



THE DIRT ON DIRT

Different plants prefer different soils. So understanding what soil is best for a group of plants in a given area can help in determining how to make adjustments.

Three concepts that all gardeners should know about soil is succession, texture and structure. Understanding a bit about each, as well as the effects of salt and aeration, can get to the root of why some plants grow while others wither.

Plants did not evolve by themselves. They are part of a diverse ecology and have established symbiotic relationships with a web of other organisms. Depending on the relative age of the soil along with climate, soil falls along a continuum from early soils that are little more than weathered bedrock to ancient woodland soils in old growth forests.

SOIL SUCCESSION

Early soils are generally lacking in organic matter, have a soil ecology that is bacterially dominant and are more alkali (higher pH). By contrast, older woodland soils have a much higher percentage of organic matter, are fungally dominant and are more acidic (lower pH).

Between these two extremes of succession, soils go from early weedy growth – mostly annuals with high seed production – through a series of trophic phases including the growth of perennial plants, the establishment of woody plants, and the accumulation and breakdown of organic matter into increasing amounts of humus. The decomposition of the organic matter involves more fungi, both in number and species diversity, some of which establish symbiotic relationships with plant roots.

One of the most common soil problems occurs when plants that evolved in older soils are planted in an earlier soil succession that has the wrong pH and not enough organic matter and related fungi. The resulting nutrient deficiencies, especially iron, create stressed plants that are more susceptible to pests and pathogens. This really isn't a soil problem; it's a plant selection problem.

Another problem can occur when nutrient cycling, the gradual addition of organic matter and subsequent humus, is interrupted by the good-intentioned gardener who rakes up and removes all the fallen leaves and branches over a prolonged period of time. If these materials aren't replaced – either with compost, mulch or grass cycling – plants will become stressed and soon decline.

SOIL TEXTURE

Soil is composed of different sized particles: sand, silt and clay. If soils contain all three they are considered "loamy." Just as plants evolved in different successional soils, plants have also evolved in different textured soils. For example, coastal scrub plants tend to prefer sandier soils while bay wetland plants are inclined to clay soils.

Regardless of soil texture, soil particles can be "glued" together into aggregates by humus and aerobic soil organisms. The more aggregation there is the more porous soil will be, increasing air flow to plant roots.

Soil structure can be quickly destroyed by compaction and poor drainage, so taking measures to aerate compacted soils can help improve soil health. While some riparian plants prefer saturated conditions, most garden plants do not. Correcting drainage problems can dramatically improve soil aeration and related soil problems. Generous applications of compost and mulch can also quickly create soil structure and improve aeration.

SOIL STRUCTURE

Good irrigation management is a key component to healthy soils. Good soil structure will reduce runoff and increase root depth and water-holding capacity. Leaks, poor irrigation uniformity or poor irrigation programming can create anaerobic conditions and shallow roots. Deep, infrequent watering with no runoff is both an efficient use of a precious resource and a way to promote healthy soil.

Repeated applications of strong synthetic fertilizers, while good-intentioned, can stress the plants they are intended to feed. Synthetic fertilizers are salts – such as sodium nitrate, ammonium sulfate and potassium nitrate – and excessive salt in soil impedes water absorption in plants.

Responsible use of organic fertilizers will avoid applying more salts to the soil and can also reduce pollution of nitrates and phosphates in our waterways. Mulch, humus and soil organisms can all help buffer the effects of salty soils. Reducing or eliminating the use of pesticides also may solve soil problems.

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