THE Cross SECTION

Published monthly by High Plains Underground Water Conservation District No. 1, 2930 Avenue Q, Lubbock, Texas 79405—Ph. 762-0181

Volume 29—No. 1 Publication number USPS 564-920, Second Class Postage paid at Lubbock, Texas *January, 1983*

Playa Lake Recharge Field Studies Continue

A District grant of 24 hundred dollars and technical assistance has been approved by the Board for field research to test some of the newest filtering methods for playa-lake recharge. Texas Tech University will conduct the study under the direction of Dr. Bill Claborn, associate professor of civil engineering and Dr. Lloyd Urban, associate professor of civil engineering and assistant director of the Texas Tech Water Resources Center.

The tests will apply several different technically advanced filtering materials to a specially designed playa lake recharge system of coarse and fine filters wrapped around conduit tubes buried in lake bed trenches. The conduit will carry 'cleared' water to a monitoring station and recharge well. The filtering materials have been provided by several chemical and special products companies. Recent lab tests on these materials using playa lake water and simulated wind motion have shown real promise for avoiding silt clogging of the recharge areas.

The study will also provide cost data to weigh economic feasibility and information to establish water quality limits for protecting the ground-water supplies.

Past experience indicates that recharge is progressively hampered as the porous media around the well is plugged. This research will use a non-woven polypropolene filter material whose life expectancy in these environmental conditions is not known, so the study may take up to six years to complete.

Many attempts to recharge water from playa lakes in the past by both the District and individual farmers, have produced little long term success. Nobody seems to know when the first recharge well was dug. But back in the 50's W. T. Nafzger, who farmed south of Olton, drilled more than half a dozen wells in his playa basin trying to drain its water back into the underground formation. The obstacle was always silt clogging.

He devised ingenious filtering systems to keep the water flowing, making improvements and discoveries with each new well. He would case a well, cap it, and perforate the cap. He tried fences and screens and great piles of corn cobs, cotton burrs, and finally gravel filters. But he never broke the silt barrier. Water would drain for a time; but only until enough silt had been seived into his filtering system to expand it into a massive muddy mound.

The Water District's field staff watched Nafzger carefully, and learned from his disappointments. In 1954 it attempted it's first artificial recharge test on the Umphrey farm near New Home. A pit was dug in a playa basin down to the caliche to form a holding pond. The caliche bed itself was expected to filter out the silt. It did, and a big mud cake eventually coated the bottom of the pit stopping all recharge.

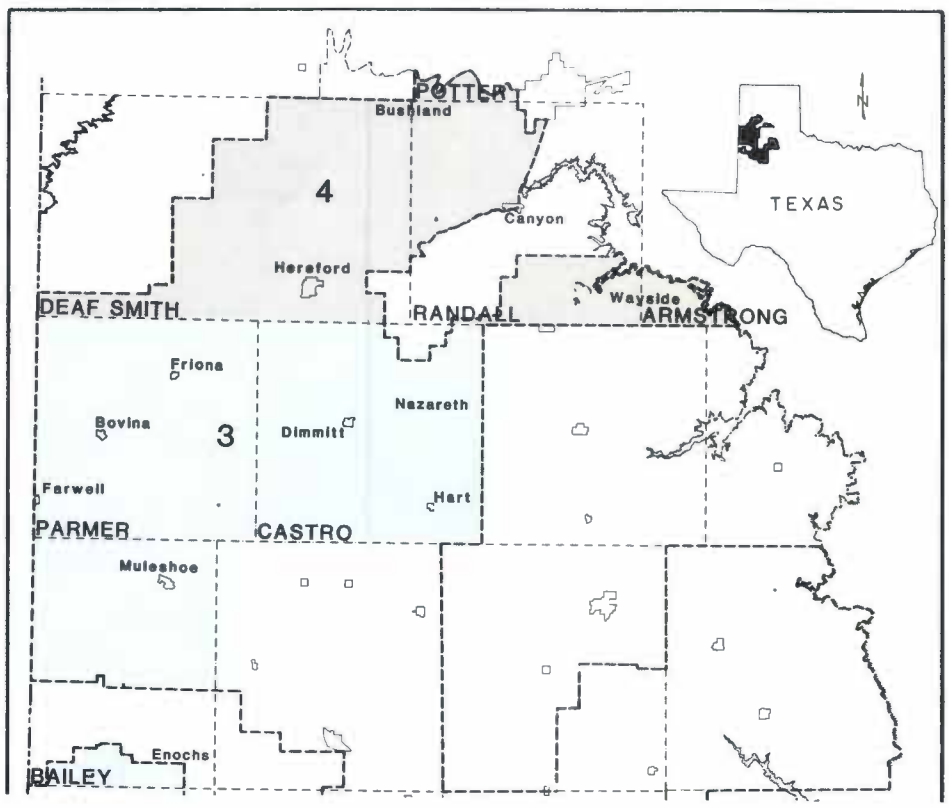
The District's first recharge well was drilled near Petersburg at the Allmon Gin in Floyd County in 1955. This well was drilled beside the playa and above the high water line of the basin. A new pump was installed in the well. A trench was dug across the playa bottom which channeled water

continued on page 3 . . . SILT

THE FIRST RECHARGE WELL drilled by the Water District was located at the Allmon Gin near Petersburg in 1955. Slotted casing was set in the well and playa water was recharged into it. Silt eventually clogged the formation.

Polls Open January 15 For District Elections

Voters in the High Plains Water District will go to the polls on January 15 this year for the annual election of a slate of District Directors and County Committeemen. The ballot will list fourteen positions for county committeemen and two District Directors in 1983.



Elections will be held only in those counties or portions thereof comprising District Director Precincts Three and Four. The seven counties included are in Precinct No. 3: Bailey, Castro and Parmer; and in Precinct No. 4: Armstrong, Deaf Smith, Potter and Randall.

New positions to be filled include places for six county committeemen who have completed two consecutive four year terms of service and are not eligible for re-election under the District's by-laws. The eight other committeemen running are eligible to serve another term.

District Directors Webb Gober of Farwell and James Conkwright of Hereford will seek re-election. Webb has served in Precinct Three for five consecutive terms and James Conkwright is seeking his third term.

Directors may serve an unrestricted number of two year terms, while committeemen are elected for four years and may not serve more than two consecutive terms.

Absentee voting began December 27th and will continue through January 11th. Voters must have a valid registration certificate, reside within the boun-

continued on page 3 . . . ELECTIONS

THE Cross SECTION

THE CROSS SECTION (USPS 564-920)

A MONTHLY PUBLICATION OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1

2930 Avenue Q, Lubbock, Texas 79405
Telephone (806) 762-0181

PATRICIA BRUNO, Editor

Second Class Postage Paid at Lubbock, Texas
District Office at Lubbock

BOARD OF DIRECTORS

Precinct 1
(CROSBY, LUBBOCK and LYNN COUNTIES)
James P. Mitchell, President ..... Wolfforth

Precinct 2
(COCHRAN, HOCKLEY and LAMB COUNTIES)
Mack Hicks, Vice President ..... Levelland

Precinct 3
(BAILEY, CASTRO and PARMER COUNTIES)
A. W. Gober, Secretary-Treasurer ..... Farwell

Precinct 4
(ARMSTRONG, DEAF SMITH, POTTER and RANDALL COUNTIES)
Jim Conkwright ..... Hereford

Precinct 5
(FLOYD and HALE COUNTIES)
Gilbert Fawver ..... Floydada

COUNTY COMMITTEEMEN

Armstrong County
Carroll Rogers, Secretary
Wayside, Texas

Tom Ferris, 1985 ..... Box 152, Wayside
Larry Stevens, 1985 ..... Route 1, Happy
Kent Scroggins, 1985 ..... Box 126, Wayside
James Bible, 1983 ..... Rt. 1, Box 10, Wayside
James Stockett, 1983 ..... Box 127, Wayside

Bailey County
Doris Wedel, Secretary
H&R Block, 224 W. 2nd, Muleshoe

W. Lewis Scoggin, 1985 ..... Rt. 2, Muleshoe
David Stovall, 1985 ..... Rt. 2, Muleshoe
Ernest Ramm, 1985 ..... Rt. 2, Muleshoe
D. J. Cox, 1983 ..... Route 1, Enochs
Marshall Head, 1983 ..... Route 3, Muleshoe

Castro County
Dolores Baldridge, Secretary
City Hall, 120 Jones St., Dimmitt

Garnett Holland, 1985 .... 1007 Maple St., Dimmitt
W. A. Baldridge, 1985 ..... 608 W. Grant, Dimmitt
Dan C. Petty, 1985 ..... Box 846, Dimmitt
George Elder, 1983 ..... Rt. 5, Box 19, Dimmitt
Floyd Schulte, 1983 ..... Route 2, Dimmitt

Cochran County
W. M. Butler, Jr., Secretary
Western Abstract Co., 108 N. Main Ave., Morton

Keith Kennedy, 1986 ..... Star Route 2, Morton
L. T. Lemons, 1986 ..... Route 2, Morton
Hershel M. Tanner, 1984, Route 2, Box 36, Morton
Richard Greer, 1984 .... Star Rt. 1, Box 4, Morton
Donnie B. Simpson, 1984, 292 SW 3rd St., Morton

Crosby County
Clifford Thompson, Secretary
2930 Avenue Q, Lubbock

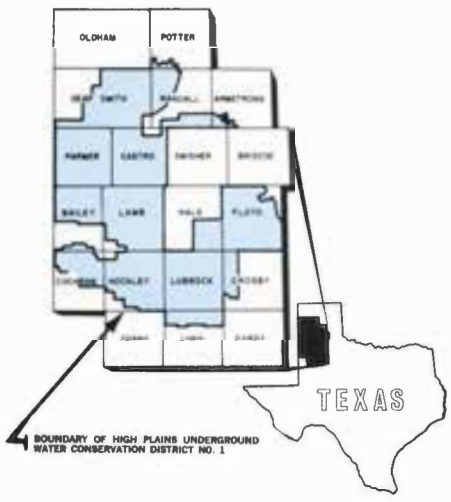
Tom McGee, 1986 ..... Box 117, Lorenzo
Bobby Brown, 1986 .... Route 1, Box 267C, Lorenzo
Tommy McCallister, 1984 ..... 209 N. Van Buren, Lorenzo
Edward S. Smith, 1984 ..... 102 N. Van Buren Lorenzo
Pat Yoakum, 1984 ..... Box 146, Lorenzo

Deaf Smith County
B. F. Cain, Secretary
County Courthouse, 2nd Floor, Hereford

J. F. Martin, 1985 ..... Box 1306, Hereford
Troy Sublett, 1985 ..... Route 1, Hereford
Virgil P. Walker, 1985 ..... Star Route, Hereford
Bill Cleavinger, 1983 ..... Star Route, Wildorado
W. L. Davis, Jr., 1983 ..... Box 312, Hereford

Floyd County
Verna Lynne Stewart, Secretary
108 W. Missouri, Floydada

Charles Huffman, 1986 ..... Route 1, Lockney
Kenneth Willis, 1986 .. Route 4, Box 103, Floydada
C. O. Lyles, 1984 ..... Route 4, Floydada
Cecil Jackson, 1984 ..... Route 3, Floydada
D. R. Sanders, 1984 ..... Star Route, Floydada



Hale County
J. B. Mayo, Secretary
Mayo Ins., 1617 Main, Petersburg

Larry Martin, 1986 ..... Box 189, Petersburg
W. T. Leon, 1986 ..... Box 249, Petersburg
Harold W. Newton, 1984 ..... Box 191, Petersburg
Jim Byrd, 1984 ..... Route 1, Petersburg
Ray Porter, 1984 ..... Box 193, Petersburg

Hockley County
Jim Montgomery, Secretary
609 Austin Street, Levelland

Marion Polk, 1986 ..... Box 185, Whitharral
Jack Earl French, 1986, Rt. 3, Box 125, Levelland
W. C. McKee, 1984 ..... Box 514, Sundown
Leon Young, 1984 ..... Route 1, Ropesville
Robert Phillips, 1984 ..... 218 Redwood, Levelland

Lamb County
George Harlan, Secretary
103 E. 4th Street, Littlefield

Haldon Messamore, 1986 .... Rt. 2, Box 272A, Sudan
Jim Brown, 1986 ..... Route 1, Box 152, Olton
P. A. Washington, 1984 ..... Box 124, Springlake
Jack Stubblefield, 1984 ..... Box 397, Spade
Larry Lockwood, 1984 ..... Star Rt. 2, Littlefield

Lubbock County
Clifford Thompson, Secretary
2930 Avenue Q, Lubbock

Owen Gilbreath, 1986 ..... 3302 23rd St., Lubbock
Pierce Truett, 1986 ..... Route 1, Box 44, Idalou
Don Bell, 1984 ..... Box 114, Wolfforth
Ronald Schilling, 1984 ..... Route 1, Slaton
Granville Igo, 1984 ..... 1304 8th St., Shallowater

Lynn County
Clifford Thompson, Secretary
2930 Avenue Q, Lubbock

Gary Houchin, 1986 ..... Box 54, Wilson
Danny Nettles, 1986 ..... Route 4, Tahoka
Leland Zant, 1984 ..... Route 1, Wilson
David R. Wied, 1984 ..... Box 68, Wilson
Wendell Morrow, 1984 ..... Route 1, Wilson

Parmer County
Pat Kunselman, Secretary
City Hall, 323 North Street, Bovina

Wendal Christian, 1985 ..... Rt. 1, Farwell
John Cook, 1985 ..... Box 506, Friona
Ronald Elliott, 1985 ..... Rt. 3, Muleshoe
Floyd Reeve, 1983 ..... Box 876, Friona
Ralph Roming, 1983 ..... 809 Ridglea Dr., Bovina

Potter County
Frank T. Beznar, 1985 ..... Box 41, Bushland
Ronnie Johnson, 1985 ..... Box 127, Amarillo
Weldon Rea, 1985 ..... Box 41, Bushland
Sam Line, 1983 ..... Box 143, Bushland
Mark Menke, 1983 ..... Rt. 1, Box 476, Amarillo

Randall County
Mrs. Louise Tompkins, Secretary
Farm Bureau, 1714 Fifth Ave., Canyon

Gary Wagner, 1985 ..... Box 219, Bushland
Jack Brandt, 1985 ..... Rt. 1, Box 280, Canyon
Johnny Sluder, 1985 ..... Box 56, Bushland
Roger B. Gist, III, 1983 ..... Route 1, Happy

NOTICE: Information regarding times and places of the monthly County Committee meeting can be secured from the respective County Secretaries.
Applications for well permits can be secured at the address shown below the respective County Secretary's name, except for Potter County; in this county contact Jim Line.

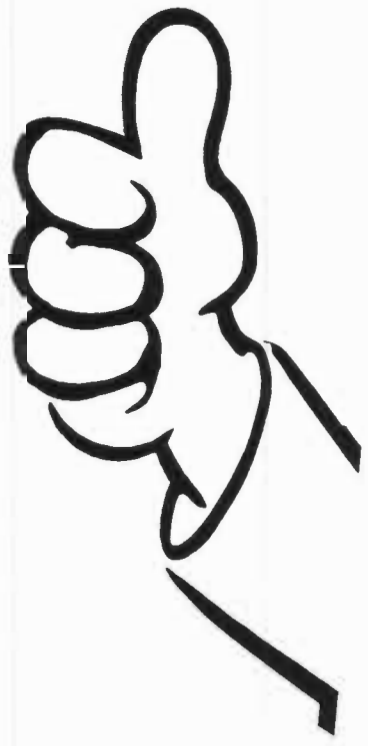
What's Up...

CALENDAR OF EVENTS

January 15—Election of 2 Directors and 14 Committeemen to High Plains Underground Water District in Armstrong, Bailey, Castro, Deaf Smith, Parmer, Potter and Randall Counties.

January 18—High Plains Irrigation Conference, sponsored by the Texas Agricultural Extension Service at Texas A&M Research Extension Center, 6500 Amarillo Blvd. West Amarillo—beginning at 9:30 a.m.

February 9 - 10 — Conservation Tillage Conference sponsored by SCS, Golden Spread Chapter of SCSA, Tierra Blanca SWCD, and Agricultural Research Service, Bushland at Bull Barn in Hereford begins at 8:00 a.m.



Conservation Tillage

Farmers looking for every bit of free information they can get to cut costs and improve yields in '83, will want to be at the Hereford Bull Barn on February 9 and 10. The Amarillo Area Soil Conservation Service, Soil Conservation Society of America, Soil and Water Conservation District and Bushland Agriculture Research Center are in cahoots to bring you the best information available during a two day Conservation Tillage Conference.

In addition to a full program of farmers relating their successes with limited tillage or no-till cropping systems, there will be an exhibit area full of equipment displays and chemicals available to help do the job. The two day program begins with 8 o'clock registration on the 9th and goes through Thursday the tenth. Some of the area farmers scheduled to talk about their operations include:

Charles Hough, Friona — farms no-till corn, sorghum, small grain and soybeans under center pivot irrigation.

Ernie Shoup, Clovis, N.M. — a no-till farmer, wheat, corn and milo using a graded furrow irrigation system.

Tom Dennis, Panhandle—a conservation tillage farmer, grain sorghum and wheat are major crops using graded furrow irrigation.

Milton Morris, Canyon—farms dryland using fallow systems and crop residues for outstanding wheat yields.

Wayne Lidster, Dalhart — will discuss advantages of conservation tillage on sandy soil in north Panhandle for corn, small grain, grain sorghum.

Lavon Harman, Tulia—has done experimental work with farming no-till cotton into existing wheat stubble. Worked with Dr. Weise, weed scientist from Bushland, on this cropping sequence. He's also worked some with new chemicals for wheat and other cereal grains.

Roman Freimel, Groom — will discuss use of air seeder in conservation tillage with one of the newest implements in Texas, farms corn, wheat, grain sorghum with both center pivot and graded furrow irrigation.

Jerry Ortho, Wildorado — using no-till methods to maintain good yields while converting from irrigated to dryland.

And there's more . . . on the benefits of mini-computers for farming operations and where to get programming help. USDA-ARS Bushland's Dr. Paul Unger will discuss no-till practices, and you can ask questions of a panel of the farmers participating in the conference.

SCS area agronomist Randy Underwood says, "Lunch on Wednesday the 9th is courtesy of several agriculture chemical companies; but outside of the display areas there are no product sales pitches on the program this year."

On Thursday afternoon, weather permitting, companies will give equipment field demonstrations to help answer any questions.

BOARD NAMES COMMITTEEMAN

Bailey County committeeman Lloyd Haire died of a heart attrack at the age of 58 on November 29th. He has served only two years of his first term as a committeeman for the High Plains Underground Water District. He was a retired Muleshoe farmer.

We wish to thank his family for Lloyd's generous service with the District and offer our sincere condolences to his wife Vera and their three daughters, Carol, Barbara and Sue.

The Water District's Board of Directors has appointed W. Lewis Scoggin to fill the two year unexpired term. Scoggin, a Muleshoe farmer, will represent Bailey County Water District residents as a committeeman until elections in 1985.

SILT CONTINUES TO CLOG FILTER SYSTEMS

(continued from page 1)

to a pipeline. Water gravity-flowed through the pipe into the well. The playa water was recharged for eleven hours before the well clogged. Then the pump was turned on and the well backwashed. Just one hour of backwashing effectively removed the mud-cake that had formed on the wall of the well. It was a partial success. But this cycle of eleven hours of recharge and one hour of backwashing was an expensive solution. Backwashing loosened sand. Pumping sand wears pumps out in a hurry. Yet, even with such limited success, the torrential rains of 1957 encouraged hundreds of land-owners on the High Plains to install similar recharge well systems to drain their own playas.

The high cost of replacing pumps led to the search for other solutions. Dow Chemical developed a fine powdery flocculant which would act as a settling agent on silt. When flocculants were aerially sprayed over a playa or holding pit, they 'cleared' the water. But flocculants were not only very slick when wet, they were undone by the wind. A good gust would break up the flocked particles, restir the bottom solids, and make another complete application necessary. Flocculants proved both troublesome and expensive. However, a Hereford chemical company did commercially manufacture a product under the name "Clear Lake" for local use.

There is a story of a single empirical test by the District to establish the practicality of applying flocculants by boat as a cheap alternative to the high cost of aerial spraying. This research was never publicized, but the oral record states . . .

Wayne Wyatt and Troy Roland of Hereford took a boat out on Bill Sutton's playa located southeast of Dimmitt. Wayne leaned way out over the bow and cranked on a modified flour sifter, sprinkling the chemical concentrate in front of the boat while Troy steered the motor.

As the boat cut the water, a fine mist atomized the flocculant back in their faces and flocked everything with a thick, gooey, slick layer. By the time they quit they were so slick they could hardly get out of the boat. Cleaning up both the boat and themselves took the rest of that day, complicated by the fact that the more water they used, the slicker they got.

The results of the study are inconclusive as the record is foggy as to the actual effects of this form of aquatic application.

Artificial recharge has been most successful when the water was collected from near the surface of the playa, treated and clarified in a settling basin and recharged through a system that minimized the clogging effect of suspended sediments. Field tests and lab research over the past 20 years indicate that these spreading basins are an economical method of recharge over most of the Southern High Plains, although still not a satisfactory one.

The District has never given up its search for successful long term artificial recharge technology. It worked with many other local and state agencies to establish a U.S. Geological Survey artificial recharge research center at Texas Tech University. While that center closed in 1980 after ten years of research, and moved to Denver where USGS research on artificial recharge continues, interest here remains high and hopeful of a long term, economical solution.

ELECTIONS . . .

(continued from page 1)

daries of the District and within the county where balloting is conducted, and they may vote only for candidates eligible to serve in the specific precinct boundaries within the District's service area where the voter lives.

Absentee voting for the District's election will be at the following locations in the counties affected:

Armstrong County:
Wayside Grain Company,
Wayside, 79094
Clerk: Mrs. Wynn Weatherford

Bailey County:
District Office, 224 West Second,
Muleshoe, 79347
Clerk, Doris Wedel

Castro County:
District Office, 120 Jones, Box 146,
Dimmitt, 79027
Clerk: Dolores Baldridge

Deaf Smith County:
District Office, 2nd floor County
Courthouse, Hereford, 79045
Clerk: Wilma Clark

Parmer County:
District Office, 323 North St.,
P.O. Drawer KK, Bovina, 79009
Clerk: Pat Kunselman

Potter County:
Bushland Grain Coop,
Box 5, Bushland, 79012
Clerk: Oliver Wann

Randall County:
County Clerk's Office,
Canyon, 79015
Clerk: Leroy Hutton

For more information on the election, or the location of January 15 polling places and judges, contact Clifford Thompson at the District's Lubbock headquarters at 2930 Avenue Q in Lubbock, 762-0181.

TAKING WATER LEVEL MEASUREMENTS from an observation well requires lowering a steel tape coated with carpenter's chalk down the well and observing the color change of the wet chalk.

Shorty Lancaster:	
Parmer	97
Hale	27
Jerry Funck:	
Castro	89
Lynn	37
Don Smith:	
Floyd	97
Obbie Goolsby:	
Deaf Smith	88
Cochran	52
Don McReynolds:	
Lamb	94
Bailey	74
Dan Seale:	
Randall	41
Hockley	91
Potter	6
Armstrong	9

Water Table Measured

Annual water level observation well measurements begin in January. District staff are heading to the respective counties to make depth-to-water measurements in a select group of wells in the District's service area. These measurements will determine the annual change in the ground-water supply which occurred during the past year. The District will measure water levels in a network of approximately 900 wells this year.

These wells are carefully chosen to reflect the variation in the thickness of the aquifer throughout the area. While new wells are continually being added to the network to upgrade and maintain good coverage of the District, most of the wells have been measured annually for many years. This allows for a comparison of current water levels with levels of past years.

Actual measurements are taken by lowering steel tapes coated with blue carpenter's chalk into the well to a predetermined depth, usually about five feet below last year's water level. When the tape contacts the water, that portion of the chalk turns a darker blue. By subtracting the amount of wet area on the tape from the total length lowered into the well, current depths to water are determined. The measurement is then written on a vinyl tag and attached to the well for the landowner's-operator's information, and is recorded by the staff.

This year's staff assignments and respective county wells to be measured are:

Ken Carver:	
Lubbock	118
Crosby	20

DIKES INCREASE YIELDS

FURROW DIKE FIELD RESEARCH at the Texas Agricultural Experiment Station at Etter in 1980 and '81 showed dramatic grain sorghum yield increases.

If you're not yet convinced, this dryland sorghum data from the Etter Research Center is so conclusive we thought it was worth repeating. Furrow dikes conserved 3.47 inches of runoff in 1981 and doubled grain sorghum yields. The evidence speaks for itself. If you can hold on to the moisture, it will make you money.

What is 3 inches of moisture worth to you? That amount of rainfall is equivalent to 26,065,920 gallons of water. It would take 181 days to pump 100 gpm on 320 acres and the pumping cost alone would amount to $1,612.80.

	SORGHUM YIELD (lb/ac)		INCHES RUNOFF CONSERVED	
	1980	1981	1980	1981
Diked Furrows	2080	2350	2.71	3.47
Open Furrows	570	1250	0	0
YIELD INCREASE	1510	1100		

Irrigation Conference Set

Leon New, Texas Agricultural Extension Service Irrigation Specialist, has lined up a full day of expert speakers for this years High Plains Irrigation Conference. The program opens at 9:30 a.m. at the Amarillo Center, Texas A&M Research Extension Center, 6500 Amarillo Blvd. West, in Amarillo on Tuesday, January 18.

Discussion topics will include:

Surge Flow Irrigation
Dr. Arland Schneider, USDA Research Agriculture Engineer, at Bushland

Pesticide Application by Center Pivot Sprinklers
Dr. Carl Patrick, Entomologist, TAES

Top Engine Efficiency
Lyman Dellinger, Technical Service Supervisor for Moline Engines from Russellville, Arkansas

Making Irrigation Profitable
Dr. Ray Sammons, Economist for TAES, Amarillo

Limited Irrigation of Crops
Dr. Leon New, Irrigation Specialist for TAES, Lubbock

The afternoon session offers a panel of growers to discuss irrigation practices, efficiencies and economics and to invite audience interaction and questions.

How much is rainfall worth to you? Whatever your situation, the answer is aplenty. Douglas Bartosh, Soil Conservation Service engineer, has put together a simple chart showing different rainfall amounts and the number of days of pumping time needed for different size pumps to deliver an equal amount of water. These figures do not allow for runoff. They are based on a calculation of one acre inch of water being equal to 27,152 gallons, and time is figured based on 24 hours pumping per day to the nearest tenth.

Doug says, "people don't realize how much moisture they would get if they could just hold on to it and use it." Now you CAN hold that rainfall and get the maximum use from any precipitation by incorporating basin tillage into your farming operation. Furrow dikes pay for themselves in reduced pumping costs and increased yields.

Figure How Much Your Water's Worth

Area Acres	ESTIMATED PUMPING COST*	RAINFALL AMOUNTS INCHES	GALLONS	PUMP DISCHARGE Equivalent no. of DAYS needed to apply at 100 GPM	200 GPM	400 GPM	600 GPM
40	$ 67.20	1	1,086,080	7.5	3.8	1.9	1.3
	134.10	2	2,172,160	15.1	7.5	3.8	2.5
	201.60	3	3,258,240	22.6	11.3	5.6	3.8
	268.60	4	4,344,680	30.2	15.1	7.6	5.0
	336.00	5	5,430,850	37.7	18.6	9.4	6.3
80	134.10	1	2,172,160	15.1	7.5	3.8	2.5
	268.80	2	4,344,320	30.2	15.1	7.5	5.0
	403.20	3	6,516,480	45.2	22.6	11.3	7.5
	537.60	4	8,689,360	60.3	30.2	15.1	10.1
	672.00	5	10,861,700	75.4	37.7	18.6	12.6
160	268,80	1	4,344,320	30.2	15.1	7.5	5.0
	537.60	2	8,688,640	60.3	30.2	15.1	10.0
	806.40	3	13,032,960	90.5	45.2	22.6	15.1
	1,075.20	4	17,378,720	120.6	60.3	30.2	20.1
	1,344.00	5	21,723,400	150.8	75.4	37.7	25.1
320	537.60	1	8,688,640	60.3	30.2	15.1	10.0
	1,075.20	2	17,377,280	120.7	60.3	30.2	20.0
	1,612.80	3	26,065,920	181.0	90.5	45.2	30.2
	2,150.40	4	34,757,440	241.4	120.7	60.3	40.2
	2,688.00	5	43,446,800	301.7	150.8	75.4	50.3

*Cost estimates are figured on a representative average electric well in the District based on tests conducted for pump plant efficiency, assuming an overall pumping unit efficiency of 63%. Lift is 185 feet, 212 gpm, .06¢ per kwh, and an average cost per acre inch of $1.68.

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CONSERVATION DISTRICT NO. 1
2930 AVENUE Q
LUBBOCK, TEXAS 79405

SECOND CLASS PERMIT

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Water Conservation: The Current Option

TEXAS GOVERNOR PRESENTS

6-State Study Recommendations

Final recommendations of the High Plains Study Council's Six State Ogallala Regional Study have been completed and submitted to the Secretary of Commerce and to the members of Congress representing the study area.

The final report of the Council includes 18 recommendations to address the numerous objectives of the study which were identified as assuring an adequate supply of food to the nation, promoting the economic vitality of the High Plains Region, developing plans to increase water supplies in the area, assuring adequate water supplies to the area, and assuring the continued growth and vitality of the region.

Assuming the continued depletion of the Ogallala aquifer, its effects on the long term production from the area, and the significance of this production to the nation now and in the future, the High Plains Study Council recommends that in the short run the primary emphasis be placed upon water conservation. Research and development, public information and technical assistance to increase water conservation, and financial incentives for water conservation are top priorities. The Council's long term recommendation is for continued water importation feasibility and planning studies with appropriate consideration for the water needs and concerns of basins and states of origin of potential export waters.

Water conservation is the primary recommendation of the Council. It does not recommend a water importation plan at this time. It does suggest that conservation is not just an alternative, but an economic necessity whether voluntary or involuntary. The

continued on page 3 . . . R&D

Court Rules

In a key interstate ground water law decision on January 17, a U.S. District Judge struck down as unconstitutional a New Mexico state law banning the export of groundwater to Texas.

In 1980 El Paso filed field well applications to drill up to 326 water wells in New Mexico to support its burgeoning municipal growth. Pumpage was to be from the aquifer just north and west of El Paso's city boundaries in the Hueco Bolson and Mesilla Bolson basins in New Mexico.

New Mexico rejected the applications citing a state law prohibiting the interstate transfer of groundwater. El Paso filed suit. New Mexico responded claiming it required the water to provide for its own projected future growth.

Judge Howard Bratton ruled last month that New Mexico could not embargo water exports for its own economic advantage. He further stated that even if the purpose of New Mexico's objection "were for conservation and preservation as the defendants maintain, the embargo does not significantly advance the conservation and preservation of the water." Judge Bratton wrote, "in essence, defendants recognize no limits on the future uses for which New Mexico should be able to preserve groundwater." He declared New Mexico's law in violation of the Commerce Clause of the U.S. Constitution.

