

Soils & Fertilizers for Master Gardeners: Soil Drainage and Water Holding Capacity¹

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This article is part of a series entitled *Soils and Fertilizers for Master Gardeners*. The rest of the series can be found at http://edis.ifas.ufl.edu/topic_series_soils_and_fertilizers_for_master_gardeners. A glossary can also be found at <http://edis.ifas.ufl.edu/MG457>.

Introduction and Purpose

Plants need to obtain water from the soil to replace the water lost through evapotranspiration. Therefore, soils must be able to hold water for use by plants. In addition, soils must drain well enough to ensure that roots receive adequate oxygen available for respiration. This publication will describe how soils are categorized based on the soil's ability to store and transmit water (referred to as Soil Drainage Class); characteristics that are variable due to a soil's physical properties (e.g., texture, structure, pore size and space; see EDIS publication Soil Physical Properties <http://edis.ifas.ufl.edu/mg451>). The major soils of Florida can be grouped into soil drainage classes. This information will help homeowners understand the natural water status of local soils, allowing them to make decisions about plant selection and irrigation needs.

Soil Drainage Class

The USDA Natural Resources Conservation Service classifies soils into seven natural drainage classes depending on

the duration and frequency of wet conditions. The drainage classes are as follows:

Very Poorly Drained to Poorly Drained

Water movement is very slow to slow through these soils and artificial drainage is required to grow most plants. Very poorly drained soils may have standing water at the soil surface and are wet most of the time. Poorly drained soils are wet to shallow depths for long periods of time. These soils occur in depressions or low lying areas. Wet conditions may be due to a seasonably high water table, high rainfall, or soil layer with slow permeability, such as a hardpan.

Somewhat Poorly Drained

These soils experience periodic wetness at a shallow depth due to a seasonably high water table, restricting layer, seepage, or high rainfall. Water movement is moderately slow through these soils and plant growth will be restricted unless the soil is artificially drained.

Moderately Well Drained

Water movement is slow during some parts of the year. These soils are wet in the root zone for only a short period of the year, which may restrict root growth. However, these soils will not require artificial drainage for adequate plant growth in most cases. Soils may have a restricting subsoil layer that slows infiltration.

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Well Drained

Water movement is good in these soils, but it is not rapid. Adequate water is available to plants throughout the year. There are no periods where root growth is restricted due to wetness, so no artificial drainage is needed.

Somewhat Excessively Drained to Excessively Drained

Water movement through these soils is rapid to very rapid and do not retain adequate water for plant growth following precipitation. Therefore, these soils will require irrigation for acceptable plant growth. These soils are usually have sandy texture or are very shallow.

Drainage and Florida Soils

The water holding and drainage capacity of soils of the coastal lowlands differs from the soils of the central ridge or highlands. Therefore, it is useful to relate these drainage classes to the major soil orders and geographic regions found in Florida.

Histosols

These organic or muck soils (histosols) typically form in depressions or low lying areas that are nearly level (e.g., marshes and swamps), where wet conditions limit the decomposition of organic matter. These soils are typically very poorly drained to poorly drained. When these soils are artificially drained, as is done in the Everglades Agricultural Area, they are very fertile and good for production. However, once drained, the organic matter component of these soils will decompose leading to subsidence (Figure 1).

Spodosols

The spodosols that dominate the flatwoods ecosystems of Florida tend to be somewhat poorly to poorly drained. These soils occur in level to gently sloping lowland areas and typically have a hardpan or restricting layer that limits soil drainage at some point during the year.

Ultisols and Alfisols

The ultisols of the Florida highlands (Panhandle) and the central ridge are typically well-drained loamy to sandy soils. The alfisols of the central ridge are well-drained sandy soils.

Entisols

The entisols of the highlands and the central ridge are excessively drained thick sands that occur on level to gently sloping areas. In contrast, the entisols of South Florida



Figure 1. Subsidence of organic soils can occur due to the rapid breakdown of organic matter following artificial drainage. Credits: Mary Collins, Soil and Water Science Department, UF/IFAS.

are very poorly drained marl or thin sandy soils that are underlain by very porous limestone bedrock.

Urban Soils

Urban soils occur in all geographical areas of Florida where human activities have altered the natural soil landscape. The ability of these soils to hold or transmit water is quite variable, depending on the level of compaction, the amount of soil covered by hard (impervious) surfaces, and surface crusting. Typically, urban soils drain more slowly than their natural counterparts. For more information about urban soils, see EDIS Urban Soils and Their Management Issues.

Summary

The ability of soils to store and transmit water varies as a result of soil texture, structure, and available pore space. The USDA places soils into soil drainage classes based on the duration and frequency of wet periods. Soils in Florida fall into all seven soil drainage classes. In general, the organic soils and soils of the coastal lowlands are somewhat poorly to very poorly drained, while the sandy soils of the highlands and central ridge are well to excessively well drained. Urbanization alters the soil's ability to hold or drain water, often resulting in wetter conditions and reduced drainage.

References

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