



SMARTGARDEN™ —Improving Soil Drainage

The water-holding capacity of soil affects plant selection in a garden

When it comes to the movement of air and water through soil, drainage and water holding capacity are two sides of the same coin. Plants that require abundant water—think of a bog garden—thrive where the water holding capacity of a soil is very high. Alternatively, xeriphytic plants, with their low moisture requirement, would most likely rot under boggy conditions; these plants need a soil with sharp drainage. The drainage requirement of most garden plants falls somewhere in the middle.

WATER MOTION

When it rains or when we supplement rainfall with irrigation, water fills the pore spaces between soil particles and aggregates. Gravity pulls water downward through the soil. The size of the pores determines how quickly water moves, and conversely, how long it is retained.

The texture of your soil—whether it is primarily sand, silt, or clay—and the content of organic matter largely determine the rate of this movement. Coarse textured (sandy) soils tend to drain quickly, retaining little water. Fine textured (clay) soils retain both water and nutrients longer than a sandy soil, but may become waterlogged. A loamy soil contains particles of various sizes and usually a good bit of humus. Water drains through loam at a rate that allows plants to receive sufficient air and water to meet their needs.

You can approximate your soil's texture by taking a two-cup soil sample to a depth of six inches and placing it in a quart jar. Add water until it is nearly full and cover it securely. Shake the mixture well, then let it sit for about 24 hours. The soil will settle into the following layers: sand, because it is heaviest, on the bottom; silt, with its mid-size particles, in the middle; and clay on top. Organic matter will float on the water's surface. This profile allows you to visually determine the relative components of your soil that are responsible for its texture.

Another factor that influences water drainage or retention of your soil is compaction. Heavy foot traffic or construction can compress soil, resulting in a critical loss of pore space that diminishes both drainage and water-holding capacity. Even when your topsoil is in good condition, drainage problems can occur if the subsoil is compacted or there is a hardpan that impedes water movement.

TESTING FOR DRAINAGE

Determining how well your soil drains helps you select plants with water requirements appropriate to your site, or identify the need to improve the drainage.

To assess your soil's drainage, perform the following

test: Wait at least a few days after a rain, until your soil has dried a bit, then dig a hole four inches deep, large enough to accommodate a 46-ounce can (a large juice can) with both top and bottom removed. Set the can in the hole and firm soil around the outside of the can. Fill the can to the top with water and observe how long it takes for the water to drain.

Ideally, the water level will drop about two inches after an hour. This indicates that your soil drains well, but also will retain the moisture necessary for the healthy growth of a wide range of garden plants.

If the water level drops less than an inch after an hour, your soil does not display sufficient drainage to accommodate most plants. Either you will have to limit your choice of plants to those that like constant moisture or "wet feet," or you will have to take measures to improve the drainage.

If the water level drops more than four inches in an hour, your soil drains too fast, and unless you plan to grow only plants that tolerate very dry soils, you will need to add organic matter to help retain more soil moisture.

Remember that different areas of your landscape may display marked differences in drainage. You may want to perform this test in several locations.

DEALING WITH POOR DRAINAGE

If your soil drains too slowly, you have several options. You can limit your selection to plants that like wet soils (see "Blooming Bogs," *The American Gardener*, March/April 2001), or build raised beds and fill them with good, loamy soil before planting. To improve drainage of a compacted soil, add organic matter. If the subsoil is compacted, you may need to break up the hardpan or add subsurface drainage tiles that will carry excess water away from planting areas.

For vegetable gardens with poor drainage, a hill-and-furrow planting method can be practiced: Broad rows can be built up several inches above the soil surface with furrows running between the rows to divert excess water. Conversely, if your soil drains too fast, use the furrows for planting. Rain or irrigation water will be channeled into the furrows where plants are growing.

For gardens where the soil drains too fast, the addition of organic matter will improve the water holding capacity, and mulching will reduce evaporation loss. But supplemental irrigation may be necessary unless you choose plants that thrive in dry soils (see "Cold Hardy Cacti," *The American Gardener*, March/April 2000, for some interesting suggestions).

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