John Hickerson, head of the El Paso Water Utilities, sees the decision as virtually the same issue involved in the case of Texas versus Altus, Oklahoma. A Supreme Court decision 17 years ago struck down a Texas state law prohibiting export of water outside the state of Texas as a violation of interstate commerce.

Black Credited With Key Role

On January 6, 1983 High Plains Study Council Chairman, Governor of Texas William P. Clements, Jr., Council Liaison Committee Chairman Mr. A. L. Black of Friona, Texas, and other representatives of the Council delivered the Council's Summary and Recommendations report of the Six-State High Plains Regional Aquifer study to Secretary of Commerce, The Honorable Malcolm Baldrige. The study was the result of extensive work by the contractor team, state researchers from each of the six member states, and federal agencies. Mr. Black played a key role in organizing the High Plains Study Council, served as Council Chairman in 1978 and served as Council Liaison Committee Chairman in 1979, 1980, 1981, and 1982, an office he holds at the present time. On January 13, 1983, Mr. Black was appointed Temporary Chairman of the Council to continue its organization through the transition of Gubernatorial administrations in early 1983.

Much of the credit for the organization of the High Plains Study Council and the Council's strong role in guiding the High Plains study contractors is due A. L. Black. His early recognition of the need for direct state and local participation in the newly authorized study, and his active personal participation in the organization and in the many meetings of the Council and its Liaison Committee throughout the 42 months of contractor work and the additional 30 months of Council and Committee

A. L. BLACK

work were both inspiring and encouraging to the many individuals who worked on this very large and intricately complex project. Through his steady, firm, and insistent guidance and participation, the study was directed from the academic to the practical. He brought to the conference tables of the researchers the real world experiences of the farmers, ranchers, and the agribusiness people of the area. The result was a more relevant and a more useful study report. The region, the state, and the nation owe Mr. Black a debt of gratitude for his participation in the High Plains Study.

Thank you A. L.

Conkwright, Gober Re-elected

James Conkwright and Webb Gober have been re-elected to the Board of Directors of the High Plains Underground Water Conservation District No. 1, according to official returns from balloting conducted on Saturday, January 15. Also elected were fourteen County Committeemen in seven counties within the Water District's service area.

Jim Conkwright, of Hereford, will serve his third term on the Board representing Director's Precinct Four which is composed of Water District areas in Armstrong, Deaf Smith, Potter and Randall Counties. Jim is a Registered Hereford cattle producer and farmer.

Webb Gober has served on the Board for ten years and will begin his sixth term. He will represent Director's Precinct Three Counties of Bailey, Castro and Parmer. Webb lives just northeast of Farwell and farms 480 acres of irrigated land.

County Committeemen elected in the balloting were as follows: in Precinct Three—Bailey County, D. J. Cox of Enochs was re-elected and Tommy Haley of Muleshoe won his first term. In Castro County George Elder and Floyd Schulte, both of Dimmitt, have been re-elected. In Parmer County Jerry London of Friona will serve his first term with Billy Lynn Marshall of Bovina.

continued on page 3 . . . LOCALS

Heavy Snows Deceptive

Southern High Plains farmers looking at the recent heavy snows and planning this year's farm operation or deciding whether or not to join the PIK program assuming good soil moisture conditions, better take a second look.

Mike Risinger, a soil scientist with the SCS in Lubbock, is working with the High Plains Water District to establish a large network of soil moisture monitoring sites over the 15 county area. At each site, aluminum tubes are set to a 7 foot depth and moisture readings are made with a neutron source. The data is used to compile annual pre-plant soil moisture deficit maps for the area.

Measurements made in Bailey, Cochran, Hale, Lamb, Lubbock and Lynn Counties during the first three weeks in

continued on page 4 . . . SOIL

THE Cross SECTION

THE CROSS SECTION (USPS 564-920)

A MONTHLY PUBLICATION OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1

2930 Avenue Q, Lubbock, Texas 79405
Telephone (806) 762-0181

PATRICIA BRUNO, *Editor*

Second Class Postage Paid at Lubbock, Texas
District Office at Lubbock

BOARD OF DIRECTORS

Precinct 1
(CROSBY, LUBBOCK and LYNN COUNTIES)
James P. Mitchell, President ..... Wolfforth

Precinct 2
(COCHRAN, HOCKLEY and LAMB COUNTIES)
Mack Hicks, Vice President ..... Levelland

Precinct 3
(BAILEY, CASTRO and PARMER COUNTIES)
A. W. Gober, Secretary-Treasurer ..... Farwell

Precinct 4
(ARMSTRONG, DEAF SMITH, POTTER and RANDALL COUNTIES)
Jim Conkwright ..... Hereford

Precinct 5
(FLOYD and HALE COUNTIES)
Gilbert Fawver ..... Floydada

COUNTY COMMITTEEMEN

Armstrong County
Carroll Rogers, Secretary
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Tom Ferris, 1985 ..... Box 152, Wayside
Larry Stevens, 1985 ..... Route 1, Happy
Kent Scroggins, 1985 ..... Box 126, Wayside
James Stockett, 1987 ..... Box 127, Wayside
Jim Burnett, 1987 ..... Route 1, Wayside

Bailey County
Doris Wedel, Secretary
H&R Block, 224 W. 2nd, Muleshoe
W. Lewis Scoggin, 1985 ... Rt. 2, Box 215, Muleshoe
David Stovall, 1985 ..... Rt. 2, Muleshoe
Ernest Ramm, 1985 ..... Rt. 2, Muleshoe
D. J. Cox, 1987 ..... Rt. 1, Enochs
Tommy Haley, 1987 ..... Box 652, Muleshoe

Castro County
Dolores Baldridge, Secretary
City Hall, 200 E. Jones St., Dimmitt
Garnett Holland, 1985 ..... 1007 Maple St., Dimmitt
W. A. Baldridge, 1985 ..... 608 W. Grant, Dimmitt
Dan C. Petty, 1985 ..... Box 846, Dimmitt
Floyd Schulte, 1987 ..... Rt. 2, Dimmitt
George Elder, 1987 ..... Rt. 5, Box 19, Dimmitt

Cochran County
W. M. Butler, Jr., Secretary
Western Abstract Co., 108 N. Main Ave., Morton
Keith Kennedy, 1986 ..... Star Rt. 2, Morton
L. T. Lemons, 1986 ..... Rt. 2, Morton
Hershel M. Tanner, 1984 ..... Rt. 2, Box 36, Morton
Richard Greer, 1984 ..... Star Rt. 1, Box 4, Morton
Donnie B. Simpson, 1984 .. 292 SW 3rd St., Morton

Crosby County
Clifford Thompson, Secretary
2930 Avenue Q, Lubbock
Tom McGee, 1986 ..... Box 117, Lorenzo
Bobby Brown, 1986 ..... Rt. 1, Box 267C, Lorenzo
Tommy McCallister, 1984, 209 N. Van Buren, Lorenzo
Edward S. Smith, 1984 .. 102 N. Van Buren, Lorenzo
Pat Yoakum, 1984 ..... Box 146, Lorenzo

Deaf Smith County
B. F. Cain, Secretary
110 East Third, Hereford
J. F. Martin, 1985 ..... Box 1306, Hereford
Troy Sublett, 1985 ..... Rt. 1, Hereford
Virgil P. Walker, 1985 ..... Star Rt., Hereford
W. L. Davis, Jr., 1987 ..... Box 312, Hereford
R. D. Hicks, 1987 ..... Rt. 4, Hereford

Deaf Smith County has a new Water District County Secretary's office in Hereford. County Secretary B. F. Cain has moved from the Courthouse to new headquarters at 110 E. 3rd Street in Hereford.

For information about District services or water well permit applications, call or come by B. F.'s office or contact one of your local Water District county committeemen.

Floyd County
Verna Lynne Stewart, Secretary
108 W. Missouri, Floydada
Charles Huffman, 1986 ..... Rt. 1, Lockney
Kenneth Willis, 1986 ..... Rt. 4, Box 103, Floydada
C. O. Lyles, 1984 ..... Rt. 4, Floydada
Cecil Jackson, 1984 ..... Rt. 3, Floydada
D. R. Sanders, 1984 ..... Star Rt., Floydada

Hale County
J. B. Mayo, Secretary
Mayo Ins., 1617 Main, Petersburg
Larry Martin, 1986 ..... Box 189, Petersburg
W. T. Leon, 1986 ..... Box 249, Petersburg
Harold W. Newton, 1984 ..... Box 191, Petersburg
Jim Byrd, 1984 ..... Rt. 1, Petersburg
Ray Porter, 1984 ..... Box 193, Petersburg

Hockley County
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609 Austin Street, Levelland
Marlon Polk, 1986 ..... Box 185, Whitharral
Jack Earl French, 1986 .... Rt. 3, Box 125, Levelland
W. C. McKee, 1984 ..... Box 514, Sundown
Leon Young, 1984 ..... Rt. 1, Ropesville
Robert Phillips, 1984 ..... 218 Redwood, Levelland

Lamb County
George Harlan, Secretary
103 E. 4th Street, Littlefield
Haldon Messamore, 1986 .... Rt. 2, Box 272A, Sudan
Jim Brown, 1986 ..... Rt. 1, Box 152, Olton
P. A. Washington, 1984 ..... Box 124, Springlake
Jack Stubblefield, 1984 ..... Box 397, Spade
Larry Lockwood, 1984 ..... Star Rt. 2, Littlefield

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Pierce Truett, 1986 ..... Rt. 1, Box 44, Idalou
Don Bell, 1984 ..... Box 114, Wolfforth
Ronald Schilling, 1984 ..... Rt. 1, Box 23, Slaton
Granville Igo, 1984 ..... 1304 8th St., Shallowater

Lynn County
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Gary Houchin, 1986 ..... Rt. 1, Box 54, Wilson
Danny Nettles, 1986 ..... Rt. 4, Tahoka
Leland Zant, 1984 ..... Rt. 1, Wilson
David R. Wied, 1984 ..... Box 68, Wilson
Wendell Morrow, 1984 ..... Rt. 1, Wilson

Parmer County
Pat Kunselman, Secretary
City Hall, 323 North Street, Bovina
Wendal Christian, 1985 ..... Rt. 1, Farwell
John Cook, 1985 ..... Box 506, Friona
Ronald Elliott, 1985 ..... Rt. 3, Muleshoe
Billy Lynn Marshall, 1987 .... 903 8th Street, Bovina
Jerry London, 1987 ..... 1210 Jackson, Friona

Potter County
Frank T. Beznar, 1985 ..... Box 41, Bushland
Ronnie Johnson, 1985 ..... Box 127, Bushland
Weldon Rea, 1985 ..... Bushland
Sam D. Line, 1987 ..... Box 143, Bushland
Mark Menke, 1987 ..... Rt. 1, Box 476, Amarillo

Randall County
Mrs. Louise Tompkins, Secretary
Farm Bureau, 1714 Fifth Ave., Canyon
Gary Wagner, 1985 ..... Box 219, Bushland
Jack Brandt, 1985 ..... Rt. 1, Box 280, Canyon
Johnny Sluder, 1985 ..... Box 56, Bushland
Roger B. Gist, III, 1987 ..... Rt. 1, Happy
Tom Payne, 1987 ..... Rt. 1, Box 306, Canyon

NOTICE: Information regarding times and places of the monthly County Committee meeting can be secured from the respective County Secretaries.

Applications for well permits can be secured at the address shown below the respective County Secretary's name, except for Potter County; in this county contact Jim Line.

What's Up...

CALENDAR OF EVENTS

February 9 & 10—CONSERVATION TILLAGE CONFERENCE sponsored by SCS, Golden Spread Chapter of SCSA, Tierra Blanca SWCD and Agricultural Research Service, Bushland, at the Bull Barn in Hereford, starts at 8:00 a.m.

February 19—WATER INC. ANNUAL MEMBERSHIP MEETING, Lubbock Civic Center, information program on 6 State Study Council Recommendations and Texas Water Plan revision, beginning at 9 a.m., concludes with luncheon. Registration: $15.

March 22 & 23—WATER RESOURCES IN TEXAS SYMPOSIUM, sponsored by Center for Research in Water Resources at Joe C. Thompson Conference Center, The University of Texas at Austin. Topics include: "policy issues, water law, financing alternatives, safe reuse of water, water and economics, waste disposal, groundwater management, coastal zone questions and research needs and opportunities for water conservation." Registration at 8:30 a.m., $60.

Mr. George Marks
State Conservationist
Soil Conservation Service
Temple, Texas

Dear George:

Congratulations on your retirement after more than 30 years of service to the SCS and over 25 of those years served in Texas!
The Board of Directors, County Committeemen and staff of the High Plains Water District want to express our deep gratitude for your hard work and dedication on behalf of all the people of the state of Texas and especially West Texas.

Your commitment of SCS personnel and resources and your own continuing visible and invisible support are the real reasons for the tremendous success of the irrigation water management evaluation program and the mobile field water conservation labs now spreading throughout Texas. Your leadership is directly responsible for the unprecedented cooperative programs between the SCS and many local and state agencies. These programs have meant real savings to West Texans through opportunities to improve their energy and water management efficiencies.

Our door will always be open to you as we consider you our friend and neighbor.

Yours,

Wayne

A. Wayne Wyatt, Manager

GEORGE MARKS (left) came to Lubbock to see the Field Water Labs for himself. Mickey Black, Budd Fountain and Bob Arhelger with SCS shared his enthusiasm.

R&D, Public Education, Cost Sharing, Incentives

(continued from page 1)

council recognizes that its recommendations are interim, stop-gap measures, and that in 30 to 50 years, new sources of water will be needed IF the High Plains area is to remain in irrigation. But that will be determined by changes in commodity prices, farm export policy, energy, consumer and other market forces influencing the price and demand for food in our nation. For the foreseeable future, conservation is set forth as the only option.

In its summary and recommendations, the Council makes many suggestions for water conservation research and demonstration, public information education, extension and technical assistance, agricultural energy alternatives, legal and institutional, environmental maintenance and protection and economic development opportunities. A key recommendation is for financial incentives such as low-interest loans and water conservation cost sharing public programs to be targeted to the High Plains area farmers.

The Council also recommends the Agricultural Extension Service increase its distribution of public information to irrigation farmers to get them to adopt and use the best water conservation practices that are already known.

Research, water conservation investments on the farm and public information programs could allow the present water supplies in the southern parts of the area to continue to support about 80 percent of present irrigated acreage for an additional 20 to 30 years.

BACKGROUND

The High Plains Ogallala Aquifer Regional Study was authorized by Congress in 1976 (P.L. 94-587). The legislation directed "... the Secretary of Commerce, acting through the Economic Development Administration, in cooperation with the Secretary of the army, acting through the Chief of engineers, and appropriate federal, state and local agencies, and the private sector to study the depletion of the natural resources of those regions of the states of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, and Texas presently utilizing the declining water resources of the Ogallala aquifer, and to develop plans to increase water supplies in the area and report thereon to Congress, together with any recommendations for further congressional action." The reasons for the study are to assure an adequate supply of food to the Nation and to promote the economic vitality of the Region.

The Governors and other leaders of the High Plains states, organized the High Plains Study Council in late 1976 and early 1977 to guide and direct the study. In September, 1978, a General Contractor, Camp Dresser, and McKee, Inc. and association, was engaged. The General Contractor managed the Study for the Federal Government and the Council and performed parts of the work. Each state performed parts of the work, and the U. S. Army Corps of Engineers conducted the water import studies.

HIGH PLAINS STUDY COUNCIL RECOMMENDATIONS

A. Water Conservation Research and Demonstration

1. Increase the levels of both public and private funding for research to increase water-use efficiencies, decrease erosion losses and improve agricultural productivity for both irrigated and dryland farms throughout the High Plains Region.
2. Expand programs to demonstrate the use of water-efficient irrigation techniques and practices, and soil/water conservation management systems.
3. Increase public and private funding for research, demonstration and market development for more water-efficient crops adapted to High Plains growing conditions.

B. Public Information, Education, Extension and Technical Assistance

1. Expand public and privately sponsored programs to publicize the need for water and soil conservation improvements in High Plains agriculture and to disseminate widely the more effective research results and management information needed for farming operations in the High Plains Region.
2. Conduct short courses and field tours in order to demonstrate on a farm basis the use of proven and cost effective management methods for both irrigated and dryland farming conditions throughout the High Plains.
3. Initiate a program for informing domestic, municipal, commercial and industrial water users in the High Plains Region of effective methods, practices and devices for improved water-use efficiencies and conservation.

C. Water Supply

1. Expand research, planning, development and use of technology and programs to increase the quantity and protect the quality of water resources available within the High Plains Region.
2. Continue regional interstate water transfer feasibility and planning studies, with appropriate consideration for the water needs and concerns of basins and states of origin of potential export waters.
3. Provide state and federal funding to continue monitoring ground water quantity and quality and the projected effects of continued ground water depletion on the Region and Nation.

D. Agricultural Energy Alternatives

1. Demonstrate the use of on-farm energy use efficiency and auditing methods and devices to increase energy efficiencies for agricultural purposes.
2. Increase research and demonstration programs and projects for the development and use of alternative energy sources for agricultural uses.

E. Legal and Institutional

1. Establish Technical Advisory Committees in each High Plains state to provide ongoing guidance and coordination for research, demonstration, education and technical assistance programs for water and energy use efficiency and conservation programs.
2. Provide financial incentives to encourage improved methods for conserving soil, water, and energy.
3. Individual states should evaluate existing state laws and institutions for water management and, where appropriate, suggest needed changes for state action to provide improved state or local management capabilities and more efficient use of waters in each state.

F. Environmental Maintenance and Protection

1. Select and manage cropping systems, irrigation and farm management practices, and irrigated, dryland and rangeland vegetation to conserve soil and water resources and wildlife habitats.
2. Provide technical and financial assistance for re-establishing permanent vegetative cover on all lands going out of cultivation in order to control erosion and to restore habitat.
3. Include provisions for management and protection of fish, wildlife, and related environmental resources in all soil and water conservation or water supply development projects and plans.

G. Economic Development Opportunities

1. Assist ongoing programs to help diversify the economy of the High Plains Region, to develop less water-intensive enterprises, and to improve the economic viability of dryland farming, ranching and non-agricultural opportunities.

BILLY GRIFFIN—SCS
Texas State Conservationist

New Head In Texas

The USDA Soil Conservation Service in Texas has a new state conservationist. Billy C. Griffin, a native of Waelder, Texas in Gonzales County, was named by USDA SCS Chief Pete Myers to take the job on January 9 for retiring Texas State Conservationist George Marks.

Griffin comes back to Texas from Mississippi where he was serving as state conservationist. After serving in the U.S. Army during the Korean Conflict he began his conservation career in 1954 at Stephenville, Texas. He then worked at Bandera, San Antonio, and Pecos before moving to Temple in 1972 when he was an area conservationist and assistant state conservationist. Griffin was promoted to deputy state conservationist in Mississippi from 1976 to 1981.

He has received awards for outstanding work with the SCS six times, most recently in 1980 and in 1982.

Bill Griffin will lead some 1140 SCS personnel in about 275 Texas state, area, planning and field offices, and work with the 201 Soil and Water Conservation Districts in Texas as well as with other local, state and federal agencies in Texas.

Harvey Davis Back

The Texas State Soil and Water Conservation Board's newly appointed Executive Director, Harvey Davis, is a powerhouse. "Not only does Harvey have a wealth of experience in guiding our agency in the administration of Texas soil and water conservation laws," said Joe Antilley, Chairman of the Board, "he will be bringing back to us even greater experience gained as a result of his heading the Texas Department of Water Resources."

Davis worked for the TSSWCB for 23 years, 16 of which he served as executive director prior to his being named the first executive director of the Texas Department of Water Resources. He headed that agency for five years, taking its helm in November of 1977 after the 65th Legislature combined the Texas Water Development Board, the Texas Water Rights Commission and the Texas Water Quality Board into the Texas Department of Water Resources.

Now back as executive head of the TSSWCB, Davis will assume agency responsibility for coordinating the programs of Texas' 201 soil and water conservation districts.

Locals Elected

(continued from page 1)

County Committeemen elected in Precinct Four—Armstrong County were James Stockett of Wayside, re-elected, and Jim Bob Burnett of Wayside serving his first term. In Deaf Smith County W. L. Davis and Roy D. Hicks, both of Hereford have won. Davis was re-elected, Hicks will serve his first term. Potter County elected Sam Line of Bushland and Mark Menke of Amarillo both to serve their second terms. In Randall County Roger B. Gist, III, of Happy was re-elected and Tom Payne of Canyon won his first term.

Official vote totals were canvassed by the District Directors at their February 3rd Board meeting.

Soil Moisture Levels Low

(continued from page 1)

December before the heavy snowfalls indicated subsoil moisture is again below average due to the shortage of fall rains. National Weather Service records at Lubbock show only 3.6 inches of total precipitation were received for August, September and October of 1982, as compared to the 72 year average of 6.6 inches for the same period.

But a re-check of eight typical sites in Lubbock County made on January 17 after the holiday snowstorms, to identify any change in soil moisture due to the heavy snow, showed NO significant increase. Preliminary indications are that the area's subsoil moisture is still below average.

Ken Wigner, National Weather Service meterologist at Lubbock explained the conditions. "The 10.7 inches of snow that fell at Lubbock airport between December 26 and January 1 contained a precipitation equivalent of only 1.12 inches. In addition, adverse conditions of low humidity, low temperatures and surface winds extended the time of snow thawing and allowed most of it to evaporate from the top surface and be lost into the atmosphere rather than melt into the ground." These conditions set a 14 day record for snow on the ground in Lubbock.

Ken reports that the January 20-21 snowstorm dumped a total of 16.9 inches, but this contained a precipitation equivalent of only 1.64 inches of moisture. He observed there are currently no rapid losses of moisture to the atmosphere, therefore a larger portion of this snow's moisture may filter into the surface. But he cautioned, "Traditionally, these kinds of snows do not add much to the soil moisture even though they are at record levels. We just don't see much improvement in deep soil moisture from any kind of precipitation during the winter."

Mike recommends that growers dig in their fields to check their own soil moisture before making major decisions.

Mike expects to again re-check enough typical soil moisture sites in the area to re-determine if there has been any significant change in moisture. These findings will be reflected in the 1983 pre-plant soil moisture deficit map which is now projected to be published by early March, perhaps before the deadline for making a decision on PIK.

THE JONES BOYS, Tom, BL, III and BL, Jr., of Jones Appraisal Service confer with IRS engineers Jack Page and Stonewall Brinkman on cost in water and land valuations.

To Figure A Tax Deduction

Water depletion information for tax year 1982 is now available from the High Plains Underground Water Conservation District for landowners to use in claiming a cost-in-water income tax depletion allowance for the area served by the Water District.

Area landowners whose ground water is depleted in the business of irrigation farming can claim a cost-in-water depletion allowance each year for the water exhausted in that year's farm operation.

To determine the owner's cost-in-water requires determining the quantity of ground water in storage beneath his tract of land for the year of purchase. The value of the water is determined by comparing the difference in land sale prices for irrigated land as compared to dryland for the year of acquisition. The value attributed to the ground water in storage beneath the irrigated tract is the amount the landowner had to pay above what he would have had to pay for a comparable dryland tract. The dollar difference is divided into the feet of saturated formation at the date of purchase to obtain the cost per foot of water. These values are obtained from actual sale records each year in the Water District's service area by the District's appraisers.

Finally a water decline value must be assigned for each year the tax deduction is claimed for each tract of land eligible for a depletion allowance.

Each year a qualified consulting appraiser collects and interprets the per acre value difference in irrigated and dryland sales in order to calculate the true cost of the water for any land acquired that year. The cost of groundwater reserves for irrigated land acquired in 1982 ranged from $140 to $755 per acre within the Water District's 15 county service area.

To assign annual water level declines in the aquifer, Water District staff members measure the water levels in a network of 950 water level observation wells within the District each January. The one year, the past five and the past ten year changes are calculated and a graph is made of these generally declining changes.

To put it all together, the landowner's cost per acre in water is divided by the saturated thickness of the aquifer beneath his land to arrive at a cost per acre per foot. As an example, if the landowner has 100 feet of saturated thickness at the date of purchase and he paid $500 per acre more for the irrigated land than he would have had to pay for similar land without irrigation water (dryland), he would then have a cost of $5.00 per foot of saturated material. Each year as he receives a "feet of decline" assignment from the Water District, the landowner can calculate the cost of depleting his ground water by multiplying feet of decline times cost per foot times total acres and arrive at a dollar value for his tax deduction. Using the example above, if he had three feet of decline he would multiply this by the $5.00 per foot value with a resulting tax deduction of $15 per surface acre.

The Water District has been providing cost-in-water decline values for 20 years now, and anticipates between six and seven thousand landowners will make requests for the values this year either as individuals or through their tax accountants. The District estimates at least three to five million dollars of tax expense allowances are saved by farmers each year by this program in the Water District's service area.

CONSERVATION TILLAGE
DOES IT PAY?

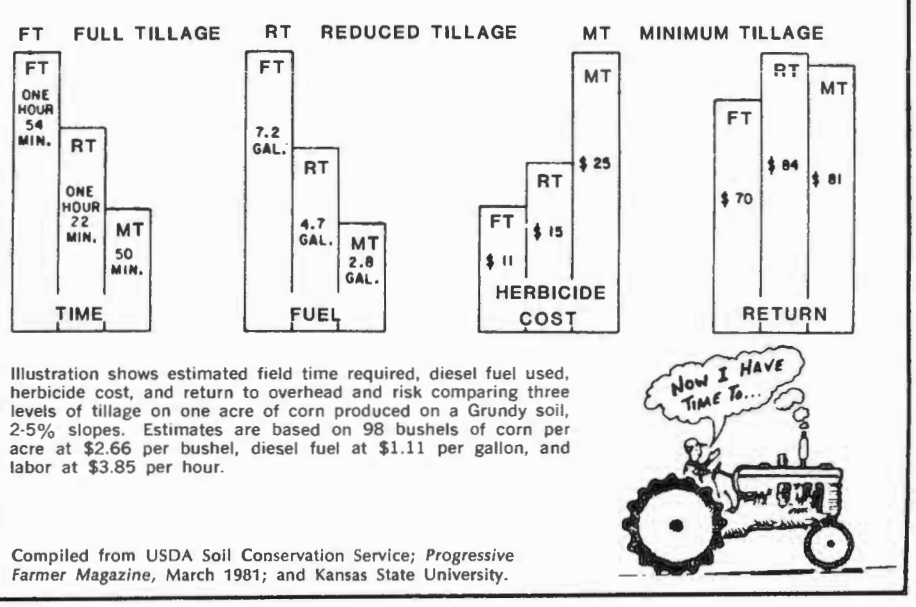

Illustration shows estimated field time required, diesel fuel used, herbicide cost, and return to overhead and risk comparing three levels of tillage on one acre of corn produced on a Grundy soil, 2-5% slopes. Estimates are based on 98 bushels of corn per acre at $2.66 per bushel, diesel fuel at $1.11 per gallon, and labor at $3.85 per hour.

Compiled from USDA Soil Conservation Service; *Progressive Farmer Magazine*, March 1981; and Kansas State University.

Don't forget the 2 day CONSERVATION TILLAGE CONFERENCE at the Bull Barn in Hereford on February 9 and 10. It promises a full program of information and success stories from eight area farmers on their limited and no till cropping systems, plus conservation tillage equipment and chemical displays and a free lunch. See you there.

THE CROSS SECTION (USPS 564-920)
HIGH PLAINS UNDERGROUND WATER
CONSERVATION DISTRICT NO. 1
2930 AVENUE Q
LUBBOCK, TEXAS 79405

SECOND CLASS PERMIT

THE Cross SECTION

AGRICULTURAL MUNICIPAL INDUSTRIAL

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Large Quantities Of Capillary Water Confirmed

Project Goal

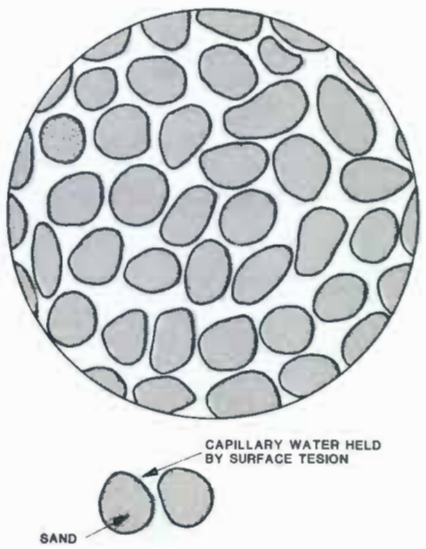
The goal of the investigation was to determine whether sufficient quantities of capillary water are stored in the Ogallala Formation above the present water table to warrant efforts to recover the water and, if sufficiently large amounts are found, to develop economically feasible mechanisms for releasing the water.

continued on page 2 . . . LEGISLATURE

Capillary Water is that water in the zone between the water table and the land surface that is held between soil particles by molecular attraction and capillarity.

For almost all naturally occurring formations, the solid material, such as a sand grain, is slightly wet. A very thin layer of water, a few molecules thick, surrounds the sand grain. This water is held to the sand

FIGURE 2
CONCEPTUAL ILLUSTRATION OF
CAPILLARY WATER HELD IN STORAGE



grain by atomic forces, and about the only way to remove this layer of water is to cook the sand grain in a very hot oven. This is not the water of interest in the study.

If the formation is wetter than described above, additional water is held in the void spaces between the sand grains. This water is held in narrow sections of the voids. This is the capillary water that was the subject of the investigation. Water would drain from even the narrowest voids due to gravity if it were not for the phenomenon of surface tension. Surface tension occurs in any water surface, but is so weak that it becomes important only when the surface area is quite small. Surface tension keeps the water between the sand grains.

Secondary Recovery Technique Successful

OBJECTIVE 1: Determine the Amount of Water in Capillary Storage.

Test hole drilling and core analysis work showed that the moisture content for material between the bottom of the root zone (about ten feet below land surface) and the 1980 water table ranged from 10 to 40 percent by volume with an average of about 25 percent. Using the average value, the 3.36 billion acre-feet of currently unsaturated material in the Ogallala Formation in the High Plains of Texas would contain about 840 million acre-feet of capillary water. The amount of capillary water which may remain when the currently saturated portion of the formation (some 2.5 billion acre-feet of material) is drained equals about 625 million acre-feet, for a total potential of 1.46 billion acre-feet of capillary water.

This study indicated that significant volumes of capillary water are in storage. If only a small portion of this water can be recovered, the amount of water available on the High Plains of Texas will be significantly increased.

OBJECTIVE 2: Identify Available or Emerging Technologies for Recovery of Capillary Water.

An exhaustive review of existing literature was carried out in an attempt to identify available or emerging technologies for secondary recovery of capillary water. No articles pertaining directly to secondary recovery of ground water were located. Early articles pertaining to secondary recovery of petroleum were researched, but few applied to recovery from material similar to the Ogallala. Five potential secondary recovery techniques were identified, air drive, surfactant/foam, thermal, vibration, and electro-osmosis. Preliminary analysis indicated that air drive and surfactant/foam were the most feasible techniques for ground-water application.

