes, which do not do well in moving water. Two types of filters are used in ponds and water gardens. Mechanical filters trap and remove large particles

from leaves down to individual cells of algae. Biological filters trap and transform very small particulates and dissolved compounds. Biological filters are most important for converting wastes from fish and other animals into the forms of nitrogen and phosphorus that plants use for growth. Biological filters support beneficial bacteria that transform wastes into fertilizers.

Stocking plants

Aquatic plants are generally categorized as floating, emergent or submerged. Floating and emergent plants tend to be most popular for water gardens. Water lilies, duckweeds, rushes, reeds and other popular plants can be obtained from nurseries or other home gardeners. Careful inspection of plants is advised to insure that you do not import pests. If fish are to be added, the plants should definitely be planted in clay or plastic pots that are submerged. The soil surface should be covered with stones that are too big for fish to disturb. A good potting soil mixed with sand is normally sufficient for several years of growth.

Fish

Gold fish and koi are the most popular for water gardens as they are very hardy and colorful. These fish can be obtained from most pet stores and some plant nurseries. They can normally survive cold winter temperatures and summer heat. A common problem with fish is overfeeding. In winter fish will eat sparingly, in summer they will be voracious eaters. However, any food introduced to the system must be processed, either as digested food from the fish, or as decomposed pellets by the bacteria. These then become nutrients that must be taken up by algae or higher plants. Our general advice is to feed lightly when you start your pond and increase only gradually as you determine how your water garden best operates as an ecological unit.

Water gardens and fish ponds can be entertaining and educational when carefully planned and operated. Arizona is richer with these small ecosystems which will surely attract birds, butterflies and other local inhabitants in addition to those stocked by the owner.



Kevin Fitzsimmons

Shocking Facts about Arizona Lightning

Adam Block/NOAA/AURANSF

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Arizona is world renowned for its spectacular lightning displays. The summer monsoon brings the key atmospheric ingredient of moisture into the state, setting the stage for the development of strong thunderstorms. Intensified updrafts in storms separate electrostatic charges between water vapor and ice particles. These charges build up in different parts of the storm cloud as well as on the ground until the charge separation is too great and an electrical discharge occurs. This discharge is what we know as lightning. Have you ever walked across a carpeted room, touched a doorknob and received a small shock? That static discharge is very similar to lightning on a very small scale.

Lightning Questions and Answers

- How much energy is in the average lightning strike? One cloud-to-ground lightning strike can generate between 100 million and 1 billion volts and reach temperatures of over 50,000°F.
- What is thunder? Thunder is a shockwave generated by the lightning path super-heating the atmosphere around the discharge path. Light is faster than sound, which is why thunder lags behind the lightning flash.
- How many lightning strikes occur on average in Arizona? The National Lightning Detection Network (based in Tucson, Arizona) can monitor all lightning strikes that occur over the continental United States. The average number of strikes in Arizona between 1996 and 2005 was over 600,000 strikes per year!
- When does lightning occur in Arizona? The summer monsoon season (July, August and September) is when Arizona experiences most of its thunderstorm activity, but lightning can occur with storms any month of the year.

- What is heat lightning? Heat lightning is observing lightning from storms too far away for the thunder to be heard. Thunder typically does not travel anymore than fifteen miles away from the originating lightning flash.
- How can I tell how far lightning is away? As soon as you see a lightning flash start counting. It takes thunder about 5 seconds to travel one mile from the originating flash. That means if you count to 5 and then hear the boom of thunder the lightning is approximately 1 mile away. (10 seconds = 2 miles, 15 seconds = 3 miles...). If you hear thunder before you count to 30 seconds lightning is very close and dangerous!
- How dangerous is lightning? Lightning is very dangerous! It is the number two weather related killer in the United States killing an average of 73 people each year. Nine lightning related deaths were recorded in Arizona between 1997 and 2006.
- What should I do if I am working outside and hear thunder or see lightning? Seek shelter immediately! A house with wiring and plumbing offers the greatest protection against a lightning strike. Stay away from electrical appliances, telephones and plumbing during the storm. If housing is not nearby, seek shelter in a vehicle with a metal roof. The metal body of the vehicle will provide a path to conduct electricity away from you in the case of a potential strike. Plan ahead for lightning when working outside.

