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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).



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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.



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