Getting the most from your wheel line or hand line irrigation system

Many wheel lines and hand lines still exist across Wyoming despite introduction of other less labor-intensive irrigation methods. These methods can still be an effective way to irrigate when used properly and maintained regularly.

First things first

Let's compare soil to a sponge to better understand the soil-water relationship. Water runs out when you lift a sponge out of a sink. The sponge has reached its water-holding capacity once it stops dripping. This is known as "Field Capacity" (FC). The water-holding capacity of soil is most greatly influenced by soil texture, or the size of the soil pores (the airspace in the soil). A sandy soil, for example, holds less water than a clay soil.

Now let's think about a sponge when you are done washing. There is some water left within the sponge no matter how much you wring. In soil terms, this is referred to as the "Permanent Wilting Point" (PWP). The PWP is the point where water is left in the soil but plants are unable to extract water from the soils and eventually die. The water that remains in the sponge for this example is known as "unavailable water."

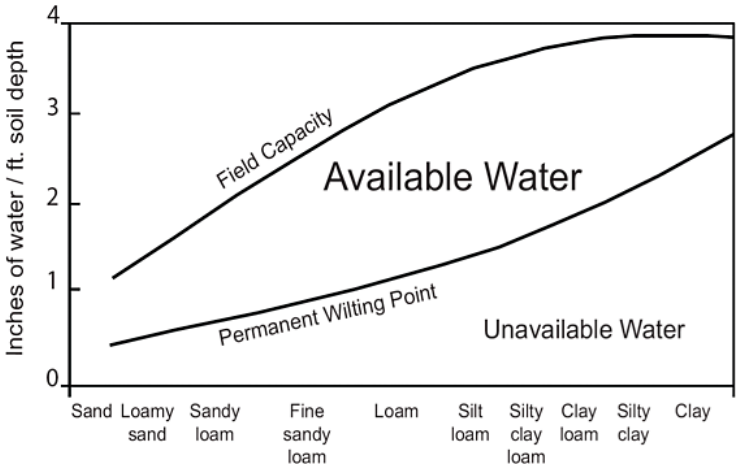

Figure 1. *Relationship between available water and soil texture. (Ohio Agronomy Guide, 14th Ed. Bull. 472-05)*

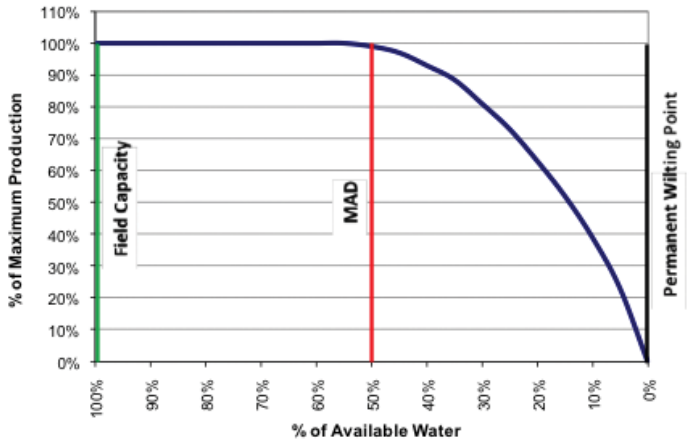

Figure 2. *A generalized curve showing how plant production (growth) is affected by soil water stress. (Peters, 2011)*

The water in the soil between Field Capacity and Permanent Wilting Point is the "Available Water." Figure 1.

One has to squeeze harder and harder to keep removing water from the sponge. Plants also face this same challenge, and there comes a point where plant production begins to drop off due to this stress. This is referred to as the "Management Allowable Depletion" (MAD). Figure 2.

While MAD is typically figured at 50 percent of the Available Water, the shape of the curve and the MAD does vary by crop, soil type, and the capacity of the irrigation system to replace soil moisture.

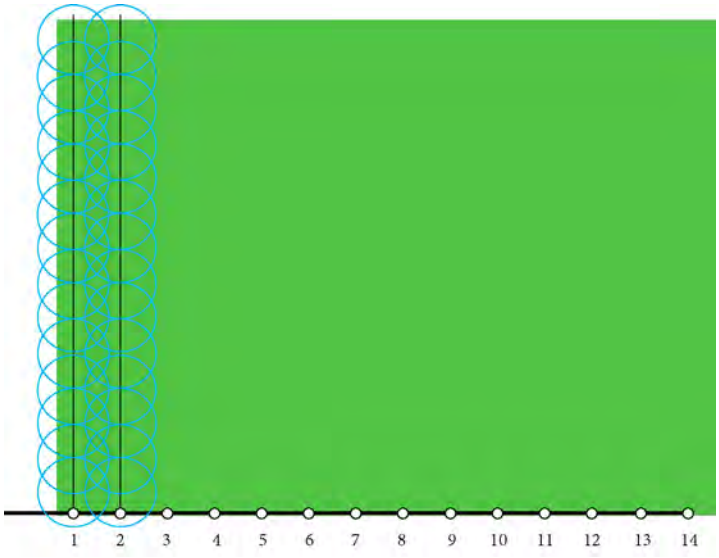

Figure 3. *Typical overlap of each set on a TAXI pattern. (Peters, 2011)*

So what does this mean for irrigation?

