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# The Cross Section

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# Drought prompts interest in ancient drip irrigation technique

**By Carmon McCain**
***Cross Section* Editor**

The small mass of gray clay spinning on the potters' wheel didn't look like much at first—but it was quickly transformed into a "miniature root zone aquifer" shaped and smoothed by Mark Hilliard's hands.

Hilliard, assistant professor of art at Wayland Baptist University in Plainview, demonstrated how he makes ollas ("oh-yahs") during a recent gardening workshop at Home Mercantile in Nazareth, TX.

Ollas are unglazed clay pots which are buried next to a plant at root zone level. The neck of the olla remains above soil surface for easy filling with water.

Instead of applying water directly to the plant at soil surface, olla irrigation allows water to seep slowly through the porous walls of the buried pot. This supplies moisture to plant roots while reducing water losses associated with evaporation and runoff.

"Everything old is new again. Ollas are an original form of drip irrigation brought by the Spanish to the American Southwest a few centuries ago—and later adopted by Native Americans. Below-average rainfall and high temperatures associated with 2011 drought have prompted people to examine all methods to become more efficient with their water use," said Dr. Darryl Birkenfeld of Nazareth, executive director of Ogallala Commons.


***Olla Irrigation***

Mark Hilliard uses two clay ollas to demonstrate the concept of this ancient drip irrigation technique. The olla at left is empty while water seeps through the porous walls of the olla at right. Hilliard also demonstrated the process of "throwing" clay to make ollas and other pots. At right, he "centers" the lump of clay on the potters' wheel.

In fact, it was a similar situation that prompted Hilliard's interest in ollas years earlier.

"Even though I grew up in a farming/gardening environment and was exposed to different type of irrigation systems, I couldn't figure out the best way to irrigate my garden while I was away working in the cotton fields. I tried everything under the sun from burying bottles to dripping water through a garden hose that was connected to a wind-up faucet timer. You name it…I even tried furrow diking!"

It wasn't long after his arrival at Wayland Baptist University that he began "fooling around" with making clay ollas on the potters' wheel.

Hilliard admits his first attempt "looked more like lidded jars to hold salsa." They were 6-7 inches tall, glazed inside and out, and had a hole on the lower side that was aimed toward the plant. "I tried multiple holes up the sides and single holes on the bottom—and they all pretty much failed," he said.

That was 10 years ago and he's worked to refine the design since then.

"I would make them during ceramics class in the summer—so I could teach the students something that was relative. Olla making in the winter doesn't have the relativity that it does in the summer. So, I tried a lot of different things and eventually came around to the idea of a real olla after reading about self-watering container gardening using 5-gallon buckets," he said.

He said that triggered the idea of just making a large unglazed pot.

"I'm surprised that I'd didn't think of this sooner. I give a lecture to my basic ceramics class about use of porous pots filled with water for refrigeration—but I never made the connection about irrigation use until a few months ago. It took 10 years of delivering the refrigeration lecture before it dawned on me to connect that idea with my burying bottles idea. I had 'rediscovered' technology that was thousands of

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## In This Issue

# District field personnel complete annual pre-plant soil moisture survey

Dry soil conditions were prevalent throughout most of the High Plains Underground Water Conservation District (HPWD) service area when the annual pre-plant soil moisture survey was completed on May 7. However, these conditions may have changed slightly due to cooler temperatures and beneficial rains received in the region during May 7-14.

"The result of the annual pre-plant soil moisture survey gives producers an idea of soil moisture levels in their respective areas. They can then make pre-plant irrigation decisions based upon this general knowledge and their own on-farm soil moisture tests," said Gerald Crenwelge, HPWD field data collection supervisor.

Field technicians used moisture meters to collect data at 80 permanently-installed soil moisture monitoring sites from April 27 to May 7, 2012. These sites were selected to provide an even distribution of data throughout the district's 16-county service area.

Readings are taken at six-inch intervals throughout the five-foot root zone soil profile by lowering a special probe into an aluminum access tube. These data were processed to calculate the current moisture level in the soil (*available moisture*) and how much moisture can still be added (*deficit moisture*) to the soil for plant growth.

The overall average 2012 pre-plant soil moisture deficit reading was 3.19 inches in the upper three feet of the root zone soil profile and 4.86 inches in the upper five feet.

This means that, on average, 3.19 inches of water was needed by irrigation or rainfall to fill the upper three feet of the soil profile and 4.86 inches was needed to fill the upper five feet at the time of the survey. Again, recent rainfall may have slightly improved soil moisture conditions in the upper three feet of the soil.

