

## IRRIGATION TEMPLATES FOR FLORIDA CITRUS

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**Abstract.** After more than two years of examining continuous soil moisture data using capacitance soil moisture probes in Florida citrus groves, the author has developed an "irrigation template" for growing Florida citrus. Using site specific data, and applying recommendations from the University of Florida, repeatable irrigation templates can be followed each growing season to maintain different levels of soil moisture at different times during the year, for each variety of citrus. With proper monitoring, growers can maintain proper moisture levels in the spring and summer to promote fruit set and fruit sizing, set much lower moisture levels in the fall and winter, using much less water. This drying down process should help increase

**brix and pounds solids and enhance the induction of bloom, while improving overall production. Examples of Irrigation Templates for Florida Citrus will be presented.**

Florida citrus growers using continuous soil moisture monitoring and Internet based software can set up irrigation templates to apply the recommendations of researchers to improve their yields and fruit quality, while using less irrigation water.

Research has shown that maintaining proper soil moisture levels during the fruit set and fruit sizing period (1 Mar. through 1 Sept.), can greatly enhance yields (Koo and Sites, 1955). One method to continuously monitor soil moisture accurately is to use electronic capacitance probes. Capacitance probes measure soil moisture content by responding to changes in soil capacitance (Morgan, 1992). Proper monitoring will help the grower maintain the water content of the soil between a predetermined minimum moisture level and field capacity.

However, there are times during the annual physiological cycle of citrus growth, that these optimum levels of soil moisture are not desirable. Recent research has shown that allowing citrus trees to go into mild stress in the fall and winter months can increase brix and pounds solids without affecting yields (Parsons, 2004). This same winter stress can also enhance the induction of flower buds, especially in absence of uninterrupted cool winter temperatures (Albrigo, 2003-2004).

### Setting up Irrigation Templates

Using C-Probe™ capacitance soil moisture probes with sensors set at multiple depths, 4, 8, 12, 20, and 36 inches, plus wireless telemetry, growers can view; using AgWISE™ Internet based graphing software, site specific soil moisture data for a representative citrus tree in their grove. By looking at continuous data over time, growers can determine at what depths their tree root system actively removes soil moisture. This is determined by a day-night stepping of the graph lines at each depth (Fig. 1). Plants “drink” water during the day time and do not “drink” water at night, since transpiration does not occur at night. Where the graph lines, decreasing in soil moisture content, do so in a smooth graphical line, only drainage is occurring, not crop water use. When the day-night steps become smaller on a daily basis, and the graph line flat-

tens out, the soil moisture at that level has dropped to the point where the plant can no longer efficiently extract soil moisture and the plant goes into early stress. This can be determined days before the plant shows any visible signs of stress, such as leaf wilt.

Once the lower rooting depths are determined, then timing irrigation events to only penetrate the soil to that depth, will determine where the “full point” can be set, where the soil reaches field capacity through the depth of the lower active root area. This is accomplished by creating a “summed” graph, which graphs the summed value of the sensors in the active root zone. That is, if rooting depth is determined to be only down to 12 inches (such as in many Flatwoods soils), then the summed graph line is composed of only the 4, 8, and 12 inch sensors. An agronomic line can then be added to the graph, which is called the “full point”, the level that the soil moisture values need to reach to provide soil moisture through the lower levels of root activity. On Ridge soils where root activity may show up down to 36 inches, the full point is typically set only to allow water penetration down to 20 inches so as not to leach nutrients below the root zone and down into the ground water. This allows citrus growers to use Best Management Practices (BMP) in applying irrigation.

The soil moisture level where the crop water use stepping slows down (the daily steps become smaller during similar cli-