The goal is to apply enough water to keep the soil above MAD while avoiding run off or deep percolation before the irrigation system is moved to the next location. For moving wheel lines and hand lines, the three commonly used methods include TAXI, WIPE and SKIP, in Intervals of 12 or 24 hours.

TAXI: A field is irrigated using every riser (the point where the hand line or wheel line connects to the main water line), and once the system reaches the end of the field is "taxied" back to the first riser and the process begins again. This is very labor-intensive. Hand lines are typically loaded onto a trailer and hauled back to the first riser. Figure 3.

WIPE: Begins the same as TAXI, but upon reaching the end of the field, the irrigator waits 12-24 hours and the process begins again in reverse. This avoids having to move the whole system back to the beginning, but it

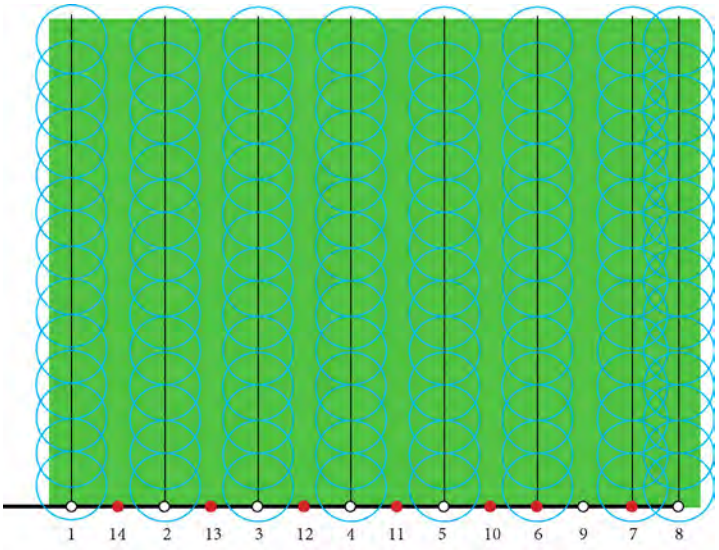

Figure 4. *The SKIP pattern showing the process of skipping risers and using them on the way back. (Peters, 2011)*

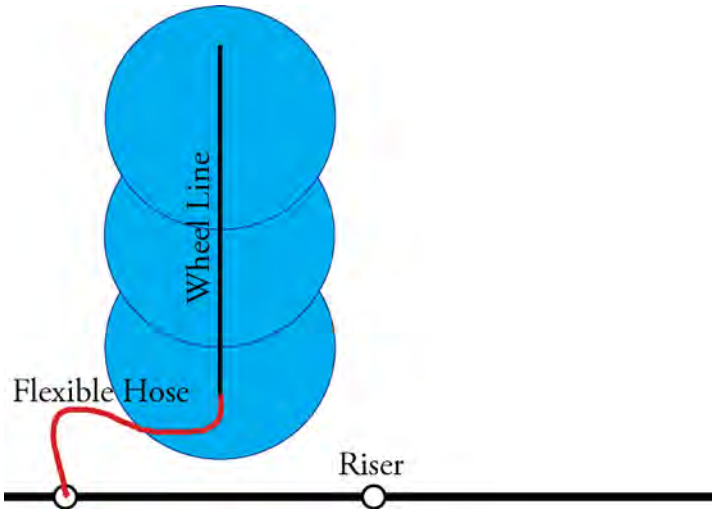

Figure 5. *Using an offset to increase uniformity. (Peters, 2011)*

results in excess water application followed by long periods of water stress at the ends of the field.

SKIP: Every other riser is used going down the field, and then the alternate risers are used on the way back. Benefits to this pattern include:

1. Eliminates excess watering and long dry spells on field ends as found with the WIPE method.
2. Labor is more spread out than in the TAXI method.
3. The likelihood of overwatering is reduced as the overlap between irrigation sets is eliminated. The result is more frequent, but smaller, irrigations and water stress and water loss due to deep percolation or runoff.

Using an offset of 20-30 feet off the riser is another strategy to increase uniformity (Figure 5). This offset would then be continued through one whole cycle. The next cycle could be offset to the other side, or back to the riser. The more uniform application of water over time created by the shift in position ensures equal water for all plants. A hand line can also be offset using a short pipe and an elbow.

Maintenance

The most important maintenance happens immediately after a hand line or wheel line is turned on. Watch the system pressurize and ensure each sprinkler is spraying and spinning properly. A short piece of stiff wire is a great tool for clearing any clogged sprinklers.

Check for leaks that might indicate a worn or broken gasket, clamp, hose, sprinkler, etc. Leaks can be significant and will affect the performance of the system. Be sure to follow manufacturer guidelines on proper maintenance for the drive system.

Lastly, properly securing the wheel line during winter is important. This is usually done by tying it securely to several posts along a fence line. Hand lines can be stacked together off the field and out of the way.

We're wondering if **Caleb Carter** ran through lawn sprinklers as a child? He is a University of Wyoming Extension educator serving southeast Wyoming and can be reached at (307) 532-2436 or at ccart13@uwyo.edu.

For more information

Managing Wheel-Lines and Hand-Lines for High Profitability. Washington State University Extension, http://bit.ly/wheelmovemanage

Wheelmove Sprinkler Irrigation Operation and Management. Utah State University, http://bit.ly/wheelmoveoperate

Maintenance of Wheelmove Irrigation Systems, Utah State University Extension, http://bit.ly/wheelmovemaintain