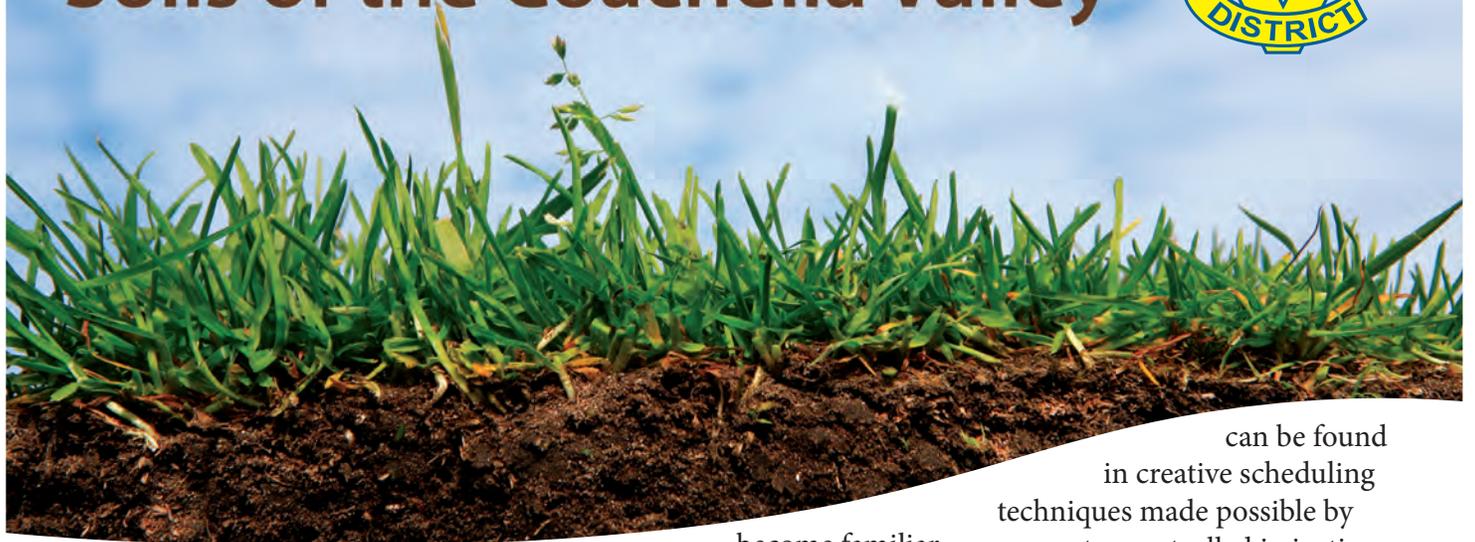


Soils of the Coachella Valley



The horticultural soils of the Coachella Valley range from the very gravelly sands of Desert Hot Springs to the loams of the city of Indio.

Proper management of the desert's most valuable resource, its groundwater, depends upon efficient irrigation practices and three of the most important factors affecting irrigation management: soil type, permeability rate, and stratified layers that determine rooting depths.

As a general rule it can be said that the soils are finer as you move down the alluvial fan, or floodplain, from the foothills into the valley lowlands, but the natural wandering course of the Whitewater River in conjunction with the silty lake deposits of ancient Lake Cahuilla complicate this simple generalization.

Frequent severe windstorms also contribute to the complexity of our soils by depositing windborne soil particles even further from their point of origin. The end result of our desert's soil building process is a soil mix of such significant variation and complexity that a conscientious landscaper would be well advised to

become familiar with our valley's soil spectrum because of the soil's role in landscape management.

Soil Types

It pays to know what type of soil you are working with.

Soils are classified and named by the USDA-Soil Conservation Service Surveys into individual soil series. In the Coachella Valley there are only five distinct soils of horticultural significance but their soil-water characteristics vary drastically. Note that the water holding capacity may vary as much as six times across the five major soil types within the Coachella Valley while the permeability rate can vary by a factor of 33. For this reason, it is important that local landscapers be aware of the soil type that makes up their site.

In many instances, irrigation problems can be attributed to the soil that is receiving water, rather than the irrigations system hardware that is delivering it. Furthermore, many of the solutions to these variations in water holding capacity, permeability rate and rooting depth

can be found in creative scheduling techniques made possible by computer controlled irrigation system.

Carsitas

- Soil permeability rate: 6-20"
- Available water holding capacity: 0.4-0.8"
- Drainage characteristics: high
- Stratification layers present: rare

Carsitas soils are characterized by gravelly sand in the first foot below the surface, with more gravelly courses sand up to five feet underground. This soil dominates (>50%) in Desert Hot Springs and is significantly present (10-50%) in Palm Springs, Cathedral City, Rancho Mirage, Palm Desert and La Quinta. The Carsitas foothill soils are the youngest in the Coachella valley and have had very little time to develop the fines necessary to increase water holding capacity. As a result they hold very little water and daily split irrigations are often necessary during the peak evapotranspiration rates of summer. These soils are also easily leached and are subject to nitrate fertilizer percolation losses. Infiltration, permeability and drainage rates are very high. Runoff is almost impossible.



Myoma

- Soil permeability rate: 6-20"
- Available water holding capacity: 0.7-1.1"
- Drainage characteristics: moderate
- Stratification layers present: unlikely

Myoma soils are characterized by layers of fine sand and very fine sand in the first five feet below the surface. This soil dominates (>50%) in Palm Springs, Cathedral City, Rancho Mirage, Palm Desert and Bermuda Dunes. It is significantly present (10-50%) in Indian Wells and La Quinta. The wind-blown soil is the most common in the western valley, which is not surprising considering that the wind played a major role in its genesis. This is a very nice turfgrass soil. Its infiltration, permeability and drainage rates are moderate and its water holding capacity is almost an inch per foot.