OBJECTIVE 3: Evaluate Capillary Water Recovery Techniques.

The identified techniques were studied by means of laboratory experiments and analytical calculations. Laboratory tests showed that applying two to three pounds per square inch (psi) air-drive pressure resulted in a 20 percent increase in water yield over that obtainable by gravity drainage alone. It was also determined that the air-injection zone must be capped with a confining layer to restrict loss of air and pressure. The addition of surfactants to a sand column increased water drainage by over 25 percent. Rapid absorption of surfactants by soil particles, however, resulted in the estimated cost of surfactants for this type of recovery system being at least $3,000 per acre-foot of recovered water. Research on the vibration, thermal, and electro-osmosis techniques showed that they would be very energy intensive.

The laboratory tests showed that an air-drive system can release capillary water from storage. The other four identified techniques were judged to be too expensive to be economically feasible at this time.

OBJECTIVE 4: Develop Plans to Field Test a Recovery Technique.

Plans for three field programs were prepared. The first two programs were primarily tests of field procedures rather than of recovery technologies. Plans developed included site-selection parameters, well-construction techniques, and measurement/monitoring procedures. An air-injection site for secondary recovery of ground water should have a confining layer above the target injection zone that greatly hinders air flow. Saturated clay layers worked well in providing this confinement but they caused well construction problems. Well designs developed appear to be non-site specific, with wrapped well screen being the type best suited for injecting air. The original design of air-monitoring wells was good, and plans for water-level measuring and soil-moisture monitoring wells evolved during the study.

Well design and monitoring techniques tested at the Slaton test site were deemed adequate to justify a major field test to be conducted at another location.

OBJECTIVE 5: Field Test a Secondary Recovery Technique.

A large-scale field test of air drive for secondary recovery of capillary water was conducted near Idalou, Texas. Over ten million cubic feet of air were injected over a six-day period. Injection rates were as high as 2,300 cfm with pressures as high as 160 psi. Results showed that an area of over 140 acres was pressurized. Water levels in wells around the injection site rose, and the area around the test site contained an estimated additional 406 acre-feet of water available to wells 160 days after the test. An economic analysis showed that if the additional water was available due to air injection, it would cost about $50 per acre-foot. Water at this cost could currently be used profitably by an irrigation farmer if favorable commodity prices existed. A city could likely afford to pay up to $136 per acre-foot presently for ground water.

It is concluded that after injection of air during the field program at Idalou, the saturated portion of the aquifer contained additional water which could be pumped by conventional wells. Sites with a saturated clay layer overlying the injection zone appear to offer good prospects for secondary recovery by air injection.

LEGISLATURE . . . continued from page 1

The Sixty-seventh Texas Legislature authorized the Texas Department of Water Resources to investigate the feasibility of secondary recovery of ground water from the Ogallala aquifer and appropriated funds to the Department for the investigation.

Project Organization

The organization assembled to perform this study involved a multi-disciplinary team of engineers, geologists, scientists, economists, other professionals, technicians, and support personnel.

The Texas Department of Water Resources served as project sponsor. The Department provided a portion of the study funding, construction of selected test holes, and general assistance to and supervision of the project.

The High Plains Underground Water Conservation District No. 1 contracted with the Department to perform the study and was responsible for overall study activities including the execution of field tests. The District also contributed funds to the study.

The Water Resources Center at Texas Tech University contracted with the District to assist in conducting the study. University efforts included laboratory tests, literature research, and analytical studies.

The Texas A&M Agricultural Experiment Station at Lubbock provided laboratory analysis of soil samples.

The District retained the services of recognized experts to serve as an Advisory Board. The purpose of this Board was to advise the District on capillary water recovery techniques, procedures for evaluating the pilot tests, and any other topics related to the study.

Work was begun during the summer of 1981 and completed with the submittal of a report to the Texas Legislature by Nov. 30, 1982.

Occurance of Capillary Water in Storage

The first objective of the study was to determine the amount of capillary water in storage.

Two major activities were completed to meet the first objective. First, a drilling program was conducted to obtain data describing the moisture content of the material above the water table. Most, if not all, previous studies of the Ogallala were directed at the saturated portion of the aquifer, but this drilling effort was aimed at the unsaturated portion, that portion above the water table.

The second activity was to determine the volume of material that contains capillary water. Maps were constructed to show the distance separating the water table in 1980 and the bottom of the vegetation root zone (assumed to be ten feet below land surface). Using these maps, the volume of that portion of the formation containing capillary water was calculated to equal 3.36 billion acre-feet.

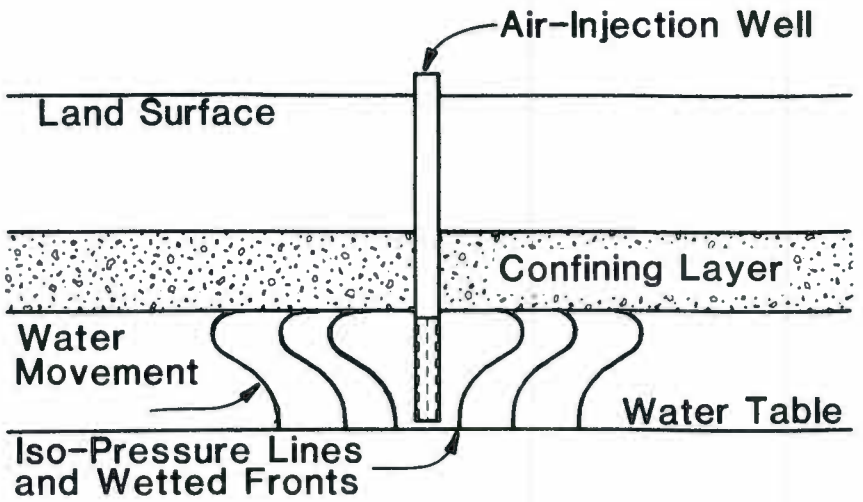
Also, the Ogallala currently contains approximately 2.5 billion acre-feet of material that is saturated with water. When the water subject to gravity drainage is removed from this portion of the aquifer, capillary water will remain.

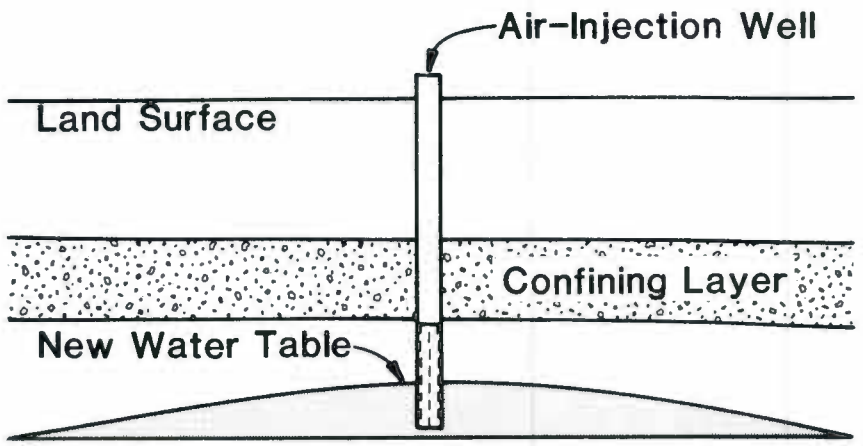
Literature Review

From an exhaustive literature search into secondary recovery of petroleum and the study of capillary water, 5

FIGURE 6 - CONCEPTUAL ILLUSTRATION OF AIR-INJECTION THEORY

a. During Air Injection





b. After Air Injection

The sequence of events that will occur as secondary recovery takes place by air injection is shown in Figure 6a. As air pressure builds in the formation near the injection well, water begins to drain from voids. The drainage tends downward due to gravity, so the lower sand grains soon become wetter and wetter until they become saturated. Also, as the voids contain more and more water, they contain less air, and this results in slower air movement. Water can move downward comparatively rapidly under saturated conditions. The upper voids contain less water; thus, they have less resistance to air-flow, and the air moves outward more rapidly from the injection well through them. The result is that the lines representing equal pressure resemble an upside-down bell. The movement of the water is downward (due to gravity) and outward (carried along with the air). Eventually, a mound of water would grow underneath the injection well; the water table would rise as shown in Figure 6b. Additional water would be available to wells due to the induced movement of capillary water to the water table.

THE Cross SECTION

THE CROSS SECTION (USPS 564-920)

potential recovery techniques were identified: air drive, surfactant/foam, thermal, vibration, and electro-osmosis. Of these, air drive and surfactant/foam appeared to offer the greatest possibility of being feasible techniques for secondary recovery of ground water, as the other methods are very energy intensive. Subsequent laboratory tests confirmed that only the air-drive method may not be too expensive for present economic application.

Laboratory Studies

During the summer of 1981, prior to the official start of the study, the District and Texas Tech University began early investigation of air drive and surfactant techniques. The goal of the air-drive test was to evaluate the hypothesis that capillary water can be removed by passing air through a formation. A test tank, five feet high, three feet in diameter and filled with clean sand, was used by Texas Tech University personnel to determine the results of passing air through an unsaturated sand column. Although there were some problems with applying the test results to an actual field operation, they did indicate that significant amounts of water could be recovered. The laboratory test showed that an application of two to three pounds per square inch air-drive pressure resulted in a 20 percent increase in water yield over the amount that drained by gravity alone.

Mathematical Models

Four types of mathematical models were developed and used during this study. Early in the study, two simple models were used to simulate movement of water in the saturated zone as air pressure was applied at an injection well. However, these models were not designed to simulate any increase in saturated storage due to recovered water.

Two other models were used to portray the recovery of capillary water by modeling air and water movement at the same time. The two models that attempted to model recovery of capillary water failed to accurately represent the bulk of the capillary water in storage. They assume that all capillary water is in contact with the water in the saturated zone, but most of the capillary water is isolated from this saturated zone. These models do accurately represent water and air in the capillary fringe, which is the thin, intermediate zone situated immediately above the water table.

Field-Test Programs

The study objectives involved field testing of secondary recovery techniques. Based on the preliminary laboratory results which showed that additional water could be obtained by air injection and the literature review which indicated that air injection could free capillary water, a field program was operated concurrently with other phases of work.

Three field tests were conducted. Two were performed at a site near Slaton, Texas, and one near Idalou, Texas.

Slaton Air-Injection Test One

The first test performed was a small-scale air-injection program with several objectives:

1. Evaluate physical air-injection mechanisms and well designs,
2. Evaluate type and spacing of monitoring equipment,
3. Evaluate responses of unsaturated and saturated zones to air pressures,
4. Evaluate, qualitatively, whether capillary water can be released, and
5. Develop design criteria for the installation of a large-scale air-injection field program.

The test site had to have some type of confining layer present above the water table. The confining layer was necessary so that the unsaturated section could be pressurized with air. Without such a layer, air would escape rapidly to the atmosphere.

A site was located near Slaton, Texas, on Ronald Schilling's farm. The Department, on drilling a soil moisture test hole on this property found a hard rock layer, between 11 and 16 feet thick, occurring about 50 feet above the water table.

This first test of an air-injection program involved design and installation of seven wells: one for air injection, five for air-pressure monitoring, and one for water-level monitoring. The air-monitoring wells were designed to permit the measurement of air pressure at different depths representing different layers in the formation. The water-level monitoring well and two nearby irrigation wells were equipped with continuous water-level recorders to record changes in the water table.

The well construction techniques used were designed to prevent air leakage. Steel casings were cemented through the rock layer. Well logging techniques were used to accurately locate suitable positions for air-monitoring intake devices. Construction techniques were satisfactory except for repeated failures of attempts to install tubes to monitor changes in soil moisture.

The test facilities were constructed during December 1981 and January 1982. Prior to beginning injection, data were collected at the site on barometric pressure, air pressures in the formation, water levels, and soil moisture. This monitoring began seven days prior to the start of air injection.

The first air-injection test started on January 23, 1982, and continued for nine days. Except for short shutdowns to service the compressors, air injection was continuous. For the first 21.5 hours, the air-injection rate was 660 cubic feet per minute (cfm) with a pressure in the air-injection well of ten psi. For the remainder of the test, the rate was 1,000 cfm with a resulting well pressure of twelve psi. An estimated 12.69 million cubic feet of air were injected during the test.

The Slaton test-one field program met its objectives. The air-injection well worked, and the air-monitoring equipment performed as expected. The rapid changes in water level which occurred were unexpected and not clearly understood. The well designs were adequate but still needed improvement. The design of water-level monitoring wells was found to need slight change. The absence of moisture-monitoring data showed that it is very important to obtain this information.

Idalou test site, air injection well (foreground), air monitoring equipment, and air compressors.

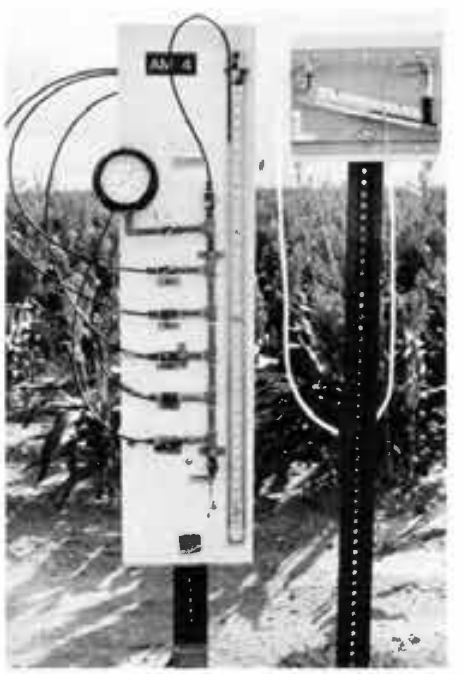
Slaton Air-Injection Test Two

The test-one program provided valuable information on how to conduct a field test. The design of several items was changed, and it was decided to test these changes at the Slaton location prior to conducting a large-scale field test.

One major change was the conversion of the water-level monitoring well from one exposed to the atmosphere to one that was pressurized.

Fifteen wells were used in the second test, including one air injection, three for moisture monitoring, five for air monitoring, and six for water-level monitoring. Air injection began on May 29, 1982 and ended on June 1, 1982. The initial injection rate was 850 cfm. It was increased to 1,700 cfm on May 29, 1982 and later increased to 2,100 cfm May 31, 1982. Injection pressure reached 180 psi at the well head, but only 15.8 psi 30 feet into the gravel pack. During the 3½-day test, 8.5 million cubic feet of air were injected.

This second test at Slaton accomplished its objectives. Most of the monitoring techniques were greatly improved over the first test even though the gravel-packed injection well was highly inefficient, and the sand-packed moisture tubes still were questionable. The pressurized water-level recorders were an improvement. Most important was the indication that more than 25 acre feet of water had been added to the aquifer during the two tests.



Recording air pressure measurements.

Idalou Field Program

Results of the two tests at Slaton indicated that a large-scale field test was needed. The principal objective of such a test would be to demonstrate the technologic and economic feasibility of using air injection as a method of secondary recovery of capillary water. Again, the two primary requirements for the test site were that a confining layer be present and that it be located near Lubbock where materials, supplies, and personnel were most conveniently available.

A site near Idalou, Texas, on the farm of Clifford Hilbers was selected. The site is underlain by layers of clay varying in thickness from 2 to 12 feet. One clay layer is so restrictive that a saturated zone occurs above the water table. The clay prevents the water from draining by gravity to the water table. This is in contrast to the Slaton site that was underlain by a hard layer of rock.

The Idalou program involved the design and construction of 17 wells. These included (a) one air-injection well, (b) seven air-monitoring wells, (c) five soil-moisture tubes, and (d) four water-level monitoring wells. The bottom of the lowest clay layer was about 144 feet below land surface with the water table being about 162 feet below land surface. The target air-injection zone contained fine-grained sand about 18 feet thick.

The Idalou air-injection test started on June 17, 1982. Air was injected for almost 143 hours, slightly less than six days. Injection stopped on June 23.

The initial air-injection rate was 250 cfm with a pressure of 27 psi in the injection well. Within ten minutes of start-up, water, air, and mud were ejected from a moisture-measurement tube located 20 feet from the injection well. About seven hours into the test, the injection rate was increased to 900 cfm with a resulting pressure of 100 psi. This rate was maintained for 72 hours.

On June 20, 1982, the injection rate was increased to 1,250 cfm with a resulting pressure of 122 psi. Within about 24 hours the pressures in the formation ceased to change significant-

continued on pg. 4, column 2 . . . TESTS

ECONOMIC ANALYSIS

The estimated increase in storage at the Idalou site was about 406 acre-feet 160 days after the test ended. If all of this water was recovered capillary water, the cost of its recovery would be about $50 per acre-foot.

The direct benefit to agriculture of having capillary water made available for pumping was evaluated by studying the yield of cotton grown under irrigation versus that grown under dryland conditions. The analysis considered two management levels (average and high, with respective average yields of 400 to 500 pounds of lint per acre), three cotton prices ($0.55, $0.65, and $0.75 per pound), three costs of energy ($3.50, $4.00, and $4.50 per MCF of natural gas), three pumping efficiencies (70, 62, and 54 percent), and four pumping lifts (100, 150, 200, and 250 feet). The analysis showed that, with average management, the price of cotton would have to be $0.65 per pound for the value of the irrigated cotton to exceed that of dryland cotton. With an average crop yield, a farmer could pay no more than $25 per acre-foot for the additional water if the pumping lift was shallow (100 feet), pumping efficiency was high (72 percent), energy was cheap ($3.50 per MCF of natural gas), and the price of cotton was high ($0.75 per pound). For the best of conditions (high yield, high cotton price, high pumping efficiency, low pumping lift, and low energy costs), the farmer could pay about $88 per acre-foot, and recovery of capillary water would be profitable. Of course, crops other than cotton can be grown and some of those may show a higher value for water.

The direct benefit of having additional water available for municipal and industrial use was evaluated by studying the City of Lubbock's water system. The study showed that the average cost to the city for ground water was $62 per acre-foot. Based on the current rates, the city receives $0.90 per 1,000 gallons. The net return equals $136 per acre-foot. This could mean that a municipality could spend $136 per acre-foot for the added water, if the water could be produced with in-place equipment. If new production equipment was required, the amount which could be spent on secondary recovery would be less.

This assumes that the price of water would not rise. Actually, there is almost no limit on the price that a person will pay for drinking water, especially if no other source is available. Currently, many domestic users in Lubbock buy bottled drinking water for $0.93 per gallon, 1,000 times the base rate. Almost any cost of recovering water may be economically feasible if the recovered water is the only water available to drink.

These economic analyses did not consider the availability of current water supplies. If a water producer (farmer or city) has sufficient supplies available without secondary recovery, there is no economic incentive to increase the supply. If the water supply decreases so that it affects the producer, an incentive begins to occur and the recovered water begins to become worth more to the producer. The incentive discussed previously ($25 per acre-foot for irrigated cotton and $136 per acre-foot for municipal use) would apply fully only as the time approaches when the secondarily recovered water is the only water available.

TESTS . . . continued from page 3

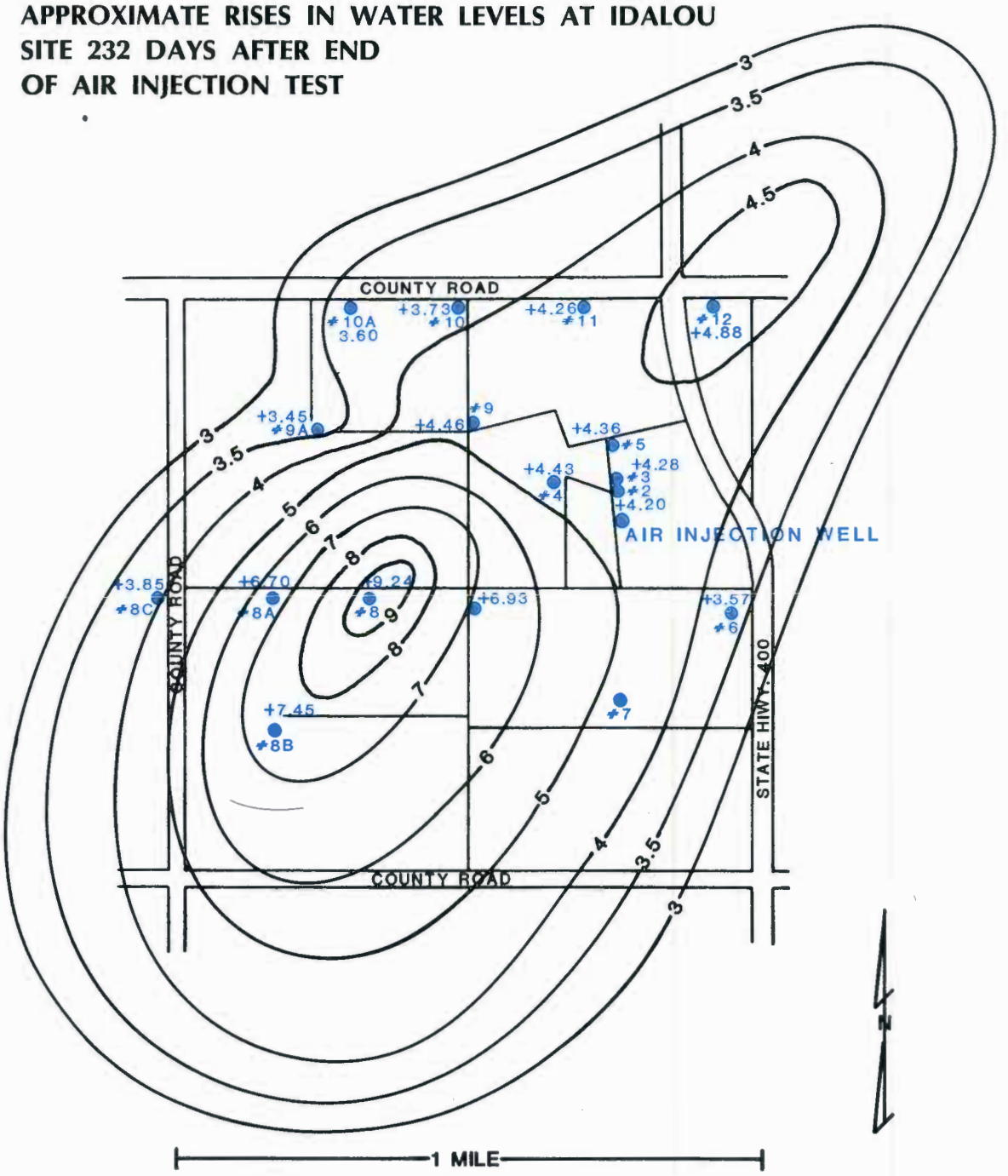
ly, and on June 21, 1982 the rate was increased to 1,750 cfm with a pressure of 142 psi. The next day the injection rate increased to between 2,200 and 2,300 cfm, the maximum rate of the compressors. The injection pressure was 160 psi. During the entire test, over ten million cubic feet of air were injected. In less than one hour after air injection ended, all wells were vented and the injected air was allowed to begin its escape.

Formation pressures during this test were much higher than those observed during the two previous tests. Pressure at the Idalou site measured 160 psi, more than five times the 30 psi measured at the Slaton site. This high pressure was due in large part to the type of material in the target zone. The fine-grained sand at Idalou restricted air flow much more than did the coarse sand and gravel at the Slaton site. Also, the clay layers proved to be a better confining layer than did the rock at Slaton.

Using all data obtained at the Idalou site, net-change-in-storage calculations were made. Thirty days after the test, the indicated net increase in storage for the region within 2,800 feet of the injection well (total area of 565 acres) was 225 acre-feet.

Water levels measured in wells near the site 100 days after the end of the test indicated 315 acre-feet of additional water. Almost all of the wells showed rises even though some of them were pumped in the 100-day period after the test. An additional 406 acre-feet of water was indicated to be in storage 160 days after the test and 876 acre-feet more 232 days after the test ended. *(See Figure below)*

APPROXIMATE RISES IN WATER LEVELS AT IDALOU SITE 232 DAYS AFTER END OF AIR INJECTION TEST



THE CROSS SECTION (USPS 564-920)
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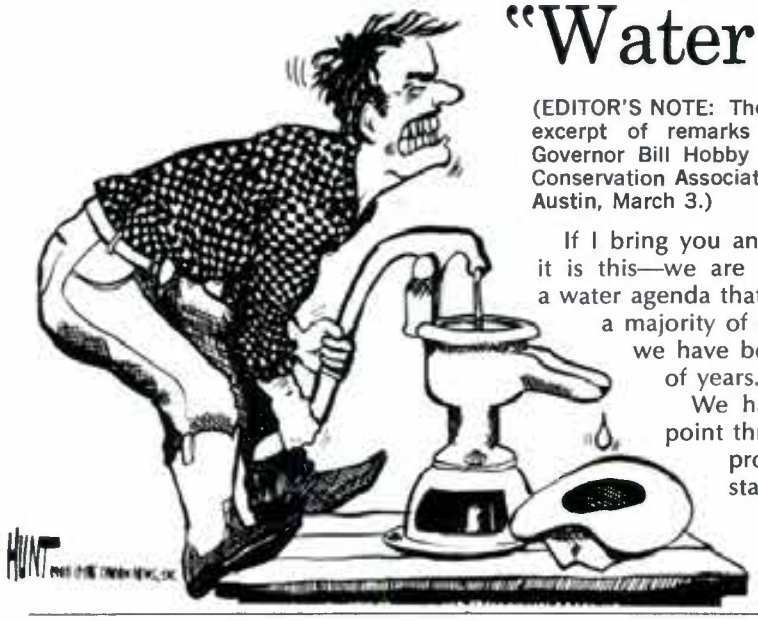

"Water For Texas-Planning For Future"

(EDITOR'S NOTE: The following is an excerpt of remarks by Lieutenant Governor Bill Hobby at Texas Water Conservation Association luncheon in Austin, March 3.)

If I bring you any message today it is this—we are closer to having a water agenda that is acceptable to a majority of our citizens than we have been in a number of years.

We have reached this point through a yearlong process that started after the defeat of Proposition Four. A number of people worked to find a plan that is broad based and not identified with any one candidate or officeholder.

Many of you participated in that process, and I thank you and commend you for your effort.

Part of the process ended two weeks ago when the Department of Water Resources staff presented to the Water Development Board a draft revision of the official planning document.

The second part of the process moved forward last week when the Texas Energy and Natural Resources Advisory Council considered legislative and administrative recommendations. In the coming weeks, these recommendations will move into the legislative forum.

It is important to note that the Department chose not to call its document "The Texas Water Plan."

Those three words have divided this state for more than a decade. Rightly or wrongly, they have served to pit region against region and cities against rural interests.

While it may be only symbolic, the new version is called "Water for Texas —Planning for the Future." Hopefully, in some form, it can provide a framework for local groups to do just that—begin to plan for their future.

This change in name is symbolic of a new direction in water resources policy. What is being talked about now is not particularly grandiose. It is not premised on huge engineering endeavors and it does not dedicate half the state's surplus.

The new version is premised on our ability to conserve and manage our existing resources. It is founded on meeting identifiable needs in a realistic way that the Legislature oversees.

This kind of discussion may not be particularly sexy. It may not provide firm answers for the problems we may face fifty years from now. It may not provide a thrilling vision, and that is certainly a legitimate criticism.

But in many ways, the problem of water in Texas right now is not financial but political. What Texas needs now is a water plan that can pass, one that is acceptable to a majority of our citizens.

To that end, in the next couple of weeks you will see a water resources agenda come together in the Texas Senate.

First, this will include an expansion of the Water Development Fund, under which the state sells bonds and uses the proceeds for loans to hardship cases.

Second, there seems to be agreement on some kind of bond guarantee or bond insurance program to help cities and districts get the best interest rate on water-related bonds that they market.

Third, you will see some discussion of a low interest loan or loan guarantee program to help farmers invest in water conservation equipment and techniques. Seventy percent of the water used in Texas is used in agriculture, and it is time we made some realistic moves in this area.

The fourth part of the financing plan is more long-term, but it may be most important for those of you involved in reservoir development.

In the future, the state must prepare itself to become more and more involved as a banker for Texas cities and districts in financing major projects. In the past, the federal government has financed reservoirs over fifty years with little up-front cost-sharing and other favorable terms. That role is passing.

None of us can say precisely what the new federal role will be. But it seems safe to say that whatever it is,

continued page 2, col. 4 . . . HOBBY

Maps Show Moisture Deficit

Excellent soil moisture conditions exist in the upper 3 feet of most soil profiles throughout the area. The annual soil moisture survey measurements taken by the High Plains Underground Water Conservation District and the Soil Conservation Service between February 14 and 23 of this year, generally indicate the top two feet are at 90% field capacity and the third foot is at nearly 75% of capacity. However the fourth and fifth feet are generally much dryer. This is especially true for marginally irrigated and dryland portions of the Southern High Plains.

Deep soil moisture reserves were depleted last summer and the area has received an average of only 4 to 6 inches of precipitation since harvest, only enough to wet the top two and a half feet of the soil profile. Where plow pans are present they did not appreciably affect the moisture penetration because the snow melt was slow enough to allow infiltration with no runoff.

Even though this year's soil moisture deficits are similar to last years, conditions are better now because 65 to 70% of the moisture is in the top three feet of the profile where the plants need it. Most of the deficit is in the fourth and fifth feet of the profile.

continued page 4, col. 1 . . . SOIL

Water Levels Measured

The Water District has completed its annual program of measuring the depth to water levels in more than 900 observation wells scattered throughout the fifteen county district area. A total of 945 wells were measured this year.

Those measurements of water levels showed an average 0.31 hundredths of a foot lowering from January 1982 to 1983. This —0.31 hundredths of a foot

continued page 3, col. 3 . . . AVERAGE

Playas Not Suitable For Large Scale Water System

Thousands of playa lakes are scattered throughout the High Plains. According to some estimates, these shallow depressions annually collect 2 to 3 million acre feet of water, or about one-fourth to one-third the water annually pumped from the Ogallala Aquifer for irrigation. Because of this apparent potential as a supplemental water supply for the area, the Bureau of Reclamation has investigated the lakes to determine whether, in fact, they could be developed as such a supply.

Before development of playa lake water could be considered, the location of the lakes, the amount of water they contain, and when the water is available had to be determined. The objectives of the investigation were to assess the quantity and reliability of playa lake water resources, assess present uses, evaluate alternative possibilities for use of playas, and identify constraints on development of playa water.

A playa lake inventory was performed using LANDSAT data (LANDSAT is the name of the Earth Resources Technology Satellites launched by the National Aeronautics and Space Administration.) Unofficial estimates of the number of playa lakes ran as high as 30 thousand. Computer analysis of the satellite imagery was required. The inventory was accomplished by selecting the best available wet period LANDSAT scenes of partial or complete coverage of 58 counties in 5 states and analyzing and using these scenes as the basis for analyzing dry period scenes. Rainfall records and LANDSAT scene quality and availability were also reviewed. Some of the major study findings are summarized here.

FINDINGS:

1. Peak rainfall in most of the study area does not coincide with major irrigation periods. Therefore, to be useful as a supplemental water supply, playa lakes must be able to provide carryover storage. But modifications to the lakes to insure this

continued page 2, col. 3 . . . PLAYAS

West Texas Chamber Of Commerce State Affairs Position Brief 68th Texas State Legislature

WATER

The WTCC has placed high priority on Water Resources Development. A comprehensive research program to ensure the most effective methods of utilization, conservation and development of existing water resources is imperative if West Texas is to maintain its economic vitality.

