Planter Drainage

Drowning Is the Number One Killer of Container-Grown Plants

by Tom Boyce

Water in, water out—simple, right? As a developer, board member, or property manager, you have undoubtedly had to deal with drainage problems in large planters. It is an expensive and time-consuming task for staff to deal with poorly draining planters that have to be dug up and remedied again and again.

While solar-gain-induced thermal shock to root systems is a key factor in stunting or killing container-grown plants in sunny Florida exposures, drowned plants are more prevalent in our rainy climate. Water-soaked

roots can kill a plant in less than 24 hours, while it can take weeks of under-watering or steaming roots in a single-walled planter, before the plant finally succumbs.

There are five key components to ensure proper drainage: the location of the drain, the size of the drain, soil media, filtration, and root blockage.

When purchasing larger planters, the primary considerations should be which planter form and drainage location are best for our sunny, but wet, Florida climate. Keep in mind that you will have to dig up your planters sometime!

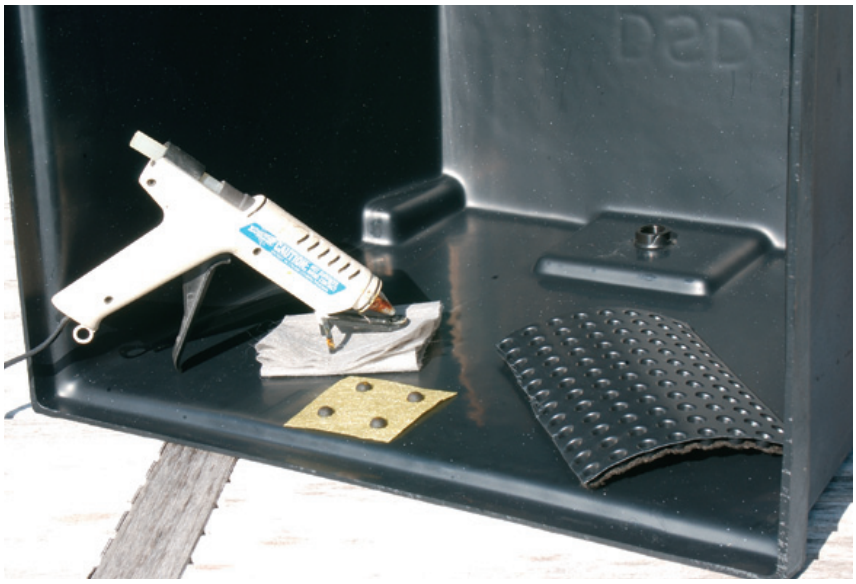
Yes, that's the dirty secret. It is inevitable, and you need to plan for it. The question is: how long can you go between major events? Simple, tested technology can now help you extend that time to 10 or 15 years. Though drainage issues can often be fixed with the plants in place if the planter liner and drain are properly designed, it is more convenient and far less costly to avoid drainage issues in the first place.

Costs of drainage problems include not only the initial cost of the planter and plants, but also the cost of the effort to figure out and remedy the problem, to remove damaged plants, and to replace them with new ones. There is also the mess to clean up, the potential for cosmetic damage to the building by workers during the process, and the disruption to the residents.

Large, free-standing planters, with separate plastic liners where the drain can be properly positioned up the side wall of the liner, avoid the structural problems associated with planters built into buildings, as poured concrete will at some point succumb to settlement cracks and drainage issues. Even the best sprayed-, rolled-, or troweled-on concrete liner systems will leak at some point in time. Digging in them to correct drainage problems doesn't help and can dramatically increase costs due to concrete spalling.

When considering free-standing planters, and larger planter liners hidden behind a decorative facade, keep modules small enough to work on. Break up the planted area using multiple, adjoining liners, rather than one big liner with one point of failure, and many plants to remove to find the problem, or to die in the event of a catastrophe.

