

Understanding Container Soils

Carey Grable – Home Horticulture Educator, Marion County

Understanding Container Soils

Agenda

- Bio
- Why do we grow in Containers?
- Soilless mixes and what they're made of
- Fertility in soilless mixes
- Watering soilless mixes

Introduction

Carey Grable, Home Horticulture Educator

- B.S. Horticulture, University of Kentucky
- M.S. Horticulture, Murray State University
- Extension Associate – Nursery Crops University of Kentucky 2010-2018
- Section Grower – Hood’s Garden 2018-2021
- Home Horticulture Educator – Purdue Extension 2021-Present



Why do we grow plants in containers?

Why do we grow plants in containers?

Limited Space

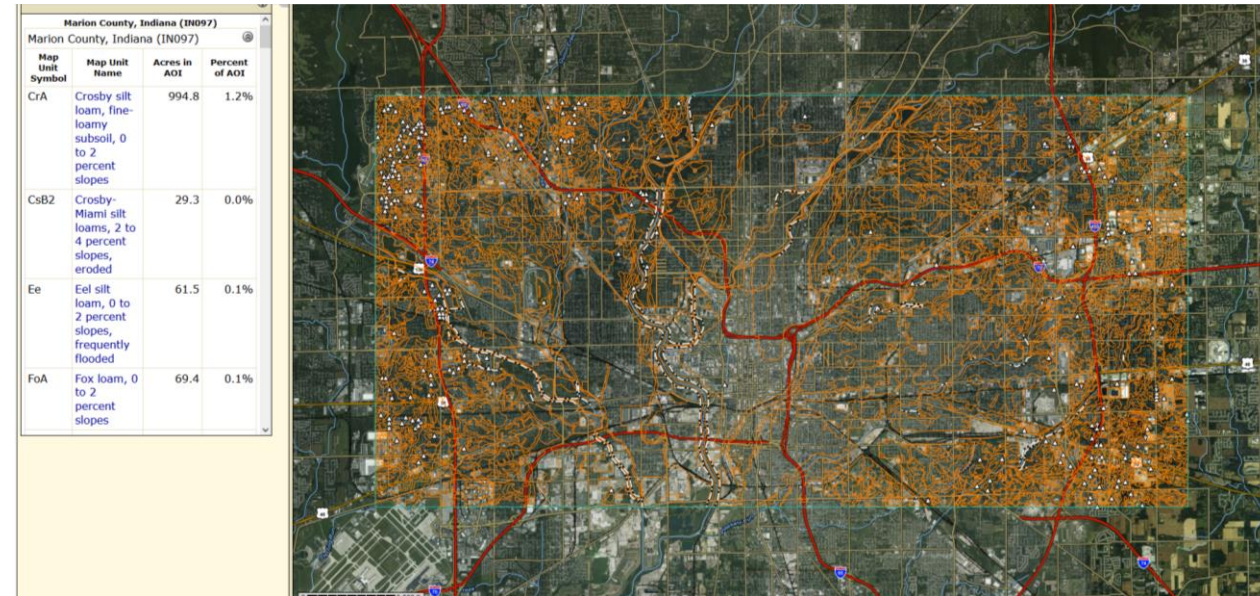
- Opens up gardening to those with limited space!
 - Patios
 - Balconies
 - Small yards



Why do we grow plants in containers?

Poor Soils

- Unknown / Problematic Soil History
 - Urban Soil Compaction
 - Soil testing
- Compaction
- Loss of topsoil
- Web Soil Survey



Why do we grow plants in Containers?

Aesthetics



Why do we grow plants in Containers?

Dwarfing/Bonsai

Containers can help control plant size



Why do we grow plants in Containers?

Indoor Growing



Why do we grow plants in Containers?

Overwintering Cold Intolerant Plants



Why do we grow plants in Containers?

Propagation

Get an early start to your growing season! Sowing seed indoors allows you to transplant a larger, more vigorous plant than sowing seed outdoors.



Why Soilless mixes?

