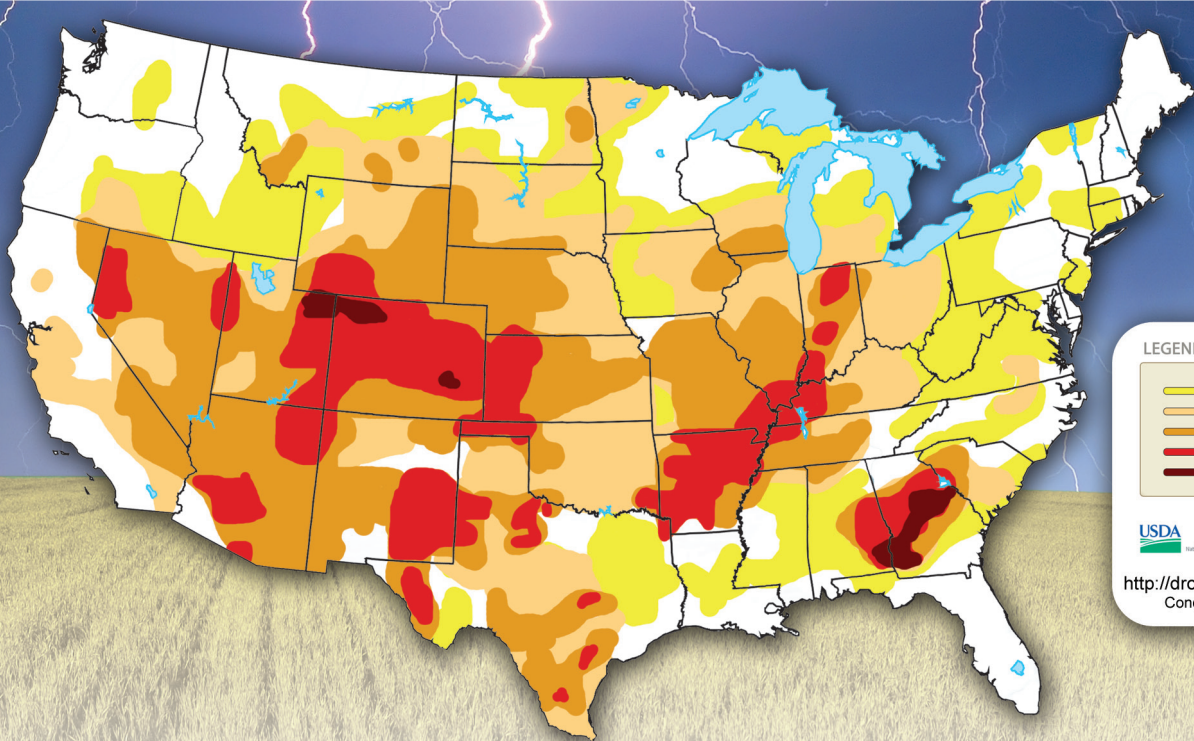


Irrigation and Soil Moisture Solutions



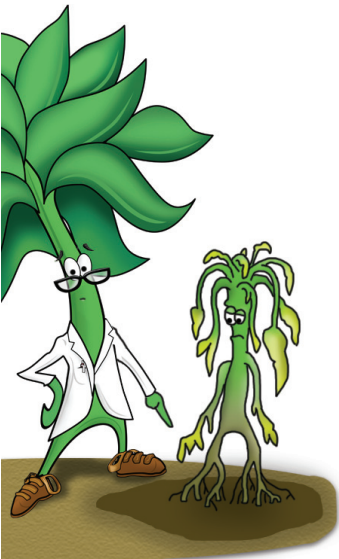
LEGEND:

- ABNORMALLY DRY
- MODERATE DROUGHT
- SEVERE DROUGHT
- EXTREME DROUGHT
- EXCEPTIONAL DROUGHT

USDA National Drought Mitigation Center

<http://droughtmonitor.unl.edu/>
Conditions as of 7/2012

DROUGHT CAN HAPPEN!
INTELLIGENT IRRIGATION BEGINS WITH THE RIGHT DATA



What can your root zone tell you?

As a reservoir for water, the soil plays a key role in the life of the plant. Nutrients in the soil solution provide the plant with the food it needs for growth. Water is essential for regulating plant temperature through the process of transpiration. Plant root systems are better developed when growing in moist soil. Excessive levels of soil moisture, however, can lead to anaerobic conditions that can promote the growth of soil pathogens and leach nutrients into the ground water.

