

How to Design a Closed-System TERRARIUM



Terrariums are beautiful interior accents for the places where people live and work. Their glassy containers are eye-catching and lead viewers into the jewel-like plants they contain.

They offer a miniature ecosystem—a window into the natural world. Humans possess biophilia, a natural, inborn love of nature. While today's lifestyles may not allow us to be outdoors as much as we might like, in a small way, terrariums give us a chance to experience nature's unique flora. Just as important as a lamp or painting to create a focal point within a room, terrariums are living sculptures. Plus, they can practically care for themselves.

Any clear glass or plastic container is suitable to use as a terrarium. Some examples include fish bowls, canning jars (both large and small), and antique milk bottles. This, of course, is not an all-inclusive list. The only really important consideration is that the container not be cloudy or tinted because this would restrict light and limit plant growth.

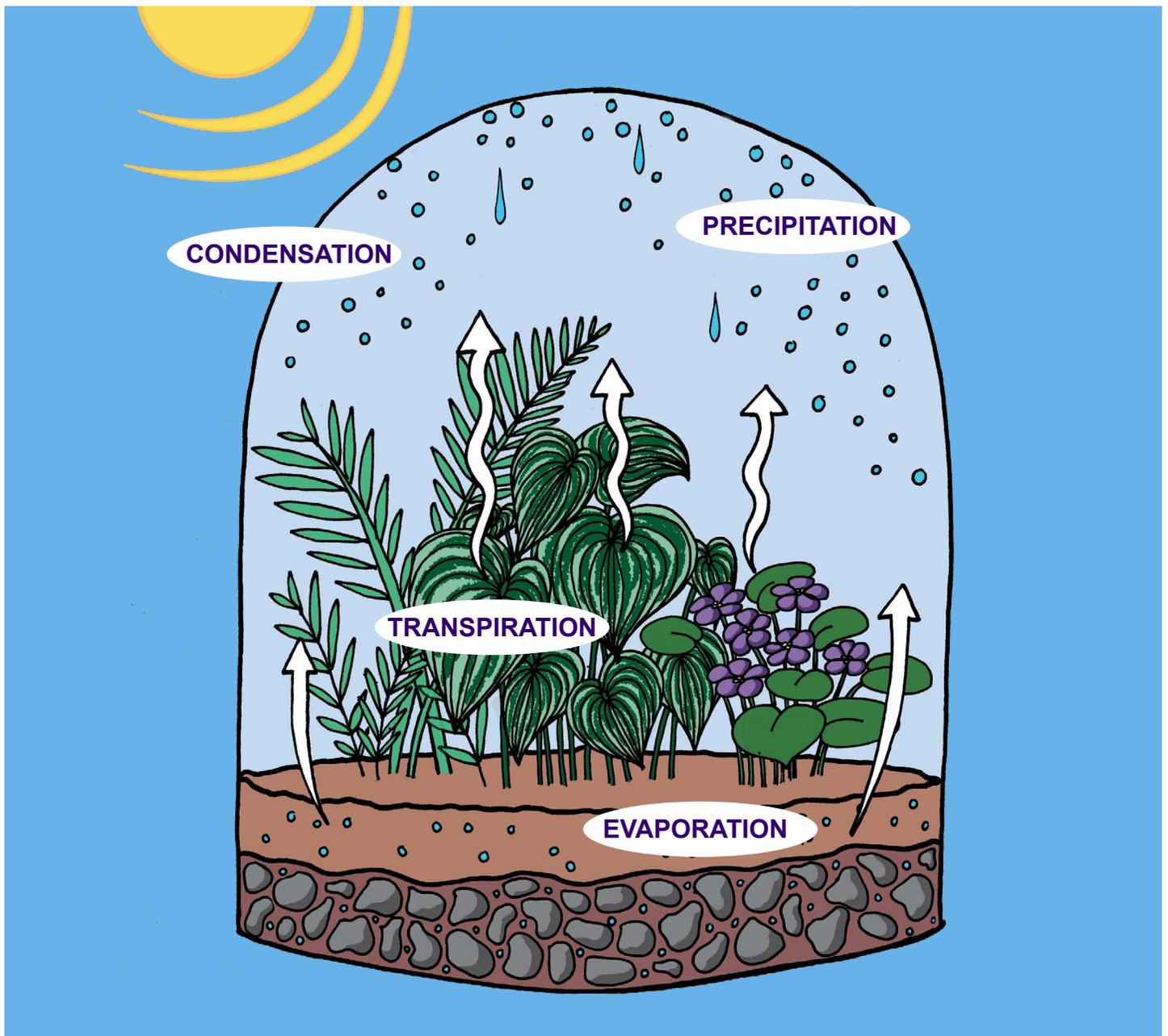
TYPES

There are two types of terrariums characterized by the selected container: open systems and closed systems.

Open-system terrariums use a container with a wide opening such as a large glass bowl. An open-system terrarium typically needs to be watered more often than a closed system and has lower humidity levels. One current trend is to use succulent plants or cacti. These plants are native to dry, arid regions and have a longer display period in an open-system terrarium. Plants from both **Tables 1** and **2** at the end of this publication can be maintained in open-system terrariums.

Closed-system terrariums use a closed (or nearly closed) container. A lidded jar similar to the one shown in this publication, or a jar with a narrow mouth, works well. These containers will sustain the ecosystem necessary for moisture- and humidity-loving plants (**Table 2**). Note that this type of container does not work well with succulents or cacti—they would quickly rot and die in this setting.

Closed-system terrariums can be surprisingly easy to maintain once their ecosystem is established. For that reason, this project outlines a closed-system terrarium.



FIND A DISPLAY SITE