Coachella

- Soil permeability rate: 2-6"
- Available water holding capacity: 0.4-1.8"
- Drainage characteristics: moderate
- Stratification layers present: possible

Coachella soils are characterized by

layers of fine sand and silt lenses in the first five feet below the surface. This soil does not dominate (>50%) in any area but is significantly present (10-50%) in Rancho Mirage, Palm Desert, Indian Wells, La Quinta and Bermuda Dunes. The Coachella soils have been worked by water as well as wind. They can usually be found near the old stream bed of the Whitewater River flood course. This is probably the best soil in the Coachella Valley because it is an ideal mix of available water holding capacity, permeability and drainage. Stratifications are often present, but they are usually thin and deep, posing a problem to deep-rooted trees. However, a deep, back hoed planting hole will usually solve this problem because the backfill will have shattered and mixed up the restricting layer.

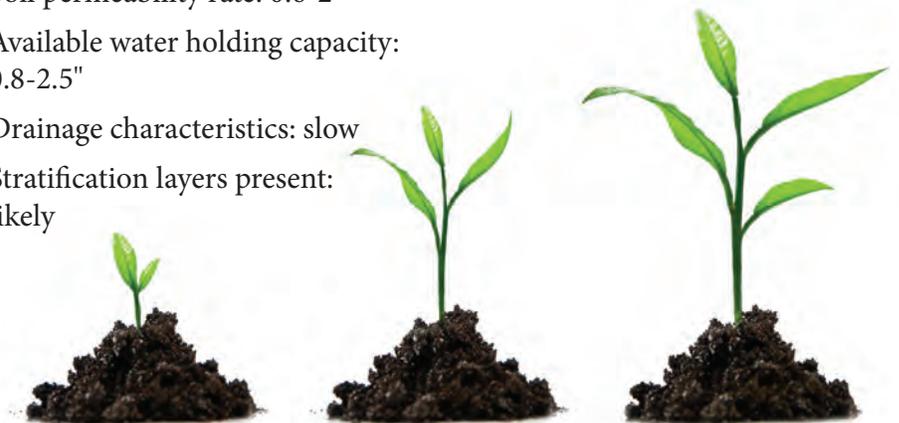
Gilman

- Soil permeability rate: 0.6-2"
- Available water holding capacity: 0.8-2.5"
- Drainage characteristics: slow
- Stratification layers present: likely

Gilman soils are characterized by layers of fine sandy loam, silt loam and loamy sand in the first five feet below the surface. This soil dominates (>50%) in Coachella. It is significantly present (10-50%) in Palm Desert, Indian Wells, La Quinta and Indio. This can be a difficult soil. Its strong point is a high water holding capacity, but getting water into and through it can be difficult, especially on slopes and in areas compacted by heavy equipment or golf carts. Stratifications are also common further complicating matters.

Indio

Soil permeability rate: 0.6-2"
 Available water holding capacity: 1.6-2.4"
 Drainage characteristics: restrictive
 Stratification layers present: likely



Indio soils are characterized by layers of loamy fine sand, very fine sandy loam and silt loam, in the first five feet below the surface. This soil does not dominate (>50%) in any area but is significantly present (10-50%) in Palm Desert, La Quinta, Indio and Coachella. This is the toughest landscape soil in the Coachella Valley and requires careful management. Its water holding capacity is excellent, but infiltration, permeability and drainage is restrictive. Trees have a hard time becoming established on this soil unless carefully irrigated. Compaction is always a potential threat and stratification is common.

Permeability Rate

The permeability rate is a measure of how fast applied irrigation water moves through the soil. If an irrigator applies water at a rate exceeding the ability of the soil to accept it, then the water pools on the surface and eventually will run off causing a non-uniform irrigation application and soil erosion. The major factors affecting permeability rate are texture and density. As long as the irrigation application rate does not exceed the permeability rate, runoff will not occur.

Heavier Coachella soils are the only soils that may be subject to runoff at typical landscape sprinkler application rates (0.5"-2.0"/hr). This problem is more severe on compacted and sloping areas. Management of this problem is particularly important during the initial seeding and subsequent overseeding because the runoff will carry the grass seed away. The best response to sprinkler irrigation runoff is to break up the sprinkler runtime when irrigating areas exhibiting slow permeability rates.

The soil infiltration rate is a related measure that determines the rate



at which the soil surface accepts water. The infiltration rate is a dynamic variable that initially changes rapidly over time. Soils usually accept water rapidly at first and then at a reduced rate until the permeability steady state rate is reached. The major factors affecting the infiltration rate are soil texture, plant cover and organic matter, thatch, compactness and slope.

The amount of available water held in the active root zone is an important factor in determining an efficient irrigation schedule. If irrigation water is applied in excess of the water holding capacity of the soil, the extra water percolates below the active root zone and is lost.

Soil stratification

Stratified soils are those that are characterized by abrupt porosity changes at various depths within the potential active root zone. These changes in dimensions of the spaces between soil particles affect water and air movement and can limit the depth of the active root zone. In turn,

this determines the total amount of soil water available to plant.

Soil stratifications are caused by abrupt texture changes and compaction. The most common textural change in the Coachella Valley is caused by the role of water in soil formation. Flooding and lake silt deposits are the most common cause of stratification here. The cuts and fills made in the process of shaping a country club or HOA on the valley's finer soils often expose stratifications. The weight of heavy earth moving machinery compresses silty layers resulting in compacted soil stratifications. Shallow stratifications can cause perched water tables and interfere with turf root development. Tree and shrub roots are affected by deeper stratifications as well.

The only way to determine the presence of stratifications on soils is to dig a backhoe pit and examine the soil profile density and texture.