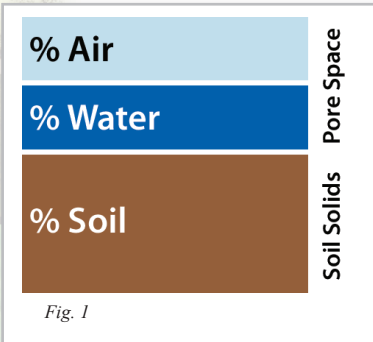
There are a wide variety of technologies that can be used to aid in managing water in agricultural, horticultural, and turf applications. But they all start with MEASURING what you need to KNOW. The options range from spot checking with a soil moisture probe to monitoring a field half a world away with a remote weather station.

Spectrum Technologies' official Spokesplant, Doc Green, describes Soil Moisture and Irrigation measurement tools for multiple applications.

Soil Moisture Measurement Tools: *Fast, Easy, and Accurate!*

FIELDSCOUT® TDR Soil Moisture Meters

A TDR meter is the perfect portable tool for taking spot measurements of the moisture in the field. The meter measures the average volumetric water content from the soil surface down to the tip of the rods. Choose which of the four rod-length options best suits your application; for example, 3" rods for a putting green or 8" rods for pivot-irrigated potato fields.



Volumetric water content (VWC) is one way to report how much water is in the soil. The soil matrix is composed of 3 main components; soil solids, air, and water. The air and water occupy the soil's pore space. VWC is the ratio of volume of water to the overall volume of soil (Fig. 1). At saturation, the VWC would be equal to the porosity of the soil. For agricultural soils, this is typically around 50%.

TDR 100



TDR 300

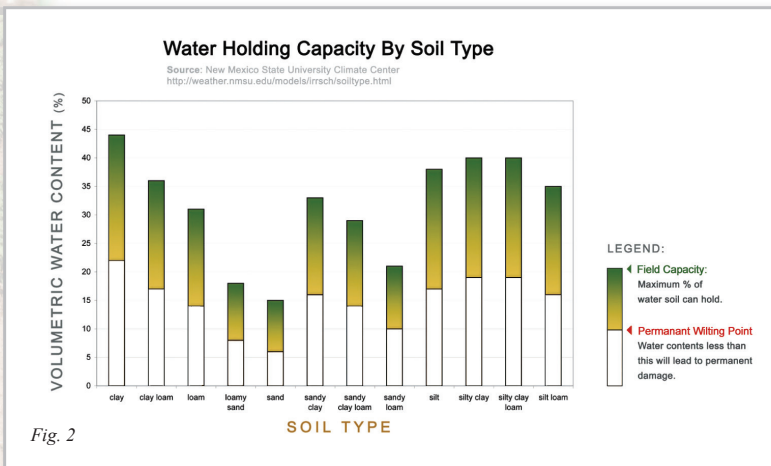
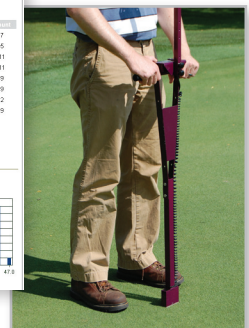
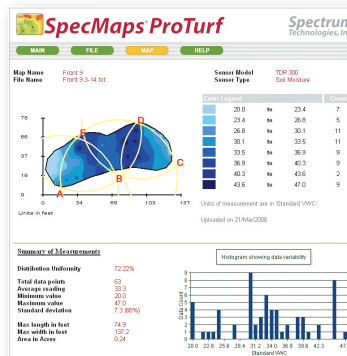


Fig. 2

Figure 2 illustrates the water holding capacities of the different soil types identified by the USDA. The upper (green) end of the range is the amount of water in a fully-drained soil (Field Capacity). The lower (yellow) end, is the minimum amount of water needed to sustain healthy plant growth (Permanent Wilting Point).

SpecMaps ProTurf

A feature of the TDR 300 is the ability to attach an external GPS unit. This adds latitude and longitude values to the data file which, in turn, allows for maps of the soil moisture variability. A two-dimensional, color map of the data provides you with a clear visual representation of the location and extent of the wet and dry spots of an irrigated area.



