Introduction

Gardening in small spaces is a challenge only because the possibilities of container choice, plant selection, color combinations and theme gardens are endless! "A small garden should not lack impact. Provided it is well planted and has some strong focal points, it becomes easy to ignore the limitations of its size." (Small and Container Gardening, by McHoy and Donaldson). In the Southwest deserts, three challenges emerge when gardening in containers, and by solving those challenges, success with container gardens is almost assured. Increasing water retention, providing excellent drainage, and modifying the alkalinity of the water are those challenges that require our attention.

Principles and Mechanics of Container Gardening

- **Light**
  - The exposure in which the plant will be placed is very important for success with the plant. Choosing the right plant for the exposure helps to ensure success! Plants requiring full sunlight in more temperate climates may flourish in a partial shade area in the Sonoran Desert. Utilize the shade of trees or buildings to temper the “4 o’clock afternoon summer sun” that would otherwise stress or even kill the plant. Make shade structures for Western exposures to protect plants if no other shade is available. Shade screen is available in small or large lengths at nurseries; use the 50% shade for these structures.

- **Container**
  - The choices of container styles available are endless. They can be old or new, clay or plastic, resin or concrete (but do not choose a metal container for the desert Southwest climate), rubber nursery containers, old shoes, baskets, plastic buckets, wine barrels, wooden troughs. The container can echo your garden style or decorating style, it can be formal or informal, it can be amusing or classic.
  - The container for use in the desert climate should be larger than those that may have been used in the Midwest or eastern part of the country. So long to those 4 and 6-inch pots!

- **Summer afternoon sun notwithstanding, most flowering plants and vegetables need a minimum of 6 full hours of sun per day, and many flourish in sun all day long. Thus, with the lower sun position of winter time, container plants may have to be moved into a different exposure to get that amount of sun, i.e., the Southwest exposure.**

- **What to do if you have a full shade situation, such as north-facing patio, balcony or porch, or deep overhang over a patio? Use those fabulous tropical houseplants available in nurseries throughout the Valley, and seek out shade-loving plant lists from sources such as the Sunset Western Garden Guide. A shady area can be a lush, tropical paradise, even including flowering plants.**

- **Containers almost always must have a drainage hole that is the diameter of your thumb, at least one hole and for larger containers, several. Drill the holes yourself or have them drilled by the garden center where they are bought if they come without.**

- **Consider double-potting if using a beautiful container without a hole, with the slightly smaller utilitarian (terra cotta) pot placed inside the larger container, sitting up on bricks or a bed of pebbles so the drainage hole in the inner pot is well above the water level in the larger pot.**
Clay pots are traditional and provide excellent movement of moisture and air through the walls of the pot; they are “mini swamp coolers” in high ambient temperatures of summer, in that heat is used from the root zone to evaporate water from the liquid to the gas through clay container walls; thus clay containers are cooler in the summer and provide more “root friendly” temperatures.

Plastic pots are much lighter in weight for hanging or moving about, though I use them only during the cool season.

A hint about containers: Buy two or more of the same size, and start a new season’s plants while the current season plants look their full-grown best. Then, don’t toss out the old plants just because the new season plants have to get planted (as happens with changing out garden beds). Peppers have time to complete their cycle; another pot with the cabbage just starting, and it can be moved into position when the pepper finally bids farewell. Or, petunias are getting their start in September or October while the summer plants are still blooming, and can then be moved into position when the summer plants finish their season.

Plants can sometimes be kept alive by utilizing the microclimates in the garden, perhaps keeping basil into winter by moving it to a southern exposure, or overwintering a tomato in a protected area, to allow it to start blossoming in very early spring as its roots are healthy and more mature. Keep plants that go dormant, either in summer or winter, in a “holding” area in your garden, away from the center of attention, but still available for care and for the time they pop back to active growth.

- **Drainage**
  - Water must be able to drain out of the container (except for water gardens!) to prevent root rot and salt burn. Holes can be drilled in those pots without them to assure adequate drainage, and sometimes existing holes need to be enlarged. Water container plants until water drains out the bottom. Resorption of water back into the root zone can cause salt build-up and toxicity here, so empty those saucers within about an hour of watering the plant (or don’t even use saucers at all!).