If you have plans for specimen plants or are planting trees that will grow too large for workers to lift by hand, make sure you have crane access to lift the trees or some way to get forklifts or tripods

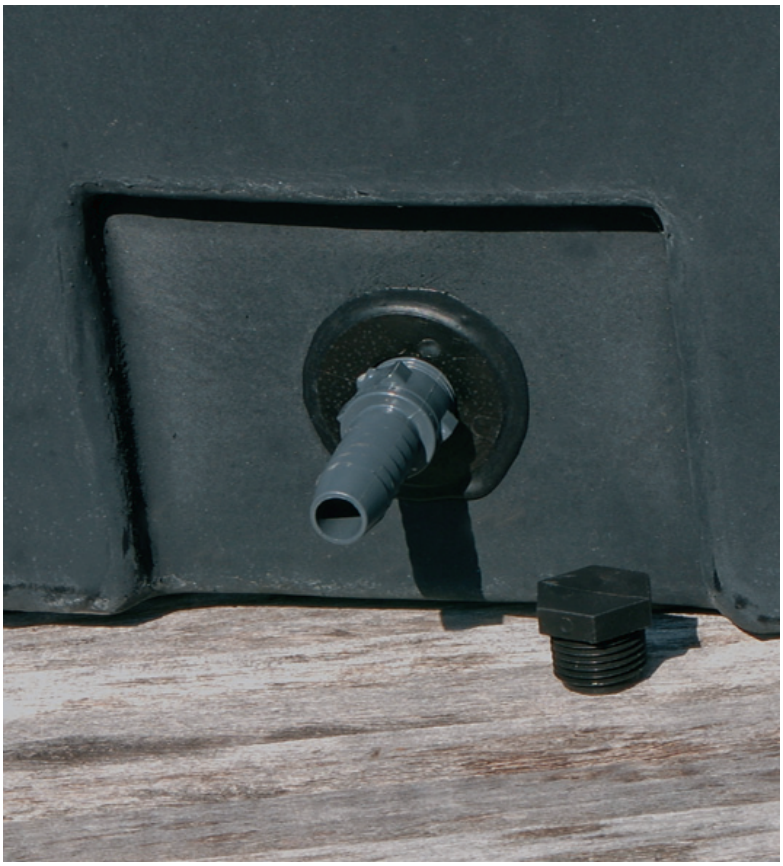


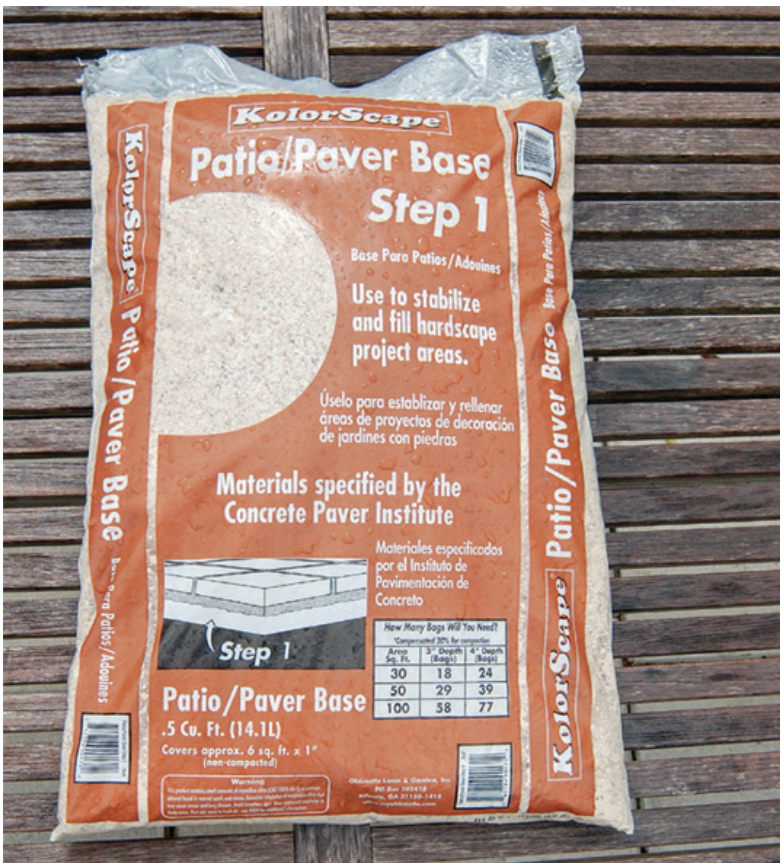
in to lift the plants out of the planter for repairs or bring in new ones should major plants die. Above all, avoid building or buying planters or liners with drains in the bottom where they will silt in, and you will have to remove plants to access them.

In both new and existing large planters, hide a vertical, two-inch PVC pipe in the plantings that runs from the bottom to above the final soil level, with a removable top to keep soil out, so that you can pump standing water out in an emergency before the plants drown.