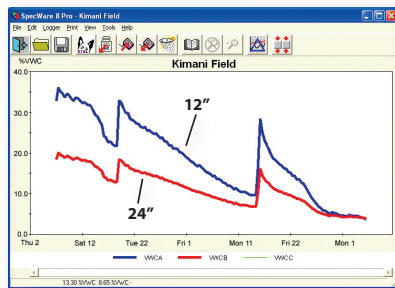


WATERSCOUT® Soil Moisture Sensors

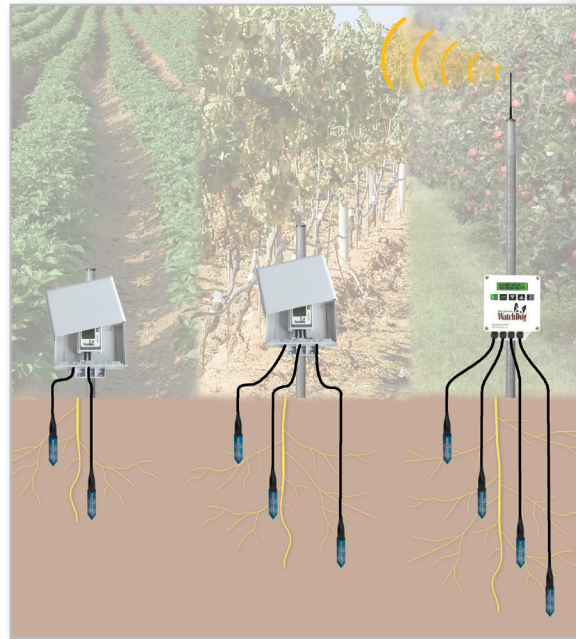
The WaterScout SM 100 is a capacitance-based soil moisture sensor that responds immediately to changes in soil volumetric water content (VWC). When used with WatchDog weather stations or hand-held readers, sensors can be placed at multiple depths to monitor water penetration and highlight when crops need to be watered. The WaterScout SMEC 300 measures VWC, soil electrical conductivity (EC), and temperature, all via the same sensor, for situations where soil salinity is an issue or where certain moisture and temperature conditions are conducive to the propagation of soil-borne diseases. WaterScout sensors help facilitate responsible irrigation only when the crop needs it, saving both money and water, and helping to retain valuable nutrients in the root zone so that they are available to the plant.

SM 100

SMEC 300



SpecWare Software showing two WaterScout SM 100 Sensors at different soil depths



WatchDog® Irrigation Stations

WatchDog irrigation stations are an affordable way to monitor soil moisture over time at specifically selected locations. The stations come pre-configured with 2 to 4 soil moisture sensors so you can track how irrigation and rain events are impacting moisture throughout the root zone. Stations are available with both the WaterScout and Watermark soil moisture sensors so you can measure volumetric water content or soil moisture tension. Sensors should be placed just above and just below the root zone to give a complete picture of when and for how long water was available to the plant.

Use SpecWare software to configure the stations and to transfer data to your computer.

WatchDog® Cellular Alert

WatchDog Cellular Alerts contact you with information from the field that requires immediate attention. You set the alert thresholds and the device uses cellular technology to call you when the thresholds are exceeded. The standard model uses an ordinary cell phone. The Pro model simply requires a SIM card.

The Flood Irrigation Cellular Alert is designed for use in furrow irrigated fields. The water sensor is placed in the furrow at the point that indicates when the water supply should be shut off. The Power Cellular Alert will send an alarm if it detects that power has been lost at the irrigation pump.



WatchDog 2900ET Weather Station

Plants cool themselves by transpiring water from the soil into the atmosphere. Water is taken in by the roots, moves up through the plant system, and is released by the leaves. The combination of evaporation and transpiration is how most water is removed from the soil. This process is known by the term evapotranspiration, or ET. Like rain, ET is reported in units of inches or millimeters. In fact, with the WatchDog 2900 ET, you can treat your soil like a bank account with deposits (rain and irrigation) and withdrawals (ET) both contributing to your current balance (volumetric water content).

The 2900 ET station uses the Penman-Monteith algorithm to compute evapotranspiration from temperature, humidity, wind, and light data measured by its onboard sensors. This algorithm calculates the theoretical ET from a grass crop. This ET value is then made crop-specific through the use of crop coefficients. Information on what crop coefficient to use can be attained from local extension agencies or university reference sources. Additionally, the station can also be connected to a variety of other sensors to monitor up to 13 parameters. An example of a typical SpecWare ET report is shown in Figure 3. Irrigation events and crop coefficients must be manually input by the user.