The WTCC supports legislative efforts that would accelerate implementation of a revised statewide water plan and continued efforts to achieve importation of water into West Texas for municipal and agricultural purposes.

The WTCC supports development and implementation of innovative concepts to provide additional methods of financing for an effective Texas Water Plan.

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NOTICE: Information regarding times and places of the monthly County Committee meeting can be secured from the respective County Secretaries.

Applications for well permits can be secured at the address shown below the respective County Secretary's name, except for Potter County; in this county contact Jim Line.

PLAYAS . . . continued from page 1

storage would be costly because modifications must be sufficient to offset the high evaporation rate in the study area, which exceeds rainfall a large part of the time.

Furthermore, both the number of study area playa lakes that would require modification and the geographical distribution of the lakes are extensive. Thus, from analysis of LANDSAT data, 4,040 playa lakes in 58 counties were found to contain water in unusually wet periods. These lakes (which constituted about 15 percent of all the lakes wet and dry in the study area) contained a total of 105,625 acre-feet for an average of 26 acre-feet per lake. In dry periods, about 2 percent of all study area lakes contained water, which totaled 7,430 acre-feet.

Therefore, considering these data, the economic feasibility of large-scale water projects incorporating the playa lakes is questionable.

2. Playa lakes are more adaptable to individual modification and use than to integration into a large-scale water project. Further, water conservation, land reclamation, ground water declines, and energy costs have prompted individuals, primarily in the central part of the study area, to maximize beneficial use of playa lakes. For the most part, however, such usage for irrigation is remaining stable or decreasing.

3. The number of playa lakes containing water in the counties monitored by LANDSAT during both wet and dry periods decreased by 87 percent from the wet period to the dry period—from 2,417 to 301 lakes.

4. Precipitation over the large Llano Estacado study area is extremely variable; that is, a wet month in one county may not be occurring in a nearby county. Thus, not all counties in the wet period were substantially wet. Some counties received more moisture in the dry period than in the wet period.

Results for these counties are not truly representative of the number of playa lakes with water present during a wet period nor of their ability to hold water for extended periods.

5. When playa lake water (surface areas and volumes) are relatively low in a county, playa lakes of ten acres or less constitute a large part of the total playa lake water and are important.

7. The reliability, or water retention capability, of playa lakes in the study area decreases going southwest. Thus, monitored lakes in hard lands north of the Canadian River lost nearly 25 percent of their content within two weeks; those in hard lands south of the Canadian lost about 33 percent; and those in mixed lands lost nearly 60 percent. Although no lakes were monitored in sandy lands, based on the above trend, lakes in these soils would probably lose about 67 percent of their content in two weeks.

13. About 33 percent of playa lakes of all size classes had been modified. However, over 67 percent of lakes larger than ten acres have been modified. Apparently, most farmers modify playa lakes to collect both irrigation water and tailwater for recirculation.

16. Literature indicates that playa lake waters are excellent quality for irrigation and have low pesticide levels and moderate nutrient concentrations.

HOBBY . . . continued from page 1

it will have to be supplemented by the kind of loan programs with appropriated dollars that were set up by the last Legislature.

One thing that will be different about this round of the water debate is that it will involve other things besides finance. You will see serious discussion of water conservation and what the state can do to encourage it.

Also, as you no doubt know, a bill has already been filed in the House on a subject that has been taboo in the state for a long time—groundwater.

The bill makes it easier for local people to organize districts but gives the state new authority in those areas where local people fail to act. It may not pass this session, but is healthy that this subject is being discussed.

Finally, there will be discussion of the bay and estuary inflow issue. Voices will be raised arguing that this matter has been studied enough, and that it is time for a stronger state policy to be articulated.

MYSTERY GRASS OVERGROWS PLAYA

Ray Kitten discovered the benefits of grazing his playa, but until recently didn't even know what his 18 head of cattle were grazing on. All he knew for sure was that this mystery grass was a great feed. His cattle fed on it all last summer. His son grazed 70 head on it for five weeks to get it down to where Ray's cows could take care of it. Ray says the mystery forage started as a patch no bigger than a tractor and was probably sewn from a sprig carried in by ducks. In six or seven years the patch has spread over his entire 28 acre lake area. This unknown perennial spreads from the root without making seed. It does not drown out no matter how much water is present. Ray claims after last summer's rains the cows waded belly deep into water to eat grass standing 2 to 3 inches taller. "And they got really fat eating nothing else all summer," says Ray. "In fact, as long as there was grass the cows wouldn't touch the protein blocks I put out."

Kitten says he isn't bothered with any lake weeds since the grass has grown in nearly solid, but he's very careful to keep the turn row against the lake clean. "I just imagine if it got into the field, I'd have a tough time getting rid of it."

The mystery forage is KNOTGRASS, according to Texas Tech Range and Wildlife professor, Dr. Bill Dahl. The text books say it is native to the Southern United States and particularly California. It does well in standing water or moist bottom lands that are periodically flooded. It spreads by creeping stems above and below ground, forming a thick flat mat in ditches and fresh water ponds. It spreads fast over wide areas and will prevent erosion and is a valuable grazing forage.

Build Moisture In PIK Acres

(EDITOR'S NOTE: The following article is reprinted from the Plainview Daily Herald. It was compiled by Hale County Soil and Water Conservation District, Hale County Extension Service, High Plains Research Foundation, Agriculture Consultant Bob Glodt, Soil Conservation Service, Agricultural Stabilization Service, Chevron, Cyamanid, Mobay Chemical, Tri-State Chemical, Pioneer Hi-Bred International and Browning Seed, Inc.)

Even before President Reagan announced the payment-in-kind program, the 1983 Farm Program called for each participating producer to set aside a given percent of his cropland from regular crop production.

With the institution of the PIK program, the number of these layout or set aside acres should dramatically increase as farmers cut regular planted acres by as much as 50 percent or more.

To aid area producers in deciding what to do to their set aside or conservation use acres (CUA), representatives from 12 different private and public organizations have composed a list of alternatives and suggestions. That information is contained in a handout available from the county ASCS office, as well as most other county USDA offices and the County Extension Office.

CUA ACRES include regular crop diversion acres along with the acres entered into the PIK program. And, according to local officials, all CUA and PIK acres must be protected from wind and water erosion.

Some of the CUA practices that are acceptable under the PIK program include: seeding annual and bi-annual grasses and legumes; seeding perennial grasses; seeding small grains if they are destroyed by May 15; leaving crop residues remaining from prior years; seeding small grains if planted in fall 1983 to be harvested in 1984; planting forage sorghums; and utilizing clean tillage.

Chemicals can be used for controlling weeds and unwanted growth from other than mechanical means, with the cost varying depending on the chemical used and the application rates. For comparing costs, the local ag officials used average suggested grower prices. (See local chemical dealers for prices and alternative chemicals.)

The application rates used in the cost comparison is based on rates for oat cover when plants are 4 to 6 inches high. Costs are generally a little higher to use chemicals that allow a broader option on the selection of the following crop.

RAY KITTEN

Combination Tank Mixes
For kill down and pre-emergence control of late germinating weeds
(per acre rates and estimated costs)

1 pt. Roundup plus ¾ pt. Sencor-4	$19.65
1 pt. Roundup plus 2½ lbs. Bladex-80W	$21.40
2 pts. Paraquat plus 1½ lbs. Evik	$22.20
2 pts. Paraquat plus ¾ pt. Sencor-4	$23.00
2 pts. Paraquat plus 2½ lbs. Bladex	$24.75

More persistant pre-emergent combinations that may eliminate chances of getting satisfactory stand of other crops within one year have been suggested in some cases. These include:

1 pt. Roundup plus 1½ pts. Atrazine	$12.45
2 pts. Paraquat plus 1½ pts. Atrazine	$16.80

Additional chemicals offer contact control only and may require additional applications or other practices to control later germinating weeds. These include:

Roundup at 1-1½ pts. per acre	$10.65-$16.00
Paraquat at 2-3 pts. per acre	$14.00-$21.00

In comparison, a preplant incorporated yellow herbicide costs $3.50 to $4.50 per acre, depending on product and rate.

Another consideration involves equipment operating costs. That also was determined and included:

2-Row Shredder	$12.00
4-Row Shredder	8.50
Tandem Disk (first time)	5.00
6-Bottom Mold Board	9.00
6-Row Planter Lister	6.50
6-Row Lister	3.50
8-Row Bed Planter	6.50
Packer	0.22
Grain Drill	5.00
Furrow Opener	3.50
Sweep	4.00
Offset Disk	7.00
Chisel	3.50
Rolling Cultivator	4.50
8-Row Cultivator	5.00
Sand Fighter	3.00
Rod Weeder	6.50
Float	7.00
Aerial Spray of Chemicals	3.25-3.50
Ground Spray of Chemicals	3.00

Seed costs were figured at $29 per 50-lb. bag for grain sorghum, 40 cents per pound for cow peas and blackeyed peas, $17.50 per 50-lb. bag for male sterile grain sorghum, for forage sorghums $15-$24 per hundredweight for hay grazer and for bundle $15 per 100-lb. bag.

Crop alternatives, and their production cost per acre, for the PIK program acres include:

• Drilling sorghum $5, seed 72 cents (3 lbs. per acre), contact killer and pre-emergence chemical $19.65 to $24.75, chemical application $3.25, total cost $30.97. Stored moisture is 44 percent of that received. (Stored moisture is the percentage of the total precipitation received during the year that will be available for the next crop year.)

• DRILLING sorghum $5, seed 72 cents (3 lbs. per acre), sweep three times $12, total costs $17.72. Stored moisture is 31 percent.

• Drilling forage sorghum grown to maturity and grazed after Nov. 1, seed drilling $5, seed cost 72 cents (3 lbs. per acre), sweep twice $8, total cost $13.72. Stored moisture 44 percent.

• Drilling forage sorghum and shredded to control height and weeds, seed drilling $5, seed 72 cents (3 lbs. per acre), shred three times $25.50, total cost $31.22. Stored moisture 44 percent.

• Seed forage sorghum on 40-inch rows, chemically killed at 8 to 10 inches, disking $7, listing $3.50, planting $6.50, seed 72 cents (3 lbs. per acre), contact killer plus pre-emergence chemical cost $19.65 to $24.75, chemical application $3.25, total cost $42.97. Stored moisture 44 percent.

• SEED FORAGE sorghum on 40-inch rows, mechanically killed at 8 to 10 inches, disking $7, listing $3.50, planting $6.50, seed 72 cents (3 lbs. per acre), sweep three times $12, total cost $29.72. Stored moisture 31 percent.

• Seed forage on 40-inch rows grown to maturity and grazed after Nov. 1, disking $7, listing $3.50, planting $6.50, seed 72 cents (3 lbs. per acre), chemical weed control $15, chemical application $3.25, total cost $35.97. Stored moisture 44 percent.

• Seed forage sorghum on 40-inch rows grown to maturity and grazed after Nov. 1, disking $7, listing $3.50, planting $6.50, seed 72 cents (3 lbs. per acre), rolling cultivator twice $10, total cost $27.72. Stored moisture is 31 percent.

• Seed forage sorghum on 40-inch rows shred to control height and weeds, disking $7, listing $3.50, planting $6.50, seed 72 cents (3 lbs. per acre), shredding twice $17, total cost $34.72. Stored moisture 44 percent.

• DRILLING MALE sterile grain sorghum grown to maturity and grazed after Nov. 1, drilling $5, seed $1.05 (3 lbs. per acre), sweeps twice $8 (male sterile should not have a volunteer problem the following year), total cost $14.05. Stored moisture 44 percent.

• Seed male sterile grain sorghum on 40-inch rows grown to maturity and grazed after Nov. 1, disking $7, listing $3.50, planting $6.50, seed $1.05 (3 lbs. per acre), chemical weed control $15, application $3.25, total cost $33.30. Stored moisture 44 percent.

• Seed male sterile grain sorghum on 40-inch rows grown to maturity and grazed after Nov. 1, disking $7, listing $3.50, planting $6.50, seed $1.05 (3 lbs. per acre), rolling cultivator twice $10, total cost $28.05. Stored moisture 31 percent.

• When cotton is grown 4 in, 4 out, with the middle 2 out rows planted in cowpeas or blackeyed peas for cover, planting $6.50, seed $6 (15 lbs. per acre), rolling cultivator $5, total cost $17.50. Stored moisture 36 percent (fallow rows store only 22 percent of moisture received).

• When cotton is grown 4 in, 4 out with the 4 out planted in wheat or rye for cover, drilling $5, seed 75 cents, rolling cultivator twice $10, total cost $15.75. Stored moisture 44 percent.

Average Annual Change In Feet For All Water Level Observation Wells Measured In The Following Counties For Time Period Indicated

	*No. of Observation Wells in County	1970-1980	1980-1981**	1981-1982	1982-1983
Armstrong	9	—1.05	—1.13	+ 0.45	—1.06
Bailey	71	—1.24	—2.57	—0.79	—0.79
Castro	89	—2.85	—3.06	—2.23	—1.71
Cochran	53	—0.22	—1.09	+ 0.56	+ 0.61
Crosby	23	—1.98	—3.28	—0.65	+ 0.30
Deaf Smith	87	—2.42	—1.42	—0.76	—1.06
Floyd	97	—1.98	—3.54	+ 0.19	—1.96
Hale	27	—1.22	—3.29	—1.53	—1.12
Hockley	90	—0.18	—1.32	—0.17	+ 1.17
Lamb	92	—2.12	—3.50	—1.92	—1.30
Lubbock	119	—0.62	—1.86	+0.03	+ 1.69
Lynn	37	+0.02	—1.60	+0.14	+ 3.09
Parmer	97	—2.87	—3.49	—1.63	—2.13
Potter	7	—1.19	—1.46	+ 1.47	—0.10
Randall	47	—1.36	—0.73	+ 1.23	—0.33
District Average		—1.42	—2.41	—0.37	—0.31

Records for some wells do not cover the entire period of record(s) indicated. Therefore, the water level records for these wells were not used in the averages.

***Severe drought in summer of 1980.*

AVERAGE . . . continued from page 1

change compares favorably with the ten year average annual change of —1.42 feet (1970 to 1980). Water District officials attribute the reduced rate of decline to improved water conservation practices, the high cost of energy to pump water and the presence of unusual amounts of precipitation in the summer of 1982. The abnormal rise in water levels in some wells probably reflects filling of the cones of depression around these wells rather than substantial recharge to the aquifer.

Most of the wells measured are operational irrigation wells. District staff usually make their observations in mid winter in order to allow for a dormant period and for well recovery from the cone of depression developed during the pumping season. Wells were measured to find the depth to "static" water level. After measuring, each well received a District identification tag for the owner's information.

Data gained from this program is used for decline rate projections, determining the amount of water left in storage in the Ogallala, and very importantly, as a basis for the income tax depletion allowance claims on landowners' tax returns.

Data on individual wells were available within a few days of completed readings, but a formal tabulation of the data on the entire network is not expected until mid-year.

Soil Moisture Good

(continued from page 1)

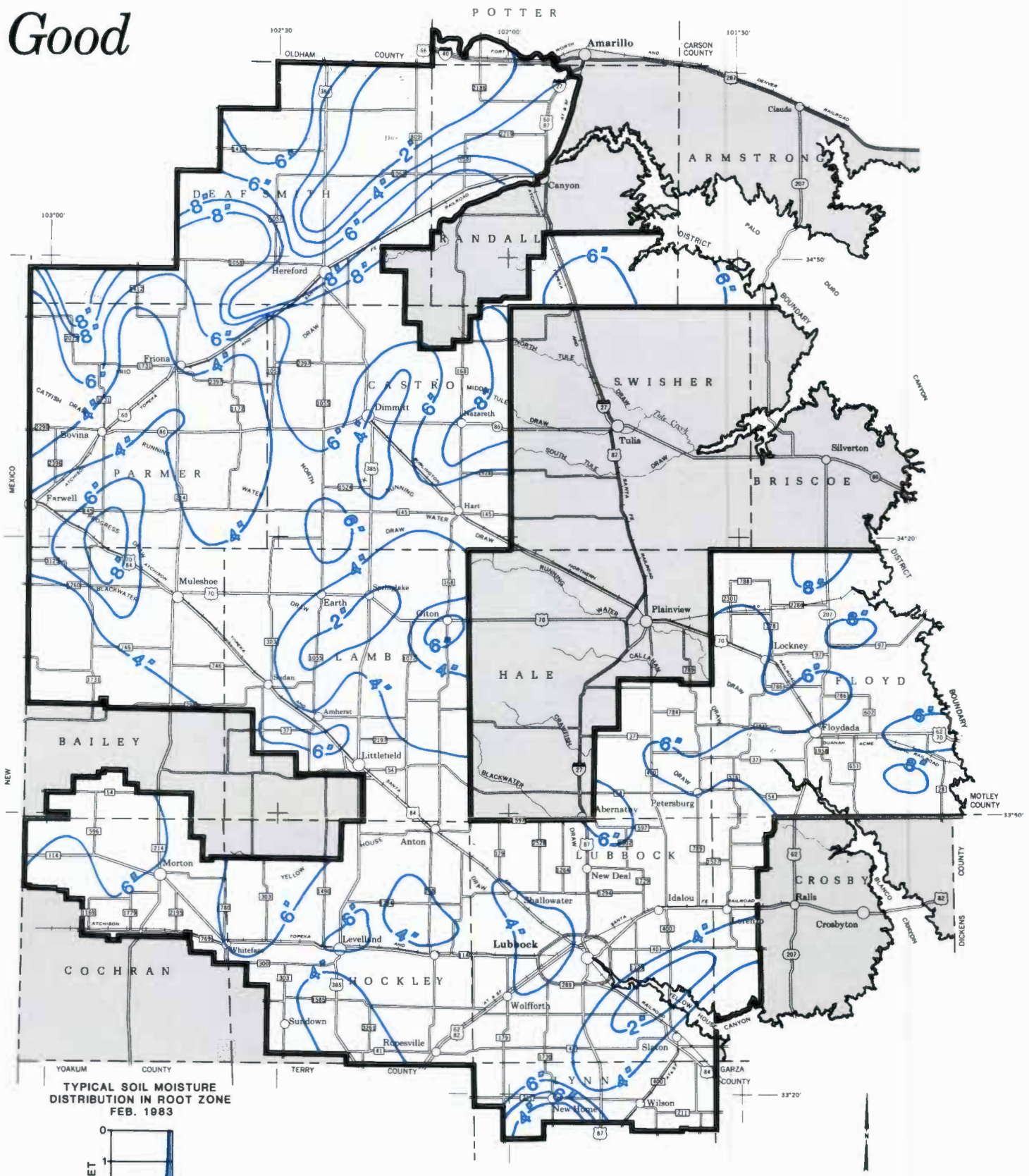
Plant response during the early growing season should be good. However, once the plant uses the upper level moisture, there is currently no reserve deep soil moisture to carry it through an extended dry period.

The soil moisture deficit map is published as a tool to give producers a better picture of soil moisture reserves over the entire area. It can help them make more informed irrigation decisions and help avoid both over and under irrigating in the Spring. It can also give an indication of potential production.

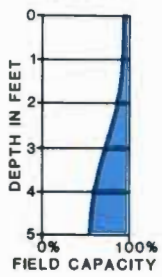
The map's soil moisture deficit readings are a measure of how much water is still needed to wet the soil in the crop root zone to field capacity. The sample indicates general trends over the area, but does not predict exact soil moisture conditions on any given farm. Each landowner needs to check his individual farm soil moisture to determine its water needs.

The survey is a cooperative effort by the Soil Conservation Service and the High Plains Water District with support from the Texas Department of Water Resources.

NEARLY NEVER missed a meeting. High Plains Water District Director Gilbert Fawver was honored by the Floyd County Soil and Water Conservation District for 32 years of service on the Board. Gilbert missed only three of the monthly meetings between 1951 and 1982. He served as SWCD Board Chairman for nearly 20 years.



TYPICAL SOIL MOISTURE DISTRIBUTION IN ROOT ZONE FEB. 1983



1982-1983 INCHES OF WATER NEEDED TO WET THE TOP FIVE FEET OF SOIL TO FIELD CAPACITY

SURVEY CONDUCTED FEB.14-23,1983

THE CROSS SECTION (USPS 564-920)
HIGH PLAINS UNDERGROUND WATER
CONSERVATION DISTRICT NO. 1
2930 AVENUE Q
LUBBOCK, TEXAS 79405

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THE Cross SECTION

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Furrow Dikes Pay Off

Larry Lockwood is a Lamb County Committeeman for the Water District. He farms 1500 acres near Spade. About 600 acres are laid out this season in the PIK program. He plans to put about 600 back in cotton, and the rest will be in wheat or fallow. Larry installed two drop line LEPA pivots about three years ago and made another change in his operation about the same time. He started furrow diking. Now he's sold on them . . .

Are you a better farmer now?

"I think so, but I'm not making any more money. I think things like dikers really help. Of course, the economy hasn't been good enough to tell by the profits, but you can tell by looking at the crop that they helped."

Are you using the dikes before you plant?

"I put them in as soon as I can after I list. I try to catch what rain we get in April and May. With my sprinkler systems, if we've got pretty fair moisture, I try not to pre-water the beds so I like to get the dikes in and at least have a chance to catch the spring rains."

You don't put them in behind your lister?

"No, some people do, but I roll my beds to flatten them out anyway, so I just run the dikers then. By rolling the beds and diking, if you have some moisture, then it doesn't take near as much rain to get enough moisture to plant. You have to watch what you do and don't just slick it off. I don't have any trouble with it blowing."

How long have you been using dikes?

"I have about wore out a set, I guess this will be the third year."

What convinced you to start using them?

"I don't know. I had read about them but had never seen them run. It just seemed like it would be a good idea. I was putting in a few of the sprinklers at that time with the drag hoses so I decided if I was going to do that, I ought to try to catch and hold all that water in the furrow that I was putting down with the drag hoses and hold it in place.

"The first year I put them in during the spring when I put the beds up and I don't think they caught any rain that year. That was 1980. I thought I was going to wear out those dikers before it ever rained. I found out, even the

continued page 4, col. 1 . . . DIKES

SURGE IRRIGATION TEST on the James Wedel farm near Muleshoe shows the second water surge on the right racing down already slicked furrows.

Surge Looks Promising

Farmers are amazed so far at the water and fuel savings they're seeing from the surge irrigation tests on their furrow watered fields. The Water District has purchased seven sets of surge equipment for tests and is receiving support from the Texas Department of Water Resources under a contract to evaluate the surge system. Equipment is on loan to the Amarillo, Dimmitt, Friona, Hereford and Lubbock SCS offices. Tests have already been run on the James Wedel farm near Muleshoe, the Phil Johnson farm near Hub and the James Mitchell farm near New Home.

James Wedel normally watered ten half mile rows on a twelve hour set and applied four acre inches. The surge irrigation applied just two inches and covered twenty half mile rows in eleven hours.

Johnson normally had trouble getting his water out on one particularly flat field. His normal pre-water was a 24 hour set applying 19.7 acre inches on quartermile rows. The surge tests ran two sets in 24 hours and put on one third the water—6.2 acre inches.

Johnson says the difference was just unbelievable. One reason for the dramatic cutback was that the single surge valve couldn't take as much water as he normally ran through two valves.

"I'm sure we got less wetting, but we got what we wanted," he said.

However, Johnson also had suggestions for redesigning the equipment as did every other irrigator.

"Their biggest gripe," says Jerry Walker, Amarillo SCS engineer, is the

continued page 2, col. 2 . . . SURGE

SCS INVITES FRIENDS FOR RECEPTION

Myron Namken, Civil Engineer on the Lubbock Area Staff, is presently on extended sick leave pending retirement.

Myron began his SCS career July 1957, as Agricultural Engineer in San Angelo. He has also been in Pecos, Van Horn and Ft. Stockton, Texas, Edwardsville, Illinois, Silver City and Las Cruces, New Mexico, before taking his present position in December 1977.

He has been an outstanding employee and an asset to Soil Conservation Service, receiving numerous awards; including a Certificate of Merit from the National SCS office in 1981 for Superior Effort in Providing Conservation Engineering Assistance to Landowners in the Use of Irrigation Water on the High Plains.

We plan to honor Myron with a retirement reception, Tuesday, May 24, 1983, from 2:00 to 4:00 p.m., in room 607, Federal Building, Lubbock. We hope many of his friends will be able to attend.

A gift book of letters will be presented to Myron. If you wish to participate, please write your letter on 8½ x 11 paper and send it unfolded, by May 18, to:

Mickey L. Black, SCS
1205 Texas Avenue—Room 424
Lubbock, Texas 79401

DAMMED FURROWS capture rainfall, hold moisture, stop runoff and prevent erosion.

WHEAT FIELD DAY

BUSHLAND, Texas — The Annual Wheat Field Day at the USDA Conservation and Production Research Laboratory at Bushland will be held at 1:00 p.m. on May 26, according to Dr. Paul Unger, Acting Director. "Everybody is invited to see the latest research on profitable production of wheat," Unger said.

In addition to observing the small grain plots, visitors will be shown research projects on cropping systems, weed control, irrigation, limited tillage, and wind energy. Latest methods of spray application will be discussed.

For additional information, contact Dr. Kenneth B. Porter, USDA Conservation and Production Research Laboratory, Drawer 10, Bushland, Texas 79012. Phone (806) 378-5721.

HONORED for conservation journalism, Patricia Bruno, HPWD information specialist and editor of the Cross Section, accepts a Communications Award from Don Langford, Chairman of the Lubbock County Soil and Water Conservation District at their annual awards dinner.

THE Cross SECTION

THE CROSS SECTION (USPS 564-920)

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NOTICE: Information regarding times and places of the monthly County Committee meeting can be secured from the respective County Secretaries.

Applications for well permits can be secured at the address shown below the respective County Secretary's name, except for Potter County; in this county contact Sam Line.

SURGE . . . continued from page 1

equipment sticks out in the field too far—maybe ten feet."

"They're going to have to redesign it," Johnson said. "But its not out of reach financially if it will work, because at about $4 or $5 an acre inch, it wouldn't take very long to pay for one if you could save even 30 or 40 percent on your water."

Research is still in the experimental stages and the tests are identifying needs for modification in the design and in the timing mechanism which could improve the system's efficiency.

Mitchell says his surge flow irrigation test has cut the amount of water he would normally apply for pre-water by 40 percent. And the fuel savings alone will more than pay for the equipment on one watering. It is also eliminating tailwater problems and overwetting near the head, while still soaking the hardest to wet areas in the middle of the field.

This system will be even more valuable during the growing season than it is for pre-watering, Mitchell believes, because he will be able to add just two to three inches in July and August without the risk of overwatering which could trigger excessive growth of vegetation late in the growing season. It will help him stabilize his yields.

About two-thirds of the High Plains acreage is furrow irrigated. This system offers furrow irrigators the chance to improve their efficiencies nearly to the degree of conservation offered by the drop line sprinklers. Since a set of surge valves and a timer can be bought for less than a thousand dollars, it is within the range of everybody.

"PISTOL PETE," Assistant Secretary of the Interior for Land and Water Resources, Garrey Carruthers exchanged views with the HPWD Board, Bureau of Reclamation area representatives, the SCS and others during a recent visit to Lubbock for an overview of conservation programs. Support was requested from Garrey and from Interior Secretary Watt for a cooperative research effort with the Bureau of Reclamation on the secondary recovery research and other studies.

TWCA LEADERS

Sam F. Collins, general manager of the Sabine River Authority of Texas, assumed the presidency of the Texas Water Conservation Association (TWCA) at their 39th annual meeting held in Austin, March 2-4.

Ronald J. Neighbors, general manager of the Harris-Galveston Coastal Subsidence District, is the president elect, and Fred N. Pfeiffer is the senior past president. A. Wayne Wyatt, manager of the High Plains Underground Water Conservation District No. 1, was elected chairman of the board.

CHECKING MOISTURE LEVELS, Shorty Lancaster takes readings from a neutron probe hole he recently installed at the Lubbock Independent School District's vocational agriculture farm. Vo Ag teacher Finus Branham asked Ken Carver who heads the Water District's vo ag education program, to install the moisture monitoring sites to help teach students about ag water conservation and to "see" the farm's plant soil moisture use.

VINEYARDS on University of Texas fields near Eakersfield were equipped with soil moisture monitoring neutron probe access tubes this spring. Ernest "Shorty" Lancaster, HPWD technician, and Mike Risinger, SCS soil scientist, towed a Giddings core drilling rig to the vineyard east of Fort Stockton to share with the Pecos area SCS their experience gained in two years of installing soil moisture monitoring sites. The sites will be used to evaluate a trickle irrigation system and to measure water consumption by grape plants. Hopefully the data will also be applicable for local vineyards.

Ag Engineer Talks Farmer's Language

"MISTER IRRIGATION"

Myron Namken has common horse sense. Lots of folks say so, especially farmers. That's not surprising since Myron grew up with farmers and with memories of a way of life he says was quiet, honest, and down to earth.

He farmed for himself through six years of the 1950's drought in the Trans Pecos area of Texas. But after only one good crop, one fair crop and four total failures he called it quits. That's when he joined the SCS and his horse sense started earning him a reputation.

"I've always been farmer oriented," Myron says of himself. "Every profession has its ways and lingo and they're real bad about talking 900 miles over your head. Well, I was always able to communicate with farmers. I think I considered more their total operation rather than an individual conservation practice."

Myron already had his degree from A&M, so when he quit farming in 1956 he went to work for the Service as an agricultural engineer. There wasn't all that much known about irrigation in those days.

Joe Camp, then his Soil Conservation Service Technical Supervisor, remembers Myron's first two years in Pecos where he got his feet on the ground learning about all types of irrigation systems, crops and range engineering.

"He was designing irrigation systems after only six or eight months with the SCS," Joe recalled. "He had a tremendous grasp and agricultural sensitivity, and he was able to work harmoniously with landowners. That was a great benefit."

Darwin Schrader remembers he and Myron ran the first irrigation efficiency studies together about 1960. "He cared about every irrigation system regardless of what it was. He worked with some old timers who farmed with mules and a slip. Their systems were just as important to him as the most elaborate system."

As Myron remembers, "When I first started out in the Pecos area, all they (SCS) advocated in that particular area was level border irrigation. The farmers didn't like it; they had a lot of reasons for not liking it, and I could appreciate their reasons. Short level borders are perhaps the most efficient for that particular area, but then it doesn't fit the equipment and it requires a lot of labor and land leveling. And invariably the graded furrow systems were outyielding the level border systems.

"It was expensive to get some of the farms in shape to irrigate, and required an awful lot of concrete lined ditches which were pretty expensive. In other words, it's about like it is today. If you do a real good job of conservation on the farm you can spend more on the conservation work than the land cost you.

"On things like this I just felt like the Service was trying to sell the wrong thing."

"What did you do about it?"