The deficit value map shown below represents the amount of water (in inches) that can still be

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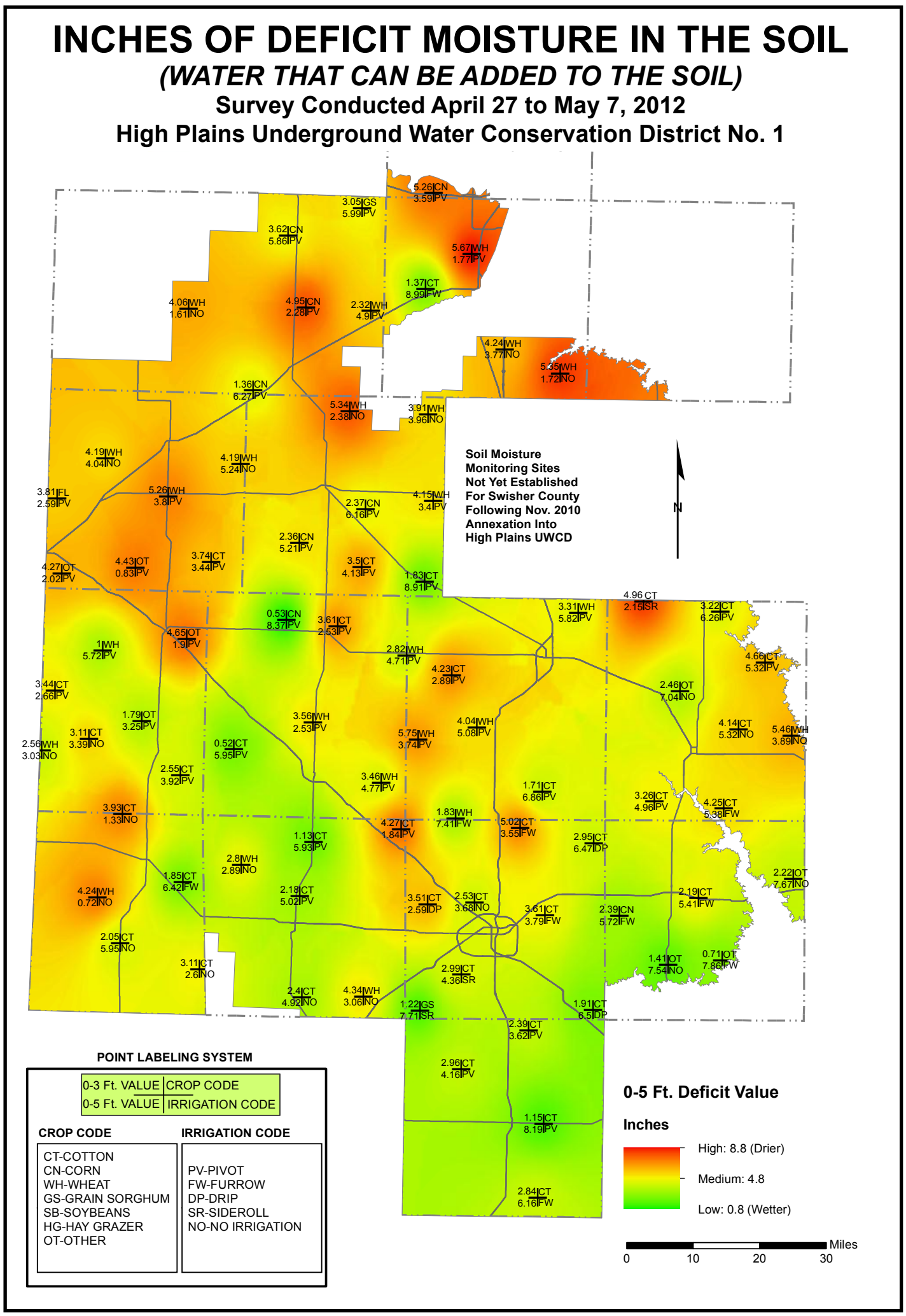



## Governor Perry makes TWDB appointments

Governor Rick Perry has appointed Frederick "Rick" Rylander of Iraan and reappointed Lewis McMahan of Dallas to the Texas Water Development Board for terms to be effective June 11, 2012 and to expire Dec. 17, 2017.

Rylander is a rancher and retired regional manager of National Oilwell Varco for the Permian Basin and eastern New Mexico territories.

McMahan is a registered professional engineer and retired vice-president of Texas Instruments.

In addition, Perry also named Billy R. Bradford Jr. of Brownsville as chairman of the TWDB.

He succeeds Edward G. Vaughn of Boerne in the position.

Bradford is a certified public accountant and has been active in several water-related organizations.

# Producers encouraged to check soil moisture conditions before planting

Continued From Page Two

added to the soil while the available value map below represents the amount of water (in inches) in the soil at the time of the survey.

Soil moisture monitoring sites are represented on the two maps by a "cross hair." The numbers and codes at each cross hair are explained in the legend at the lower left corner of the two maps. These data are organized so crop information, irrigation methods, and soil moisture in the upper three /upper five feet of the soil can be evaluated.

