SOUTH PLAINS
# GROUNDWATER NEWS

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# IRRIGATION MANAGEMENT TOOLS

Entering the 2001 growing season, many challenges are evident for both irrigated and dryland producers. For everyone, though, the basic challenge is a matter of survival, especially in the wake of the 2000 crop disaster. Irrigators, however, have an additional challenge this year while determining how to cope with higher energy prices associated with pumping groundwater. In conjunction with economic factors, there is also some information which may help irrigators get the most "bang for their buck". This information consists of knowing soils' water holding capacities, timing irrigations to best meet the crop needs, and making sure application methods are efficient.

Terry County has a number of different soils, but three different soils cover approximately two-thirds of the county. These soils vary in their available moisture holding capacity, expressed as inches of water available per foot of soil.

For example, a layer of Amarillo loamy fine sand, 1 foot thick, will hold approximately 1.0 inches of water applied to the surface. Or, to wet the top 5 feet to field capacity, you would have to apply 5 inches of water. Once the top 5 feet are wetted to field capacity, additional water causes runoff and/or deep percolation. Table 1 shows three different soils, their corresponding coverages (acres), and their water holding capacities.

| Soil | Acres | Water Holding Capacity |
|---|---|---|
| Amarillo Fine Sandy Loam | 112,386 | 1.5 inches/foot |
| Amarillo Loamy Fine Sand | 156,280 | 1.0 inches/foot |
| Brownfield Fine Sand Thin | 111,377 | 0.7 inches/foot |

(Source: USDA Soil Survey, Terry County)

Why is this information important? Knowing how much of the soil profile is wetted to field capacity tells you how much you have in your "bank account". Deposits are rainfall or irrigation, and disbursements are evapotranspiration. Evapotranspiration is a measure of soil water reduced by soil evaporation and plant water use (transpiration). Monitoring your "bank account" and estimating the beginning balance may help a person decide when to start irrigating.

Irrigation scheduling is another tool which helps conserve energy and groundwater. Using the bank account example, making deposits and writing checks at the proper time is crucial to maintain a desired balance. Prior to or right at planting, should your bank account be full? Ideally, the answer is yes, but a person may meet or exceed their budget simply trying to apply 5-8 inches to wet the profile to field capacity.

Recent data from the Texas Agriculture Experiment Station (TAES) at Halfway shows that significant preplant irrigation may be lost before planting. In a non-replicated experiment at the Halfway research site, 81% of spray, 55% of LEPA and 23% of SDI (subsurface drip irrigation) applied water had been lost by

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planting time (Bordovsky, 2000). This occurred after applying preplant irrigations of 5 inches. What caused the high preplant irrigation loses? High winds and the bare soil surface contributed to much of the losses. However, a surprisingly large portion of the LEPA and some of the spray and SDI losses were from drainage below the 5-foot root zone. So, keep in mind that a significant amount of preplant irrigation water may be lost.

Generally, early irrigation should be enough to establish a crop and promote early development. Additionally, keep in mind that having a soil moisture deficit is not necessarily bad during the early season. Plant water needs are fairly low early in the season. Also, our chance of rain generally increases during planting season, and a few inches of rainfall may be enough to finish filling the soil profile. If the rainfall occurs after the profile is full, or near full, much of it may run off or be lost to deep percolation.

Having established some data concerning preplant and early irrigation, what data helps establish an irrigation schedule during mid and late season? For one thing, a person does not want to hurt the crop by delaying an early irrigation. An irrigation application made prior to fruiting at least gives the crop a chance to benefit from a rain later on. Scheduling irrigations using a PET (Potential Evapotranspiration) program may also be a benefit. Using this tool allows a person to calculate the daily PET and observe the effects of irrigation, rainfall, and plant water demands on the soil moisture profile.

Developing an irrigation schedule also requires that a person account for their system's application efficiency. For example, suppose a person tries to wet the top 18 inches of a soil whose water holding capacity is 1 inch/foot. To wet 18 inches of this soil requires 1.5 inches of water. Now, if the application efficiency is 80%, only 1.2 inches have been applied to the soil, wetting it to a depth of approximately 14.5 inches. However, if the application efficiency is raised to 95%, the same soil is wetted to a depth of approximately 17 inches. If spray nozzles are used, the entire soil surface is wetted. However, if LEPA applicators are used in alternate furrows, the wetted area is drastically reduced, which significantly reduces evaporative losses.

Table 2 contains information which shows the approximate depth of soil wetted by spray nozzles vs. LEPA applicators, assuming the soil has a water holding capacity of 1 inch/foot.

| Application Amount (inches) | Wetted Depth (spray) | Wetted Depth (LEPA) |
|---|---|---|
| 0.5 | .5 feet | 1.0 feet |
| 1.0 | 1.0 feet | 2.0 feet |
| 1.5 | 1.5 feet | 3.0 feet |

*assuming 100% appplication efficiency

Evaporative losses are decreased when using LEPA in alternate furrows because:

1. water is applied directly on the ground, reducing wind losses, and
2. the water is applied to approximately half the surface area of a spray.