Much of the information presented here was gathered from the National Weather Service Lightning Safety Webpage.

See www.lightningsafety.noaa.gov/ for more information.

What is That Plant?

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ANSWERS

FROM PAGE 13



Plant No. 1 is a native globemallow. There are approximately 12 species (and several varieties) found in Arizona. Flower color varies from apricot (the most common)

to red, pink, lavender, pale yellow and white. Many of the globemallows flower in spring and again in summer. Another common name for globemallow is sore-eye poppy, from claims that the plant irritates the eyes. However, Native Americans used the plant for healing some ailments and the stems as a type of chewing gum. Globemallow colors the Arizona landscape in the spring and summer and provides some forage for wildlife and livestock. Despite the sore-eye claim, globemallow has more good attributes than bad.



Plant No. 2 is Russian knapweed, a foreign pest that originated in southwestern Asia and Eurasia. This is clearly a bad plant. One attribute of Russian knapweed is its ability to

establish nearly single species infestations if it is not eradicated during early stages. Deep, extensive, perennial roots that propagate from vegetative buds enable Russian knapweed to encroach into and then dominate a wide range of habitats. The leaves and stems are poisonous to horses, but they will not graze this weed unless there is nothing else to eat. However, hay contaminated with Russian knapweed can poison horses. Poisoning by this knapweed causes a condition known as chewing disease in which jaw and throat muscles are paralyzed to the point horses can not chew or swallow.



Plant No. 3 is a native grass called tobosa. It occurs in heavy clay soils in central and southern Arizona. A close relative is galleta, which is found in northern Arizona and

the Mohave desert. Both of these perennial grasses provide soil protection, cover for wildlife and forage for livestock. Tobosa exhibits most of its growth (and grazing potential) during the summer monsoon season, drying out to a coarse, low value forage during the winter. This plant would fit in the good or harmless category.



Plant No. 4 is another bad one - buffelgrass. Based on botanical evidence, this grass was first introduced into Arizona between

1938 and 1944. By 1979, this African grass was widely distributed across the Sonoran Desert in Arizona. Buffelgrass is drought-tolerant and easily colonizes and spreads. This adds a fuel source for wildfires that historically did not occur in the Sonoran Desert. Many native desert plants such as saguaro, palo verde and ironwood are not tolerant of fire. As buffelgrass increases, the probability for more fire and less native Sonoran Desert vegetation increases. Winter temperatures limit distribution in Arizona to warm deserts.



Plant No. 5 is Malta starthistle and is another plant not native to Arizona. Malta starthistle is an annual that germinates when moisture is available

during fall or winter, survives winter as rosette and then produces yellow flowers with spines and seeds in May and June. This weed is native to southern Europe and was first documented in Arizona in 1901. Infestations typically inhabit areas that receive some kind of disturbance. Due to this weed's fall and winter growing season, by early spring the plants are already aggressive competitors for space, moisture, light and nutrients before native plants begin their spring emergence. This plant is definitely a bad one.



Plant No. 6 is a native known by such names as silverleaf nightshade, white horse-nettle, or blueweed. It grows on rangeland, disturbed sites in urban areas,

roadways, and farm fields. Though some people may put it in the harmless category, others would call it a problematic weed. It is not readily eaten by livestock due the spines, but it is poisonous. The small fruits (green or dry) are the most poisonous part of the plant. Interestingly, the fruits have been used by Mexicans and Native Americans to curdle milk for home-made cheese. Some people might think of this plant as harmless, while others consider it bad.



Can a Cactus Save Your Home From Wildfire?

