

Soil Moisture Monitoring System Saves Money



Jerry Faulring

At the October 2, 2009 MNLA field day held at D. R. Snell Nursery, Steve Black, Raemelton Farm, Dr. John Lea-Cox, University Of Maryland Extension and I (Jerry Faulring) reported results related to soil moisture monitoring systems installed at Waverly Farm and Raemelton Farm.

The photo, on the next page of my computer screen, shows one set of probes. There are five probes connected to each of three nodes. Each probe will read the soil moisture, in this case plant available water, differently due likely to variances in soil dynamics. The average of the five probes gives me a basis for decision making. The spikes on the graph indicate a rainfall or irrigation event.

The goal of our system includes two major components.

First, over a period of years, we hope to become very aware of when to turn on irrigation, when to turn it off and to gain some measure of precision in knowing how much a particular plant of a given age needs to sustain healthy and active growth. You may be surprised to know very little information is available related to these growth requirements.

I will only address my experience.

Dr. Lea-Cox and Dr. David Ross, University of Maryland Extension, installed a system here on June 26, 2009. Moisture monitoring probes are installed into the soil 6" and 12" below the soil surface inside of the 6" PVC pipe. The installation pictured below should help to understand the mechanics. The probes are connected to 'nodes' that collect data every 5 minutes for storage and eventual retrieval on my desktop computer.

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Above ground components; 6" PVC tubes contain the moisture probes and data collection nodes mounted to posts

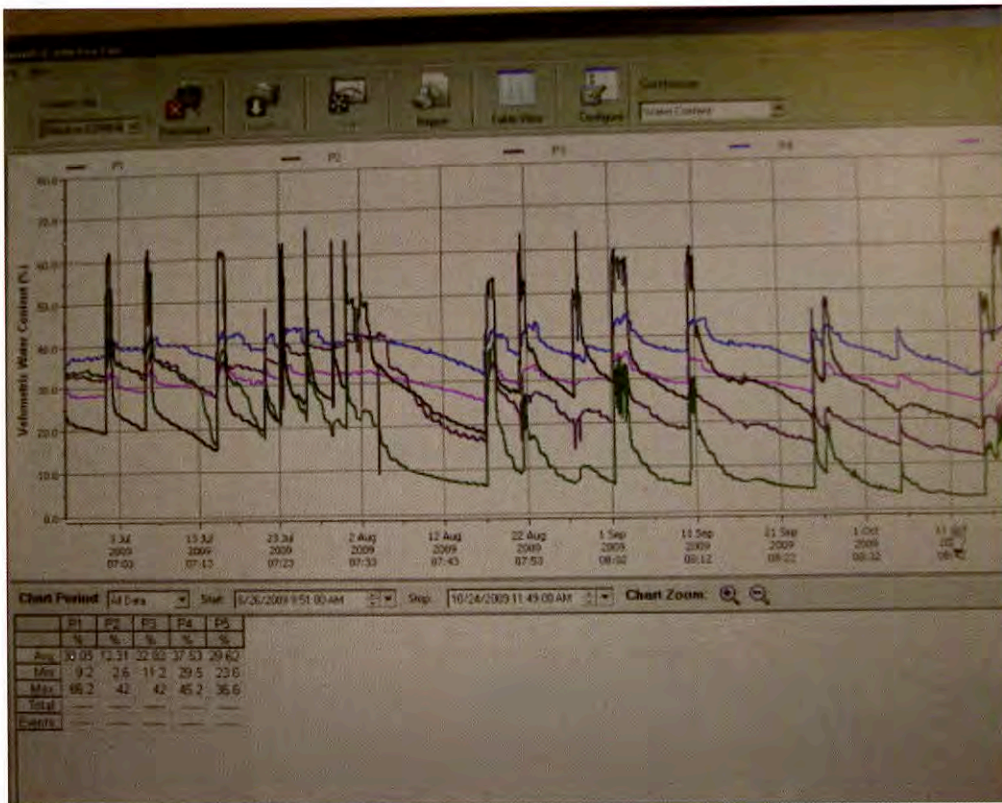


Photo of data on my computer monitor

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Second, I want to learn more about the benefit of compost amended soils related to water holding capacity and therefore reduced irrigation requirements. Pick up any article on compost and it is said that irrigation requirements will be reduced when soils are amended with compost. What we don't know is how much water a given plant will need at different ages growing in the same soil but of different levels of organic matter. To help get started in this matter, the three rows of Leyland Cypress (see first picture above) which are the subject of this study are each treated differently with compost. Row 1, to the right has no added compost, the control. Row 2, the center row, was amended at the rate of 100 tons per acre; our regular practice. Row 3, to the left, was amended with 200 tons per acre.

Knowledge gained in just a few short months has been very useful. It is known that 2009 was a cooler year than normal, by a degree or two in some months. We also had more summer rain than normal but we also had 3 short duration (3-4 weeks) droughty periods. At our site, we are 1/10th inch below our 12 year average on this date, October 19. The rain did come in a more timely fashion but not more rain than average. Given this information, our pumping cost for electricity is down 27.9% YTD compared to 2008. I believe this is mostly attributed to what we have learned from the soil moisture measurement system.

In 2008 we started monitoring soil moisture with

relatively inexpensive hand held measurement probes. They certainly are not the perfect tool but give a very good relative understanding of soil moisture. Electric cost for pumping in 2008 was basically equal to 2007. Thus a 28% reduction in 2009 compared to the two nearly equal previous years is significant. Rainfall here in 2007 was 22.37" on this date and 30.93" in 2008 on this date. What this tells me is we wasted a lot of water in 2008.

In 2009 I synchronized the hand held probes with the soil in the zone of precision measurement. I then took measurements all over the farm. Prior to having this resource our system of knowing when to irrigate was simply "it looks dry, start the irrigation"; not much science there. I learned this year that what previously looked like soil dry enough to irrigate was not always true. I also learned that we have been overwatering. I took measurements in the center of rows, plant rows spaced 5 feet apart for smaller shrubs, and realized we have been irrigating well beyond the distance the plants had any chance of being able to get to that water.

This is a long term research. Relatively little is known about the water requirements of field grown plants. Dr. Lea-Cox recently received a five million dollar grant from USDA to further his research on this subject for which he is one of the founding pioneers. This is a huge grant and strongly suggests USDA acknowledges water is a diminishing resource and opportunities exist to implement conservation measures. 🌱

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Environmental nodes measure rainfall, temperature, relative humidity and light intensity

Data collection nodes save data every 5 minutes and send it wirelessly to office computer



Hand held moisture measuring probe available from Gemplers (item # SM36)