- **Water**
  - The watering schedule will vary by the needs of the plant, the season, the amount of light available, and the growing medium used.
  - Manipulating the container, growing medium and placement of plants can decrease the workload of constant watering, and still keep the plant, and the gardener, happy. This is one of the many benefits of gardening in containers.
  - Try a watering wand with a shut-off valve at the end of the hose—its longer reach makes watering easier, and turning it off when moving between plants helps conserve water.
  - If the hole is in the bottom of the pot (almost always), raise the pot above the surface, either on commercially available “pot feet” or on bricks, saucers, etc., allowing water to drain out unimpeded and air circulation. Notice that rubber nursery containers have the holes on the sides of the bottom so they can sit directly on the patio or soil surface and still drain well. Consider drilling holes in that manner in pots without holes.
  - Routine thorough flushing of the root ball of your plants so that the water drips through for a few minutes flushes excess salts, (including fertilizer salts), out of the growing medium.
  - Using containers for plants can also conserve water, as water is applied only to the container and not to the whole ground area around a plant. The water is contained just where it is needed.
  - Container plants in the garden and patio can be put on a drip system—clear plastic hose is available that fades into the background.
• **Fertilizer**
  - Container plants need nutrients nearly constantly. I fertilize most, but not all, plants with dilute amounts of water-soluble fertilizer, every 2-3 weeks, or at every watering in winter (succulents and cacti need fertilizer only once or twice a year, and only during their growing season).
  - Use a basic all-purpose fertilizer for most green plants, but change to a high phosphorous (the middle number on the fertilizer container) fertilizer for flowering plants (one brand name is SuperBloom) and look for the middle number (phosphorous) of 50 or 60. Most fertilizer makers make a high-phosphorous fertilizer. Or, consider “super triple phosphate” to add the needed phosphate.
  - Interestingly, phosphate also encourages root and stem growth as well as flowers, so it is an excellent material to use at planting time.
  - Some fertilizers include micronutrients, and when used, may seem to perk up the plants. Some gardeners use fish emulsion, manure tea and even worm castings to supply some of these fertilizer and micronutrients organically. Blood meal provides adequate nitrogen (the first number on the fertilizer container) and bone meal provides phosphorous (the second number on the fertilizer container). (The third number, potassium, is plentiful in our soils and water, and desert horticulturists generally do not supplement the potassium.)

• **Air**
  - Roots need air, as does the plant above soil level. The root zone needs air spaces, for healthy growth, and the plant above soil level needs moving air to provide the carbon dioxide and fresh air needed for growth and to help prevent mildews and molds.

• **Pest Management**
  - The environmentally sensitive gardener will favor the least amount of chemical insecticide use as possible, and try the least toxic methods of pest management first. Sprays of water, soapy water (1-3 tsp. per gallon of water), Safer’s insecticidal soap, and use of B.T. (Bacillus thuringiensis) on plants susceptible to larval damage, seems to work for most infestations, but sometimes other agents need to be used. Follow instructions on the container meticulously. Do not subscribe to the “if some is good, then more is better” theory of chemical use.
  - Care must be taken when using chemicals on food crops; read the directions on the container closely.

• **Pollination**
  - On vegetables and fruits, fruit set can sometimes be a problem in city gardens; give nature a hand at pollinating those tomatoes, squash and cucumbers by gently shaking the self-pollinating plant, or using a tiny brush to transfer pollen from male flowers to the female.

• **Growing Medium (soil-less mixes)**
  - Virtually all newly purchased plants need to be repotted with a prepared growing medium. Suggested growing media are listed below. These recipes can be modified by personal experimentation, but these suggested work very well.

  | The all-purpose mix listed provides adequate drainage to prevent disease problems, holds moisture to be gradually released to the plant, and raises humidity levels around the plant |
  | Use an appropriate medium for the type of plant, i.e., succulents vs. veggies, etc. |
Our desert soils do not make an adequate growing medium for most container plants (possibly excluding cacti & succulents), and it may contain disease organisms or weed seeds that may contaminate container plantings. Growing medium mixes are listed below. The first is an all-purpose mix for non-native plants, flowering plants, veggies and houseplants. The second is the recipe for succulents and cacti. The third is a light-weight mix to use when the weight of a heavy pot becomes an issue. These are not the only mixes that work; however, they work so well that they can become your standard mixes. Just shift to the succulent mix when planting those wonderful succulents and cacti.