Before purchasing plants and supplies, give thought to where the terrarium will be displayed. It is a good idea for it to blend with the interior style. Consider how it can be shown, whether on a table or a plant stand.

It is best to keep the terrarium in a dedicated space. Limit moving it to varying locations because changes in light intensity and duration may be detrimental to plant health. Find a space that has bright, indirect light. Often, an eastern exposure with morning sun is good for terrariums. Similarly, a western exposure may work well as long as afternoon heat is avoided.

Avoid placing a terrarium close to a window because solar energy can build heat in the container. This can literally burn the plants inside.

LESS IS MORE

Plant-supply departments often carry an array of terrarium supplies. You can also find these materials online.

Beyond the container, decorative accessories can give a theme to the design. Decorative items can be ceramic, glass, metal, or plastic; anything impervious to moisture. They can be a dominant part of the design, or they can be subordinate. It is fine to leave them out, keeping the design natural and unencumbered.

This example uses heat-treated bark. Do not use bark intended for outdoor landscapes because it can harbor pathogens that will introduce disease into the terrarium. Heat-treated bark for indoor plant use is a nice alternative to moss or can be used in combination with it for pattern and textural variety. Similarly, it may be a good idea to use only one variegated, fancy-leaved plant with other green plants.

Horticultural-grade charcoal consists of pure carbon chips, about one-fourth of an inch long. This material is used to provide a filtering effect to water that has percolated from the soil mix. You can also use aquarium charcoal, but it may cost a bit more. Only use clean, washed gravel and sterile soilless potting mix.

CARE AND DISPLAY

When water droplets (condensation) form on the inside walls or lid of the terrarium, open the lid for about an hour. This will allow the excess water to evaporate. Continue this process until you see very little if any condensation. At this point, the terrarium ecosystem has reached equilibrium and can withstand long periods without any additional watering—from weeks to years!

