Container & Raised Bed Gardens:

A crop of veggies, a splash of color or a native plant oasis

Why Use Containers & Raised Beds?

- Excellent in Small or Difficult Spaces.
- Better accessibility & ease of use.
- Optimize Soil – way to deal with bad or diseased soil.
- Gopher or rodent problems can be eliminated or controlled.
- Portability
  - Make difficult sun exposures & microclimates more manageable.
  - Renters can move their gardens.
- Large deck or patio to embellish.
- Infinite options for plantings.
- Can have a lot of visual impact.

Disadvantages

- Soil can dry out more quickly.
- Soil can warm more quickly, get hot and also cool more quickly.
- In an arid climate they require more frequent watering.
- Cost of soil and container materials to start up.
- Some container materials are not durable
  - Wood
  - Plastic
  - Low-fire terra cotta and clay
- Some plants are not suited to containers.
- Salts can build up if you don't 'flush' with water periodically.

Considerations

- Limitations – *time, $, water, space, climate, micro-climate, travel.*
- **Size – Tucson's climate requires 24" diameter for best results.**
- Location
  - Sunlight – Natives, vegetables and many annuals and dwarf fruit trees require 6 to 8 hours of sunlight daily.
  - Plan for lowest and highest temperatures – how will you protect the plants?
- Nutritional needs of the plants.
- Soil mix for pots.
- Containers.
  - Cost, Size, Quantity, Weight and Material
- How are you going to water?
  - Drip.
  - By Hand.
  - Monsoon rains.

The garden is a love song, a duet between a human being and Mother Nature. Jeff Cox

Container Materials

- Clay, wood, plastic, metal, blown foam.
- Containers must:
  - Be big enough to support plants when they are fully grown.
  - Hold soil without leaking and spilling.
  - Have appropriate drainage.
  - Be non-toxic.
- Rodent proof?
  - Hardware cloth?

Your time, money, and site are the major limiting factors for what you can use for a container.

What do Plants Need from the Soil?

- Anchor and protect roots.
- The soil particles trap water between them allowing the plant to draw water.
- The soil contains air pockets that allow for the uptake of oxygen into the plant.
- The nature of soil allows nutrients and minerals to be attached to them, enabling the plant access to a ready store of nutrient "food" to help them grow.

Plant roots without and with Mycorrhizae

Plants don't necessarily need soil – check out Hydroponics & Aquaponics for alternative growing methods.

Nutrients

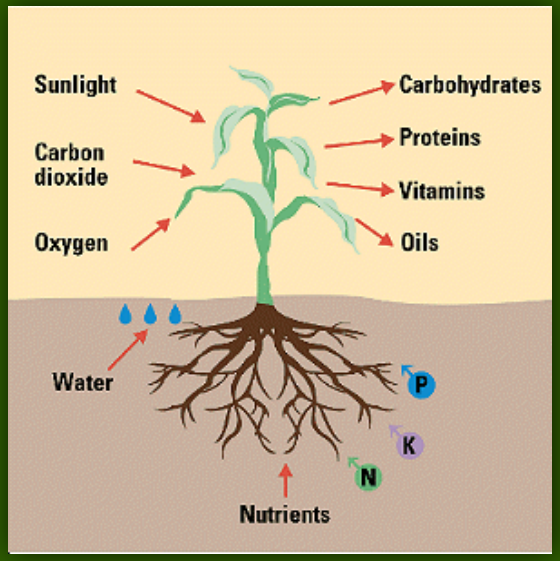
These 13 macro & micronutrients dissolve in water and are absorbed through plant roots:

Primary Macronutrients:

Nitrogen (N)
Phosphorus (P)
Potassium (K)

Secondary Macronutrients:

Calcium (Ca)
Magnesium (Mg)
Sulfur (S)



Micronutrients:

Boron (B)
Copper (Cu)
Iron (Fe)
Chloride (Cl)
Manganese (Mn)
Molybdenum (Mo)
Zinc (Zn)

