Volume 18 No. 1 February - March 2007

Water. Power. Environment.

KRCD
Kings River Conservation District

Reliable resources for the Valley.

IRRIGATION NEWS

Lagging Supply Makes Scheduling Critical

As if growers did not have enough to worry about with the recent cold weather, the prospect of a dry rainfall year looms on the horizon. Snow accumulation within the Kings watershed in late February was running around 43 percent of the April 1st average, with only 12-18 inches of water content within the existing pack. This runs contrary to National Weather Service forecasts that an "El Nino" event would generate above average precipitation levels for the southwestern United States. Unless conditions change dramatically, last year's carryover and this season's limited runoff potential could mean a significantly curtailed irrigation run for most Kings River units.

Irrigation scheduling is critical under such conditions. It is a topic that has been a central theme for *Irrigation News* since its inception in 1990. Scheduling can be done by a variety of methods. Some are quite simple and require little effort. Others are more complex and require expensive equipment. But regardless of the methods used, the end results should be the same: irrigation decisions need to be based on plant need at any particular stage of development.

All irrigation scheduling decisions begin with the soil. Each soil type has a specific volume of water it can hold and make available to a plant based on its texture. How much of this water a grower allows to be extracted between irrigation cycles may depend upon his ability to replenish that supply. In good water years with long irrigation runs, this is not an issue as full deliveries ensure that the profile is refilled with each cycle. In short years such as what may occur this season, the delivered supply may be insufficient to fully refill the profile with the second or third irrigation. Certain changes in cultural practices may be necessary under such conditions.

Soil texture is determined by the ratio of three classes of particles: sands, silts, and clays. Sand is the coarsest of the soil particles. It forms soils that have very high infiltration rates, yet it cannot hold onto water for very long. Soil water drains through the soil pores quickly, leaving a very thin layer next to the sand grains.

Silts find themselves in between the larger sands and the smaller clays. The smaller particle size allows for more, but smaller pore spaces. This allows for more water to remain within the soil longer, but the rate it can be replenished is reduced because of the higher density of particles with a given volume.

Clays are the smallest of the soil particles. Because of their size, pore spaces within clay soils are very small. Consequently, infiltration rates are much slower. Yet, the volume of water that such soils can hold is much greater than soils dominated by sands or silts.

Each soil is a ratio of sand to silt to clay. As these ratios change, the ability of a soil to hold water for crop use changes with it. One foot of sandy soil may hold 0.75 inches of available water, while a foot of clay soil can hold 3.6 inches or more of available water. Understanding how much water is available within your soil is critical to irrigation decisions.

Irrigation management research has developed a strategy called Maximum Allowable Depletion (MAD). Basically, the available water content of the soil is determined and only a certain percentage of that water is allowed to be depleted prior to the next irrigation cycle. This gives the grower time to apply the next irrigation, plus some buffer in case of a problem. Typically, the MAD is set between 30 and 50 percent of the available water.

How long will the soil water last? That depends upon the evapotranspiration (ET) rate of the crop being grown and the soil type. Each crop has a specific level of daily water consumption, which can vary according to the time of year. A proper irrigation should replenish what

(Continued on back page)

Free Pump Testing Available

Irrigation pump and system tests remain available for growers within the Kings River Conservation District. However, the amount of available appointments has been reduced for the winter months. Make note that these appointments are scheduled on a first-come-first-served basis. If your system is not performing as well as you would like, please call and schedule an appointment as soon as possible. Contact Ray Johnson at (559) 237-5567, ext 121.

Lagging Supply Makes Scheduling Critical (Continued)

was previously used in the most time-efficient method possible, with minimal losses to direct evaporation or runoff.

To calculate the irrigation interval for a particular crop, the grower begins with the available water content of the soil times the depth of the root zone (2.5 to 5 feet typically), multiplies that by the allowable depletion percentage, and then divides that number by the crop usage per day. Soil survey maps are available to help determine what type of soil a grower has, and what the available water content should be. ET rates can be obtained using the KRCD's AgLine service at 237-4800. Here is an example:

((2.0 inches/foot x 5 ft) x 0.35 MAD) / 0.25 inches/day = 14 days

This crop can go two weeks between irrigations with this soil type. It does assume that only the crop is using the water (no weeds) and that the irrigation can replenish the soil moisture in a timely manner. The MAD percentage is a conservative one, but realistic. Increasing the MAD to 40 percent yields a 16-day irrigation window. Direct exposure of the soil surface to sunlight can increase the depletion rate of the soil (through direct evaporation of the soil water), and this must be considered as well.

Deficit irrigation takes place when the amount of water applied during an irrigation event is less than the amount "consumed" during the previous cycle. It is important to tabulate the crop usage for the period since the previous irrigation and compare that to the amount replaced with the current irrigation. If the irrigation did not refill the root zone to 100 percent, the next irrigation interval would need to be calculated on the current volume of available water. If the soil is only refilled to 75 percent (7.5 inches vs. 10 inches), the grower may no longer get 14 days between irrigations but now only 10 unless the consumption rate drops off considerably. To again get 14 days between irrigations the ET rate would have to drop to 0.19 inches per day. Allow a higher depletion level (about 45 percent) and the grower can wait 14 days again. But the amount needed to replenish the soil water climbs from 3.5 inches to 6 inches (the 25 percent under from the last irrigation plus the 3.5 inches consumed during the last 14 days).

As can be seen, this can "snowball" quite quickly. Eventually, the soil is running at the bottom of the holding capacity, with no margin for error. In order to save as much water as possible, try these tactics:

1. Narrow the furrows that convey the water from the head of the furrow to the tail end of the field. Smaller furrows require less water to fill and should allow you to irrigate within the same time frame. Shorter runs have also been shown to increase irrigation efficiency.
2. On east-west plantings, irrigate in the north furrow. These furrow are shaded during the summer months (less direct evaporation), and more water will be able to sub across the berms to irrigate the crops. Many already practice alternate row irrigation; this just eliminates the alternating process.
3. If you have a field segment that has high infiltration rates, irrigate it last. Spread available water to the ground that will hold it longer, then come back to the lighter ground. It is better to maintain full production on as much of the field as possible, so put the water on the best ground available.
4. Once harvest is completed, cut irrigations back to maintenance levels. If there is no demand on the crop (trees in this case), limit the amount of water so as to maximize the supply elsewhere. Remember that any pre-harvest stress placed on the trees needs to be addressed as well.

Using crop ET data to predict the duration of soil moisture and the timing of the next irrigation will help the grower maximize his water resources during periods of short supply and possibly help control costs when water is more plentiful. Should you have any questions regarding this article or any other irrigation issue, please call Eric Athorp at (559) 237-5567, extension 117.

IRRIGATION
NEWS
KRCD

Reprint freely with credit to:
Irrigation News, a bimonthly publication of the Kings River Conservation Ditrict

For more information, contact
Eric Athorp at
(559) 237-5567 ext 117
www.krcd.org

Kings River Conservation District
4886 E. Jensen Avenue
Fresno, CA 93725-1899