What a field person can do when he has the opportunity is to well document the evidence to support his thinking, present it in a positive manner to his superiors for possible consideration and changing of SCS standards and specifications. SCS continually revises and improves on standards and specs by learning from farmers and ranchers. Now we advocate graded systems.

Myron feels there were a couple of instances like that where the SCS changed its operation because he came forward and promoted a different approach.

"One of them in New Mexico was the use of these gabions, wire baskets, as diversion dams across arroyos. These divert the streams into their irrigation beds. But these streams are very unstable, gravel bottoms, with intermittant flows out of the channel bottom. And nearly everywhere these streams come out, they are diverted into an irrigation ditch. They used everything under the sun to try to divert this water, and when it flooded everything was washed out. So when I first came to New Mexico we got the idea of putting in some of these wire baskets on a real big scale, about 3x3 feet square and 12 feet long generally, and we filled them up with rock and tied them together. If the bottom is unstable they can move around without cracking and falling all to pieces. They've become very successful there. That was a program we got started. I had more to do with getting it instigated, promoting it and getting it financed.

"The other thing, I think, was the idea of the mobile labs, trailers with equipment. I think that concept has caught on and has made the SCS tremendously more effective in working with farmers and being able to have the equipment available to them. To such an extent that the Service is now buying and equipping trailers in other states."

Myron's contributions to the recently developed Irrigation Water Management program and to conservation irrigation in general are already becoming a legend in our time. He is perhaps most responsible for the contageous interest in improving irrigation efficiencies which has infected the High Plains. Myron worked with this District in designing and equipping the first mobile field water conservation labs. He helped train dozens of SCS technicians and other agencies' staff. He promoted the first demonstration testing and helped sell academics, service agencies, energy producers and distributors, and irrigation operators on the benefits of adopting water and energy saving techniques demonstrated by the use of the field water labs.

It was Myron who spurred several irrigation systems manufacturers to reevaluate and ultimately redesign their equipment to perform at even higher efficiencies. He built nozzle displays for the demonstration trailers. He developed a slide rule for the irrigator to figure his irrigation application rates. He developed the training and planning guides for SCS to use with operators, and he developed the written trial training guides for procedural methods to be used by SCS in irrigation efficiency evaluations.

For Myron, it just made sense. "A big problem I recognized, particularly when I was farming, was that farmers

continued page 4, col. 3 . . . NAMKEN

Innovative Irrigator Keeps Improving On His Efficiencies

James Mitchell has been honored by the Texas Soil and Water Conservation District as Conservation Farmer of the Year for Lubbock County and for Region I, which covers 48 South Plains and Panhandle counties. James farms near Wolfforth in Lubbock County and New Home in Lynn County. He has been a cooperator with the SCS in up-to-date conservation planning for 15 years.

He has regularly revised his operation to include innovative conservation practices including conservation cropping systems, crop residue use, mobile drop tube furrow irrigation systems, irrigation pipeline and irrigation water management. His latest plans are to install wind strip crops in his cotton this year, and he is already experimenting with surge flow irrigation equipment on his furrow watered rows.

In honoring James, the Soil and Water Conservation described his achievements.

CONSERVATION FARMER

By BOB ARHELGER
SCS District Conservationist, Lubbock

He could be called a modern day pioneer in soil and water conservation. James P. Mitchell's influence on the conservation movement is so far-reaching it cannot be measured. Conservationists from arid regions across the nation and world have been to his ½ section farm to observe his innovations in farming, and returned to their homes to share the invaluable knowledge acquired. His ideas are being applied across the United States and in foreign countries such as Israel, Australia, Africa and Japan.

What kind of man is James Mitchell? He is a farmer just like his neighbor down the road. There is one difference. He has exceptional foresight and is not afraid of change. He considers his basic resources of soil and water as a trust and never forgets his responsibilities to the land.

James grew up on a dairy farm near Lubbock. He attended Texas Tech University and studied agriculture. He began farming in 1954, and married his wife, Sylvia, the same year. They have a daughter, Cindy Stevens, and a son, Kevin. Kevin is following in his father's footsteps as a farmer.

The Mitchell home farm consists of 317 acres. 230 acres are irrigated cropland and 84 acres are dry cropland. James became a cooperator with the Lubbock County Soil and Water Conservation District in 1968. His conservation plan has been modified and updated several times as new conservation innovations are planned. All planned conservation practices have been carried out on his farm. He now plans to install a system of perennial wind strips on his entire farm this spring to better control wind erosion. This will be a new practice in Lubbock County that will serve as an example to other farmers.

The 230 acres of irrigated cropland is watered with 13 wells which produce a total of 450 GPM. These wells were all tied together with 13,378 feet of underground pipeline with the assistance of the Soil Conservation Service. The water is pumped to a collector

continued page 4, col. 1 . . . MITCHELL

DOWN IN THE FIELD, Myron and James discuss the results of an irrigation evaluation on his soybeans under a drop line sprinkler.

DIKES . . . continued from page 1

small showers we got do a whole lot of good. You can tell it. They don't have to stand full of water to do any good. Even if you have to run them a year and think they are not doing anything, I think that even one rain can pay for the dikers."

Did you buy your dikers or make your own?

"I bought Texas dikers. Wheel dikers, the ones with the big wheel. They work real well, but I think there are better ones now. In fact, I loaned mine to a neighbor and he said he could build me some better ones and he's doing that now."

Are they fairly inexpensive?

"Yes, it doesn't take very long to pay for one. I paid around $150 per row. I suppose they are probably still about the same price, but they have some little better designs."

How often do you plow out your dikes?

"I plow them out right in front of the planter and put them back in as soon as I can after planting, but I usually wait until after I get a stand up to make sure I am not going to have to plant it over again right quick.

"They are a little more trouble, but I usually cultivate and put them in at the same time. I think if you are going to use them you ought to have them in there the biggest percentage of time you can. The one time you have them out may be the only time you get that rain and with the little amount of water we get here and the cost of the energy, I don't think you can afford to lose any rain that you have a chance to keep.

"Diking is always done in conjunction with something else. The only time there is an extra operation is in the fall when I plow them out. I leave them in until as late as I can and plow them out before the cotton gets too big before it's stripped."

What does your diking operation cost you each year?

"I don't think the diking costs hardly anything except your initial cost. It adds some time and labor if you want to make a good dike, but any rainfall you can save that helps, is profit."

NAMKEN . . . continued from page 3

associate with other farmers and they tend to watch their neighbors. So, if you want them to do something different, you can go out there and talk to them all you want but you don't really convince them until you begin to show them.

"I have always advocated getting out there on the ground with these people and finding someone that's willing to participate in whatever you're trying to do as an example to some of the others. And let him tell the others."

Myron has a nack for teaching. In fact, he says of his role with the SCS, "I think primarily I was a trainer. My time was divided between three major jobs and one of those was training. The other was designing work that was more complex—larger jobs than the field offices were able to handle. And third, was checking on field work, spot checking cost-sharing programs for quality and competence. In other words, their ability to do the job."

What did you do with a problem?

"We put it in a training plan and then we provided the training!"

"I spent a lot of time doing that. I think as a member of the (Lubbock) area staff that's the most significant job you really have to do because I always felt, for instance with 35 or 40 people in the field here involved doing engineering work, I can't compete as an individual with them in getting the work done. It has always been important to me to have those 80 trained hands to where they can go out and do the job."

Myron revealed that he takes the most pride in his contributions as a trainer. "I think my greatest contribution is to the individuals who have worked for SCS, rather than to the individual farmers. Giving them confidence in what they are doing and stimulating their interest in conservation. I think that's the key. If you get good qualified people that know what they're doing, that are confident in their work, then they'll do the job for you. I've tried to give them that confidence that they can handle the job. But let them do the job. And let them take the credit."

Myron's contributions to the SCS and the conservation irrigation have not gone unnoticed. He has been cited by the SCS over eight times in his 25 year career for Outstanding or Exemplary or Exceptional Performance, for Superior Effort and Assistance, and honored most recently by the USDA-SCS in Washington, D.C., with a Certificate of Merit for superior effort in providing conservation enginering assistance to landowners in the proper use of irrigation water on the High Plains of Texas.

To what does he attribute his appreciation for conservation and his common horse sense?

"I don't know, it was just a natural thing. From listening to people and reading, and just understanding the basic nature and environment. If you do things that are against nature, they won't work."

"I guess if I have to credit anybody for really instigating this it would be the first District Conservationist I had in San Angelo, Barney Jefferson. He believed in conservation and the benefits of it. He gave me a lot of material to read. I guess it's part of ecology.

MITCHELL . . . continued from page 3

tank. It is moved from the collector tank by booster pump to two center pivot pads. With less than 2 gallons per minute, per acre, James' crop production is still in the top 10% of the county. He says he can prove that conservation pays.

The center pivot sprinkler was evaluated by the Soil Conservation Service in 1978 at 59.8% overall efficiency. James started farming in a circle under his pivot and converted it to a drop tube furrow irrigation system. The water is placed directly in each furrow by drop tubes. Furrow diking in the furrow helps maintain even distribution and holds any rain that falls. This system was evaluated as 75.8% efficient in 1981 by SCS technicians. Still not satisfied, James modified the system still further with different pressure regulators and nozzles. In 1982, an SCS evaluation showed 88% efficiency. As James experiments and progresses, everyone benefits from his advances. Several irrigation sprinkler manufacturers have incorporated improvements and modifications from James' system into their designs.

METER READER, James monitors gypsum blocks for soil moisture.

James says that with his limited water supply, he practically spoon-feeds each plant. He cannot afford to waste a drop. He uses gypsum blocks and tensiometers to check his soil moisture, insuring irrigation water applied in proper amounts and only when needed. This monitoring equipment and a neutron probe are used in cooperation with the SCS, Extension Service, and the High Plains Underground Water District for research. Research is also carried out on the use of PIX, a plant growth regulator, to increase yields and mature cotton earlier in the season, decreasing water use by the crop.

James shares his knowledge and experience with the news media and all types of groups and tours. At least twice a month, he has visitors from TV, periodicals or newspapers. His farm is an annual tour stop on the joint SWCD and Extension Service Agriculture Tour. His farm was visited by Peter Myers, shortly after Mr. Myers assumed his duties as Soil Conservation Service Chief.

James has no idea how many people he has influenced. His farm was used for a film documentary by the Isaac Walton League, and a series on water was made by a Japanese TV company for viewing in Japan. His farm was used for the 1982 "Farming Frontier" film by John Deere. Several TV news briefs have been shown. Numerous articles have been in "Irrigation Age" and "Southwest Farm Press." Features on James have also been printed in the following publications: National Geographic, Science World, Farm Journal, High Plains Journal, and the Wall Street Journal. A syndicated feature from the Austin American Statesman was printed in 100 papers across the United States. James has been in the "Agriculture Extension Service Annual Report" the last two years. Articles have appeared in "Soil and Water Conservation News" and "Progressive Farmer."

As busy as James is, he still has time to serve his community. He is an active member of the First Baptist Church of Wolfforth and a member of the Wolfforth Chamber of Commerce. He was also a member of the Frenship School Board. He has been chairman of, and now serves as a member of the Frenship Coop Board. He is swine superintendent of the Lubbbock County Livestock Show. He still has time to serve as chairman of the South Plains Program Building Committee. James was elected to serve as a member of the board of directors of the High Plains Underground Water Conservation District No. 1 in 1976. He became president of that board in 1979 and continues to serve in that capacity.

THE CROSS SECTION (USPS 564-920)
HIGH PLAINS UNDERGROUND WATER
CONSERVATION DISTRICT NO. 1
2930 AVENUE Q
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Chronic Tailwater Waste Violators Warned

by Clifford Thompson

In spite of the high cost of pumping, the limits of the water resource, and the demonstrated dramatic losses caused by poor water management, tailwater wasters are still running water down county road bar ditches in several Panhandle counties. This year they are attracting more attention and irate complaints from county neighbors.

The Water District is charged with preventing this conspicuous waste, not only in principle but by law. Chapter 52 of the Texas Water Code defines waste as constituting: "Willfully causing, suffering, or permitting underground water to escape into any river, creek, natural water course, depression, lake, reservoir, drain, sewer, street, highway, road or road ditch, or onto any land other than that of the owner of the well."

District policy and procedure are to handle every complaint. A field technician goes to the scene, identifies the source of the waste, documents and photographs the runaway tailwater, and brings the information to the attention of the landowner/operator. A file is kept on every violation and a letter is sent to the landowner/operator soliciting cooperation in preventing the waste. Offenders have been given every opportunity in the past to manage their tailwater and to correct the waste without legal enforcement. However, public pressure is such that the Water District cannot be as tolerant in the future.

In cases of excessive waste, particularly where the violations have been documented in the past, and where it is evident that the landowner/operator is not attempting to control his water, the District will no longer be patient. Chronic violators should not be surprised to receive notice that an injunction has been filed to restrain them from their continually wasteful practices.

In the past month the District filed and received a temporary injunction against an operator in Parmer County. At the time the Judge issued the injunction he specifically explained to the offender that if he violated the injunction he would be held in contempt and would be assessed a fine and/or time in the county jail. The judge reminded the violator that the injunction should not be taken lightly.

continued pg. 2, col. 3 . . . TAILWATER

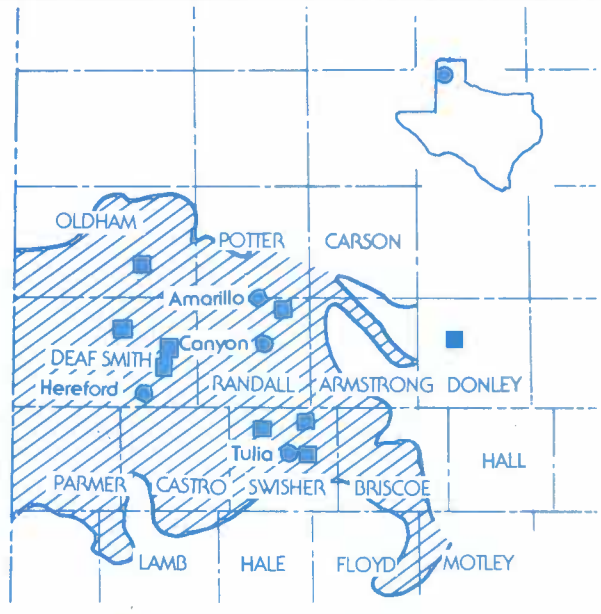
Why Salt?

FAVORABLE SALT CHARACTERISTICS

- Salt is abundant
- Salt is structurally sound
- Salt has good radiation shielding properties
- Salt is relatively easy to mine
- There are many salt mines in existence that can be used to study the conditions likely to occur in a salt repository
- Salt has good thermal properties
- Salt has high inherent plasticity
- Bedded salt deposits and salt domes are relatively old structures. This indicates that ground-water flow has not significantly affected them for that time

QUESTIONABLE SALT CHARACTERISTICS

- Salt is soluble in unsaturated water (however, salt domes and bedded salt deposits have remained, undissolved, for 100 million years)
- Salt, a metamorphic rock, has the potential for mobility, allowing it to flow (however, this allows it to essentially "heal" itself)
- Rock salt has low shear strength
- Salt is a resource and has potential for human intrusion



■ EXPLORATORY BOREHOLES

This area in the Texas Panhandle was designated for more extensive area studies because it met salt thickness (at least 125 feet) and depth (between 1,000 and 3,000 feet) specifications.

(By U.S. Department of Energy, Office of Nuclear Waste Isolation)

DOE Drilling In Palo Duro Salt Formation

The High Plains Water District is continuing to review the technical data compiled from site "screening and characterization" investigations in Deaf Smith and Swisher Counties where the Department of Energy (DOE) is proposing to locate a high level nuclear waste repository.

Johnny Sluder of Bushland spoke for fellow County Committeemen in Armstrong, Deaf Smith, Randall and Potter Counties at a Hereford public hearing recently, and voiced their serious concern over the possible choice of bedded salt below the Ogallala Aquifer for a nuclear waste dump.

Sluder listed ten specific concerns about the site characteristics discovered during examination of the geology and hydrology of boreholes drilled near Hereford and Tulia. He cited investigation report reviews by Water District geologists evaluating the information for the safety and usability of the identified salt sites in the areas represented by these 20 County Committeemen.

Sluder stated that the review and evaluation had raised numerous unanswered questions. He began his testimony before the DOE hearing examiners in Hereford saying, "Our first concern begins over the general assumption that the upper contact of the salt beds should have a flat surface and the beds should have a uniform thickness if no dissolution of these beds has occurred. The tops of the salt formations in this area are not flat which is the reason for our concern."

He continued, "The principal source of published material which has been reviewed has been the Bureau of Economic Geology at the University of Texas at Austin. These publications indicate the following:

1. That the upper contact in the Permian salt beds is eroded.
2. That the thickness of the upper Permian salt beds varies considerably over short distances.
3. That there is current dissolution of the bedded salts by movement of water through the beds.
4. That the area of dissolution of the salt beds extends beneath northern Deaf Smith, and eastern Randall and Swisher counties.
5. That the numerous aquifers in the upper Permian and younger geologic formations above the salt beds has not been studied adequately and the effect of these aquifers, such as leakage, has not been determined.

continued pg. 4, col. 1 . . . SALT

Declines Slow

A recent analysis of water levels obtained from wells within the High Plains Underground Water Conservation District No. 1 revealed that during the 1960's the annual rate of decline was 2.5 feet. The annual rate of decline decreased to an average of 1.4 feet during the 1970's and thus far in the 1980's has further decreased to an average of one foot per year.

Comparing the rate of decline in the 1980's to the rate of decline in the 1960's would indicate a 60 percent reduction. The High Plains irrigator is to be commended for his improved efficiency which has led to this continuous reduction in the rates of decline.

OIL AND GAS LEASING SEMINAR SCHEDULED

The Lubbock County Extension Service is sponsoring an Oil and Gas Leasing Seminar, June 21, 1983 at Plains Cooperative Oil Mill, 2901 Avenue A at 7:00 p.m.

Dr. Wayne Hayenga will be giving information concerning Negotiating Oil and Gas Leases, Taxation and general topics and questions relating to land owners and operators. Dr. Hayenga is the Extension Service Economist and Management Project Supervisor for Texas Agricultural Extension Service. His program has been presented throughout the state.

This meeting is conducted through the Central Planning Group of Lubbock County Extension Service, Joe Brown, president. For more details, contact the Lubbock County Extension Office at 741-8084.

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NOTICE: Information regarding times and places of the monthly County Committee meeting can be secured from the respective County Secretaries.

Applications for well permits can be secured at the address shown below the respective County Secretary's name, except for Potter County; in this county contact Sam Line.

BY SPECIAL REQUEST the Water District treated Dick Siegel, USDA Deputy Assistant Secretary of natural resources and environment, to a High Plains cattle country delicacy during his tour of conservation management programs that will receive technical assistance funds in SCS target areas.

TAILWATER . . . continued from page 1

But that it was a serious matter which would lead to dire consequences if ignored.

The District will continue to pursue chronic violators and take action to prevent waste of the groundwater. Irrigators must be made aware of the value of the resource, if not by reason of its limits and the high cost of pumping, then by legal recourse.

There are ways to prevent and control tailwater runoff. The district has long advocated tailwater return systems, steep borders, sprinkler systems and shorter rows. Current tests on surge irrigation look very promising as a means to control tailwater runoff and deep percolation losses.

CONSERVATION FARMER James Mitchell shares the credit for receiving this Soil and Water Conservation District area award with his family, Cindy, Sylvia, Steve, Kevin and Karen.

2.4 MILLION FARMERS:

Their Impact...

On Jobs

Every farm worker creates jobs for 5.2 other workers who make things farmers use or who handle farm output. That's about 21 million jobs, or one fifth of all civilian employment.

On Government Outlays

Federal outlays to subsidize farmers may reach a record $21 billion this year—more than five times as much as in 1981. An additional $20 billion is spent on government outlays for food, which tend to prop up prices.

On Finance

Farm assets, mainly real estate, amount to a bit more than $1 trillion—up 61 percent since 1977. In that same period, farmers' debts more than doubled and now total $218 billion. It costs farmers $23 billion a year to pay interest on that debt.

On People's Spending

Americans last year spent $350 billion on food—one fifth of all personal spending. Of each dollar, farmers got about 35 cents, a sharp drop from 44 cents in 1972. The rest went to packagers, transporters, processors, wholesalers, and retailers.

On Foreign Trade

Without farm exports, America's balance-of-trade deficits would be enormously greater. Farm goods account for about 20 percent of all exports. A farm trade surplus of $166 billion since 1972 offset much of the trade deficit in oil and autos.

On Productivity

Farmers are models of efficiency. Their output per hour of work grew 4.4 percent a year in 1972-82—more than six times the rate of growth among nonfarm businesses. In 1972, one farmer produced food for 53 persons. Today, one farmer feeds 78.

Though they number but 1 percent of the U.S. population, farmers affect the lives and pocketbooks of Americans far out of proportion to their numbers.

(From U.S. News & World Report, May 30, 1983)

Surge Equipment and How it works:
A valve in the timing control box rotates to open a hose which fills the rubber bladder inside the bell with water. The bladder compresses against the pipe cutting off the water flow to the gated pipe. Meanwhile the bladder in the other bell deflates allowing water to flow to the other set of gated pipe.

SURGE CONTROLS WETTING

Surge continues to capture the imagination of area row water irrigators as more tests and demonstrations add to a growing body of evidence.

STEVE JONES—Lubbock

"Where I was normally watering ground for about six to eight hours to get out the end of the furrow on about 20 rows, with surge I watered 50 rows in six hours.

"Wetting was basically about the same if I had flood watered and I can get across at least 60 to 70 percent faster. Infiltration was good. I feel I got just as much water on the lower end as I did on the upper end and I didn't collect as much tailwater.

"I figure it cost me about a third less because I watered a lot less time."

Steve is surge watering 130 acres of onions. They don't require deep water penetration since the root zone is shallow. For the same gpm pumped, his surge watered six acres while his normal set watered only 1.8 acres. Steve watered on one hour intervals with approximately 400 gpm and surged each set three times. The only disadvantage he saw was in having to adjust the eight inch outlet to his six inch equipment.

"I think it will work fine on most vegetables, with the possible exception of watermelons because the vines get into the row and may prevent getting the water out. I would like to try just to see what it would do."

DAVID STEPHENSON—Marble Farms, Dimmitt

"We were trying to water up cotton and were normally watering 60 rows of diked, skip row cotton. With surge we watered a total of 108 rows and ran 24 hours on both the surge and the continuous watered sets. The surge watered sets got through the field in probably 12 hours, but in order to get the lateral soaking in the skip rows we ran the surge a lot longer and got some tailwater. We got a good wetting."

David ran two wells and metered the flow at 1020 gpm through the system. Because he was watering so many rows in the two surge sets, his furrow stream was weak. He attempted to add another well to the pipe and double the furrow stream. But when the surge flow changed sets it blew off the eight inch bell and fitting. Ten inch bells are available for greater capacity systems.

"I knew it would have handled some more water. I just don't know what its capacity was.

"I was impressed with the system. It watered 15 acres with the surge in a 24 hour period where I would normally water 8 or 9 acres. It took a little more time to regulate the rows so that the water would run evenly and get out close to the same time. You still have to put some management into it. But I am very impressed.

"The way we were hooked up to the gas it was easy to figure the cost. A 24 hour test on 15.7 acres ran $11.13 per acre in natural gas, and the normal watering on 9.34 acres in 24 hours cost $18.80 per acre. That's a dramatic savings."

DISTRICT TOOTS ITS OWN HORN

For the first time in its 50 year history, says the U.S. Department of Agriculture, it is dedicating its annual Yearbook to natural resources. The High Plains Water District has been honored with an invitation to write a chapter for the 1983 Yearbook of Agriculture under the section devoted to "management success stories."

The title of this year's Yearbook will be "Natural Resources—Managing for People." Introductory chapters will describe the basic building blocks of ecosystems and their inter-relationships, according to the editors. The rest of the book will be devoted to selected case histories and reports on current issues which describe some of the important things that are being done to recognize and manage natural resource systems.

The Water District followed the lead of the yearbook editors who suggested the district's story "is the case history of a district which has earnestly set about learning (and teaching others) how to live well with less water." The story relates a multitude of water conservation ideas exportable throughout the arid West.

A quarter million copies of the yearbook will be printed this Fall to be distributed by members of Congress, agencies of the Department of Agriculture and others. Copies will go to libraries, colleges and universities, Extension Service offices, State and Federal agencies, public schools, and other groups and individuals.

James Mitchell, president of the Board of Directors of the Water District feels this opportunity to write a chapter of the USDA's 1983 Yearbook of Agriculture is a high compliment for the Water District and for the people of this area. "Our water conservation efforts are being recognized on a national level in a highly prestigious publication."

Tailwater Cut With New Irrigation System

BUSHLAND, Texas — Minimizing or eliminating tailwater runoff from graded furrows utilizes a limited irrigation water supply to best advantage, according to Dr. Arland Schneider, USDA Agricultural Engineer. Eliminating tailwater by changing sets when water reaches the end of the field reduces set time by one-fourth to one-third. This inexpensive change in water management increases both the amount of land irrigated and total production from a limited supply of water. Schneider, who is located at the USDA Conservation and Production Research Laboratory at Bushland, conducted the research with Leon New, Texas Agricultural Extension Service, Irrigation Specialist, and Jack Musick, another USDA Agricultural Engineer.

The scientists conducted the furrow irrigated study for two years on a field that had 0.3 percent slope and was three-eighths mile long. The soil was Pullman clay loam which contained about one-third each of sand, silt, and clay; and had 1.5 percent organic matter and a pH of 6.5. The spring of the first year was wet and the field was not pre-irrigated. Three seasonal irrigations were applied after the crop was planted. The second year was dry, and the field was preplant irrigated. In the summer of the second year, two and four irrigations were compared. In the first year, no tailwater time was compared to two, four or eight hours of tailwater runoff. In the second year, no tailwater was compared to three and six hours of runoff.

Schneider said, "Sorghum grain yield in the first year was 5070 pounds per acre for the whole field with no runoff." When irrigation was continued four and eight more hours to wet the lower end of the field, yields increased to 5370 and 5720 pounds per acre over the entire field. The amount of irrigation water applied ranged from 10.2 inches with no runoff to 14.6 inches with eight hours of tailwater runoff. The researcher said 3 of the 4.4 inches of water applied during the last eight hours ran off the field. Consequently, only a small proportion of the water applied during tailwater runoff soaked into the soil where it could benefit the sorghum.

According to the engineer, there was no difference in yield in the upper half of the fields. With no tailwater, yields dropped about 30 percent three-fourths of the way down the field. All treatments were at full yield at the lower end of the field where water tended to pond regardless of the amount of tailwater. Even with 8 hours of runoff, yield decreased some three-fourths of the way down the field.

In the second year, yields down the field were about the same as the first year. However, yields increased substantially when the number of seasonal irrigations increased from two to four. According to Schneider, with two irrigations and no tailwater, yield was 4980 pounds per acre. Yields increased to 5310 and 5350 pounds per acre with 3 and 6 hours of runoff. With four irrigations and no tailwater, yield was 7000 pounds per acre. Three hours of tailwater jumped the yield to 7250 pounds per acre, but yield dropped back to 7040 pounds per acre with six hours of runoff.

Schneider pointed out that eliminating or reducing tailwater increased the amount of sorghum grain produced per inch of irrigation water applied. For example, with no runoff, 470 pounds of grain were grown the first year for each inch of irrigation water applied. When eight hours of runoff were allowed, only 370 pounds of grain were produced for each inch of irrigation water. The same trends in water use efficiency occurred the second year.

While interpreting his research, Schneider pointed out that frequent small irrigations are best adapted to his system for saving irrigation water. Frequent irrigation keeps the upper end of the field wet, and a higher percentage of applied water flows toward the lower, drier part of the field that has a high infiltration rate. "As a result, irrigation water application varies less over the whole field," he said.

Rainfall during an average summer supplies about 30 percent of the water required by a sorghum crop. Because rainfall comes evenly over the entire field, both wet and dry parts are wetted. Thus, the combined water supply from irrigation and rainfall is more evenly distributed than irrigation water alone.

Schneider says that when using the system, during dry years, severe lodging can occur on the lower quarter of the field. He proposes using a reduced or dryland seeding rate on that part of the field. A low plant population does not use all of the water early in the year, saving some for fall when lodging might occur. Schneider says plans are available at the Research Laboratory for a seeding device that enables a tractor driver to change seeding rates while traveling across the field. Reduced seeding rate at the lower has worked well in the LID (Limited Irrigation Dryland) irrigation system developed by Dr. B. A. Stewart at the Research Laboratory at Bushland. The LID system is similar to Schneider's system except that furrow inflow is often stopped before the wetting front reaches the end of the field.

Schneider says using this system does not cost anything, but can increase water use efficiency as well as the amount of grain produced with a limited amount of water. When tailwater loss is not allowed, irrigation set time is reduced by 25 to 35 percent. This water can be used to water more land. For example, with no tailwater the first year, yield was 5070 pounds per acre. If the tailwater had been used to irrigate 30 percent more land, total yield would have been 6590 pounds from 1.3 acres. The 870 pounds of grain at $5.00 per hundred weight would return an additional $43.00 for the irrigation water. "That could be the difference between profit and loss," Schneider said.

SALT . . . continued from page 1

6. That previous and current investigations indicate that surface discharge of ground water from geologic formations older than the Ogallala are currently occurring. These discharges contribute substantial volumes of water to the Canadian River basin on the north and the Red River basin on the east.
7. That the water from both the Canadian and the Red Rivers is an important source for municipal supply by many towns in the region.
8. It appears that there is a strong correlation between the paths of the modern surface drainage system and the pre-Tertiary drainage network. It could be inferred that the development of the old drainage network was influenced by and occurred along channels of salt dissolution. We are concerned that this drainage has not been given adequate consideration.
9. That the research developed to date indicates that the larger playa basins (more than 8,000 feet wide) occur in areas with active dissolution of the underlying salt beds. Many such playa basins exist in Deaf Smith, Randall and Swisher counties. These may be connectors between the Ogallala and the salt beds.
10. That within the Triassic aquifer (immediately between the Ogallala and upper Permian aquifers) there is a very pronounced change in the water salinity as one moves north or south of a line drawn between the towns of Hereford and Tulia. The explanation for this change in salinity can only be explained by postulating some change in the hydrologic components of the upper Permian aquifers.

Sluder concluded by saying, "Our concerns as indicated by the ten items I have just provided, lead us to believe that the site is unsuitable and further that much additional study will have to be made to satisfy or answer many of these questions."

The purpose of the DOE public hearings was to inform area residents of the proposed nomination of sites in Texas for site characterization, and to receive recommendations of issues to be addressed in the environmental assessments and site characterization plans. DOE also solicited issues to be addressed in studying the potential sites as a candidate for a repository.

The Palo Duro Basin bedded salt formation sites nominated are in Deaf Smith County just north of Hereford and in Swisher County northeast of Tulia. Two sites in the Texas Panhandle, along with sites in Louisiana, Mississippi, Utah, Washington and Nevada, are being considered by DOE for a permanent radioactive waste repository to be chosen by the president in 1987. The list of possible sites must be narrowed to three by August of 1983.