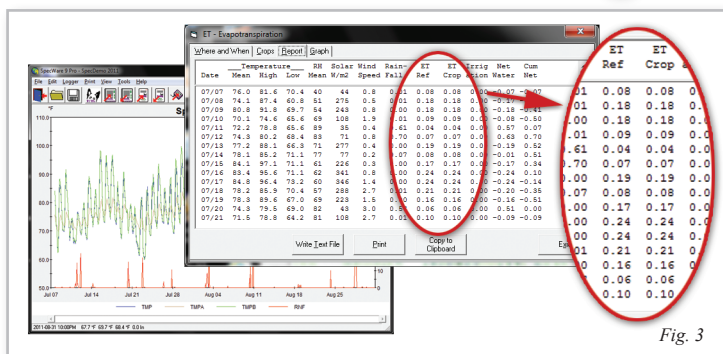
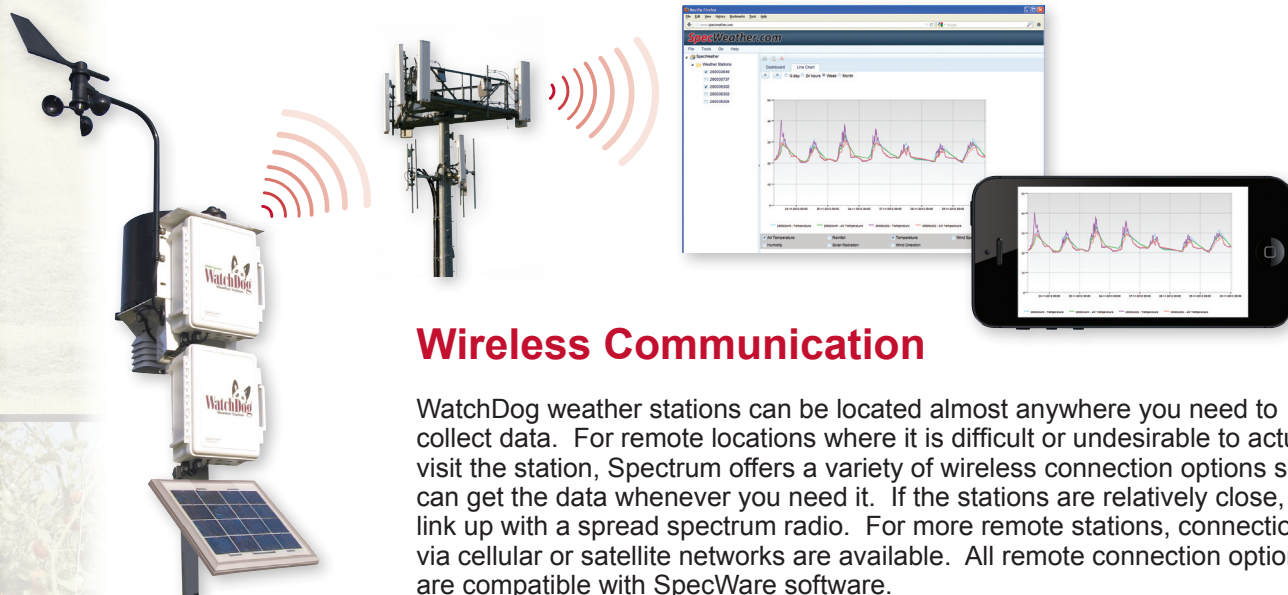


Fig. 3



Wireless Communication

WatchDog weather stations can be located almost anywhere you need to collect data. For remote locations where it is difficult or undesirable to actually visit the station, Spectrum offers a variety of wireless connection options so you can get the data whenever you need it. If the stations are relatively close, just link up with a spread spectrum radio. For more remote stations, connections via cellular or satellite networks are available. All remote connection options are compatible with SpecWare software.

Spectrum Technologies, Inc.
"To Measure Is To Know"

3600 Thayer Court
Aurora, Illinois 60504
Toll Free: (800) 248-8873 • Phone: (815) 436-4440
Fax: (815) 436-4460 • E-mail: info@specmeters.com