Container Soils

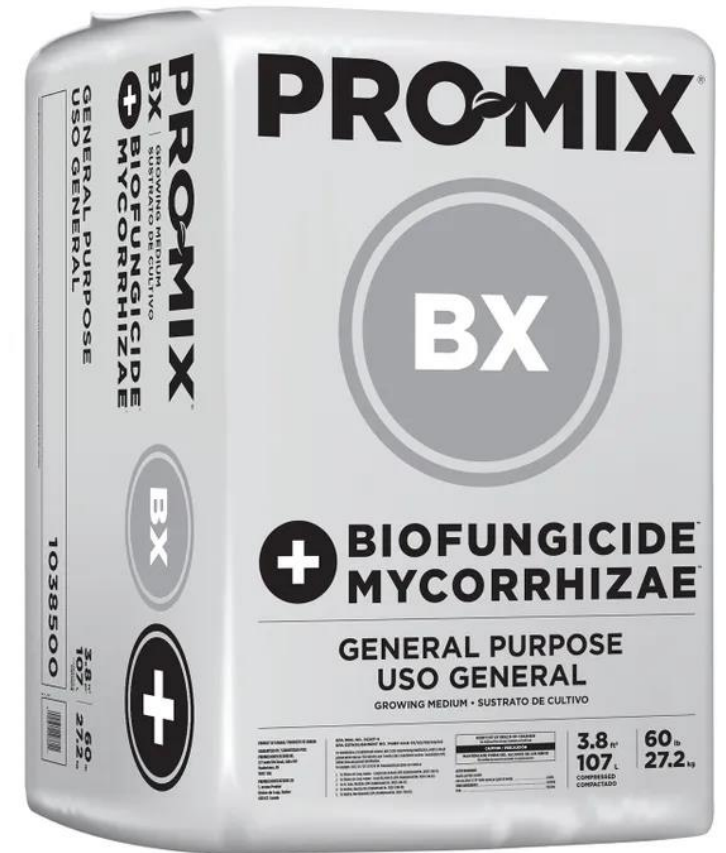
Terminology

- Soilless Mix
- Soilless Media
- Artificial Media
- Potting Mix
- Potting Soil
- Container Soil

Container Soils

What is soilless media?

Soilless mixes or peat-based potting media do not contain any actual soil, but generally consist of peat moss combined with horticultural grades of vermiculite and/ or perlite.



Container Soils

Why do we use soilless mixes?

- Garden soil alone will soon become compacted in a container garden, leading to poor aeration and water drainage.
- Plant roots need to breathe and can drown in soils with poor drainage!
- Lightweight, well-drained and well-aerated media is best for growing plants in containers.

Media Ingredients

Peat

- Peat is a special type of organic material that comes from decomposed plants in bogs.
- Most peat comes from Sphagnum moss (hence “Peat Moss”).
- Major component of almost all potting mixes because it retains moisture without becoming waterlogged, is lightweight, and does not easily become compressed.



Media Ingredients

Vermiculite

- Product of heating mica chips.
- Gray, spongy material that increases water retention in mixes.
- Also holds on to nutrients and keeps fertilizer available for the plant roots for longer periods of time.



Media Ingredients

Perlite

- White, volcanic rock that is reminiscent of Styrofoam.
- Lightweight and porous.
- Used to improve the drainage and aeration of potting mix.



Media Ingredients

Sand

- Another common component of potting mixes.
- Can improve drainage.
- Is often added in large quantities to mixes intended for cacti and succulents.



Media Ingredients

The problem with peat...

- Peat grows very slowly.
 - About a yard deep every thousand years.
- Peat serves as a water purifier and is a unique ecosystem.
- Sources are becoming more scarce.



Sphagnum peat moss harvest in Canadian peat bog

Peat Alternatives

Spent Mushroom Substrate (Mushroom Compost)

- The soil-like material remaining after a crop of mushrooms.
- Spent substrate is high in organic matter making it desirable for use as a soil amendment or soil conditioner.



Peat Alternatives

Compost

- Occasionally included in potting mix for added nutrients.
- Can reduce air space in soil and should be used sparingly for potted plants.
- Should make up no more than 1/3 of a potting mix.