WATER FOR TEXAS HEARING SET

AUSTIN—Charles E. Nemir, executive director of the Texas Department of Water Resources, announced that eight regional public hearings have been scheduled to receive public comment on the Department's draft planning report, WATER FOR TEXAS: PLANNING FOR THE FUTURE. Data and water-resources planning information are contained in this report to be used in amending the Texas Water Plan adopted in 1968.

Public hearings in the High Plains and Trans Pecos region will be at the Lubbock Civic Center at 1501 6th Street in Lubbock on Tuesday, July 12 at 7 p.m.

Water quality protection, water conservation, municipal and industrial water supply development, and water for environmental needs are emphasized in the report. The planning report may be revised depending upon comments received. After the hearing process is concluded, the document will be submitted to the Texas Water Development Board for consideration of adoption as the amended statewide water plan for Texas.

Copies of the draft planning report have been distributed across the State for review and comment. It is a flexible guide for meeting Texas' water needs in an orderly manner in future years. Copies of the 700-page document and a 39-page summary are available for inspection in each of the Department's District Offices and various libraries across the State. Each of these reports is also available upon request, at no cost, from: Planning and Development Division; Texas Department of Water Resources; P. O. Box 13087; Austin, Texas 78711.

Nemir said that he encourages individuals and organizations to make their views known relative to water needs or problems, as well as the contents of the document. Written statements will also be welcomed at the hearings or may be mailed to the Department at the above address.

New Standards For Water Wells

The Water Well Drillers Board has revised and expanded their standards for drilling, completion, capping and plugging of all state water wells. A key provision of the new standards is that all wells, including domestic wells, now require a surface cement seal.

The new standards were developed to protect underground water supplies from pollution by surface water runoff, by contamination from rodents burrowing between a casing and bore hole, or by intrusion of brine from other water-bearing strata.

In part, the rules require that domestic, industrial and irrigation wells shall be completed according to the following specifications:

"The annular space between the borehole and the casing shall be filled from ground level to a depth of not less than ten feet below the land surface or well head with cement slurry.

In all wells where plastic casing is used, a concrete slab or sealing block shall be placed above the cement slurry around the well at the ground surface.

The slab or block shall extend at least two feet from the well in all directions and have a minimum thickness of four inches and should be separated from the well casing by a plastic or mastic coating or sleeve to prevent bonding of the slab to the casing.

The surface of the slab shall be sloped to drain away from the well.

The top of the casing shall extend a minimum of one foot above the top of the slab.

In wells where steel casing is used, a slab or block as described above will be required above the cement slurry except where a pitless adapter is used.

All wells, especially those that are gravel packed, shall be completed so that aquifers or zones containing waters that are known to differ significantly in chemical quality are not allowed to commingle through the borehole-casing annulus or the gravel pack and cause quality degradation of any aquifer or zone.

The well casing shall be capped or completed in a manner that will prevent pollutants from entering the well.

Of particular interest to local residents are the standards for plugging existing wells. The new rules state that "if the use of a well that does not contain any undesirable-water zones is permanently discontinued, all of the removable casing shall be removed from the well and the entire well filled with cement to the land surface . . . The well may be filled with fine sand, clay, or heavy mud followed by a cement plug extending from land surface to a depth of not less than ten feet.

The revised rules also contain new reporting requirements for well drillers denied access to a well by a landowner to perform his duties of proper drilling, completion, capping and plugging a water well.

These new regulations will result in a slight increase in drilling costs to the consumer, but the safety afforded to the aquifer by these standards will more than offset the added expense.

NOW'S THE TIME to capture every drop of rain that hits the field. Larry Lockwood used dikes "the biggest percentage of the time" on his farm near Spade. He says, "even one rain can pay for the dikers."

THE CROSS SECTION (USPS 564-920)
HIGH PLAINS UNDERGROUND WATER
CONSERVATION DISTRICT NO. 1
2930 AVENUE Q
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THE Cross SECTION

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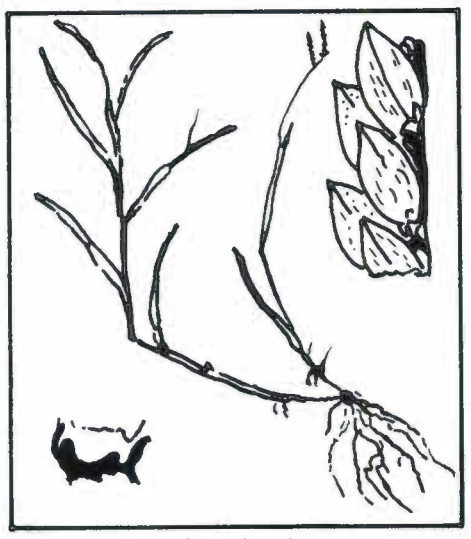

Paspalum distichum L.
(păs' pā - lŭm dĭs' tĭ - kŭm)

KNOTGRASS — Perennial by creeping stems above and below ground; culms are 1-2 feet tall, erect or ascending, sometimes branched, the long creeping somewhat flattened stolons as much as 2-3 feet long often form loose mats or close sod, taking root at the nodes, often with a few hairs.
Native. At low elevations throughout Southern United States.
Primarily in standing water or in moist bottomlands that are periodically flooded. When growing in water the plant develops an extensive rhizome system as well as numerous erect flowering stems, the upper part of the stem and the racemes are above the water level. Following recession of the water, long stolons are produced causing a rapid spread of the plant over a wide area. Because of this type of growth, Knotgrass becomes valuable in preventing erosion of ditch and stream banks. Knotgrass becomes a serious weed in turfgrass and is difficult to eradicate. It is valuable forage for grazing animals.

Knotgrass Thrives In Playa Lakes

In the April 1983 issue of the Cross Section we reported on knot grass, (paspalum distichum) a perennial which apparently has potential for use in a livestock grazing program and seems to be especially suited for playa lakes in the Texas High Plains. We have since followed the progress of the knot grass growing in a playa lake on Ray Kitten's farm near Slaton.

Ray's playa is located on a 28 acre tract. Of the 28 acres, about 18 to 20 acres are covered with knot grass. The knot grass is growing in the bottom and sides of the playa basin which is sometimes covered with water. The knot grass has not spread to the high ground around the outside of the lake. This is covered with native grasses such as buffalo and gramma and is considered typical dryland pasture area in the High Plains.

On March 16, Ray put 62 head of cattle to graze on his 28 acre tract adjoined to a seven acre tract of wheat. The cows were allowed to graze the wheat for a short time as well as the knot grass. When the cows were put on the grass patch, they were in fair to poor condition. By June 3rd the 62 cows and calves grazing on knot grass were all fat and looked healthy.

Ray plans to move all but 15 animals off the grass by the end of June and continue to graze only 15 head on the knot grass in the playa for the remainder of the year. If the grass makes as good a forage as it has in past years, Ray believes it will provide ample grazing for the 15 head through the entire year.

A fascinating quality of this knot grass is that most of it survived submerged under one to four feet of water from June to December of 1982. The grass which had about two and a half feet of water over it survived very well. Ray observed that although the knot grass was submerged, its stems would grow up through the water surface and provide the necessary ingredients of light and oxygen to keep the grass alive. Ray commented that during the time the grass was submerged, the cows would wade in and graze on its leaves and stems which had grown through the surface of the water.

In June the dry lake bed showed some patches with little or no grass and a few other areas with only a thin grass covering. Ray says these bare spots were the low points in the lake. Water had stayed on them through the winter months for a total of eight months. He says these bare patches have occurred other years and he believes the grass from the better covered areas will spread and cover the spotted and bare areas by late summer.

In the spring, says Ray, weeds grow in the bottom of the playa, but the grass will normally choke them out by mid-summer. It may even happen sooner if he has an especially dry spell. The grass can continue to grow because its roots extend deep into the lake bottom soil, while the weeds' shallow root systems cause them to dry up and die. Ray has observed that the grass is hardier than the weeds growing in the area of the playa and says he has never had a weed problem.

Another observation Ray has made is that the knot grass greens up late in the spring after the buffalo grass has already come out and started growing. However, it stays green later into the fall even after the buffalo and other grasses have become dormant.

Ray believes the knot grass has a very high protein content. "During the summer the cows will not consume a single protein block while they are feeding on the green knot grass," he says, "but the cows will eat some protein blocks in the fall and winter months when they have only the dry knot grass to graze on."

SOME ECONOMIC IMPLICATIONS

There are approximately 17 thousand playa basins in the High Plains of Texas. These range in size from less than one acre to more than 200, averaging about 20 acres. A large percentage of these lakes could be used for livestock productions if they were planted to a grass cover which could survive and reestablish after being submerged under water for an extended period of time. The economic potential to the area from use of these lake bottoms to produce grass for livestock consumption appears to be tremendous.

continued pg. 2, col. 3 . . . PLAYAS

MILLION DOLLAR STUDY PROPOSED TO BUREAU OF REC.

The Water District has submitted a proposal to continue its Investigation of Secondary Recovery of Ground Water in the Ogallala Formation to Commissioner Robert Broadbent, Chief of the Bureau of Reclamation, U. S. Department of Interior in Washington, D.C.

After two years of work with an expenditure of over $500 thousand dollars in state and local funds in its investigation of secondary recovery of capillary water, it is the concensus of the project investigators that the research effort should be continued. The proposed study includes numerical, physical and laboratory modeling and field testing. Researchers hope to develop a more complete understanding of capillary water, the mechanisms involved in the release of this water, and they hope to perfect field techniques for releasing and capturing the water which are very affordable.

Wayne Wyatt, High Plains Water District Manager, related to Commissioner Broadbent that the value of this research in human benefits will be tremendous if the technique is perfected. It should have world-wide application especially in depleting ground-water aquifers with similar climatic and geologic settings.

The District has asked the Bureau for nearly $782 thousand dollars for the study to be matched by over $596

continued pg. 4, col. 1 . . . FUNDS

SOIL MOISTURE GUIDE

Tool For Judging Water Needs

A free, handy, pocket-sized soil moisture guide for irrigators is available from the High Plains Water District, the Soil Conservation Service or the County Extension Office in each of the 15 counties served by the Water District. From Armstrong to Lynn Counties, each county has its own separate guide. Each one identifies the five main soils in that county, lists their dominant textures, their average soil root zone depths and each soil's water holding capacity for a full profile in the root zone.

That's just half the story. Each plastic card also carries a guide for judging by using the feel and appearance method, how much moisture is available for crops. What good does it do to figure out a) how much moisture you've got in the ground right now, b) the water holding capacity of your soil, and c) the root zone depth of your soil? With this information you can calculate the total amount of water your soil still needs to fill up the soil root zone to field capacity.

These soil moisture guides are another tool to help you make better irrigation decisions and apply water for the most efficient irrigation. They can help you avoid over or underwatering where you can control your application.

Providing moisture to the root zone is the key. The soil moisture guide also explains that root zone depths vary. Most crop roots stop when they reach calcium carbonate concentrations greater than 35 percent (caliche). Because the depth to caliche will vary, the guide gives an average figure for each soil's root zone depth. But indi-

continued pg. 3, col. 4 . . . GUIDE

TAES Field Day In Amarillo

AMARILLO, Texas—The Annual Field Day at the Texas Agricultural Experiment Station, North Plains Research Field, will be August 17, 1983 at 1:00 p.m., according to Dr. G. B. Thompson, Research Director at the Texas A&M Research and Extension Center in Amarillo. Arrangements for the event are being made by Cecil Regier, manager of the Etter facility. Thompson invites everyone to observe research that will lead to more productive and profitable agricultural in the High Plains.

The event will start at the "West Campus," one-half mile east of the intersection of U.S. 287 and FM 281 at Etter. At this location, cultural practices, timing of irrigation, sprinkler automation, and chemigation under center pivot irrigation will be shown and discussed.

Later at the "East Campus" near the headquarters building, corn, sorghum, and cotton variety trials will be shown. The efficiency of a furrow irrigation system that practically eliminates tailwater will be explained. Economical methods of managing PIK acres and research on death losses in cattle will be presented.

THE Cross SECTION

THE CROSS SECTION (USPS 564-920)

A MONTHLY PUBLICATION OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1
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Telephone (806) 762-0181

PATRICIA BRUNO, *Editor*

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NOTICE: Information regarding times and places of the monthly County Committee meeting can be secured from the respective County Secretaries.

Applications for well permits can be secured at the address shown below the respective County Secretary's name, except for Potter County; in this county contact Sam Line.

PLAYAS . . . continued from page 1

Assume half or 8,500 of the average 20 acre lakes had a grass established which would support two animal units per acre for 90 days and three-fourths of an animal unit for the remainder of the year. Also assume that each animal gained two pounds per day. The yield would be 15,450 pounds of beef a year per lake, or over 131 million pounds for the 8,500 lakes. If the beef were sold for 60 cents per pound, the return would be about $79 million annually to the area. The gross return would be about $460 per acre, which compares very favorably with 750 pounds of lint cotton per acre at 60 cents per pound or to 125 bushels of corn per acre at $3.50 per bushel.

Playa lake grass also offers a full season livestock grazing program opportunity for High Plains livestock producers (wheat to playa grass to hybrid sudan, back to playa grass until the wheat is ready).

Additional benefits would include reducing wind erosion, increasing natural recharge to the aquifer and eliminating breeding grounds for harmful crop insects.

Knot grass does not produce seed; therefore it must be established by transplanting root stock. The Water District has attempted to locate a grass nursery which can provide root stock for those interested in establishing knot grass in their playa basins. As of this date, no supplier has been located. If readers are aware of a supplier for knot grass root stock, we would appreciate their name(s) and address. If any are located, we will inform those who inquire.

IT'S A WHAT?

It's a cylinder ring infiltrometer. All this complicated gadgetry of a water level recorder, cylinder tank, hoses and rings (there is a little one inside the big one) are measuring how many inches of water this particular Olton soil is taking in for a given length of time. Fred Pringle, Amarillo SCS soil scientist, set out three of these rings in Dale Gober's field looking for how much water the soil will take in at what speeds in order to measure a final rate of intake for that soil.

This and similar soil water infiltration tests being run by the SCS will contribute to a program to reclassify the intake curves for Texas High Plains soils. The scientists are seeking a better understanding of the water intake characteristics of given soils and the properties that control their water intake rates, such as texture, chemistry, organic matter, and even management practices. All this will help them spot problems such as plow pans which may require a change in your soil management practice to get the most efficiency out of your irrigation system or the optimum water use for a dryland cropping system.

WATT ANNOUNCES

National Water Summary

Interior Secretary James Watt recently announced immediate steps to implement a system to produce an annual National Water Summary that will make water resources information more readily available and useful to policy makers and managers at local, state, and national levels.

"In keeping with administration policy that the responsibility for water resources management rests with the states, the Interior Department has an important role in providing state and local agencies with current, accurate evaluations of water conditions and critical water problems," Watt said. To accomplish this goal, the Secretary directed Interior's U.S. Geological Survey (USGS) and the Office of Water Policy (OWP) to take the following steps:

First, the USGS will prepare annual National Water Summary reports targeted for initial publication in October 1983. The initial report will summarize national conditions, and subsequent annual reports will also focus on selected water problems. OWP will coordinate with state and local decision makers to ensure that the information presented is responsive to users' needs.

Second, the USGS will develop a water resources information system containing summary data about the nation's water resources. This information system will be used in conjunction with existing water data bases to retrieve, analyze, and display information about water resources conditions and track changes over time. OWP will coordinate responses and suggested improvements to the system from policy makers and managers.

Finally, using data supplied by USGS and other agencies in the public and private sector, OWP will work with state officials to identify critical water problems. The Interior Department will then respond to specific local needs and requests and develop programs to provide needed assistance.

(Water Current, March/April 1983)

Irrigating By The Block

"Surprised," "disappointed," "rudely awakened": These were reactions from a long time irrigator who is now reading moisture blocks under his crop and discovering for himself the decision-making edge they offer.

A cotton farmer near Morton and two corn farmers, one near Bovina and one in Olton, recently shared their experiences and reasons for trying gypsum moisture blocks as an irrigation management tool.

Dale Gober waters 450 corn acres south of Bovina. He's already got five sets of blocks out in his fields this year.

DALE GOBER

"I guess the most impressive thing they've taught me is how much water we put on when we irrigate and how little water we get into the ground when we get a rain. I get a two inch rain and think gosh it ought to be wet all the way down. It isn't. That's the thing that really surprised me. That showed me I need to start watering corn a lot quicker after a rain. It is a rude awakening and a disappointment. Rain doesn't always wet the field as much as you think it should."

Dale made those observations soon after he began reading and charting soil moisture with his gyp blocks back in 1981. Gypsum moisture blocks are small, about an inch long, plaster cylinders imbedded with a lead wire that trails several feet. A set of 4 blocks is usually buried in the crop root zone at one foot intervals in a single augered hole down to the four foot level under a crop row. The lead wires trail back to the ground surface and are secured, tagged and read with a conductance meter. It meters electrical resistance to indicate the moisture content in the soil at that foot level. The blocks cost about $3.00 each and must be replaced each year. The meter will run about $100 and will last several years.

This year Dale hopes to use his blocks to irrigate on demand. Until the 50 percent layout program this year, he says he had so many acres of corn he had to just water all the time. "This year I think I can pick the times for my watering, with the blocks to help me. If they tell me I need to water then I can get it done in three or four days. If I can save one watering, of course that's a lot of money, $15.00 an acre and a lot of water saved for future use. Or if we get a rain and the blocks tell me we have enough soil moisture to last another week, we may be able to save the last watering. At the cost of fuel that's a big savings."

Dale also learned something about residual soil moisture from his blocks. "That's one thing it will sure show you. You may have soil moisture left over from last year's crop. This winter they (the Water District) kept saying we didn't get a good deep moisture even though we had all that snow. Well, I've got blocks in ground that was planted in wheat last summer and I have land that was in corn last year. The moisture is a whole lot better in the old corn ground than in the wheat ground simply because I watered corn late. I guess the snow didn't wet the ground as we hoped it would."

"I intend to continue using blocks. To me it's worth my time to put them in and use them, just to see where we are with our moisture."

Royce McFadden is also a corn grower. He has two 125 acre circles in 'no-till' ground near Olton. He is trying moisture blocks for the first time this season because he says, "I've been checking moisture for some time and have been running sprinklers for 10 to 12 years and I've decided I still don't know how to best use my sprinkler. I'd just like to learn a little more about soil moisture, know how much moisture is down there, at what depth, and when the plant is using it. I want to grow a corn crop on 18 inches of irrigation water. I don't know if it's possible or not in West Texas. But the blocks should help give me some idea of moisture use by corn.

ROYCE McFADDEN

"I've got to do one of two things: quit irrigating or figure out how to irrigate less. I can't stay in business for $4. a mcf for gas. That's when I decided to come up with some kind of different method to do something about it."

Royce is reading his blocks twice a week to learn whatever they can teach him, he says. "The only problem is that the blocks still read wet and I am wanting to irrigate. They (district field staff who installed his first blocks) told me to watch them, read them, and figure out how I want to use them. The blocks are really just a measuring device. So they don't say, if it reads 9, 'you don't need to water'. I think if I use them for a year I'll pick up some trends to follow."

Donnie Simpson, farming near Morton on the other hand, has had blocks in his fields since the District introduced the growing season soil moisture monitoring program in 1981. He says he learned one lesson the hard way . . .

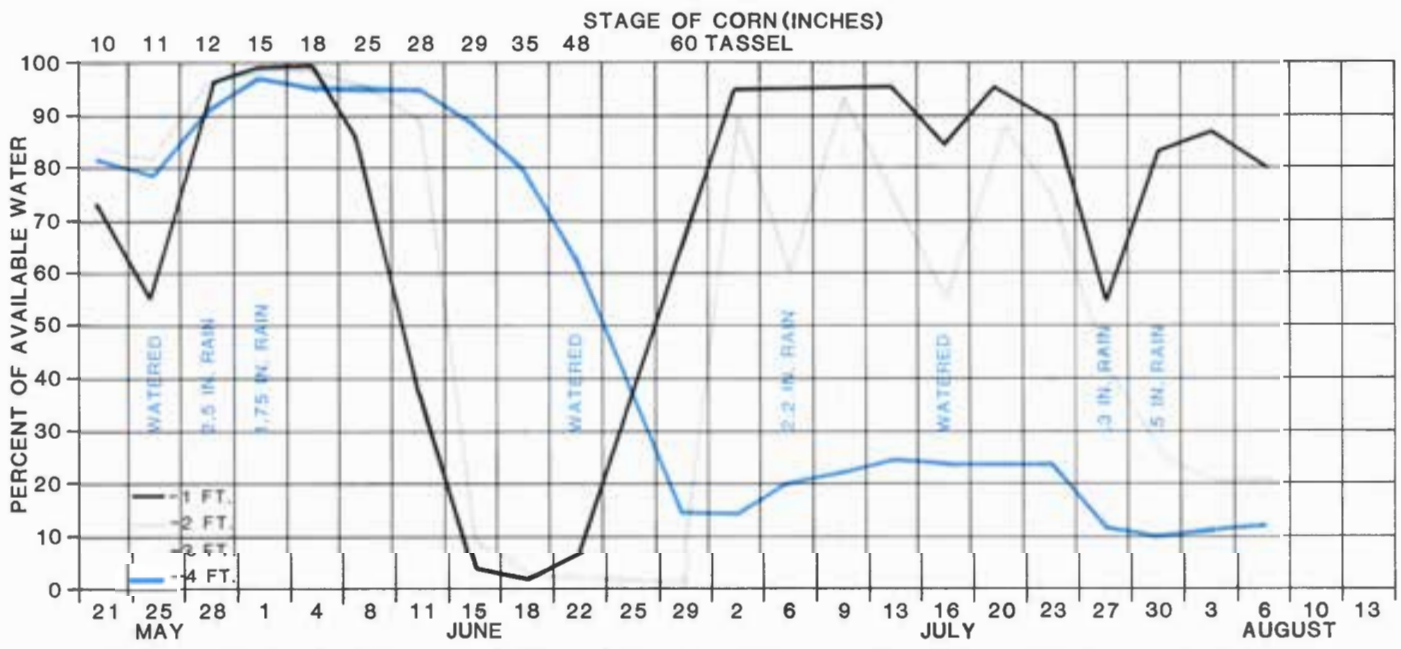
"I didn't pay attention to them last year, and I should have been watering when I didn't. I made half a bale to the acre instead of a bale. I was reading my blocks but I just didn't think they were right. There were; and I just sat here and lost a crop because I didn't pay attention to them; and I had them put in free and was reading them with a borrowed meter."

Donnie had 525 acres of irrigated cotton last year. He had two sets of blocks under each circle because of soil differences from one side of his field to the other. Now he'll be the first one to tell you looking at the top of your soil is no clue to your root zone soil moisture.

"No, it's deceitful. I'd take a shovel and dig down eight inches deep where I could get a handful of wet dirt. I'd think, it's been this way two weeks; it's gotta go on down. But it sure doesn't."

Donnie laughs now at a friend who would come by to look at his blocks and say, "there's gotta be something wrong with them, 'cause, see, we've got plenty of moisture." But Donnie says his blocks showed him it was wet on top and not down on the bottom. His recommendation now is just to read your blocks. Know your land and how well it holds moisture, and know

continued pg. 4, col. 3 . . . EVEN



Soil Moisture Readings with Gypsum Blocks in one to four foot zone under corn at Gober farm south of Bovina.

GUIDE AVAILABLE . . . con't. from pg. 1

vidual soil conditions will also vary. Some crops, such as sunflowers, are nonconformists. Their roots are not affected by calcium carbonate content and may grow deeper than average.

The 3x5 cards are available in each of the 15 counties, including Armstrong, Bailey, Castro, Cochran, Crosby, Deaf Smith, Floyd, Hockley, Lamb, Lubbock, Lynn, Parmer, Potter and Randall. To pick up yours, stop by your local SCS or water district office or request one from the water district headquarters in Lubbock.

And just a reminder: information and irrigation water management assistance for pump efficiencies, power plant efficiencies, sprinkler evaluations, furrow evaluations and use of soil-water monitoring equipment are available from the SCS and Water District at no cost.

FUNDS . . . continued from page 1
thousand in non-federal cost sharing contributions by the Texas Department of Water Resources, Texas Tech University, Texas A&M University, the High Plains Water District and a special Texas legislative appropriation of $200 thousand dollars, for a total projected research cost of $1,378,000.

The seven principal investigators will include Wayne Wyatt; Don Rauschuber, president of Rauschuber and Associates, Inc., Austin; Bill Claborn, associate professor of civil engineering, Texas Tech University, Lubbock; Bob Sweazy, director, Water Resources Center, Texas Tech; Don Reddell, professor of agricultural engineering, Texas A&M University, College Station, Tommy Knowles, director, Data Collection and Evaluation Division, TDWR, Austin; and Art Stoecker, associate professor of agricultural economics, Texas Tech.

The project goals are to further optimize the secondary recovery process and to predict the probable success of secondary recovery by air injection at a particular site, including its cost.

In the initial studies and field tests, capillary water recovery techniques were identified and evaluated with lab experiments and analytical calculations. A large scale field test of a compressed air drive method of recovery was conducted near Idalou, Texas on Clifford Hilber's farm. Over ten million cubic feet of air were injected over a six-day period. Injection rates ranged from 250 cubic feet per minute (cfm) to a high of 2,300 cfm with pressures ranging from 10 pounds per square inch (psi) to a high of 160 psi. Field data indicated that an area 18 feet thick covering about 140 acres was pressurized. The net result of the air injection test at this site is that water levels have risen in the vicinity of the Idalou test as much as nine feet, adding an estimated 840 acre-feet of water to the aquifer. Almost a year after the air was injected, the water levels are still rising even though irrigation wells have been pumped in the immediate vicinity of the test area.

The proposal to the Bureau of Reclamation states that while the significant rise in water levels is extremely positive, there are other data that needs better definition, "for instance, a preliminary analysis of soil moisture contents, as measured with a neutron probe in several wells, does not indicate a significant reduction in specific retention. This could be a result of sampling error and the difficulty in accurately monitoring in-situ soil moisture deep within the Ogallala Formation. Other data from the field test are also difficult to correlate with present theories on flow in the unsaturated zone."

The proposal calls for a three year study to define the physical processes responsible for the release and movement of water within the unsaturated (vadose) zone; to formulate mathematical models of the physical processes; to design and execute laboratory experiments, including a physical model; and to conduct two field tests to demonstrate and refine the use of air injection as a secondary recovery technique.

It is hoped that continued research will result in a developed technology and methodology to release capillary water from the vadose zone and increase the available water supplies from the depleting Ogallala aquifer.

Benefactors of this proposed research are identified. They include municipalities, industries, irrigators, as well as private and public water purveyors. The proposal states that this project, if successful, will have far-reaching effects in satisfying the needs for additional ground-water supplies for individual homeowners as well as for major water users. Researchers anticipate opening a completely new dimension and era in water management and development in this country.

"Even for dryland farming, blocks would be an asset if you defoliate"

(continued from pg. 3)

how thick your crop is and how fast it starts pulling water.

Donnie has found several applications for the information his blocks offer him. For example, he says it can tell him whether or not it would pay to defoliate. Pointing to an October 1981 meter reading of 9.5 in his three foot root zone Donnie said, "If you still had this much moisture in the ground at this date, I think it would pay to put a defoliant on cotton to knock the leaves off and stop the growth. Even back as early as the middle of October. It costs about $8 an acre to defoliate. At the price of fuel today with this kind of soil moisture, it could possible save you a preplant."

"Even for dryland farming the blocks would be an asset," says Donnie, "if you had a program where you defoliated. Or maybe if you knew how much moisture you had in the ground it would tell you how many pounds of seed to plant per acre or how many seed per row to plant. I imagine the blocks could even tell you how much fertilizer to put on. If you knew you only had a little moisture you might want to put on $7 worth of fertilizer, if you had real good moisture you might want to put on $27 worth on dryland."

What was very clear from each irrigator was that he would probably be depending on his blocks to help make irrigation decisions from now on.

DONNIE SIMPSON

IRRIGATION ENGINEER, Allie Blair, a graduate student at the University of Texas at Austin, spent some time at the District office showing the staff and SCS personnel his latest computer programs on water management. The irrigation scheduling program is designed for inputs of local conditions so irrigation timing and amounts can be projected.

Learn More About Surge

The Soil Conservation Service is hosting an agricultural field demonstration on July 14 at the Phil Johnson farm in Hub, Texas. The program will begin at 9 a.m. and go until noon. It will be located at the intersection of Highways 86 and 214 at Hub. The SCS has run two surge tests on the Johnson farm this year. They will be discussing the results of the tests. The equipment will be out on the ground.

Phil Johnson normally had trouble getting his water out on one particularly flat field. His normal pre-water was a 24 hour set applying 19.7 acre inches on quarter mile rows. The surge tests ran two sets in 24 hours and put on just a third the water—6.2 acre inches. Johnson says the difference was unbelievable.

The SCS is also inviting Leon New to discuss his work with pumping plant efficiency tests.

For more information about the ag field demonstration, contact Duval Burton, District Conservationist at Friona at 247-2220.

THE CROSS SECTION (USPS 564-920)
HIGH PLAINS UNDERGROUND WATER
CONSERVATION DISTRICT NO. 1
2930 AVENUE Q
LUBBOCK, TEXAS 79405

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THE Cross SECTION

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AT THE LUBBOCK HEARING—A. L. Black, acting chairman of Six State Study Council, and Charlie Nemir, Executive Director of Texas Department of Water Resources confer.

TEXAS WATER PLAN

NEEDS PLAN OF ACTION

(EDITOR'S NOTE: One of only eight hearings to obtain public comment on amending the Texas Water Plan was held in Lubbock on July 12 for the West Texas and Trans Pecos areas of the state. The High Plains Water District was one among many representatives who observed or gave testimony at that meeting. The following comments are taken from a full text addressed to the Texas Department of Water Resources by Wayne Wyatt, District manager.)

The Water Plan contains a good assessment of the water resources and needs of the High Plains, but it does NOT contain a solution to meeting the long term water needs of the area.

The plan does mention several things which might be done which could extend the limited water supplies of the area, such as: a maximum conservation effort, secondary recovery of ground water, weather modification, desalinization and water importation. The plan does NOT contain any plan of action to accomplish any of these alternatives. The plan only promises to provide technical assistance, coordination, monitor developing technologies and to continue studies.

We believe that the plan should contain a positive action approach to those things which can be accomplished by the Department. We would like to suggest that you adopt and implement action programs to accomplish the suggestions you have made in the plan.

Item Number One:

The Water Plan suggests that a maximum water conservation effort by all residents of the High Plains is the best solution for extending the life of its ground water supplies and keeping its economic activity at the highest possible level.

With a maximum conservation effort, your studies predict we could reduce depletion by 18.7 percent and keep 14.1 percent more acres under irrigation by the year 2000, and further by the year 2030, the High Plains would have 38.2 percent more water available and would be irrigating 42.7 percent more acres.

It appears to us that the Department could develop a plan of action to assist those agencies such as the Water District who are currently working very hard to help High Plains water users achieve their maximum conservation potential. We suggest that you could help with this extensive demonstration and education program by providing people and funds to support the program.