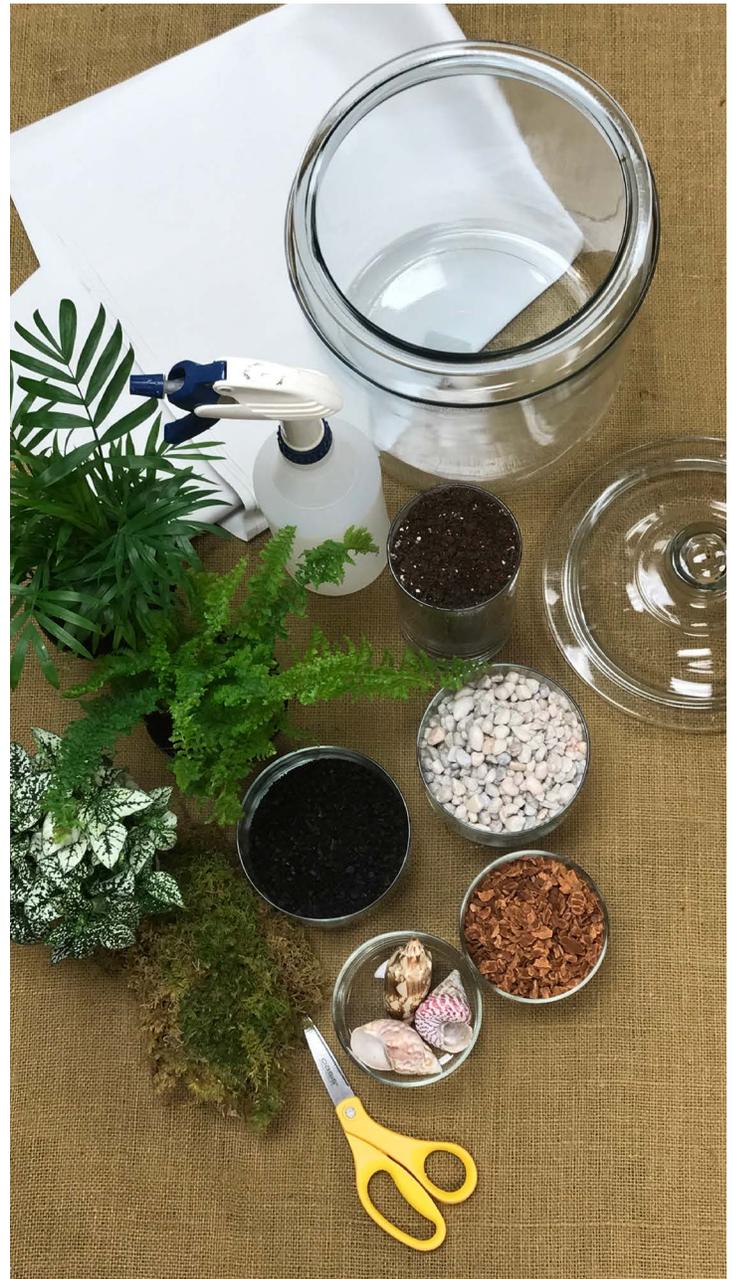
One of the goals of terrarium culture is slow growth. This limits the amount of pruning you will have to do. Air, moisture, and sunlight will aid in photosynthesis, which is the production of light energy into carbohydrates. This is all a terrarium needs to thrive. There is no need to add fertilizer to the closed system.

It is unusual for a terrarium to have a display life of longer than a year or two. As plants mature, they may outgrow the jar. It may become necessary to prune plants or remove them. Take this opportunity to refresh the design by rearranging existing plants or adding others. This is a fun and relaxing activity any time of the year!

PROJECT MATERIALS*

Container (2-gallon glass jar)

Plant selections (Neanthe bella palm, nerve plant, Boston fern 'Fluffy Ruffles')



Finely chopped, heat-treated bark

Gravel

Horticultural-grade charcoal

Potting mix

Moss (undyed sheet moss)

Decorative items (miniatures, shells)

Mist bottle and water

Scissors or snips

Newspaper or other paper

*Not all of the listed materials are necessary for every project. Plant supply departments often carry an array of terrarium supplies. You can also find these materials online.