Peat Alternatives

Bark

- Bark (typically pine) that has been ground and partially composted is often incorporated into less expensive potting mixes in place of peat.
- Provides good aeration but dries more quickly than peat; requires more frequent watering.
- Base material used in nursery mixes.



Peat Alternatives

Coconut Coir

- Fibrous material from coconut husks that is sometimes used in place of peat.
- Similar to peat in that it retains water without becoming soggy.



Container Soils

Types of Container soils

- Nursery Mixes – Pine, Peat, Sand
 - Well drained and aerated. Promotes root growth for woody species.
- Greenhouse Mixes – Peat, Perlite, maybe Pine
 - Frequently heavy on peat and perlite. Has a balance of water holding capacity and drainage
- Garden Pot Mixes – Peat, Perlite
 - Leans a little more towards water retention to aid the home grower with watering.
- Specialty Mixes - Varies
 - Succulent mixes for dry-loving plants and Acidic mixes for things like Azalea

Container Soils

Make your own!

To make 1 bushel of soilless mix, combine:
1/2 bushel of peat moss
1/2 bushel of vermiculite
1/2 cup of ground limestone
1/2 cup of superphosphate
1 cup of fertilizer
(5-10-5, 6-10-4, or a similar formulation)

Container and Raised Bed Gardening (HO-200-W)


PURDUE EXTENSION
HO-200-W

Consumer Horticulture

Container and Raised Bed Gardening

B. Rosie Lerner

EXPERT REVIEWED



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- **General Horticulture** (tips, techniques, and practices)
- **Flowers** (house plants, garden flowers)
- **Landscape Plants**
- **Fruits**
- **Vegetables**

Containers

Containers that can be used for gardening are limited only by your imagination. Clay, wood, plastic, cement, and metal are all suitable materials for growing plants. Many items around the house can be modified for use as plant containers such as pots, tubs, crates, buckets, bushel baskets, whiskey barrels, tires, wheelbarrows, and hanging baskets. Whatever the material, however, a good container must allow excess water to drain out and provide sufficient space for roots to grow.

When excess water cannot escape the container, soil pores that should hold air will be filled with water and roots will die from lack of oxygen. To provide drainage, drill three or four small (1/4 inch) holes in the bottom of the container. Holes larger than 1/4 inch in diameter will allow too much soil to escape. Placing a layer of gravel or broken pottery pieces on the bottom of the container, below the soil, can help stop the flow of soil through larger holes.

Wood containers should be made of a naturally water-resistant wood (such as redwood or cedar) or synthetic lumber (such as recycled plastic). If using chemically preserved wood, choose lumber that has been pressure treated with a copper-containing product such as alkaline copper quaternary (ACQ). Copper and zinc preservatives that are painted onto the wood are less effective in preventing decay. Do not treat wood with creosote or pentachlorophenol (Penta) because they are potentially toxic to plants, particularly when grown in small, enclosed areas. See *More About Treated Lumber* for details.

Most vegetables and flowers have roots that go 2 to 3 feet deep in good quality soil, but can be grown in shallower soils. Plants that have restricted roots will be smaller, less productive, and may produce smaller-sized fruits. Small containers dry out more quickly, requiring frequent watering. A container with a minimum depth of 10 to 12 inches is recommended for most plants exposed to drying wind and sun.

Growing Media

Lightweight, well-drained and well-aerated media is best for growing plants in containers. Garden soil alone will soon become compacted in a container garden, leading to poor aeration and water drainage. Many garden supply stores offer premixed potting soil or soilless mixes and are ideal for small containers. For large-scale container gardening, mixing your own media may be more economical.

Purdue Extension
Knowledge to Go

Container Soils

Wetting Agents

- Wetting agents are chemical substance that increases the spreading and penetrating properties of a liquid (ie. water) by lowering its surface tension. These are used in potting mixes to enable water to thoroughly wet the mix.
- Tip: Moisten a potting medium with warm water before using to have uniform moisture throughout the container.
- Plants potted in dry medium and then watered will have inconsistent moisture levels in their root zones.
- Organic mixes may contain yucca extract as a wetting agent.