Soil Mix:
Non-native plants

The soil mix needs to be light and provide ***excellent*** drainage:

- Pre-made can be costly and are generally too heavy for Tucson.
- Make your own:
  - **1/4 Peat Moss or Coconut Coir** = absorbs water.
  - **1/4 Vermiculite** = retains moisture so plants don't dry out and lose access to nutrients.
  - **1/4 Perlite** = allows adequate drainage which gives access to vital oxygen.
  - **1/4 Potting Soil or a really good compost** = Nutrition.
  - Optional - ¼ to ½ cup of Bone Meal for root growth.
  - Optional - ¼ to ½ cup of Soft Rock Phosphate for soil structure and minerals for the plants.

"Garden soil doesn't offer enough air, water or nutrients to container-grown plants."
Lee Reich

Cacti and Succulents:

- This soil does not need any humus material.
- Equal parts of:
  - Sand.
  - Garden soil.
  - Vermiculite.
  - Perlite.

Hydrozone

- Plan for and arrange plantings by:
  - Watering needs.
  - Fertilizing needs.
  - Planting dates.
  - Available space.
  - Available time.
- For vegetables consider square foot gardening techniques.
  - Optimize space and production.
  - Keeps plants culturally ‘clean’.

“Half the interest of a garden is the constant exercise of the imagination.” Mrs. C.W. Earle, *Pot-Pourri from a Surrey Garden*, 1897

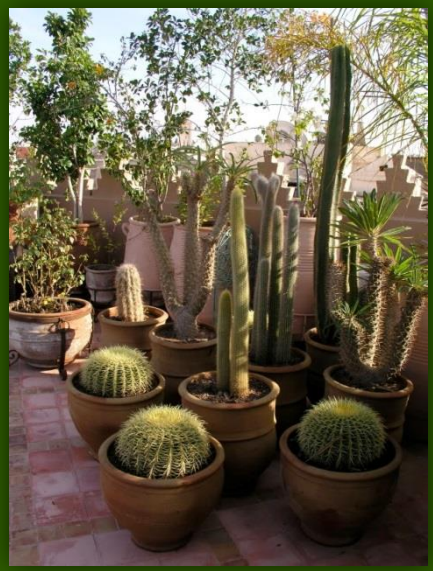
Planting Guidelines

- Equipment:
  - Sterile (clean) container.
  - Screen or coffee filter (for drain holes).
  - Landscape cloth for raised beds.
  - Soil Mix.
    - Scoop.
  - Water.
  - Fertilizer.

Hint: Soak terra cotta pots in cool water before planting. A dry pot may leach all fluid from the delicate plant roots and dry transplants out.

Maintenance

- Make sure that fertilizing and watering are appropriate for the plantings and locations.
  - Delicate plantings may require moving pots seasonally.
- Pots - Re-pot every 2 – 3 years.
- Raised beds - add compost 2 – 3 times/year.
- Remember watering depths!
- Flush salts periodically.
- Clean saucers or do away with altogether.
  - Mosquitoes can breed in a bottle cap of water!
  - Too much moisture can draw scorpions to this area.
  - Saucers can increase salt build-up issues.



10 Best Vegetables to Grow in Containers

1. Eggplants (warm)
2. Carrots (cool)
3. Cucumbers (warm)
4. Swiss Chard (cool)
5. Lettuce (cool)
6. Parsnips, turnips (cool)
7. Potatoes (cool)
8. Radish (cool)
9. Tomatoes (warm)
10. Zucchini (warm)

Top 10 Flowers for Tucson Containers

- Summer Annuals:
  - Celosia
  - Marigold
  - Portulaca
  - Salvia
  - Zinnia
- Winter Annuals:
  - Alyssum
  - Calendula
  - Pansy
  - Stock
  - Petunia

Shrubs and Small Trees

- Add shrubs and small trees
  - Pomegranate
  - Fig
  - Guavas – tropical, strawberry, pineapple
  - Kumquats
  - Dwarf citrus and deciduous fruit trees
  - Milkweeds
  - Tecoma stans v. esperanza
  - Roses
  - Salvia