This program involves putting teams of people out in West Texas fields, nearly year round, systematically showing farmers on the ground the benefits of water conservation, through the use of the "state-of-the-art" water conservation technology.

We are promoting the maximum utilization of furrow dikes, drop-line

continued pg. 4, col. 1 . . . HEARING

Fresh Water Drilling Swells Formation Clays

Fresh water may be the wrong fluid to use in drilling water wells on the High Plains. The Water District recently conducted an investigation to determine if the Ogallala Formation contains swelling clays which might be inhibiting well yields. Many new wells drilled in the area have very poor yields even though they were drilled in areas where the aquifer was thick enough to support much higher yields. The study revealed the culprit may be the fresh water drilling process itself.

To begin the investigation District staff collected drill-bit cutting samples from mud pits of 102 wells drilled in an eight county area. Dr. Necip Guven with the Department of Geosciences at Texas Tech University was contracted to make a survey of the mineralogy of the samples by x-ray analysis. The x-rayed samples revealed the presence of swelling clays. Major minerals also found in the samples were quartz, calcite, and feldspars. Bentonites, swelling clays, appears to be the dominant clay mineral in all of the samples, making up as high as 80 percent of the clay fraction. This clay can be very detrimental to fluid flow through porous media like the Ogallala Formation. One possible reason is that fresh water is easily absorbed into clay molecules weakened when they are disturbed by aggitation.

Damage to the fresh water formation's pore spaces and their capacity to allow flow through the formation results when clay particles are torn apart and allowed to move back into the formation during the drilling process. As clays swell they lodge in place

A TYPICAL rotary water well drilling site. This mud pit lacks any barrier to prevent circulation of solids with drilling fluid.

and cannot be removed by bailing or pumping. The pore space is blocked and water from the formation cannot move to the well. The formation is damaged and its potential well yield reduced.

This discovery suggested to the investigators that the presence of clays should influence the choice of well drilling fluids. The most damaging system would be fresh water. The best fluids for drilling would be oil, air, or foam. Where use of such fluids is not possible and fresh water must be used, precautions should be taken to inhibit the clays from swelling.

Depending on the percentage, distribution and types of clays, various fluid systems could be used for drilling, such

continued pg. 2, col. 1 . . . SALT

WATER ED. PILOT PLANNED STATEWIDE

Water awareness and conservation education is fast becoming a top priority for the private professional sector in Texas. Recently the Texas Society of Professional Engineers' water committee targeted statewide water education in the Texas public schools as one of its first priorities. A TSPE water education task force headed by Dave Dorchester of Midland "took the bull by the horns" and called a meeting with members of the Texas Education Agency, Texas Water Conservation Association, the Department of Water Resources, Texas Water Utilities Association and the Consulting Engineers Council.

"Public education is the key to beginning to move out and solve the Texas water problem," says Dorchester. "We felt we should go back to zero and start in the school system. In the not so distant future these kids will be voting. What they learn in school can also rub off on their parents so we felt that this is the place to begin to reach the largest number of people."

continued pg. 3, col. 1 . . . TEACHER

Salt Helps Stop Clay Swelling

(continued from page 1)

as salt water, potassium chloride water, combinations of sodium chloride and potassium chloride, various polymers and polymer combinations and salts. Salt in the water increases the strength of the electrical bond of the clay molecules which helps minimize their water absorption.

Investigators believe efforts should be made to keep drilling solids from returning to the borehole. As a minimum, a gate should be constructed in the pit to help keep solids away from the suction pump. If additives are introduced, an in-line mixer on the discharge side of the suction pump should be used.

After reviewing the status of the investigation, the District's Board of Directors authorized a test well drilled using brine as the drilling fluid to stabilize the clays. A drilling site was selected on a farm south of Wolfforth in Lubbock County. The saturated portion of the Ogallala in that area has a very high clay content. In addition, a well was drilled on the site in 1980 using normal procedures and material making it a point for comparison.

The 1980 well was drilled by direct rotary method using fresh water. The base of the Ogallala was encountered at 130 feet below land surface and the static water level was at 90 feet. Twenty feet of Johnson Irrigator continuous wire-wrap screen had been placed in the lower part of the saturated section with a few feet of torch-slotted casing above and below the screen. The well was gravel packed using Brady-fine emplaced by pouring while clean water was being circulated.

The well was then developed by combination of surge swabbing, bailing, and high velocity jetting over a period of about 10 hours. After the water cleared a submergible pump was installed and production tests were conducted.

Specific capacity of the well was 0.6 gallons per minute per foot (gpm/ft). After two hours of continuous pumping, the rate of production began to decline and it was decided to attempt a chemical stimulation. Various surfactants were injected using a garden hose for implacement. These treatments were followed by additional pump tests over a period of several weeks with no improvement in well yield measured. For sustained pumpage, the well yielded 12 gallons per minute which indicated a specific capacity of 0.3 gpm/ft.

In May of 1982, the test well was sited just 90 feet from the 1980 well. A "U" shaped pit with a gate between the two legs was dug and lined with six millimeter Poly Vinyl Chloride plastic sheeting. The pit was filled with weighted brine water (total dissolves solids equaled 323,000ppm and sodium chloride equaled 303,000ppm). Drilling was direct circulation rotary and the base of the Ogallala was encountered at 134 feet below land surface with static water level at 91 feet. During the drilling, dry granulated salt was poured into the drill pit directly above the suction hose intake. Salt—a total of 400 pounds—was added while the hole was drilled from 90 feet to 136 feet.

Casing and 40 feet of Johnson Irrigator screen were then set and the annulus filled with Brady-fine gravel. The well was then very lightly bailed for a few minutes to be certain it was making water. No further development was attempted at that time.

A submergible pump was then set and production tests were started. A sparling four-inch meter was used to measure well yield. Water levels and pumping levels were measured with an E-line gauge in the production well and a graduated steel tape was used for measurements in the old well located 90 feet from the new well. A squeeze valve was used on the discharge of the pump to limit production of water from the new well during the first two hours of the test. The valve was then fully opened and the well was produced at maximum capacity of the pump for the remainder of the test.

The test lasted only 1300 minutes because of inadequate disposal for the pumped water. Later during the growing season the well sustained long-term pumpage at a rate of about 60 gpm. This equated to a specific capacity of 1.4 gpm/ft as compared to the 1980 well's specific capacity of 0.3 gpm/ft, an increase of more than 400 percent.

SOME OBSERVATIONS

Residual chloride levels in the water produced during the pumping test were monitored with these results:

Residual Chloride Levels During Production Test

Minutes	*Chloride Level (PPM)*
20	15,000
44	12,000
120	8,000
250	4,500
1300	700

Free salt was added to the drilling fluid after reaching the water table, reasoning it would help plug the pore spaces of any zone accepting fluid. The fluid level in the pit had not declined perceptibly when the drilling was finished. And the character of the return fluid was visibly less turbid than fluids observed in conventional drilling. Cutting accumulations within the pit were almost totally confined to the entrance. On larger or deeper wells, it may be necessary to slightly enlarge or deepen the entrance portion of the pit.

The decision to not attempt any type of development activities may require additional thought. It was reasoned that the natural condition of the geologic formation and hydraulic characteristic was equal to 100 percent. The objective of this project was to drill a well without inflicting any damage. As a consequence, if the objective was successful, there would be no need to attempt development back up to the 100 percent efficiency level.

The efficiency of the new well is difficult to determine without a series of observation wells close enough to be affected by pumpage during a reasonable period of time. However, the efficiency may be estimated theoretically. The theoretical specific capacity of the well was 2.4 gpm/ft. The new well did not perform at this level. It has a specific capacity of 1.4 gpm/ft. However, the theoretical approach assumes homogeneous conditions which are obviously not true at this location.

Brine used as a drilling fluid stabilized the swelling clays which undoubtedly reduced damage to the formation and resulted in a more productive well. But there are advantages and disadvantages: Brine water is generally available throughout the High Plains or it can be made. Brine water is very corrosive. Drilling equipment would need to be flushed or washed down after use. The pit must be lined and the salt water properly disposed of after the drilling is completed. This includes the initial production from a freshwater well drilled with brine.

If future tests prove successful, contractors could obtain lined storage tanks and reuse the brine water as a drilling fluid. As an alternative, a portable tank with a solids control system could be easily adapted to satisfy the problems of handling brine water.

THE CROSS SECTION

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PATRICIA BRUNO, *Editor*

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Non-wilting Cotton Tested

Seven new drought-tolerant germplasm lines of cotton have been released by the Agricultural Research Service of the U.S. Department of Agriculture, the Texas Agricultural Experiment Station and Texas Tech University. These cotton lines are from exotic germplasm and have shown above - average tolerance to water stress.

These strains were developed from cooperative investigations among scientists involved in a multidisciplinary Plant Stress and Water Conservation Research Program located at Lubbock. The initial germplasm source was P.I. 154035 (Texas No. 25). This stock was obtained from the World Collection of cotton germplasm maintained by USDA-ARS personnel at College Station. Texas-25 will not flower under the long-day field conditions of temperate zones.

Early observations of Texas-25 under water-stressed field conditions at the USDA-ARS Field Station at Big Spring, revealed the non-wilting nature of this germplasm source as compared with that of a hundred other stocks. Additional field and rainout shelter studies showed that Texas-25 produced more biomass per unit of water than other stocks. Studies on water relations, stomatal behavior and transpiration, photosynthetic rates, soil water use, and root growth and development have supported the drought tolerance of Texas-25. Results of these studies are documented in several publications.

The uniqueness of this germplasm is the potential for producing more seedcotton when water is a limiting factor. The non-wilting leaf characteristics can be scored in August when the plants are under water stress. Each of the lines contain considerable variability in plant and boll types, earliness of maturity and other growth characteristics.

Germplasm quantities of the seed from these seven lines and more information about the tests are available upon written request to the USDA-ARS, Southern Plains Cotton Research Laboratory, Route 3, Lubbock, Texas 79401.

TEACHER . . . continued from pg. 1

From this initial meeting came a vision and rough plans for blanketing Texas schools with a water education program. The first order of business was to train teachers with a pilot program using the set of interdisciplinary water education teacher materials for K through 12th graders developed by Water & Man, Inc. out of Bountiful, Utah.

The goal of TSPE and others is to have water education taught at every school and grade level from the same text, at least to the end of this century. "We're not trying to sell a concept or promote anything," says Dorchester. "All we want to do is teach these children enough about the relationship between water and man and water and society, environment, industry and economics that they can then go out and make intelligent decisions."

The pilot program is designed to be a telescoping teacher training program which involves the regional educational Service Centers in Texas and through them the local school districts. In May a representative of Water & Man, Inc. came to Dallas and trained a core of two ESC staff each from three areas of the state. They, in turn, will conduct workshops to teach a select core of teachers and familiarize them with the Water & Man materials. The group plans to target 4, 6, 9, and 11th graders in four or five schools in each regional service center area. The areas identified for the pilot are Region VII, the Lufkin area in East Texas; Dallas, Region X in North Texas; and Midland's Region XVIII in West Texas.

In Midland the Educational Service Center staff teacher trainers are Sue Ashwood and Bill Whitfield. They have lined up six schools for this year's water education training session with two teachers from each school district involved. They hope the project will begin in November and that the interest will be contagious. Teachers will be drawn back together for evaluation and comments during the school session before a formal evaluation of the pilot next Spring.

Dave Dorchester pointed out that the pilot is aimed at several grade levels to get a feel for how the materials fit and what might need improving. The idea behind going to these regions, he said, was to try the material in dry West Texas, in a metropolitan area and in East Texas where everybody perceives that they have lots of water.

For the pilot this Fall, TSPE is funding the entire program. They have budgeted $7,000 for this phase of the project. "But I don't believe it will cost that much," says Dave. "A number of organizations have already indicated they will have funds available to help pay for the program. At this point we have not asked for any funds. We don't even have any estimates of what we'll need or what we can efficiently spend because we do not have our total program outlined yet or where we're going from here. We're not sure of the mechanics for expanding this program."

Dorchester says TSPE will probably be asking all the water organizations in Texas for some funding to carry out this program. Assuming they feel this fall's program was effective.

TSPE has invited representative organizations interested in the project to form an advisory committee. Advisory members identified so far include the Texas Education Agency, the Texas Department of Water Resources, the State Department of Health, Texas Water Utilities Association and Texas Water Conservation Association. The advisory committee's role will be to give direction to the steering committee now being formed to carry out plans as they are formulated. The group's next meeting will be in Dallas on August 31st when they hope to begin outlining the 1984 education program.

Anyone interested in lending financial or other support should contact Dave Dorchester at the Texas Electric Service Company, Box 1230, Midland 79702, (915) 683-4651.

TAES FIELD DEMONSTRATIONS:

AMARILLO, Texas—The Annual Field Day at the Texas Agricultural Experiment Station, NORTH PLAINS RESEARCH FIELD, will be AUGUST 17, 1983 at 1:00 p.m.

The event will start at the "West Campus," one-half mile east of the intersection of U.S. 287 and FM 281 at ETTER. At this location, cultural practices, timing of irrigation, sprinkler automation, and chemigation under center pivot irrigation will be shown and discussed.

Later at the "East Campus" near the headquarters building, corn, sorghum, and cotton variety trials will be shown. The efficiency of a furrow irrigation system that practically eliminates tailwater will be explained. Economical methods of managing PIK acres and research on death losses in cattle will be presented.

For additional information contact Dr. G. B. Thompson, Texas A&M Center, 6500 Amarillo Boulevard West, Amarillo, TX 79106, phone (806) 359-5401; or Cecil Regier, Texas Agricultural Experiment Station, North Plains Research Field, Etter Route, Box 74D, Dumas, TX 79029, phone (806) 966-5447.

LUBBOCK, Texas—The Texas Agricultural Experiment Station at the Lubbock location will host it's field day on Tuesday, September 13, 1983 beginning at 1:00 p.m. Other agencies located AT THE LUBBOCK-HALFWAY CENTER and cooperating in the event are the USDA-ARS, Texas Forest Service, Texas Agricultural Extension Service and the High Plains Research Foundation.

Highlights and topics to be featured will include weed control, cotton fiber quality, drought stress of crops, and grape research. In addition, specialists will be centrally located and available for discussions of specific problems.

Displays and exhibits will also be featured for public viewing. For more details call Don Rummel, 1983 Field Day Chairman at the Texas Agricultural Experiment Station, 746-6101.

FEDERAL WATER BILLS

New authorizations for the federal Clean Water Act are working their way through the congressional labyrinth and are expected to be brought to the House and Senate floors in late fall. The sheer complexity of the Act and its wide-ranging impacts on a variety of economic interests has generally given Congress cause for caution in the amending process.

Frequently understanding has been reduced to advocates of "clean" versus "dirty" water, good guys versus the bad guys, industry versus the public. This year's debate, however, has already produced a complex set of negotiations and discussion among participating parties.

Senate hearings are set to consider a new program left out of a full Committee bill to establish mandatory controls on non-point source pollution. This proposal authorized $150 million in new funding to establish a new state/federal program. States would be given primary responsibility for developing and later implementing management plans and practices to combat non-point source pollution. The matching program allows for the compatibility of plans between states, as well as consistency between state and federal plans. However, considerable opposition is expected from farm groups and some state agencies.

Amendments to ease certain provisisions in the bill are expected on the House floor. The committee bill included provisions that held to current protections for pretreatment and water quality standards, while extending industrial permits to 10 years. Industry supported amendments still under discussion that could be proposed on the Senate floor including a narrowing of coverage and placing of time deadlines on the Corps' 404 (dredge and fill) program, changes in pretreatment requirements and the tight water quality standards.

The bill is expected to include authorizations, deauthorizations, cost sharing, environmental mitigation, and other "holistic" approaches to address the water infrastructure. It is also expected to have a sizeable price tag.

"SODBUSTER" BILL AIMED AT EROSION

Congress is working on efforts to curb the rapid loss of the Nation's topsoil. Measures in both the House and Senate are aimed at eliminating incentives that farm subsidies provide for intensive plowing practices on fragile land.

The "sodbuster" bill (S663) would discourage plowing of land classified by the Soil Conservation Service as "highly erodible" by halting federal subsidies for fragile land cultivated for crops. Major farm organizations, conservation groups and the Administration support the bill.

House companion bill (H.R. 1077) was incorporated into a more comprehensive soil conservation measure entitled the Soil Conservation Act of 1983. This bill embodies three major provisions.

One provision mirrors the sodbuster proposal. Another offers cost sharing payments for land set aside for conservation practices under long term Conservation reserve contracts. The third allows farmers who use soil saving crop rotation practices to enter their land in a certified voluntary set-aside program. Under this program farmers could credit this land to any future federal acreage reduction obligation they may have.

House Agriculture Subcommittee on Conservation Chairman, Ed Jones (R-TN) believes the bill's cost to the government "would be very small indeed in comparison with what they save by reducing water pollution, flooding, dust storms and other damage."

(Edited from Water Information News Service, Vol. VII, No. VI.)

WATER FOR TEXAS Hearing Panel: Grubb, Nemir, McCleskey, Henry.

HEARING . . . continued from pg. 1

sprinkler systems, moisture sensing devices (gypsum blocks and tensiometers), and surge irrigation systems to conserve water. We do need your help in evaluating the economic benefits of these practices. We certainly could use your assistance in making videotapes to illustrate these water conservation techniques. These videotapes need to be shown at common gathering spots such as cotton gins, grain elevators and bank lobbies.

We would appreciate your help in developing an extensive information program directed at water conservation opportunities for all our water users. This information needs to be targeted at key individuals in the community such as bankers, loan and credit corporations, town councils or county commissioners. We need knowledgeable people who can help us explain to these community leaders how their towns could save money by adopting water conservation measures. Help them formulate a community water conservation program and a plan of emergency preparedness. We need your help in mobilizing a manpower force armed with model plans for cities and examples of positive economic results from water conservation. Also we need for you to stay long enough to see it initiated. We acknowledge financial assistance from the Department to help us start some of these programs. This financial assistance has long been exhausted, but the need has increased.

Item Number Two:

The Water Plan suggests that the release of water from the wet sands of the Ogallala Formation (secondary recovery of ground water) offers promise for extending the life of the water supplies in the High Plains of Texas. The Water Plan states that much additional research will be required to assess the recovery potential and the cost to release this water.

The Water District has conducted an extensive investigation of this potential water supply during the past two years, with assistance from the Department, Texas Tech University and others. We have concluded from our studies that it may be possible to release 25 percent or more of a total potential of 1.46 billion acre-feet of capillary water for future recovery by wells. Twenty-five percent recovery of this capillary water would increase our water reserves by 365 million acre-feet.

We believe that the Texas Department of Water Resources should provide some of the people and resources necessary to help us develop the technology to economically release capillary water for future use in the area of the Ogallala Formation, especially where the efforts could result in almost doubling the life of the High Plains' current water supplies.

Item Number Three:

The Water Plan suggests that desalting technology might help meet some of the state's future water needs. We agree with this assumption. The plan suggests that the Department will monitor the state-of-the-art desalting technologies and assist local governments and the private sector in planning and implementing desalting projects as resources permit. We did not find in the plan an up-to-date inventory of the saline water resources for the state. We believe that the Department needs to make a current inventory of this potentially valuable resource, especially for West Texas. We need maps illustrating where these saline aquifers are located, the depth below land surface that salt water aquifers occur, the thickness of these aquifers, the approximate quality and potential yield of these aquifers.

Many of the small towns in West Texas, in their search for future water supplies, need reliable data to evaluate this potential water supply source and to be able to compare costs associated with its development and treatment in the vicinity of the city to the cost of the purchase of fresh ground-water rights or construction of a reservoir several miles from the city with the associated cost of dams, treatment plants, wells, pipelines, and pumping costs.

Item Number Four:

Importation of water to the High Plains seems to be the ultimate solution of the High Plains/West Texas water problem. We realize the high cost associated with water importation at this time. Also, we realize that the United States currently has a surplus of food and fiber. Studies thus far on importing water to the High Plains indicate that if construction began today it would be 20 years before the first delivery of water was made. We do not believe the United States will continue indefinitely to have surplus food and fiber. In fact there was a story in the July 10, 1983, Sunday edition of the Lubbock Avalanche-Journal on the coming global water crisis. The global study group quoted in the story predicts a world wide food/fiber/water crisis before the year 2000. If we started construction tomorrow, we could not get water delivered to the High Plains before this crisis is predicted to occur. We, therefore, recommend that the Department continue to keep updated all of its water importation plans and keep all the options open for developing water importation agreements with our neighboring states.

We do have additional suggestions for positive action plans on artificial recharge, weather modification, and others; however, as a courtesy to those waiting to make presentations we will end our suggestions at this point, but promise to submit our further suggestion in writing within the next thirty days.

FLB LOAN OFFICERS RECEIVE TRAINING

FEDERAL LAND BANK LOAN OFFICERS from across High Plains came to Lubbock to learn more about soil and water conservation practices.

The Water District recently hosted presidents and loan officers from the Federal Land Bank Associations in the Panhandle and High Plains of Texas. Over 30 area representatives attended a High Plains Irrigation Seminar designed to answer basic questions and expose them to the state of the art in soil and water conservation practices on the High Plains.

The program touched on 18 different subject areas addressed by local experts in the hydrology of the aquifer, wells and well development, irrigation delivery, reclamation and application systems, soils, agricultural conservation management practices, efficiency evaluations, water related research, groundwater regulation, groundwater law and the future of irrigation in West Texas.

The program was a cooperative information exchange provided by the staffs of the Water District, the Soil Conservation Service, the Texas Department of Water Resources and the Texas A&M Experiment Station and Extension Services.

The seminar grew out of an idea by Austin Federal Land Bank Vice President Mark Harbin as a way to provide additional training and a better understanding of agricultural conservation programs to local loan officers already working with area operators. This training will help them to help irrigators implement good soil and water conservation programs.

The two day seminar included a field trip to get a closer look at some of the efficiency evaluations and soil moisture monitoring techniques being used on the James Mitchell farm at Wolfforth.

"The field trip most impressed many of us, "Mark Harbin told the District, "with how such a very small amount of water can be spread over such a wide area. Our chief concern is the cost of water and how it can be used by the operators to their best advantage."

This initial training was intended to provide a stepping stone off into more specific training topics for the Federal Land Bank associates. Participants say they also found there is lots more information available and easy to use than they had realized.

The success of this seminar will be reflected in the Federal Land Bank's ability to promote more and better soil and conservation practices and make loans for financing these practices in the future.

The District is planning to hold similar seminars in the coming months for other agricultural loan officers of banks, production credit associations and the Farmers Home Administration.

THE CROSS SECTION (USPS 564-920)
HIGH PLAINS UNDERGROUND WATER
CONSERVATION DISTRICT NO. 1
2930 AVENUE Q
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THE Cross SECTION

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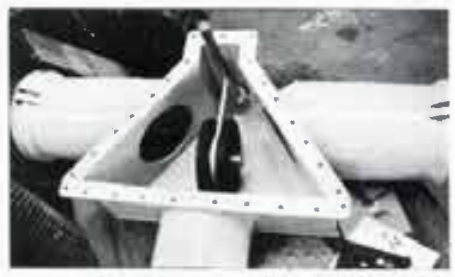
Volume 29—No. 9 Publication number USPS 564-920, Second Class Postage paid at Lubbock, Texas *September, 1983*

MAPS SHOW VOLUME OF STORED WATER

Colored maps illustrating the saturated thickness of the Ogallala aquifer in 1980 and as projected for the year 2000 are printed on pages two and three of this issue of the Cross Section. The 1980 map was compiled from detailed maps constructed by the High Plains Underground Water Conservation District No. 1, the Panhandle Ground Water Conservation District, the North Plains Water District and the Texas Department of Water Resources. Individual county hydrologic atlases for those counties served by this Water District are available from the District office.

The colored map for the year 2000 is a computer constructed map produced by the Texas Department of Water Resources using the 1980 map as a base. Changes between the two maps are a result of projected pumpage which was introduced into the computer program to simulate pumpage between 1980 and the year 2000. The water use projections are based on the assumption that the High Plains irrigator will implement as many conservation techniques as possible from now to the year 2000.

The table that follows gives the estimated volume of gravity water in storage in the High Plains aquifer by county in 1980 and the estimated quantity which will be in storage in the year 2000. *(See page 4.)*



A NEW CONTRAPTION—Roger Kitten explains what he likes about surging. The battery powered timer controls when the gear switches water from a set on one side of the valve to a set on the other. The valve openings are sealed by a moveable rubber disk. (Valve manufactured by Aluminum Metal Products, control box by Lubbock Electric.)

Surging Saves Water

Surface irrigation's newest improvement since underground pipe is being called surge. What makes it unique is its ability to control flood furrow watering by cycling the water flow for specific periods, diverting it from one side of the set to the other. The on-off surge influences the speed with which the water travels down the furrow and affects the soil's water intake and distribution pattern.

The advantages of surge irrigation are its ability to let an irrigator water more rows in the same or even less time, while leveling out the pattern of infiltration down the row. Surge still gives good root zone wetting without losses to deep percolation at the top or bottom end of the field. Surging can control tailwater or even eliminate it without sacrificing a good soaking, just by controlling the rate at which the system switches water flow from one set of furrows to the other. That will depend on the soil's infiltration rate. Surge improves irrigation efficiency and uniformity.

There are several commercially available surge systems coming on the market. Each has some kind of valve which diverts water from a set of gated pipe on one side of the riser to a set on the other side, and each has an automated switching control device or a timer.

The system on Roger Kitten's farm near Slaton runs on a 12 volt battery. This differs from other systems which use a minimum of two pounds of water pressure to operate the valves and a 6 or 12 volt battery for the control switches (see Cross Section June 1983). Kitten's unit uses an electric motor with an actuator to do the switching. One valve is opened as the other closes to change the direction of the flowing water in the pipe. The control timer can be set anywhere from 15 seconds to 640 minutes (10.6 hours).

Kitten says he normally watered four rows at night and three during the day with his 250 gpm well on 12 hour sets to get his water out. He could only run three rows during the day because with the heat he just couldn't get out four rows. After he hooked up the surge, Kitten says he could run 5 rows on each set every 12 hours for a total of 10 rows in 24 hours. "And we hardly had any tailwater, where normally we'd have it all over." He almost gains one half day of watering for each full day of operation with the surge.

"If you looked down this row at how far the water soaked out," Kitten illustrated scraping the soil with his heel, "normally on this skip-row cotton it would soak out from the stalk about 40 inches on both ends of the field. Through the middle it would barely be out past the cotton. When we started using surge we got an even soaking all the way through the field."

Kitten says he thinks the surge system will also help him on his new load management irrigation well control agreement with the electric coop. "With this system our rows are already set, so if they cut off my wells I won't have to come out here and do anything but turn them back on when the controls are cut, and just go on back to the house."

Richard Bendarz, also a Slaton irrigator, invited the Soil Conservation Service to run their first surge test in Lubbock County this spring on his cotton. "We were watering 6 rows every 8 hours, and getting the water out real well," said Richard. "But when they came out with this surge equipment, we ran 12 rows for 10 hours. They were out in 8, but we gave each side another hour to make sure the bottom end got wet enough to plant."

Richard says he hasn't gone back to regular watering since. "I like the surge so much I bought the unit and just kept running it." I think you can water, depending on the land, from 50 to 100 percent more ground if you wanted to. But while you're doing that you're putting down half as much water."

Surge is also proving a real labor saver for Richard. "I've got a surge system in Wilson running right now.

continued pg. 4, col. 2 . . . SURGE

TAX CREDIT PROPOSED

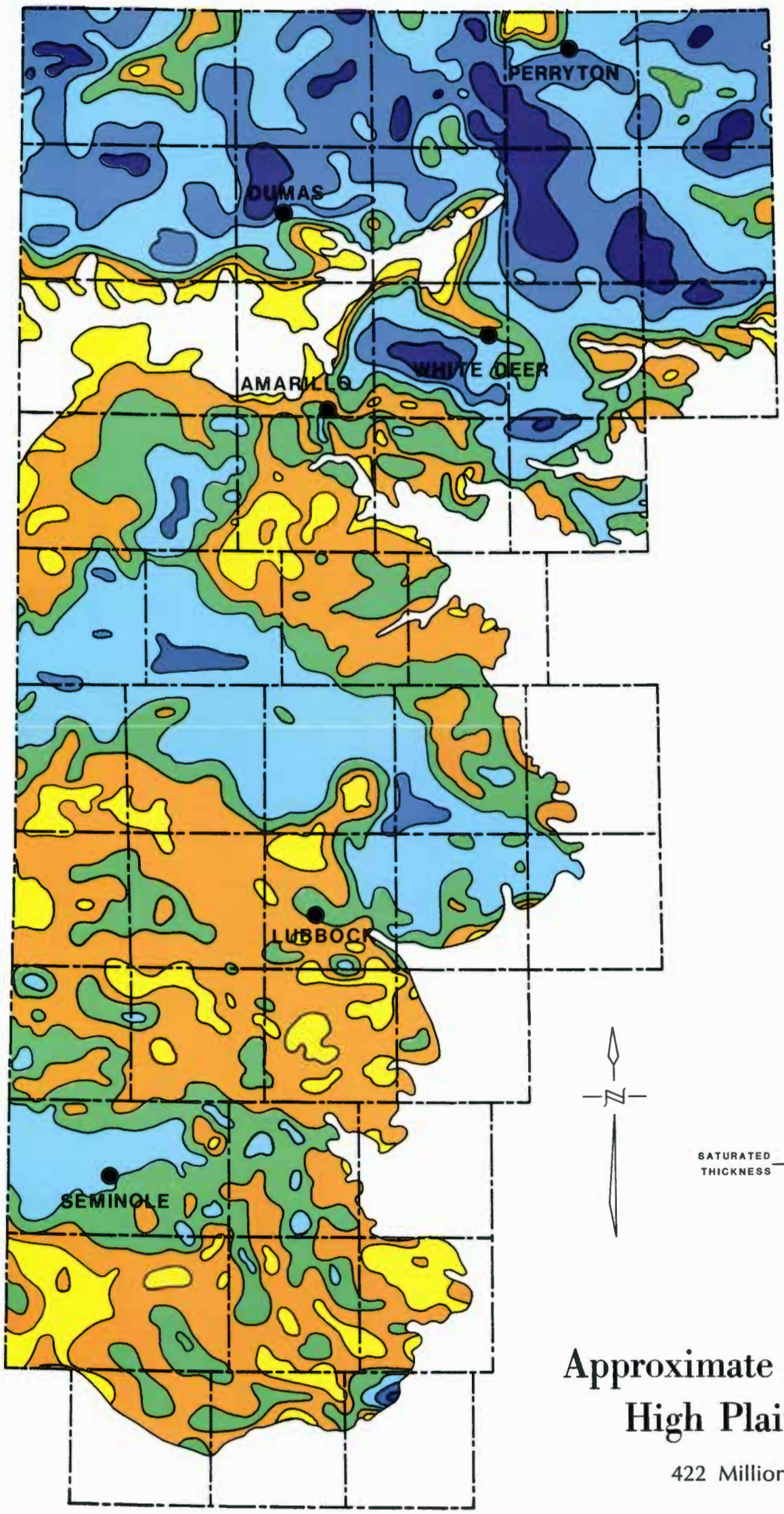
A landmark amendment has been introduced by Congressman Kent Hance (D-Tx) to allow an additional ten percent investment tax credit for new, more efficient irrigation equipment.