Container Soils

Moisture Retaining Treatments

- The moisture holding ability of the soil breaks down over the season, usually by mid to late summer.
- Some potting mixes contain moisture retaining polymer gels, crystals or chemicals that absorbs water.
- These help to reduce the need for watering over the growing season.
- When hydrated, water retaining gels look like clear chunks of glass, but are soft to touch.
- A little extra care will be necessary to avoid overwatering when the temperatures are still cool since the soil will be slow to dry out.

Container Soils

Fungal Growth on potting soil

- Fungi and slime molds occasionally appear on the surface of growing media.
- These organisms will not hurt the plants or roots. They are saprophytic fungi involved in the decay of organic matter and are more likely to occur when the growing media remains wet for prolonged periods of time.
- Under normal outdoor growing conditions the fungi are usually short-lived.



Container Soils

Reusing Container soil

- If the plants in the containers were healthy during the growing season with no major disease issues, you could remove the plant material at the end of the season and reuse the media next season.
- You may have to add some additional new media to fill the container.
- There will come a time when the media in the container will need to be replaced. Over the course of time, the organic materials that the soilless media is made from break down and decompose to the point where you will lose the drainage and aeration properties that are inherent in soilless container medias. When that happens, discard the media to the compost pile or to the garden and refill the container with fresh media.”

Fertility in soilless mixes

Fertilizing

- Because plants only have access to the nutrients available in their pot, they need more fertilizer than in-ground plants, which are able to expand their root systems to access nutrients in the surrounding soil.
- To keep container gardens healthy and productive throughout the season, add a slow-release fertilizer at planting time and reapply a soluble fertilizer every two to four weeks.

Fertilizing

Liquid Feed & Controlled Release

- Formulation of both depends on the crop.
- CRF can be mixed with soil, or top dressed.
- Fertilizer levels should be monitored to determine if CRF is adequate or if supplemental liquid feed will be needed.
- Liquid feed has little residual life in soil.

Fertilizing

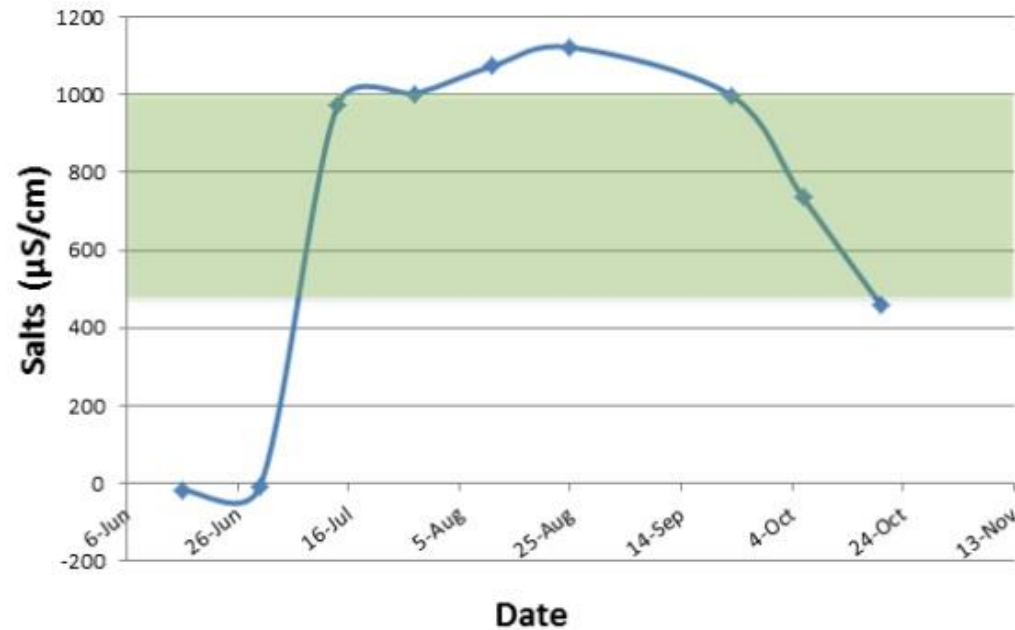
Controlled-Release Fertilizers

- Fertilizer designed to slowly release over time.
- Contained in resin “prills”
- Formulation of resin coating determines the product’s longevity.
- NOTE: Longevity is often advertised in months AT 70 DEGREES.