Meckenzie Helmandollar

Gene Twaronite, Instructional Specialist, Wildfire Defensible Space, University of Arizona Cooperative Extension, Yavapai County

While no plant is fireproof, there are certain characteristics which make some plants more resistive to fire. If you live in an area prone to wildfire (which includes much of Arizona's grasslands, foothills and mountains), choosing fire-resistive plants for your landscape can be a key factor in whether your home survives the next fire.

Admittedly, if your house lies in the path of an uncontrolled, catastrophic wildfire, no fire-resistive plant will save it. But most wildland house fires start not as a result of being engulfed by the main fire, but rather from floating embers carried far aloft and the creeping surface fires they ignite. Visualizing how these potential spot fires might move through your landscape is critical. Obviously you do not want plants near your home that will burn with high intensity or that will readily carry fire.

While all plants are potential fuel for wildfire, fire-resistive plants generally burn at a lower intensity, spread slower and have shorter

flame lengths. They burn this way due to various characteristics, including their chemical composition, form, growth habits, adaptations and maintenance.

Perhaps the most important characteristic is the total amount of moisture a plant contains relative to its dry weight. This is what makes a cactus (or any other succulent such as an agave) the perfect choice for a fire prone landscape. A plant that has the ability to store water is not one that will readily ignite or carry fire. But even a cactus needs regular watering during the hottest months to maintain its fire-resistive qualities; otherwise, parts of the plant will shrivel and die, providing a ready fuel source. A succulent, however, will require substantially less water to keep it green and healthy – an important fact to consider in this arid region.

Deciduous trees and shrubs (those that lose their leaves in the fall) also tend to hold more moisture. They are an excellent choice

to replace more flammable trees and shrubs in the area of wildfire-defensible space immediately surrounding your home.

Another important characteristic is a plant's chemical content, particularly with regard to how much resin or other volatile compounds it contains. These chemicals cause the plant to burn more readily and with such great intensity and flame heights that in some wildfire literature they are referred to as "gasoline plants." Included here would be most coniferous evergreen trees and shrubs (such as pines, spruces, junipers, cypresses, and arborvitaes) and many of the chaparral species of shrubs such as manzanitas (*Arctostaphylos* spp). Even when well irrigated, such plants still burn readily (as anyone who has burned piles of fresh cut juniper branches can attest). Though they are still not good choices for within 30 feet of your home, in some cases such plants can be "tamed" and made more fire-resistant through proper pruning and thinning.

Low growing plants also tend to be more fire-resistant because they produce shorter flame heights and offer the advancing fire less total vegetation (fuel). Included here would be irrigated turf (or some of the shorter native bunchgrasses), many groundcovers and wildflowers, and shrubs that grow to a height of less than 2 feet at maturity. There are even some creeping species and varieties of manzanita that can be

considered fire-resistant. For example, bearberry (*Arctostaphylos uva-ursi*), only grows 6 inches high and very slowly at that.

This brings up another point. Often it is a combination of characteristics that makes a plant more fire-resistant. Thus a plant that is both low growing and slow growing is a much better choice than either of these characteristics alone. A gambel oak (*Quercus gambelii*) is fire-resistant not only because it is (a) deciduous, but also because it is (b) deeply rooted and drought tolerant, and (c) requires little maintenance because of its slow growth habit.

Some salt tolerant plant species also show a natural fire resistance, such as four-wing saltbush (*Atriplex canescens*). Just because a plant is salt tolerant, however, does not necessarily make it fire-resistant. The invasive, non-native saltcedar (*Tamarix ramosissima*), though salt tolerant, contains volatile oils that make it highly flammable; it also grows rapidly and displaces more desirable native plants.

Though choosing fire-resistant plants is critical, even more important is how and where you plant them. Overly dense plantings of fire-resistant plants can create higher fuel loads that can nullify any fire-resistant qualities they may possess. Maintenance is also important; a plant that is dead or poorly maintained is no longer fire-resistant.

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