Some ideas…

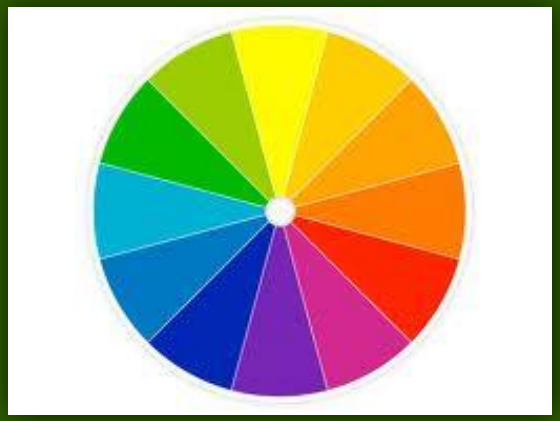
- Mix flowers in with your vegetables.
- Flowers, especially those in the daisy family, attract beneficial insects.
  - Many beneficial insects attack and kill pests such as tomato hornworms or aphids.
  - Other beneficial insects pollinate fruit-bearing vegetables, such as tomatoes, eggplants, peppers, cucumbers, squash, and melons.
- Pick plants with edible flowers so they can do double duty.
  - Use them in salads *and* let them attract beneficial insects.
  - Try calendula, dianthus, marigolds, mums, clover, and nasturtiums.
- Cool Colors add depth while warm colors bring plants closer visually.
- Harmonious / analogous = calming
- Complementary = more energetic

"Flowers always make people better, happier, and more helpful; they are sunshine, food, and medicine to the soul."
- Luther Burbank

Thrill, Fill & Spill

Design Principles for Containers

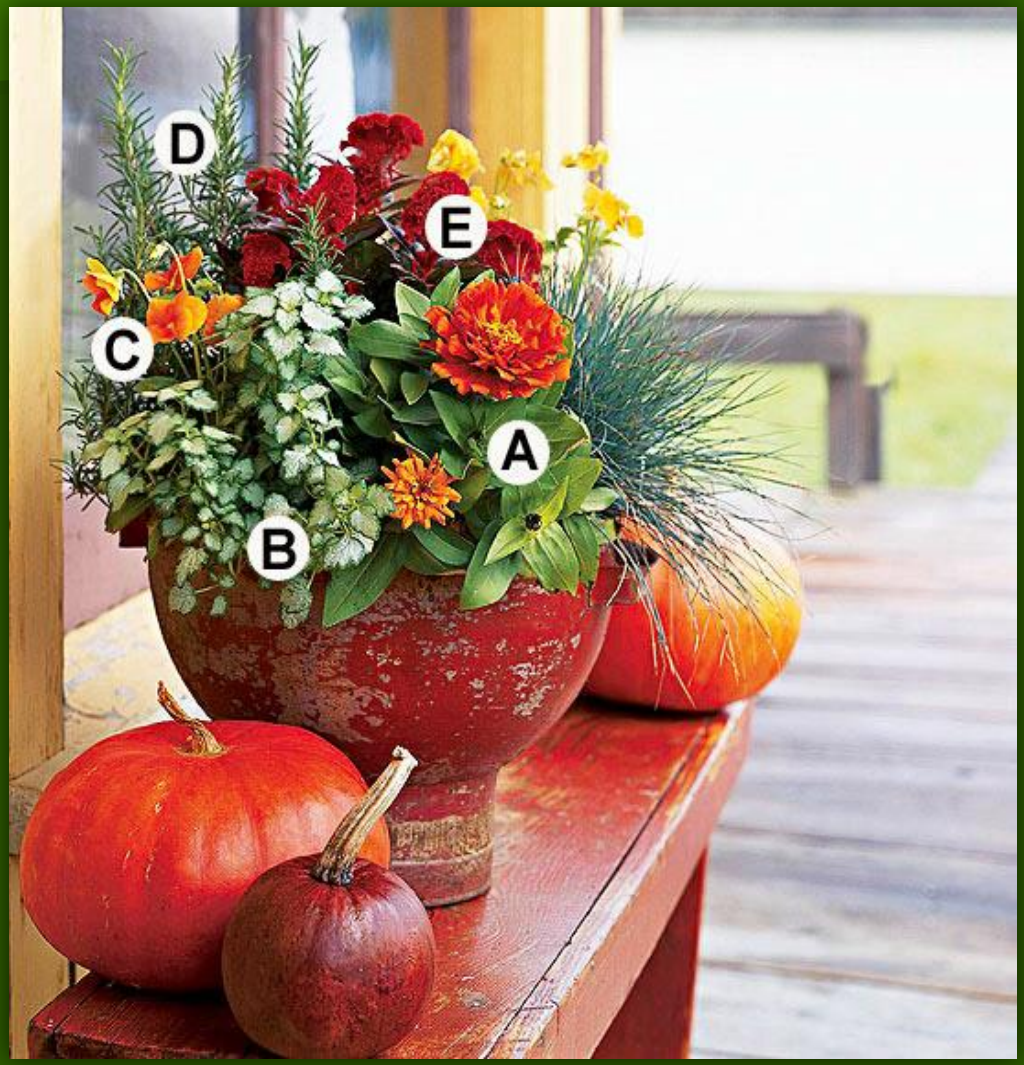
- **Think in 3's**
  - *Three colors*
  - *Three textures (leaf texture, size, shape)*
  - *Plant in 3's*
    - Easy equation = 3 kinds of plants, in 3 contrasting colors
- *Thrill, Fill, and Spill* **=** 1 tall, 1 short, 1 that trails
- **Balance color, texture, and density.**
- **Keep it simple.**