Fertilizing

Slow Release Drop-off (5-6 month blend)



4 Months!

Figure 2. Soluble salt release in 'Green Mountain' Boxwood. Shaded area indicates desired range for periods of active growth.

Fertilizing

Nutrient Monitoring



Fertilizing

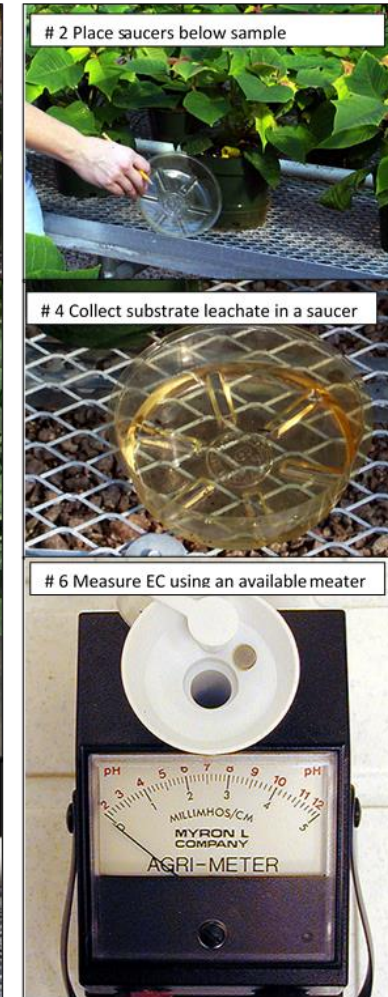
Electrical Conductivity (EC)

- Soil electrical conductivity, referred to as EC, is the ability of soil to conduct (transmit) or electrical current.
- EC is expressed in milliSiemens per meter (mS/m) or at times is reported in deciSiemens per meter (dS/m).
- Soil scientists use EC to measure soil salinity.
- Fertilizers are salts that contain various plant nutrients.

Fertilizing

Pour Through Technique

- Things needed:
 - EC/PH Meter
 - Plant to test
 - Collection Saucer
 - Distilled Water



Fertilizing

Track your fertility!

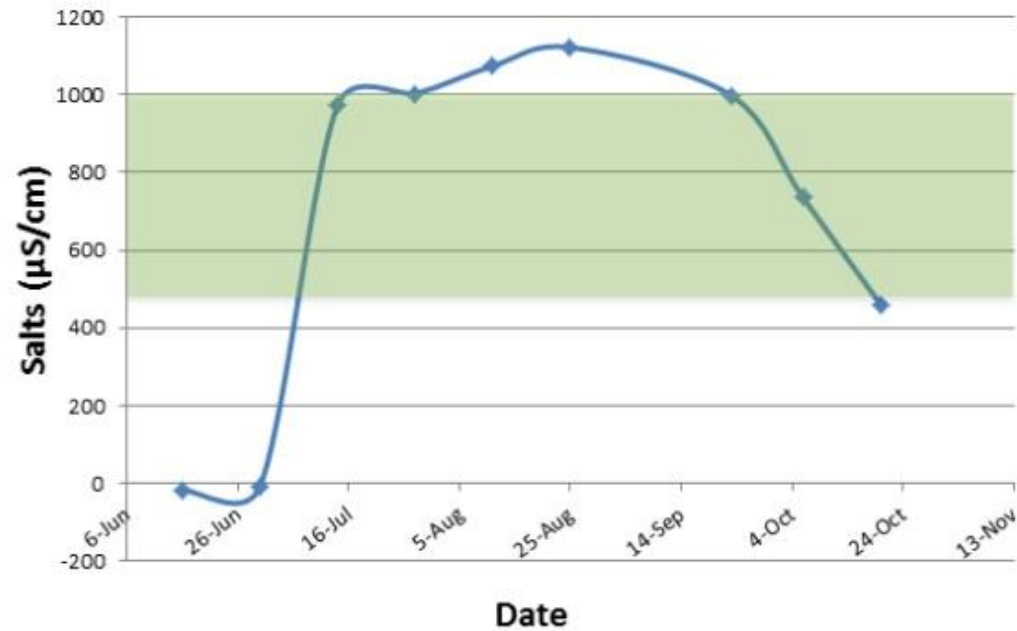


Figure 2. Soluble salt release in 'Green Mountain' Boxwood. Shaded area indicates desired range for periods of active growth.

