

MEASURE AND MANAGE

Crops Stressed by Dry Weather

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Large areas of Southwestern Ontario have been moisture stressed. Some areas of the province have received as little as a half inch of rain since May. The impact on crop growth is obvious, uneven growth, nutrient deficiency symptoms abound and some crops will simply be abandoned for crop insurance claims. Others will have disappointing yields. Yet in some fields, parts of the crops are normal and some neighboring fields are fairing better than others even though they received the same amount of moisture. Which begs the question why?

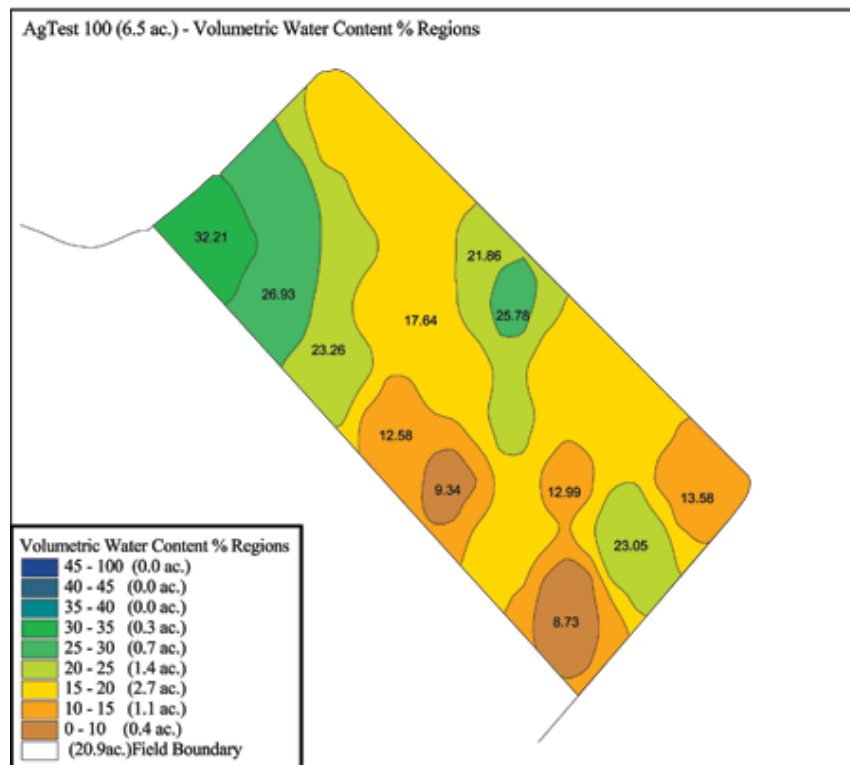
Uneven fields are often attributable to management affects such as timing of tillage and corresponding compaction and others are small differences in soil texture and structure. Moisture exists in soils as a film around soil particles. In a field that has sufficient moisture to support plant growth the film is thicker and often individual soil particles are joined contiguously by the water film.

This allows for easy movement of nutrients, such as P and K by diffusion. Diffusion is the movement of nutrients from an area of high concentration to an area of lower concentration. This takes place easily in soils with adequate moisture. As nutrients nearest the root are absorbed it creates the drop in gradient that is necessary to move nutrients. As soils dry out this water film becomes thinner and the contiguous connection of water film around soil particles disappears. This makes movement of nutrients to roots difficult; the nutrients diffuse over greater distances in the thinner water film reducing the rate of uptake.

It is important that roots continuously expand to maximize nutrient uptake, Nutrient uptake takes place with new root hairs. Most root hairs are active for 24 to 48 hours before they become suberized and unable to absorb nutrients. In dry soils, root extension and formation of new root hairs is impaired and the rates of diffusion slow down due to lack of soil particle connectivity by thinner water films.

Potassium (K) is the nutrient that is most impacted by dry soil conditions. Soils testing low in K will acerbate the deficiency symptom even more under dry conditions. Depending on stage of growth and moisture differences soybeans will likely show more severe K deficiency symptoms. Soybean seed contains more K than corn so the later growth stages of R5 and on will be more critical for final yield than for that of corn. Stalk strength will be more of a concern for corn.

The following map shows the differential in soil moisture levels across a field landscape this illustrates the variability we see in the crop canopy. Some areas of the field will show drought symptoms quicker than others and at the same time will respond quicker to rainfall due to higher infiltration rates. However these areas also have low retention levels and return to drought stress more quickly if moisture is not sustained. Usually these areas to no surprise are sandy knolls. Other areas are lower slope and different soil texture such as higher clay content. These are depositional areas with slightly lower infiltration rates but higher retention or greater amounts of plant available moisture. These areas will maintain crop growth, root extension and nutrient uptake longer than other up slope landscape positions.



This map is showing the percentage of water by volume clearly illustrates the wide range of moisture content across a given landscape largely contributed to topography and soil texture.

While all of this is painfully obvious the question really is how do we drought proof our soils?

Drought proofing involves 3 main concepts.

- Capture as much rainfall as possible (infiltration)
- Maximum storage of water (water holding capacity)
- Efficient recovery of stored water (root extension, soil quality)

Organic matter is often the key. Every 1% increase in organic matter adds approximately another 16000 gallons of water per acre foot.

Stay tuned for further articles on this subject.