Rules of the Road:

- Know the **mature size** of the plant.
- Group by **watering and fertilizer** needs.
- Think about **mixing perennials with annuals** changed out each season.
- Think about **mixing vegetables with edible flowers**.

Ideas…



A Zinnia Magellan Orange
B Larnium maculatum
C Pansy (Viola Panola Orange)
D Rosemary
E Celosia Prestige Scarlet

Ideas…

A Swiss Chard
(*Beta vulgaris* 'Bright Lights')
B Flowering kale
(*Brassica* 'Pigeon Purple')
C Coralbells
(*Heuchera* 'Marmalade')

Ideas…

A Flowering kale
(*Brassica* 'Osaka White')
B Flowering kale
(*Brassica* 'Pigeon Purple')
C Flowering kale
(*Brassica* 'Redbor')

Ideas…

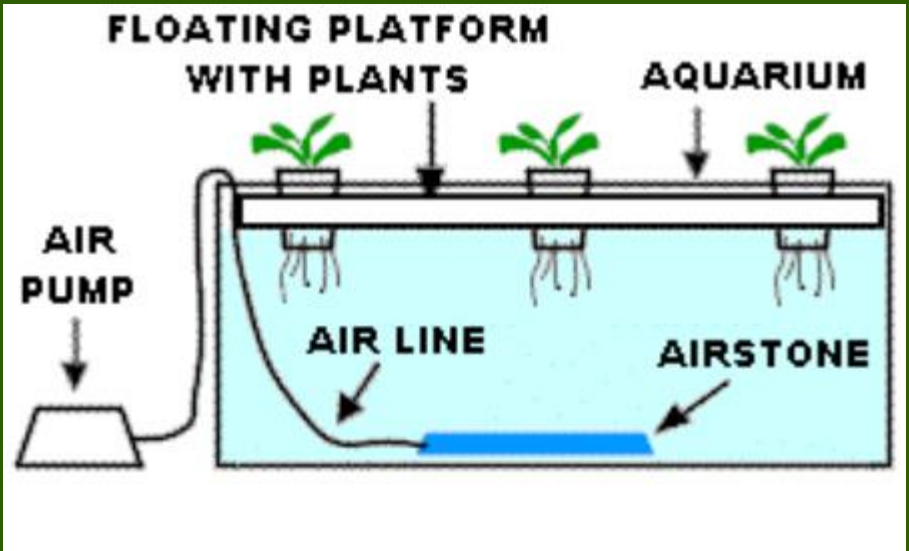
A Cardoon (Cynara cardunculus) or try Artichoke
B Coleus ('Rose Queen')
C Diascia (try Bacopa instead for a spark of white)