The color background on the maps indicates a generalized overall moisture pattern within the HPWD service area-based upon the upper five feet of the soil. The redder areas are drier *(less available moisture)* and the greener areas are wetter *(more available moisture or lower deficit moisture)*.

Color patterns show some sites with much drier *(redder color)* or wetter *(greener color)* that the surrounding sites in the area.

Typically, this can be caused by factors including limited rainfall, failed crops due to the 2011 drought, different farm management and crops than nearby sites, or a difference in irrigation *(irrigated or dryland)*.

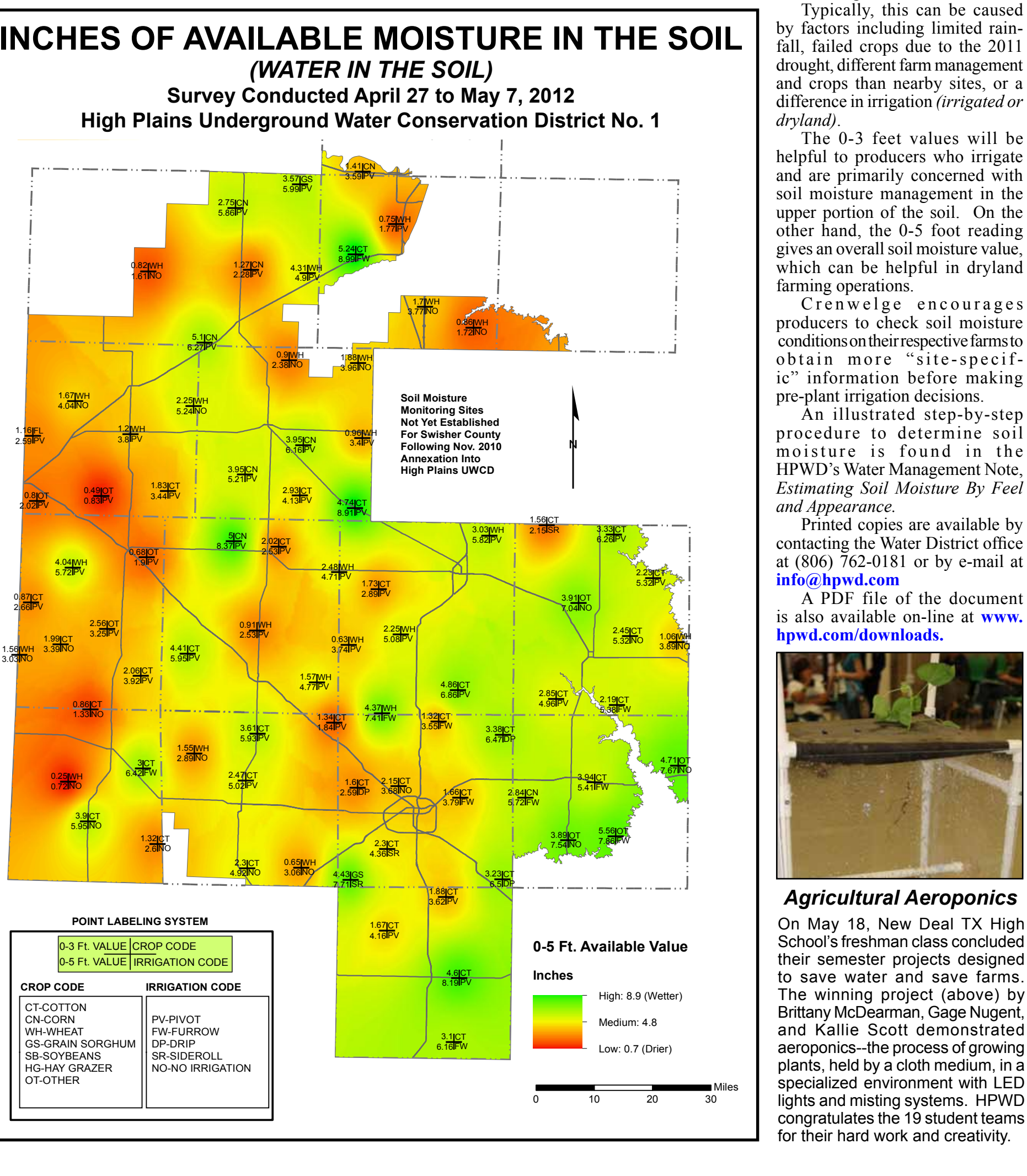
The 0-3 feet values will be helpful to producers who irrigate and are primarily concerned with soil moisture management in the upper portion of the soil. On the other hand, the 0-5 foot reading gives an overall soil moisture value, which can be helpful in dryland farming operations.

Crenwelge encourages producers to check soil moisture conditions on their respective farms to obtain more "site-specific" information before making pre-plant irrigation decisions.