**GROWING MEDIUM -- I**

**ALL-PURPOSE MIX**
- One-third high quality commercial potting soil
- One-third pumice (or perlite if in a pinch)
- One-third shredded sphagnum peat moss or sifted home-made compost

The ingredients I prefer and recommend most highly are pumice and shredded peat moss or sifted home-made compost. I strongly prefer pumice instead of perlite; it holds water within each particle, so it helps to prevent root rot by soaking up excess water in the soil medium. Pumice is heavier and doesn’t float out of the mix with watering or rain, helps make the soil more crumbly and adds air spaces, making the soil very “root friendly”. The organic materials (peat moss, compost or the newly available coir bricks) soak up water like a sponge, and then release it slowly to the mix. They also generate an acid reaction in the soil as they break down, helping to modify the alkalinity of our water. Thus they help make the mix more neutral between acid and alkaline, which most non-native plants prefer and actually must have for proper growth.

This mix can be used for virtually all houseplants and most garden plants, but use the cacti and succulent mix below for those plants. Many horticulturalists in the Valley use sand instead of or along with pumice or perlite. Sand can certainly be used, but note that it is finer and clumps together more than pumice, and doesn’t hold water as pumice does.

Home-made compost, well rotted (so the composting action has stopped) and sieved, can be used in place of the peat moss as well. The organic material adds some acidity to the mix, counteracting the alkaline conditions of Arizona water.

**GROWING MEDIUM -- II**

**SUCCULENTS AND CACTI**
- Two to three parts pumice
- One part potting mix

This mix is used by horticulturalists at the Desert Botanical Garden for their cacti and succulent plantings. Also, cacti and succulents can be rooted in this mix, or in a 100% pumice medium.
LIGHTWEIGHT MIX--CAN BE USED FOR HANGING BASKETS OR WHERE WEIGHT IS AN ISSUE
(Though I still use the all-purpose mix listed above in hanging baskets)

- One-third vermiculite
- One-third perlite
- One-third shredded peat moss

Compost can be added to this mix as well.

- Planting
  Plant vegetables, herbs and flowers for the season to ensure success in gardening in the Sonoran Desert.
  - Cool season plants can tolerate some degree of frost, produce well even with cold nights, and grow well with the lower light levels, shorter days and lower temperatures of the cool season.
  - Warm season plants need warmer soil temperature to germinate (if grown from seed), need higher light and heat levels to grow and fruit vigorously, and cannot normally tolerate frost. **Planting for the seasons ensures season-long success of your garden.**
  - Vegetables and flowers that can do very well here are the short season varieties -- we actually have two short seasons, not one very long one. A short-season tomato can produce before frost, and a short-season cabbage can produce before the heat of summer, which might make it bolt (go to seed instead of growing slowly and making a head).

- Choosing a Healthy Plant
  - Train your eye to pick out healthy plants by looking through nurseries, plant stores, etc. Once you know what is healthy, it is quite easy to find the unusual specimen, and the well grown one.
  - Plants should be stocky, and should not look too large for the container.
  - Plants should be a healthy color and not look “washed out”. Those yellowing plants have suffered from too low a light level or overwatering in their early growth.
  - Many nurseries now grow their seedlings right here in the Valley. When plants start their life here, they acclimate better and more quickly than those that start in San Diego and then travel to Phoenix. Ask where the seedling plants were grown! Local nurseries here pride themselves on growing many of their own seedling plants.

  - Plant so that the bottom of the root ball is in firm contact with the soil, and water in well. The top layer of soil should be about one inch below the top edge of the pot, and the soil should be smooth and level.
  - Plants in containers can be placed much closer together than normally recommended for those in the ground. This makes a more lush, fuller looking container sooner in the season. Generally, use of the larger plants available also makes the container look fuller sooner, and then it stays looking great for a longer period of time.

  - A note: Planting vegetables and flowers from seed is a rewarding way for the gardener to obtain a wider choice of varieties, as well as being less expensive. Some successful container gardeners seed directly into the top of the end-use container; others set out seed in seed flats or other seed starting units. As germination of many plants is fairly uniform and rapid under proper conditions, starting your own plants from seed can be very rewarding.