Ideas…

Use discarded steel rods for herbs and utensils near the BBQ

Hydroponics

- Growing plants using mineral nutrient solutions in water, without soil.

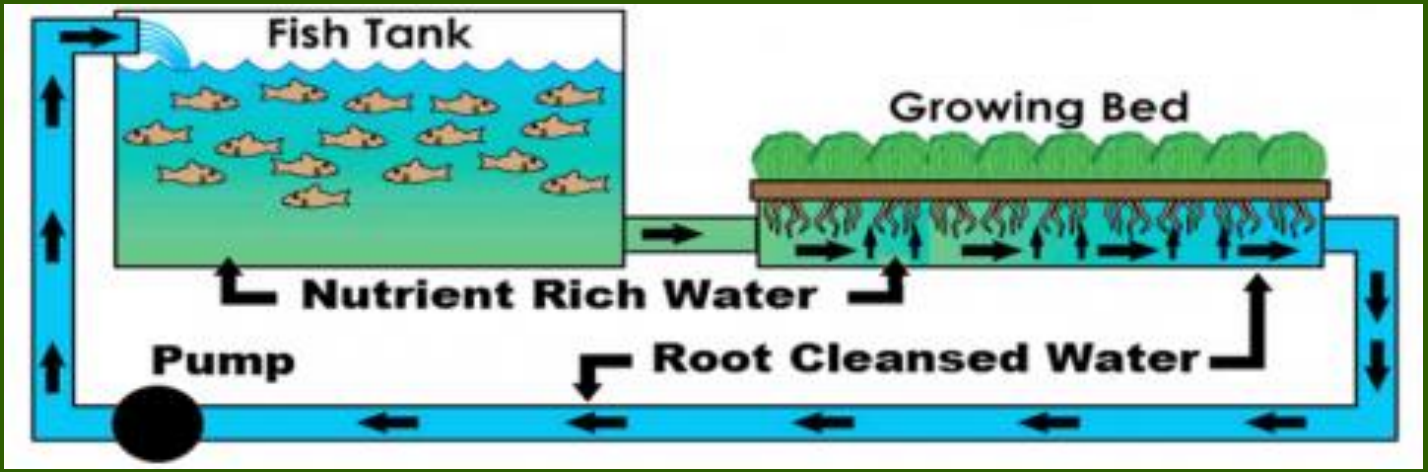


Lots of options:

- Static & Continuous-flow solution culture
- Aeroponics
- Sub-surface irrigation
- Ebb and Flow or flood
- Top-fed deep water culture
- Deep water culture
- Fogponics
- Rotary

Aquaponics

- Combines:
  - Aquaculture = Raising Fish.
  - Hydroponics = Soil-less growing of plants.



Courtesy Tucson Aquaponics

1- Fish product waste that feeds the plants.

2- Plants filter the water that returns to the fish.

Aphids

Thrips

Flea Beetles

Whitefly

Tomato Hornworm

Rules of Thumb for Tucson:

- Last average date of frost is March 17
- First average date of frost is Nov. 15
- Periodically test the pH of your soil (Tucson water adds alkalinity)
  - Alkaline is a high # on the pH scale or 7 and above
  - Blueberries and potatoes require most acidic soil with pH of ~5
- Do not underestimate evapo-transpiration
- Evening watering allows the water to work better
- Fruit bearing = transplants
- Leafy or root vegetables = seed directly

"Gardening is cheaper than therapy and you get tomatoes." Author Unknown