An illustrated step-by-step procedure to determine soil moisture is found in the HPWD's Water Management Note, *Estimating Soil Moisture By Feel and Appearance.*

Printed copies are available by contacting the Water District office at (806) 762-0181 or by e-mail at **info@hpwd.com**

A PDF file of the document is also available on-line at **www.hpwd.com/downloads.**






## Agricultural Aeroponics

On May 18, New Deal TX High School's freshman class concluded their semester projects designed to save water and save farms. The winning project (above) by Brittany McDearman, Gage Nugent, and Kallie Scott demonstrated aeroponics--the process of growing plants, held by a cloth medium, in a specialized environment with LED lights and misting systems. HPWD congratulates the 19 student teams for their hard work and creativity.

# Ollas find place in community garden

**Continued From Page One**

years old," Hilliard said.

The ollas made by Hilliard range from 1/3 of a gallon to 1 ½ gallons capacity.

Some are being utilized in Wayland Baptist University's community garden.

"I grew cucumbers in my own garden last year under drip irrigation which allowed me to apply about 5-6 gallons of water during a 30-40 minute time period. However, with a 1 ½ gallon capacity olla, I was able to fill it up on Mondays and continue watering until Thursdays. I replenished it then because I don't like water levels in ollas to drop below the halfway mark," he said.

The olla can also be used to apply fertilizer to the plant roots. "You could mix up an organic tea or use other fertilizers with the olla. You just need to make sure that the fertilizer does not affect the olla's porosity by plugging the holes," said Hilliard.

Proper placement of the olla in relation to the plant can be a little tricky, he said. "Generally, I place the ollas 18 inches apart and about 12 inches away from the plants. This year, I put ollas 8-10 inches away from onions—and that didn't work. Onions really don't have much of a root system and that may have been the reason," he said.

Hilliard just started a blog (**www.runningwaterpottery.wordpress.com**) so that people can offer feedback on how they are using ollas, including garden plot size, plant varieties being irrigated by ollas, spacing from plants, and other information.

"I am confident that ollas can be a great asset in small scale gardens. They are miniature root zone aquifers that can be dug up at the end of the year and reused," he said.

Some academic papers suggest ollas have a useful life of five years or so.

"No one seems to know right now because it's new research. I'm going to experiment at the end of the season by cleaning some of the ollas, leaving one or two in the ground, and leaving one or two for control purposes. We'll wait and see what happens," he said.


# The Cross Section

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# Amarillo precipitation totals 2007-2011

| | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2007** | 0.95 | 0.29 | 4.00 | 0.65 | 5.40 | 2.71 | 1.83 | 0.88 | 3.55 | 0.95 | 0.08 | 1.21 | **22.50** |
| **2008** | 0.24 | 0.59 | 0.30 | 0.38 | 2.08 | 4.03 | 4.96 | 4.43 | 1.32 | 3.87 | 0.19 | 0.05 | **22.44** |
| **2009** | 0.03 | 0.45 | 1.01 | 1.84 | 0.43 | 2.79 | 3.78 | 8.07 | 0.83 | 1.42 | 0.26 | 0.32 | **21.23** |
| **2010** | 0.94 | 1.29 | 1.61 | 3.28 | 2.18 | 1.00 | 8.02 | 2.55 | 1.79 | 0.78 | 2.88 | 0.22 | **26.54** |
| **2011** | 0.06 | 0.43 | 0.06 | 0.05 | 0.08 | 0.49 | 1.00 | 0.52 | 0.92 | 1.23 | 0.62 | 1.54 | **7.00** |

# Lubbock precipitation totals 2007-2011

| | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2007** | 1.12 | 0.36 | 5.94 | 1.23 | 5.35 | 3.39 | 0.94 | 1.99 | 2.20 | 0.28 | 0.20 | 0.94 | **23.94** |
| **2008** | 0.07 | 0.72 | 0.10 | 1.07 | 5.32 | 2.91 | 1.77 | 3.48 | 8.70 | 3.77 | 0.08 | 0.01 | **28.00** |
| **2009** | 0.13 | 0.73 | 0.37 | 1.51 | 0.68 | 2.44 | 1.69 | 0.47 | 2.46 | 0.78 | 0.13 | 1.48 | **12.87** |
| **2010** | 1.41 | 1.78 | 2.85 | 4.65 | 1.14 | 2.55 | 7.14 | 1.33 | 0.93 | 2.61 | 0.07 | Trace | **26.46** |
| **2011** | 0.06 | 0.43 | 0.35 | 0.00 | 0.26 | Trace | 0.05 | 0.34 | 1.25 | 1.34 | 0.26 | 1.52 | **5.86** |

**Source:** *National Weather Service Forecast Offices, Amarillo and Lubbock.*


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