Irrigating Soilless Mixes

Watering

Timing and Frequency

- Water at the beginning of the day! This helps reduce having a wet canopy which can lead to disease issues.
 - Important on cloudy and rainy days. Try to water before 10-11 am in these conditions
- Do NOT rely on rain to irrigate your container plants.
 - Rain will not provide a thorough enough irrigation unless you are getting more than a couple of inches. Particularly for well drained, soilless media.
- Don't water too frequently. How often you water should depend on the size of the container.
 - Larger containers should go longer between irrigations.
 - Frequent watering leads to shallow rooting

Watering

Water THOROUGHLY

- If you are watering a pot, you should be completely saturating the media.
 - Water should be coming out of the bottom of the pot.
 - Salts can build up in the pot if you are not flushing it.
- Let the pot dry down until the plant needs water again and then water thoroughly again. For larger planters, this could take a few days.
 - Its okay to let the plants tell you they need water. A little flagging is okay.

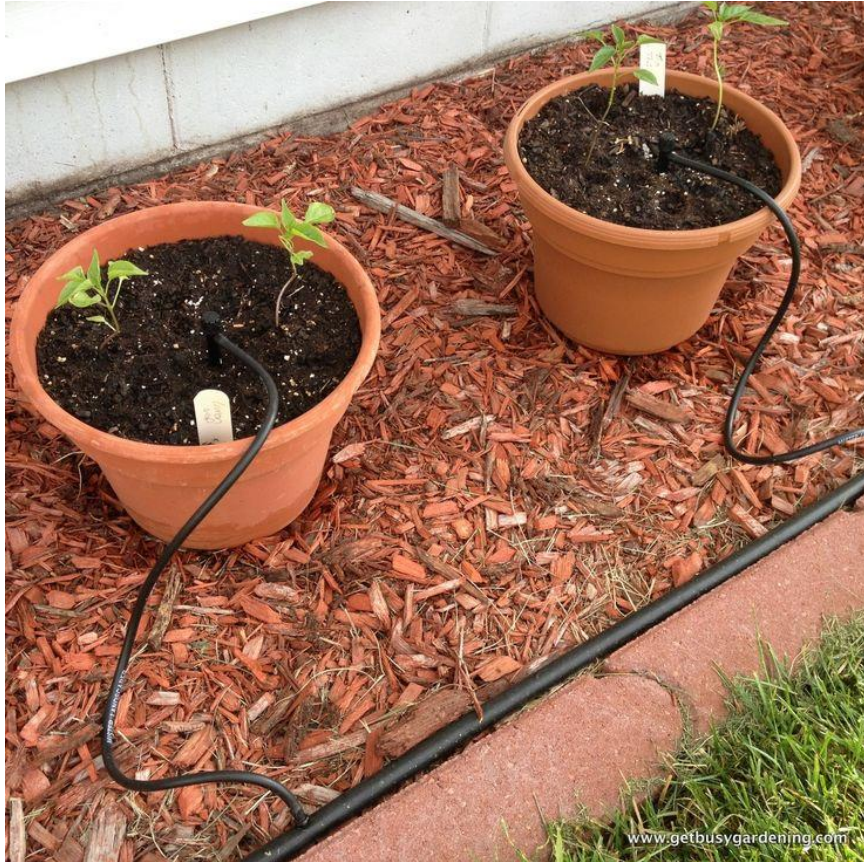
Watering

Watering Wand & Breaker



Watering

Irrigation Systems



Watering

Irrigation Systems

- Use shot off valves!!!
 - Allows you to create irrigation “zones” of like needs pots/plants.
- Timers should not be relied on.
 - Great when out of town.
 - On regular days, irrigation systems should be used when pots are ready for irrigation.

Questions?