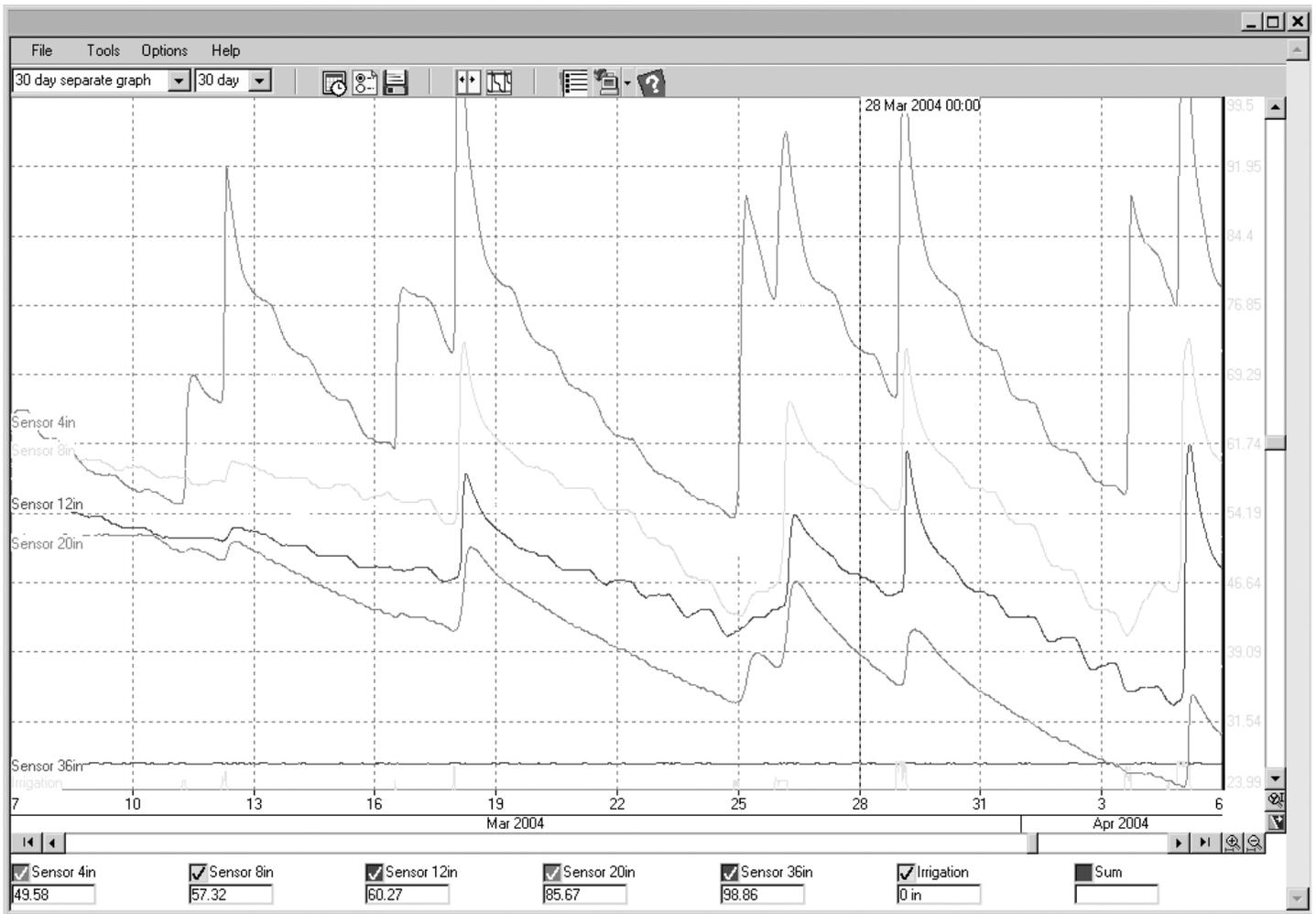


Fig. 1. Separate layer graph showing root activity (stepping) down to 12 inches in depth. Note no “stepping” at 20 inches indicating no root activity at that level.