  - To assess the root ball of the plant, when I am buying plants, I gently and unobtrusively push the plant out of the cell container to assess the roots. If the nursery has a problem with this, then ask them to do it for you. You can tell much by looking at the roots! If the soil ball just falls apart and you see very few roots, the plant may well need to stay in special nursery conditions to grow a larger root zone, and may not be mature enough to “go it alone” in your garden. If the plant comes out of the cell container with roots winding many times around the root ball, then it is root bound, and may never be able to develop the new feeder roots it will need to take up water. If the root ball stays together and you see some roots on the outside of the root ball, perhaps a few more at the bottom, that should be a healthy plant ready for transplanting.
Remember that the tiny root balls in many of the nursery packs need to be kept moist until planted.

When planting these plants, I lightly score ("tease") the root ball along the sides and gently cut off or pull off circling roots on the bottom. Do this gently, just enough to allow space for new feeder roots to grow out from the center of the root ball to grow into your planting area. My favorite tools for doing this are a curved linoleum knife, or old serrated kitchen knife. A scissors also works, but often is not as sharp as a knife. A good garden knife would be perfect for this job!

Combine plants with a knowledge of the plant’s needs. Keep plants with similar needs, light and watering conditions together, and they will grow well and complement one another. A cactus in the middle of annual color plants would be over-watered, while petunias placed in complete shade will not flourish at their best.

Use perennials as well as annuals in your container gardens. Ground covers, tall, spiky plants, and even desert shrubs can be the focus of a gorgeous container garden.

Appreciation and Design Principles

I wander through my garden observing my container plants, just as a gardener would on a large estate. Observing what is going on is the best way to appreciate the plant’s qualities, troubleshoot its problems, or to decide to try something else.

Plants with a vertical (tall), round (mounding) and horizontal (trailing) can provide a great look in a pot. Sometimes, just the spiky look is desirable to play off nearby pots. A large, mounding (round) plant can be very attractive in the midst of other shapes of plants and pots.

Appreciate the design qualities of plants and their containers, and try to incorporate design principles, including color, texture, form, size and shape in container plantings. Look through garden books to understand these principles, and try combining shapes and colors, textures and forms to make the container garden more interesting.

It is fun to try growing different plants and learn more about the many plant materials that are available.

Try container plantings using perennials instead of just annuals.

Plants can solve design problems in the garden, such as providing architectural detail, screening, transitions, and color accents.

Curving or straight rows of utilitarian containers of food crops can be a beautiful sight indeed, especially when we’re starving for a good tomato!

Combine vegetables and flowers; how pretty is the purple leaf lettuce contrasting with a peach geranium, and the multi-colored Swiss chard plant can be the understory plants for your roses! Plant peppers among perennials to add different texture and the color and shapes of the peppers.

Learn

My library of plant books and seed catalogues grows constantly, and reading each book, I learn more.

Choose those excellent reference books from our local experts and gardeners. Guidance by local experts is a giant step in success with your garden in the Valley of the Sun.

Also, experiment with plants! Try new varieties, or ones you have not grown before, or new combinations. Observe container plants in local resorts, hotels, malls, banks and other public spaces, to see what grows well. Find color or plant combinations on local garden tours and duplicate them!

One of the rules I have learned is, rules are meant to be broken. Just when a blanket statement is made that “you can’t grow that here”, I learn of a gardener who does.

Keep a garden journal of successes, failures, and ideas, and a calendar to help plan for the seasons.