Here in Florida, storms can dump six inches of rain in just a few hours, so it is easy to overwhelm a poor drainage system—you can literally see containers overflow the top. At other times, long periods of drizzle and gray sky combine low evaporation with soaking soil to subtly build up fatal water levels in planters without an effective drainage system.

The primary reason for water buildup is not that the drain is too small; it is that the drain is clogged by soil or roots, preventing drainage of water from a malfunctioning watering system or heavy rainfall.





A planter filled with nothing but water six inches deep will drain at the rate of about a cubic foot per minute through a three-fourth inch opening, so no amount of rain alone will overwhelm a properly sized and functioning planter drain. Single-point drains of this size are convenient to use for inconspicuous controlled planter drainage systems on balconies, rooftops, and courtyard patios and are safe to use if properly designed.

The third component in drainage is starting with the right soil mixture, both for the plant and for the building weight limits, as we often find on rooftop and balcony projects. You are looking for soils that will hold nutrients, pH, and moisture within fairly specific ranges that best suit what is being planted at the lowest possible weight. Very seldom is dirt just dumped into a container. This soil selection process, done right, eliminates much of the problem caused by "fines," the small clay-like particles that are the major factor in blocking filter membranes.

A four-layer filter is the fourth component of an efficient drainage system. A planter is really just a shaped French drain. The fines are carried by the gravity-induced water flow downward toward the drain. Unfiltered, these fines will block any filter membrane in a short time. The standard practice to create a filter well area is to fill the bottom of a planter with a few inches of gravel over a bottom drain. It is easy to see the weakness in this tried-and-true method.

Even with the best soil selection, the speed of the water flow determines where fines will settle. If the water drains too fast, fines will be drawn to the drain, even a sidewall drain clogging the filter; if the water drains too slowly, the plants drown.

The first aspect of controlling water speed is a layer of at least two- to four-inch thick covering of very clean, very coarse sand of one to two

millimeters particle size. (For reference, the wire of a medium paper clip is one millimeter.) The reason for this size is to moderate the speed of the water flow. Gravel, even pea gravel, does not slow down water enough, drawing fines to the filter. Masonry or playground sand compacts, slowing water down too much, creating a watertight seal.

While clean coarse sand is hard to find, one good and readily available material, though not perfect, is Paver Base found at home improvement stores. Most of the grains are large enough, but it still has a lot of fines in it. Wash it first if you can. Properly placed sidewall drains in commercial-grade planters are deep enough to handle this without clogging the drain.

The coarse sand filter covers "drain board" (think of a thin, non-crushable egg crate covered with geo-textile covering), which is used to increase the drainage surface area.

The final components prevent the drain from being clogged by roots. To create an easy two- to four-inch root protection zone, wrap a small square of BioBarrier in weed-block fabric and place it under the drain board over the drain opening before covering the composite with the sand layer. With plastic planter liners, the composite filter can be held in place by hot-melt glue before covering with the final filter layer, but it is not necessary.

BioBarrier, used for more than 15 years by commercial growers, is a fabric embedded with plastic dots containing a non-systemic herbicide that leaches out over a 15-year period. It has a lower toxicity than table salt or aspirin, yet creates a two-inch thick root-deflection zone around the drain. It is guaranteed effective for 15 years by its manufacturer. Using BioBarrier, combined with a proper filtration composite, you should be able to go 15 years without digging up a planter for drains blocked by roots.

On a final note, for projects with large built-in planters, or high surface areas such as remaking barren heat producing concrete spaces into cooling and carbon absorbing "green" roofs or decks, there are high-tech drainage mats that are used by giant sports stadiums and golf courses with millions of dollars at stake if drainage fails. Composed of high-tech, crush-proof mats of one-inch diameter plastic tubing covered with geo-textile, they ensure a large drainage area and directed water flow by interconnecting fittings to prevent damage to grass and delays in play caused by flooding. These can be covered with a rolled out layer of BioBarrier before sodding.

This is an impressive solution for single- or multi-point directed flow systems that may be adapted for balconies, roof gardens, interior courtyards, and other areas where drainage control is required. It weighs less than traditional gravel systems, and that weight savings can allow for a green roof or pool deck where it would have been weight prohibitive, or allow for a deeper planter medium than less effective gravel systems.

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