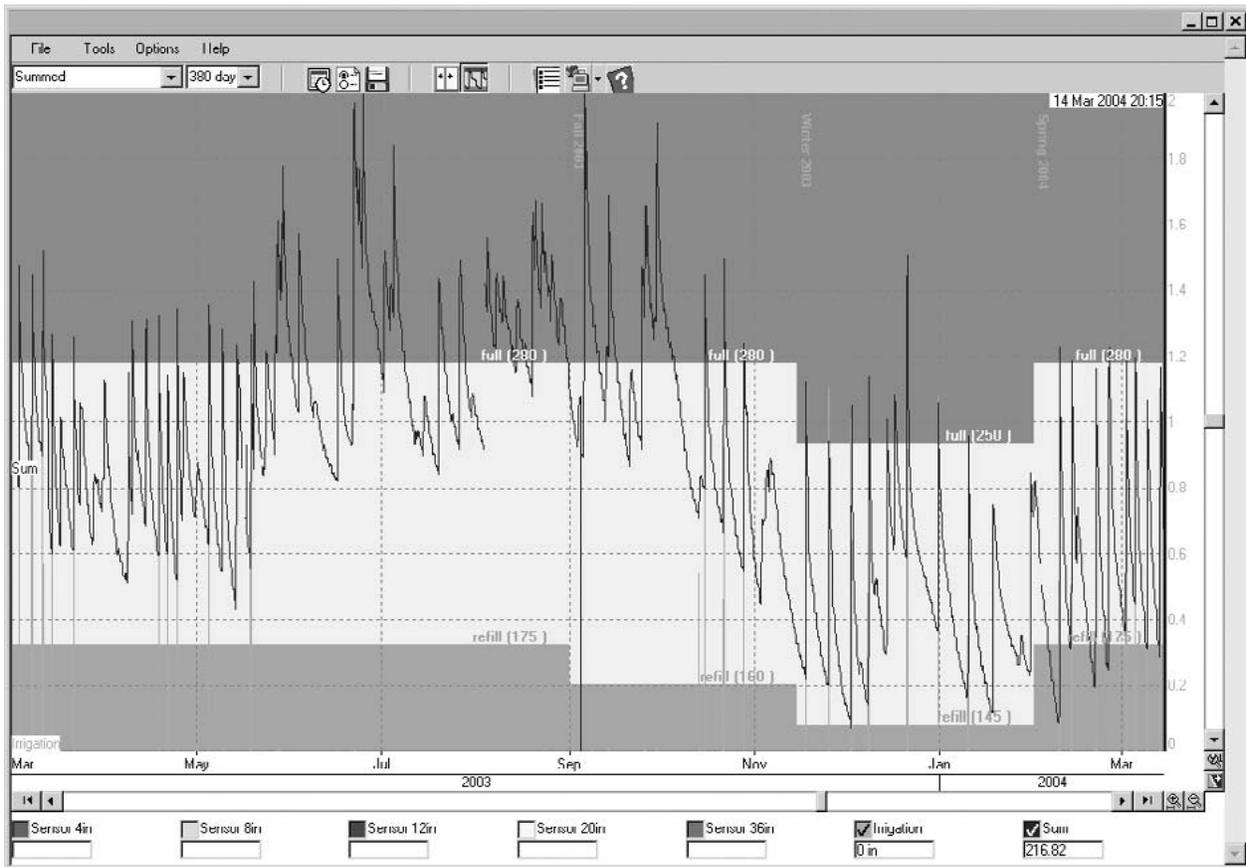


Fig. 2. Irrigation template for Flatwoods soil using a summed graph.

