Soil Moisture and Scheduling Irrigation

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The soil consists of solid particles such as clay, silt, sand, and organic matter. There are open areas between these particles called pore spaces. When a soil is in good tilth, that is not compacted yet not too fluffy, about half the volume consists of solid particles and half is pore space. If all the pore spaces are filled with water, the soil is said to be **saturated**. This condition often occurs after a heavy rain or irrigation. With time, some of the water moves downward, due to gravity, leaving about half the pore space filled with water, the other half, air.

In a well drained soil, this takes about 24 hours. At this point the soil is at **field capacity** and has an ample supply of air for the roots and moisture for plant uptake. Soil moisture continues to be lost through evaporation from the soil surface and transpiration through plant leaves. The combination of these processes is called **evapotranspiration (ET** for short).

Some of the soil moisture is bound tightly by soil particles and is unavailable to plants. At field capacity there is ample water that is held loosely in the pore spaces and is easily taken up by plants or lost by evaporation. As the loosely held moisture is lost by ET, the remaining water is more and more difficult for plants to extract from the soil. Eventually, the only water that remains is unavailable and the plants wilt and will not recover, even if water is added. The is called the **permanent wilting point**.

The amount of moisture between field capacity and the permanent wilting point is called **available water**. Although plants can use all of the available water, much of it is difficult to extract, placing plants under moisture stress. When plants are under moisture stress, the leaf stomates close. Stomates (or stomata) are pores on the underside of leaves that allow oxygen and carbon dioxide to move in and out of the leaf. Water vapor also moves out through the stomates in the process of transporation.

When the stomates close due to moisture stress, gas exchange is limited and this slows photosynthesis. Photosynthesis is the process by which plants manufacture carbohydrates which are necessary for growth. So, when plants are under stress, growth slows or stops. Moisture stress occurs well before wilting is evident.

To minimize moisture stress, irrigation should begin when 30-40% of the available water has been used.

It is important to plan on running irrigation systems just long enough to bring the soil in the root zone up to field capacity. Application of excess water is wasteful and leaches nutrients to areas below the root zone.