And...use your University of Arizona Cooperative Extension office! The experts at Extension can help solve problems and suggest resources for further information. All publications are available free of charge on the Maricopa County Master Gardener website www.maricopamastergardener.com.
Ideas for inspiration:
- Want wildflowers? Plant the seeds in a container!
- Need some grass for Easter or other decorations: Plant grass seed in a container. How cute this looks just on its own in a centerpiece, or with those Easter eggs and bunnies. Plant bulbs beneath the grass, and have a “lawn” with “naturalized” daffodils!
- Five onions will bulb out nicely in a 5-gallon container, spaced evenly in a circle, or try beets or carrots. Containers are a natural for these root crops, providing the loose growing medium to optimize their growth.
- Sow a stand of greens, lettuces, chard, or mustard, in a 5-gallon or larger container.
- Plant potatoes in a 15-gallon container, using the mounding method one would use in the ground.
- In a 15-gallon or larger container, plant two larger plants close together, such as broccoli, tomatoes, peppers, eggplants, and treat as a multi-stemmed plant.
- A nice little combination herb garden will grow in a 5-gallon pot.
- 12- or 15-gallon containers (or even a half whiskey barrel) can make an excellent mixed herb garden, allowing for even the taller or more spreading herbs.
- 1-gallon pots can become an herb garden, one variety per container -- placed close to the door, but still in full sun, they can be watered as needed, and easily harvested for the gourmet additions to menus.
- For fun try a stand of early sweet corn for fall production (sow several seeds in a 5-gallon or larger pot, and place several of these pots together to achieve pollination). The mini corn field may even be ready to dry for Thanksgiving decor!
- Experiment with different varieties for ease of growth in a container and for taste, for high yield or to allow continuous harvest, or grow an even greater variety of vegetables for the table.
- Experiment with staking methods for tomatoes. Try using floating row cover to protect plants from insects or even a light frost or rain.
- Try a fruit tree in a container, several containers of strawberries, containers with trellises for cucumbers, squash, melons or snap peas, or pole beans, staked up or trellised on a porch pillar.

Vegetable selections to try:
- A small selection of container-sized varieties from the listed seed sources (there are many more in the catalogs). Note that careful reading of all the catalogs will reward one with a many, many different, smaller-sized, short-season varieties to try.
- Thompson and Morgan offers a mini-cauliflower called “Bambi” (though this is not an early variety), a mini-cabbage, “Duchy Hybrid” (60-days), and a cucumber “Bush Champion” (55 days).
- The Cook’s Garden offers smaller-sized seed packages, and offers the small round zucchini “Ronde de Nice”, a 3”-season” spinach “Space” (40 days), and a “Sweet Pepper Mix” or “Hot Pepper Mix”, with just a few seeds of several varieties to try. They offer several mixes of greens blends, such as “Cutting Mix” lettuces, “Gamish Mix”, “Mild Mix”, and “Tangy Mix”. These come in a small 2 gm packet or 1/2 or 1 oz packets.
- Shepherd’s Garden Seeds offers selections such as “Little Gem” mini-romaine, “Mixed French Lettuces”, “Chameli” melon, “Market Express” turnips (30 days!) and the “Baby Boo” pumpkins, and has a nice selection of European and Oriental varieties of veggies, herbs and flowers.
- Pinetree Garden Seeds offers very small packages (many only $0.55-60 ea.) of a wide variety, including European and oriental varieties. Try “Radicchio-Silla” (50-days), a small-headed radicchio, “Garden Baby” watermelon (70 days), or “Spacemaster” cucumber (59 days), full-sized cukes on 3-foot vines.
All purchased plants need to be repotted!

**Soil-less Mix**

- 1/3 vermiculite
- 1/3 perlite
- 1/3 shredded peat moss or vermiculite

*can add some compost*
INGREDIENTS FOR SUCCESS

CONTAINER
Bigger IS better!
No 4-6" pots.

LIGHT
Proper exposure ensures success.

AIR
Essential above ground (of course) but roots need air too.

DRAINAGE
Excellent drainage is essential.

MULCH
Dress the soil surface.

PLANT FOR THE SEASONS
Local reference books tell when & what to plant.

More soil holds more water.

Get creative,
But, don’t use metal outside.

Clay breathes - transpires moisture, keeps soil mix cooler.

Plastic holds moisture, but also stays warmer in summer.

Most plants like cooler soil in the summer.
**PLANTING**
Plant new plants at the level they were in the container. Tickle the root ball to loosen roots. Keep moist.

**FERTILIZING**
Fertilize thru out the growth cycle. Use high phosphorous fertilizer for flowering plants. Balanced blend (20-20-20) for green plants & shrubs.

**POLLINATING**
May use a small brush to give nature a hand.

**PESTS**
Watch for signs of pests. Eaten leaves. Holes in fruit.
Use recommended controls. Start with least toxic method. Hand pick those worms!

**GROOMING**
Remove spent flower heads. Groom regularly.

**WATER**
Our water is very salty so . . .
Water so some seeps out of the pot. Don’t over water. Good soil mix helps keep soil moist.

**DRAINAGE**
Provide excellent drainage. Pots must have drain holes. Use screen to cover holes. Good soil mix allows air space for drainage. Raise container above surface. Don’t let pots stand in saucer of water.