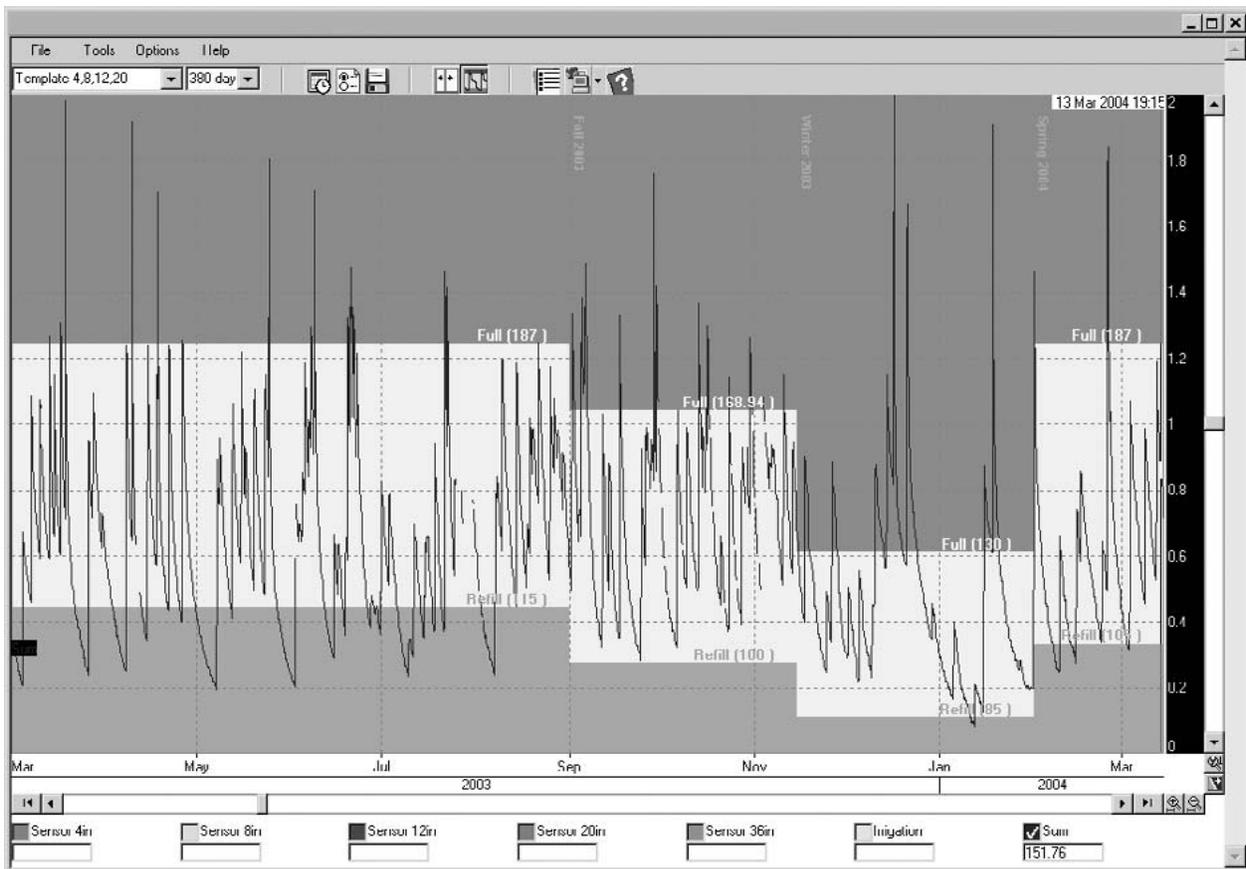


Fig. 3. Irrigation template for Ridge Soils using a summed graph.

matic conditions), is where the “refill point” is set, the point where irrigation needs to begin again. By maintaining soil moisture levels in this optimum range, between the refill and full points, fruit set and sizing should continue without any interruption.

Setting different agronomic stages within the graphs during different physiological stages of plant growth, will allow for varied soil moisture levels throughout the season (Figs. 2 and 3).

In the spring and summer, soil moisture is kept in the optimum range to promote fruit set and sizing. In the fall, beginning as early as October 1, the refill point can be lowered by 1 or 2 days worth of crop water use. By 15 Nov., when temperatures become cooler, the agronomic lines can be lowered even further. Typically, the full point is set so that irrigation applications only reach 8 inches (Albrigo, 2003-2004). Preferably, irrigation water is applied only at the beginning of a cool spell and not during a warm spell so as not to promote vegetative growth during the winter. The refill point is set to allow

mild stress to occur in late morning and afternoon, but where leaf wilt recovers overnight. The lower levels of soil moisture are maintained until the first half of February, just before bloom. Therefore, sometime between 1 Feb. and 20 Feb., the agronomic lines are returned to the optimal soil moisture levels desired for good fruit set and sizing.

Once these irrigation templates have been set up, they can be followed every season and are highly repeatable.

#### Literature Cited

- Albrigo, L. G. 2003-2004. Flower Bud Induction Overview and Advisory, <http://www.lal.ufl.edu/CRECHOME/Flowerbudinduction.htm>
- Koo, R. C. J. and J. W. Sites. 1955. Results of research and response of citrus to supplemental irrigation. *Soil and Crop Sci. Soc., Fla.* 15:180-190.
- Morgan, K. T. 1992. Determination of evapotranspiration rates in citrus groves with electronic soil moisture probes. *Proc. Fla. State Hort. Soc.* 105:63-66
- Parsons, L. 2004. Citrus Irrigation Management, presented at Irrigation Management Seminar, Immokalee, Fla.