STEPS

Water the plants in their original pots a few hours or the day before construction.

Be sure to wash the terrarium container before using it.

Lay down a few layers of newspaper for easy clean-up of your work surface.



Add 1 inch of gravel to the bottom of the container.



Make a funnel with two or three layers of newspaper or other paper. Using the paper funnel, slowly add about ¼ inch of charcoal.



Next, add about 2 inches of the soil mix to the container. Make a hole in the soil large enough to accommodate the plants' root balls.



Remove plants from their pots and carefully break up the soil at the top and bottom of the root ball.



Often, there are multiple plants of the same variety per pot. Carefully open up the root ball with your fingers to separate plants into smaller pieces.



You may need to prune a few leaves or stems if they touch the sides or lid of the container.



Place the tallest plants toward the center and the remaining plants around the center. Allow a bit of space between them, and evaluate the need for additional pruning.



Add the plants and tamp down the soil around the rootball.



Now it is time to water the terrarium. Using a mist bottle, mist the interior sides of the glass jar. This not only provides water to the soil, but it also helps to wash charcoal dust or other organic materials from the glass. You can tell the soil is moistened by the way its color appears saturated. Be sure to heavily mist the root ball area of each plant, but do not fully saturate the soil. Water can always be carefully added to the terrarium, but not drained from it.



Break up large pieces of moss and add them to the soil surface in patches. Add chopped bark to other patches. Finally, add decorative items.

To establish the moisture balance within the terrarium, follow these steps:

1. After finishing the project, leave the container open for about 24 hours. This will allow excess water vapor to escape.
2. Replace the lid for 24 hours.
3. Remove the lid for another 24 hours, allowing condensation to evaporate.
4. Replace the lid again for another 24 hours.
5. Keep repeating this process until there is no moisture collecting on the inside glass of the terrarium. At this point, the terrarium has reached an equilibrium and will not need to be watered for weeks, perhaps months, at a time.



Foliage or stems resting against any of the interior glass surface can be detrimental to the health of the leaf, plant, and entire terrarium system. The surface of the leaf gives off water vapor; if it is near the glass, moisture will be trapped and create an environment for disease. Similarly, it is best to keep plants from touching each other to avoid rapid disease spread.

Table 1. Plants (cacti and succulents) suitable for open-system terrariums.

Aeonium
Aloe vera
Burro's tail
Cactus
Crown of thorns
Devil's backbone
Echeveria
Flaming Katy (Kalanchoe)
Hens and chicks
Jade plant
Panda plant
Pencil plant

Table 2. Plants suitable for both open- and closed-system terrariums.

African violets (including miniature African Violets)	Norfolk Island pine
Anthurium (miniature varieties)	Orchid (such as miniature Phalaenopsis)
Ardisia	Palms
Artillery fern	Peperomia
Baby's tears	Philodendron
Bead plant	Pilea
Creeping fig	Plumosa fern
Croton	Pothos
Dieffenbachia	Purple velvet plant
Dracaena	Rabbit's foot fern
Dwarf schefflera	Rex begonia
Fern	Selaginella
Flame violet	Spider plant
Gold dust Dracaena	Strawberry begonia
Ivy	Tillandsia
Lipstick plant	Venus fly trap
Maidenhair fern	Zebra plant
Nerve plant	

REFERENCES

- Carloftis, J. (2006). *Beyond the windowsill*. Franklin, TN: Cool Springs Press.
- DelPrince, J. (2013). *Interior plantscaping: Principles and practices*. Clifton Park, NY: Delmar.
- FTD Fresh. (2014). *Twenty popular types of succulents*. Retrieved from <https://www.ftd.com/blog/share/types-of-succulents>
- Hessayon, D. (1998). *The house plant expert*. London: Transworld Book.
- Martin, T. (2009). *The new terrarium*. New York, NY: Clarkson Potter.
- Pleasant, B. (2005). *The complete houseplant survival manual*. North Adams, MA: Storey.



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