Reducing evaporative losses is especially important when following a high-frequency deficit irrigation schedule. Research from the TAES-Halfway has shown positive results from frequent LEPA irrigations using amounts as low as 0.2 inches every 2 days. Cotton yields from 1999 & 2000 experiments show a yield increase of 100 lbs./acre and greater using LEPA compared to using the same volume of water through a spray system (Bordovsky, 2000). Though hard to believe, precise placement of even a minute amount of water on a high frequency basis has worked well on cotton. Obviously the difference is due to the application efficiency of the LEPA system.

Hopefully, rainfall will help answer a lot of irrigation questions this year. However, knowing the water holding capacity of your soil and application efficiency of your irrigation system will always be a benefit. If you would like more information concerning any of the information presented in this article, call or come by the District office.

**References**

Bordovsky, J. P. 2000. Cotton Irrigation Management for Reduced Surface Losses with Limited Water resources.
USDA. 1959. Soil Survey of Terry County Texas

# PROPER WELL PLUGGING

One way the District is able to help preserve groundwater quality is to educate people on proper well plugging procedures. Improperly plugged wells and open holes pose a great threat to groundwater quality, as well as human and animal life.

A few questions the District often receives are:

- Do I need to plug a test hole?
- Do I need to plug a well that has caved in?
- If I drill a well and abandon the site by removing the casing, do I need to plug the well?

The answer to all of the above is yes! However, plugging a well properly does not entail plowing over the well site a few times. District Rule 11.2 states that all wells drilled within the District shall be completed or plugged in accordance with Chapter 76 of the Water Well Drillers and Pump Installers Rules. A summary of the accepted plugging procedure is:

1. If a well is abandoned or deteriorating, all removable casing shall be removed and the entire well pressure filled with cement from bottom to land surface.
2. Acceptable plugging materials are cement or bentonite grout.
3. A landowner or driller may petition the Texas Department of Licensing and Regulation, in writing and request an alternative method (i.e. using chlorinated gravel, caliche and cement in lieu of cement only).
4. The landowner or driller must submit a plugging report to the Texas Department of Licensing and Regulation.

In the case of a well that is caved in, a person may ask how all removable casing is to be removed. The SPUWCD has asked the Department of Licensing and Regulation how to handle these situations. The response has been that the Department realizes casing may not always be removed in its entirety, but that every effort should be made to remove casing which is removable. Additionally, where a well has caved in, there may be no way to get cement to the bottom of the well. Again, every effort should be made to get cement into the well as deep as possible, though it may not be to the bottom.

How expensive is it to properly plug a well? Obviously it depends on how big and deep the well is. The following chart provides a few cost estimates for different sizes and depths of wells, assuming cement is used:

| Diameter of well (inches) | Depth of well (feet) | Cost to plug ($) | Diameter of well (inches) | Depth of well (feet) | Cost to plug ($) |
|---|---|---|---|---|---|
| 8 | 100 | $126.24 | 16 | 100 | $354.95 |
| 8 | 150 | $164.36 | 16 | 150 | $507.43 |
| 8 | 200 | $202.48 | 16 | 200 | $659.91 |

**Assumptions:**
Volume of the well is the volume of the well bore itself.
Cost of concrete is $59/yd^3 and delivery is additional $50

For the SPUWCD, most wells will be between the 100-200 ft. depths. So, for an 8-inch diameter hole, the cost is approximately $126-200 for enough cement to properly plug it.

Whatever the size of a well, the fact remains that any open or deteriorated well may serve as a conduit to our groundwater. Properly capping and plugging wells helps ensure that pesticides and other substances stay out of our groundwater supply.

During fiscal year 2000, the District worked with landowners to plug approximately 10 open or deteriorated wells. The cost to properly plug a well is money well spent, especially considering the fact that your water quality could be affected by nearby deteriorated wells. It is ultimately the landowner's responsibility to make sure wells on their property are properly maintained or properly plugged if the well is deteriorating.

## *Well/Irrigation System Registrations on New Properties*

Have you purchased or rented a new property within the District this year? If so, please call or come by the District office and verify that all wells and irrigation systems have been registered. Registration of all wells and irrigation systems is required by District Rules 5.1,13.1and 13.2.

Your help in verifying the well/ irrigation system information on a new property helps us maintain the District's database and continue to improve our level of service.


## *Ag Loan Update*

On February 7, a representative of the Texas Water Development Board's ag loan program met with the District staff and two Board members. As a result of late borrower repayments, the TWDB has indefinitely suspended release of the $400,000 loan requested by the District. There will be no loan funds available until all borrowers are current on their payments as outlined in the TWDB's memo to the District. Additional updates will be presented in future newsletters.

## *Calendar of Events*

| | |
|---|---|
| *March 6* | *Board Meeting* |
| | *1:30 pm-District Office* |
| *April 3* | *Board Meeting* |
| | *1:30 pm-District Office* |
| *April 13* | *Good Friday* |
| | *Office Closed* |
| *May 1* | *Board Meeting* |
| | *1:30 pm-District Office* |
| *May 30* | *Memorial Day* |
| | *Office Closed* |

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