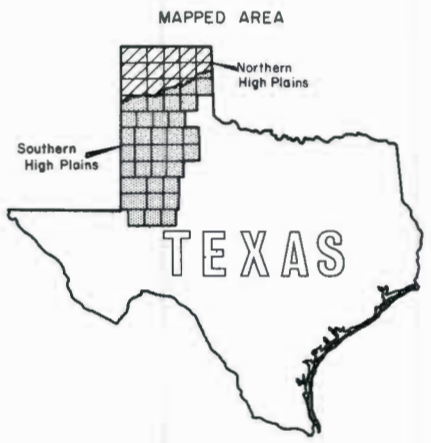
H.R. 3759 would amend the 1954 Internal Revenue Code to allow the 10% tax credit for equipment purchased beginning January 1, 1983 through December 31, 1989. The new equipment as specified in the bill is "new irrigation water conservation property . . . which is used in the irrigation of agricultural or horticultural commodities . . . which is part of a system which, taking into account such property, is a qualified irrigation system (including property necessary to convert into a qualified irrigation system a system which, when placed in service, was not a qualified irrigation system . . ."

Qualified irrigation systems defined by the bill include: a low-pressure precision application sprinkler system, a drip irrigation system, an automated surge furrow irrigation system, a gated pipe furrow irrigation system, or an underground irrigation pipeline system. The term qualified irrigation property defined by the bill means equipment to monitor soil moisture, flow meters and equipment to recirculate tailwater.

The bill also specified that the tax credit allowed cannot exceed 25 percent of gross income derived from farming.

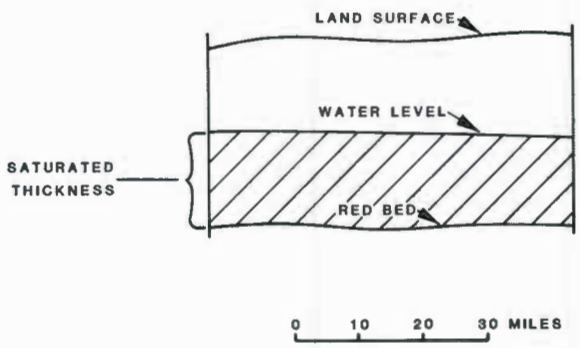
HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1





EXPLANATION

- Less than 20 feet
- 20 to 60 feet
- 60 to 100 feet
- 100 to 200 feet
- 200 to 300 feet
- Over 300 feet

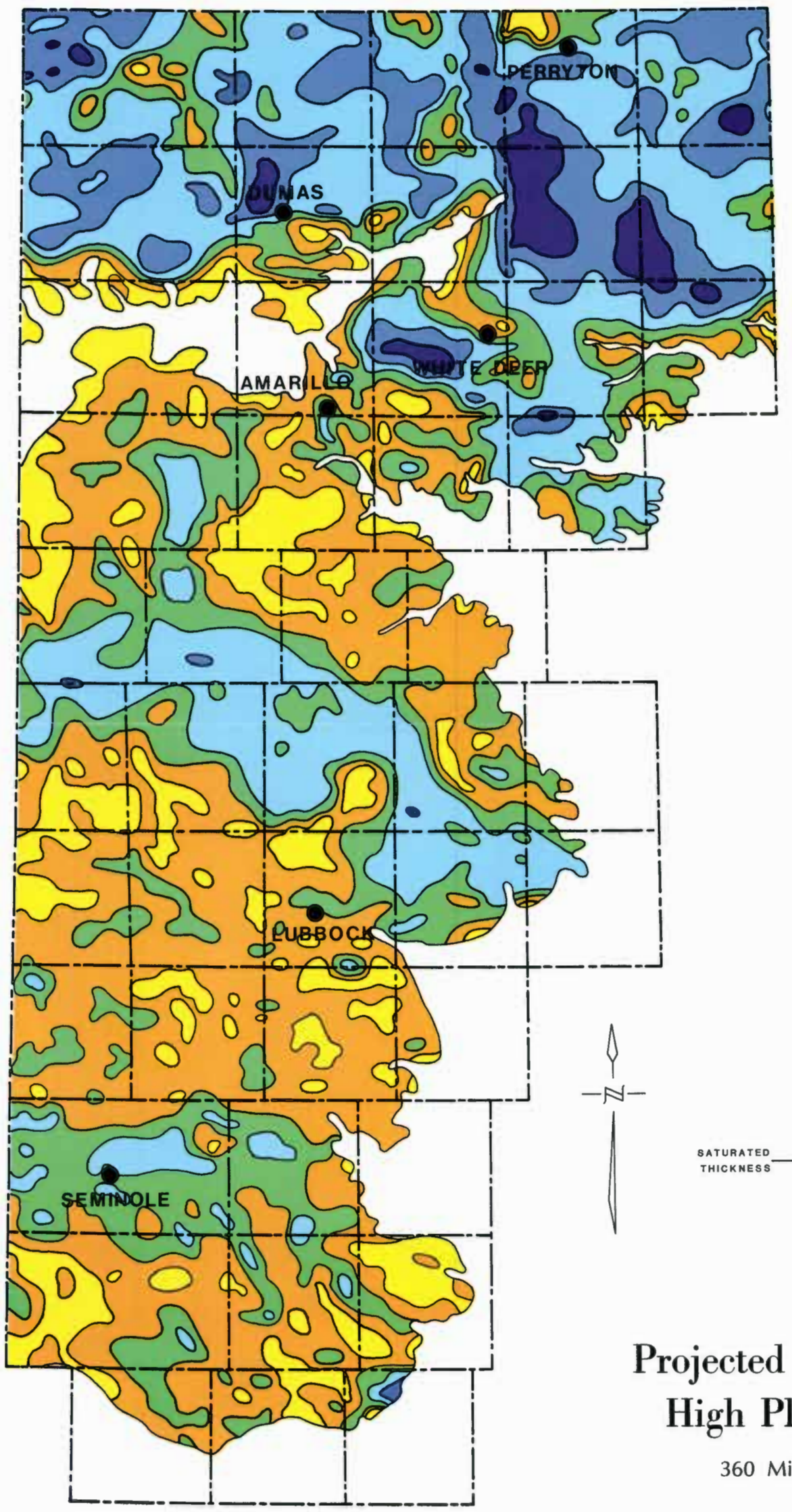


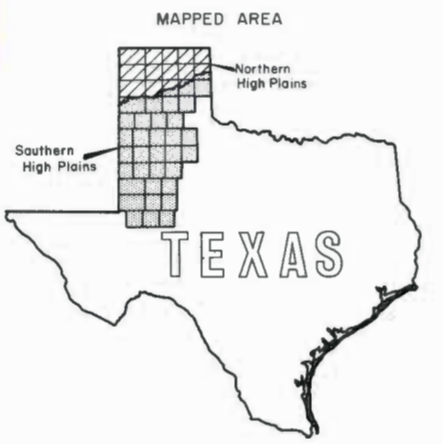
Approximate Saturated Thickness High Plains Aquifer, 1980

422 Million Acre-feet of Water.

Compiled by the Texas Department of Water Resources from working maps constructed by the High Plains, North Plains, and Panhandle Underground Water Conservation Districts and TDWR.

HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1





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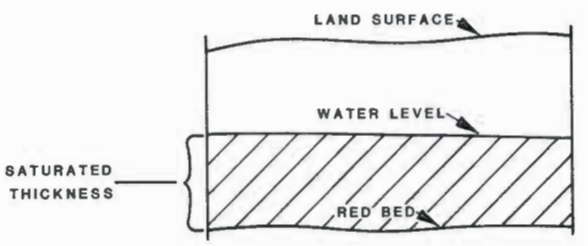

0 10 20 30 MILES

Projected Saturated Thickness High Plains Aquifer, 2000

360 Million Acre-feet of Water.

Map projection computer generated by Texas Department of Water Resources.

Estimated volume of recoverable gravity water in storage in the High Plains aquifer by county

This is the amount of gravity water in storage in 1980 and the estimated quantity which will be in storage in the year 2000 if High Plains residents maximize water conservation efforts. It assumes that the bottom ten feet of saturated formation will not be recoverable. This bottom ten feet of formation would contain an additional 35.9 million acre-feet of water. Values are in acre-feet of water.

County	*1980*	*2000*
Andrews	3,340,000	3,000,000
Armstrong	3,100,000	2,640,000
Bailey	5,990,000	4,440,000
Borden	30,000	20,000
Briscoe	1,100,000	710,000
Carson	13,600,000	11,240,000
Castro	12,300,000	8,150,000
Cochran	2,780,000	2,070,000
Crosby	5,180,000	5,080,000
Dallam	28,430,000	23,370,000
Dawson	4,150,000	4,120,000
Deaf Smith	9,970,000	7,140,000
Donley	7,340,000	7,000,000
Dickens	630,000	530,000
Ector	1,810,000	1,770,000
Floyd	8,840,000	6,500,000
Gaines	12,040,000	9,940,000
Garza	260,000	250,000
Glasscock	840,000	800,000
Gray	12,480,000	11,650,000
Hale	12,710,000	10,420,000
Hansford	23,620,000	18,170,000
Hartley	26,960,000	24,100,000
Hemphill	15,370,000	15,000,000
Hockley	3,360,000	2,950,000
Howard	580,000	550,000
Hutchinson	10,170,000	9,080,000
Lamb	10,100,000	7,450,000
Lipscomb	19,590,000	18,720,000
Lubbock	3,880,000	3,480,000
Lynn	1,900,000	1,890,000
Martin	3,510,000	3,390,000
Midland	1,270,000	1,070,000
Moore	13,650,000	10,460,000
Ochiltree	18,140,000	15,670,000
Oldham	880,000	780,000
Parmer	10,370,000	6,430,000
Potter	2,760,000	2,260,000
Randall	3,410,000	2,410,000
Roberts	26,610,000	26,000,000
Sherman	22,440,000	17,280,000
Swisher	4,000,000	2,790,000
Terry	2,980,000	2,560,000
Wheeler	7,540,000	7,000,000
Yoakum	4,210,000	3,500,000
TOTAL	384,670,000	324,200,000

Source: Evaluating the Ground-Water Resources of the High Plains of Texas; Texas Department of Water Resources; Austin, Texas, 1982.

RICHARD BEDNARZ

SURGE . . .

(continued from page 1)

It's at least 10 miles to get there and I'm changing sets every six hours because the cotton is trying to heat up and I haven't got enough water to get across it fast enough. I couldn't go out and change water every six hours there and at my dad's and plow unless I had the surge. It's changing water for me and I get out there twice a day now. That saves one trip a day."

"I think it's a step toward a sprinkler system. With a sprinkler you can put down an inch of water if you need it. Surge can get close to that. You can't get that slight an amount, I don't think, but if you want to get down a light watering, you can. I like it, I think they're great."

Surge irrigation also has several late season applications. For example, surge units are now being used in light watering where only a little additional moisture is needed to help hold the fruit on cotton. A normal flood furrow watering this late in the year could trigger new vegetative growth which would not mature but would cut into yields and increase harvest costs. Wheat growers who will drill wheat into dry beds this fall need only a small amount of water to germinate the seed. Surge is an excellent tool to "water up" winter wheat, since it can apply a light watering of only a few inches just to get the seed growing.

FROM A HANDFUL of dry grass sprigs taken this Spring from Ray Kitten's playa near Slaton, Wayne Wyatt has sprouted a hearty 30 x 3 feet patch of KNOTGRASS and set out over 60 pots. His thriving patch is over 12" tall and extending runners over 3 feet long. Samples for protein analysis have been collected.

Comparing Moisture Sensors

Three different soil moisture measuring instruments that are capable of predicting when to irrigate for maximum benefits, are being studied on several area farms by the Water District and the Soil Conservation Service. The three are the neutron moisture meter, the tensiometer and the gypsum moisture block. Each uses a completely different mechanism to measure soil water, and each has its advantages and disadvantages.

The purpose of the study is to calibrate all three instruments and come up with a comparison for the gypsum block and the tensiometer that relates to moisture content of the major soils in the area. In this comparison, the neutron meter is being used to gather the base-line data for evaluating the more farm adaptable and affordable tensiometers and gypsum blocks. The neutron meter reads soil moisture most accurately of the three and displays the relationship of moisture content to the soil in terms of inches per foot. The study team will develop tables for irrigators to use to convert the relative scale reading of the gypsum block meter and/or tensiometer gauge into inches of water needed to refill the soil profile.

The neutron moisture meter uses a radioactive source and state-of-the-art electronics to measure soil water. It is very reliable and accurate. It is also expensive ($3,600) and owners must be licensed to handle it by the Texas Department of Health. Because the radioactive source could create a health hazard, its use requires special storage, transportation and handling procedures.

Tensiometers are reliable, but require maintenance in the field. They are successfully used in determining the need for irrigation when the soil moisture is kept near field capacity. Their range of usefulness is dependent on soil texture. In sandier soils they will read soil moisture down to 60% moisture depletion or 40% of field capacity. Most crops require additional irrigation water before 50% of the soil moisture is depleted. In clayey soils, tensiometers lose their ability to indicate soil moisture at about 25% soil moisture depletion, or 75% of field capacity. The clays hold water in greater tension than the tensiometer can continue to measure. Therefore, they lose contact with the soil and stop indicating moisture levels before it's time to irrigate.

Tensiometers cost about $40 each but are reusable. They are made in different lengths to measure moisture at various soil depths. They are simple to use, but require periodic filling with a fluid.

Gypsum blocks are made by casting gypsum around a pair of stainless steel electrodes with lead wires trailing. The blocks are buried in the soil and their resistance to an electrical current is measured with a resistance meter. The wetter the soil, the lower the resistance reading. Gypsum blocks cost about $2 to $4 each. Four are usually buried at different depths at each site. The meter costs about $100. New blocks must be installed each growing season because the gypsum deteriorates. They are inexpensive, simple to use and measure a wide range of moisture contents. They sometimes do not operate correctly in loamy sands because when these soil types are fully wet they are not plastic enough to seal the gypsum block. Also, the gypsum blocks are not always accurate when soils are near field capacity, but give accurate moisture readings when soils are less wet.

Tensiometers are best used when soil moisture must be maintained at 50% or above field capacity in high moisture-using crops such as corn and vegetables. Gypsum blocks work best when used with less water-sensitive crops such as cotton, grain sorghum and small grains.

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THE Cross SECTION

INDUSTRIAL AGRICULTURAL MUNICIPAL

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A COUPLE OF FIGHTERS: Tx. Rep. "Buck" Buchanan (L) and Sam Collins (R) President of TWCA and general manager of the Sabine River Authority, both addressed the TWCA ground water and irrigation panels in Dumas.

WEST TEXANS WARNED:

TAKE CARE OF BUSINESS OR FACE STATE CONTROL

The Texas Water Conservation Association's Groundwater and Irrigation panel members rode to Dumas last month from all around Texas for a first hand look at water conservation West Texas style.

Dumas State Representative, J. W. "Buck" Buchanan warned, "if Texans don't take care of business and form groundwater control districts created by local elections under legislation we can live with, the State is going to come in and look after it for us." Buck reminded the panel that the League of Women Voters, the Sierra Club and others are proposing that the State ought to control ground water. Buck agrees that all the State's water should be managed, but he said that the bill he introduced last session to change the way water districts were formed in the State to allow for the creation of many more local ground water management districts never made it out of committee.

Buck also spoke on another controversial issue. "Water importation will be necessary," he said. "Right now it's a bad word, especially in East Texas; but if we keep growing there will not be enough water in the State to take care of the need. We can't expect to go outside of the State until we've developed the remaining 19 reservoir sites already identified in Texas."

Buck suggested that bays and estuaries, recreation and fish and wildlife people should begin to pay fees for future dam construction. "Every Texan would benefit from having available, plentiful supplies. So every Texan should be willing to pay for water," Buck said.

Sam Collins, TWCA President, and general manager of the Sabine River Authority in Orange, Texas, also spoke during the two day program and farm tour. He had some good news and some bad news. "The good news is that by the year 2050 we'll be drinking recycled sewage. The bad news is there won't be enough to go around."

Speaking on local responsibility for controlling water pollution, Collins said the most effective place to monitor waste disposal is at the source of potential pollution. Citing a bill in Congress to create a national groundwater commission, Collins echoed Representative Buchanan's remarks saying, "Everybody's getting into the groundwater business. Don't sit back and let someone from the federal government take over."

On the 120 mile farm tour program participants reviewed some of the newest irrigation water conservation technologies and research going on in West Texas. Leon New, Texas Agricultural Extension Service Ag Engineer in Amarillo, presented an update on pump plant efficiency gains since initial efforts to improve agricultural energy use. Bill Lyle, TAES Ag Engineer in Lubbock, presented new designs in a prototype ultra low pressure sprinkler using micro electronics for a no-till operation that in the future could allow the irrigator to plant, fertilize, chemigate, water and not have to enter the field with equipment until harvest.

Cecil Regier, TAES Research Scientist at Etter, Texas, reviewed current research in LID, Limited Irrigation Dryland, and other limited irrigation application systems under different cropping rotations, and summarized a study comparing high and low pressure center pivot performance.

SCS Ag Engineer Jerry Walker in Amarillo, presented the first findings on the application of surge irrigation as a labor, water and energy saving system

continued on pg. 3, col. 4 . . . TWCA

EXOTIC COTTON LINE IS SUPER WATER SAVER

An old research tool being put to new use at the Texas A&M Agricultural Experiment Station of Lubbock is opening new avenues of plant research and is playing an essential role in evaluating exotic cotton germ plasm.

It's much bigger than a bread box, but it does a similar job. It keeps out moisture and controls the environment. Researchers call it a rainout shelter. The Experiment Station introduced the use of rainout shelters on station in 1976. Their first shelter was a little 20 x 40 foot moveable sheet steel box. Today they use five shelters to cover nearly an acre of research plots to evaluate exotic cotton and grain sorghum lines, turf varieties, growth regulators, and for other cooperative studies by TAES, the USDA and Texas Tech University.

The shelters are not an original idea, but researchers say their practical research application at TAES is unique in the world. For example, in one study here, soil-plant-water scientists, plant breeders, plant physiologists and geneticists are cooperating in an integrated program of genetic screening to develop new crop varieties that will eventually be in producers' hands. For this purpose the shelters offer some special advantages.

"The big thing I see," says Dr. Jerry Quisenberry, research geneticist, "is that we can get consistent information on crops year after year. I just finished working 5 years of data from the rainout shelter with consistent results. When we're looking at lots of variables occurring in the environment each year and trying to study just one—water—the shelters give us consistency. It's not the real world but it's repeatable."

West Texas weather is some of the most variable in the world. The shelters offer effective crop protection from untimely rains and hail. In 1981 and

continued on pg. 3, col. 1 . . . SHELTER

ON THE ROAD—In Dumas, Bill Lyle, TAES Agriculture Engineer at Lubbock, explains the design of an experimental dropline nozzle which reduces soil erosion in the furrow under a low pressure sprinkler.

Black Hole Discovered

THIS ABANDONED domestic well in a residential area in Lubbock was discovered by children playing.

Remember 4 year old Jared Artho's miraculous rescue from a 260 foot open hole in Deaf Smith County two summers ago? His uncle was filling the hole with sand when the boy got too close. It was the first case in the water district's 30 year history of a child falling down an abandoned hole.

Those lessons are hard to forget. But some of us do. Over the last year the water district field technicians have located 48 abandoned open holes in Parmer County. These discoveries were made during a routine survey for this and other programs. Those landowners and operators have all covered or completely filled those holes. But that represents just one county in the High Plains where the estimated number of wells is near 70 thousand.

The District won't find most of the abandoned well holes. We are usually notified of an open hole by someone else, often hunters, surveyors, or neighbors who live close to those dangerous abandoned well sites.

Most recently we were notified of an old domestic well hole that was discovered by children playing in a Lubbock city lot newly cleared of a demolished house. That site was located in a residential neighborhood surrounded by family homes. The district filled and sealed the 35 foot hole without incident but not without concern.

Said Obbie Goolsby, District field technician who oversees the open hole monitoring program, "People need to know how dangerous these are. Even if its only a 15 foot deep hole, if a child fell in and the dirt fell in on top of him, he could suffocate. It's a death trap."

State law requires that all open holes, ten inches or more in diameter be kept covered at all times with a permanent cover. The District's rules are the same as state law.

If you know the location of any of these dangerous abandoned well holes, notify the High Plains Underground Water District or your local police.

Water Ruling

In a case with far-reaching implications for agricultural, energy and urban development in Colorado, the State Supreme Court has ruled that deep groundwater supplies cannot be tapped by developers or corporations which simply lay claim to them. Rather, groundwater can be claimed only by landowners who secure state permits and comply with state regulations designed to prevent the depletion of aquifers and damage to neighboring users.

The case involved claims to more than 1.5 million acre-feet of groundwater by Denver geologist/lawyer John Huston and a group of partners. The claims were based on the state's constitution which grants water rights to the first person who claims the water and puts it to beneficial use. The high court ruled, however, that groundwater is not subject to appropriation and adjudication procedures as surface water is, thus rejecting the priority system, and that access should be regulated by the well permit system in which an applicant for a groundwater permit must be the person owning the land above the water. The Court's decision "will prevent the wholesale hoarding of groundwater for private speculation," said Governor Dick Lamm.

(From the Groundwater Newsletter, July 31, 1983)

HOUSE TO STUDY

Local Water Issues

Texas House Speaker Gib Lewis recently announced the interim study charge to the House Committee on Natural Resources. Two of the topics he assigned for study by the Committee should be of interest to West Texans. They are to investigate and monitor all efforts being made in Texas with regard to, and determine the potential for, increased ground water production and supplies through enhanced recovery methods. The Committee is also charged to investigate and recommend legislation for management of ground water.

The Committee is made up of State Representatives Tom Craddick, R-Midland, chairman; Rodney Tow, D-Conroe, vice chairman; Gerald Geistweidt, R-Mason, chairman for Budget and Oversight; J. W. Buchanan, D-Dumas; Chip Staniswalis, R-Amarillo; Hill Kemp, D-Manvel; Arves Jones, R-El Paso; Roman Martinez, D-Houston; and Noel Grisham, D-Round Rock. The Committee is to prepare a final report to the 69th Session of the Texas Legislature.

Other interim study charges made by the Speaker to the House Committee on Agriculture and Livestock of possible interest include the assignment to examine the economic feasibility of the conversion of irrigated farmland in West Texas to water-efficient crops and/or dryland farming.

Water Legislation Committee Named

Lieutenant Governor Bill Hobby and Speaker Gib Lewis announced their appointments to the Joint Study Committee on Water. Membership consists of Senator Tati Santiesteban, El Paso, Chairman; John Sharp, Victoria; John Montford, Lubbock; Bob Vale, San Antonio; Representative Tom Craddick, Midland, Vice Chairman; J. W. "Buck" Buchanan, Dumas; Hill Kemp, Manvel; and Rodney Tow, Conroe. Lewis Beecherl, Jr., Chairman of the Texas Water Development Board is an ex-officio member of the Committee.

The committee is to study the proposed legislation that was introduced last session as the "Water for Texas" package.

That package included eight water-related bills that included financing, conservation, fresh water inflows to bays and estuaries, and pollution control relative to oil and gas recovery. *(TWCA Water News, 8-83)*

THE Cross SECTION

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RAINOUT SHELTER at Agricultural Experiment Station at Lubbock.

SHELTER . . . continued from pg. 1

1982 rain and hail played havoc with Experiment Station research plots. According to Dr. Quisenberry, the weather in 1981 and 1982 was so erratic that the only quality data on the whole station came out of the rainout shelters. "What's that worth?" asked Quisenberry. "Figure the operation out here at a value of 3 to 4 million dollars a year. If a hail storm comes across and takes all of it out, the taxpayer still pays and gets zilch for it. So what's the value of a rainout shelter on five acres?"

The shelters are beginning to pay off with results in some exciting new research discoveries. One of the first has been the development of breeding lines from the exotic cotton line T25.

The breeding lines from the exotic are the collective work of many scientists and over five years of meticulous genetic screening through several rainout shelters.

The process began with parents from the world collection of wild, exotic cottons. These were screened for varieties with water use efficiency characteristics in the "which" shelter—which do we keep and which do we throw out. Offspring from these select parent plants went to the "why" shelter where scientists searched for why these plants produced more dry matter. T25 was the only cotton line to survive the long screening process to produce efficient water uses.

T25 has an extensive fibrous root system with lots of lateral roots. It's not a traditional cotton tap root. It also has 5 vascular bundles (more than all commercial cottons) to take the water up the plant and move it to the leaf surface. T25 has a better regulator system of stomata resistance (stomates are the pores that let the water out). Scientists find a tighter coupling in T25 than in most cottons between its photosynthesis (the taking in of carbon) and transpiration (the giving off of water). This is where it gets its water use efficiency. T25 collects more water and has a better control valve to release it at the leaf surface.

T25 is the result of 5 years of cooperative work in rainout shelters between TAES, the USDA Agriculture Research Service and Texas Tech University. "We started really developing the lines from T25 in 1981 and 82 and are testing in 83," explained Dr. Quisenberry. "We have a joint release of the germ plasm signed by Texas A&M, Texas Tech University and USDA, but are holding it because we don't yet have enough seed to supply the requests."

The Plant Stress Program (PSP) lines are the first to make it all the way through the screening research program under the shelters, but researchers envision the program expanding.

Says Dr. Charles Wendt, TAES Soil-Plant-Water scientist who is responsible for getting the first shelters on station and pushing for their broader use, "If we had 5 acres (of shelters) we could fill them up right now. The rainout shelters are going to be an ongoing tool for research from now on—at least until something better comes along."

Thanks, Wilson

The Board of Directors of the High Plains Underground Water Conservation District No. 1 extend their sincere appreciation to the Wilson, Texas Lions Club for their expression of support from the residents of Wilson. The Wilson Lions have contributed an unsolicited check for a hundred dollars to help promote water conservation in the High Plains of Texas. The Board and staff view this expression of support as a vote of confidence and a statement that the people we work for really care about what we're doing and about solving the water problems of our area. Thanks, Wilson! We'll redouble our efforts and do even more.

Conservation Chemical Till Could Save An Irrigation

Interested in saving a four inch application of water in the Spring? It can be done through a conservation chemical tillage program. The Hale County Soil and Water Conservation District, Soil Conservation Service and the Hale County Extension Service have begun three pilot conservation tillage plots in the Plainview area.

Reasons for pushing this concept are economics and the fact that chemical companies have developed several outstanding chemicals that open the door to this method of farming.

The three landowners who have helped get this project on the road are Mr. Flip Calhoun, Mr. Paul Robertson and Mr. Weldon Gregg. The no-till situations they have utilized have been sorghum, millet and/or soybean planted into wheat stubble. Chemicals used and furnished to the Hale County SWCD have been Poast, Blazer, Paraguat, Dual, Roundup, Sencor, Lexone, Lasso, Banvel and Igran 80W. The Hale SWCD and SCS have piloted this project to adopt new equipment and chemical application to their local conditions. If you are interested in these field size plots and how they are performing, contact Dennis Neffendorf, Agronomist, Lubbock (743-7644) or Jimmy Lewis, District Conservationist, Plainview (296-2149) for more information. One of the reasons these plots have been initiated has been to demonstrate and show how no-till works on the southern High Plains.

BUFFALO AND TYE NO-TILL equipment were furnished to demonstrate the use of conservation chemical tillage, its versatility and effectiveness, in planting a proper seedbed in heavy residue.

Roming Appointed

As promised, Governor Mark White recently appointed a West Texan to the Texas Water Commission. Ralph Roming, a 44 year old Parmer County farmer from Bovina, is already on the job in Austin serving his 4 year term as a commissioner. His appointment was announced on September 2, and Ralph says he learned of it only an hour before he was sworn in.

Roming is Chairman of the Citizens Advisory Committee to the Texas Low Level Radioactive Waste Disposal Authority and a member of the Agricultural Producers Advisory Committee jointly created by the Governor's office and the Texas Department of Agriculture. Roming served for 8 years as a county committeeman of the High Plains Underground Water Conservation District No. 1. He is a co-founder and former chairman of the Texas Chapter of the American Agriculture Movement and a member of the President's Council, Texas Farmers Union.

His responsibilities with the Water Commission, formerly the Texas Water Rights Commission, include acting on applications for water use, waste disposal and other permits, the creation of water districts and funding approval of applications for bonds by water districts.

Roming has worked in water related issues and in state government as chief clerk of the Texas House of Representatives Agricultural and Livestock Committee from 1979 to 1980. He was legislative director of the Alcohol Fuel Products Association from 1980 to 1983.

A graduate of Muleshoe High School, Ralph farmed in Bovina for 20 years. He produced corn, milo, wheat, cotton and mixed vegetables on 1700 irrigated acres, and grazed 3 to 5 hundred head of steer yearlings on wheat pasture and crop residue during the winter months.

Roming says he has realized that water is the most crucial problem that the state faces for the next 20 years.

TWCA . . . continued from pg. 1

for furrow watering. The surge system allows for greater flexibility and greater control over application, helps eliminate deep percolation losses and tailwater runoff. But Jerry reminded the attendees that the surge system will not work by itself, it requires management.

The TWCA meeting was hosted in Dumas by the North Plains Water Conservation District Directors and Manager Orval Allen, and by the High Plains Underground Water Conservation District.

DOE RESPONSE POOR

Concern is growing among the High Plains Water District staff geologists and directors that the Department of Energy is either evading the facts or does not itself understand them, concerning the site evaluation studies and technical reports on proposed nuclear waste disposal sites in the Southern High Plains of Texas.

James Conkwright, Board Director representing Armstrong, Deaf Smith, Potter and Randall Counties within the Water District's service area, questioned DOE's response to a set of technical questions he submitted to it through a recent letter to Senator Lloyd Bentsen. There was serious difference of opinion between DOE's answers and what HPWD geologists believe the evidence says. The questions relate to groundwater hydrology studies of the area's salt beds, brine migration, and aquifer systems. The interpretation of the findings could have far reaching consequences for the surrounding communities which rely on the Canadian and Red River basins and on the Ogallala Aquifer for their water supplies.

Conkwright stated in his letter to Senator Bentsen, ". . . I consulted with the High Plains Underground Water Conservation District No. 1's geologists who have been studying the reports provided by the DOE and the Bureau of Economic Geology at the University of Texas at Austin, on the studies which have been made to evaluate these sites. There is a vast difference in opinion as to what the evidence says; therefore, I have restated my questions and the answers provided by DOE as well as the response made by the Water District's geologists to the DOE answers for your consideration. I sincerely believe that the DOE is not accurately responding to my questions. They are providing answers which probably sound adequate to someone who does not have technical training; however, our technical people were appalled at some of DOE's responses."

The following is an excerpt of only one of those questions, answers and responses.

Question 1: Information developed by the Bureau of Economic Geology at the University of Texas at Austin indicates that the salt beds in which the nuclear waste is to be stored are saturated with water and, further, water is moving through these beds. The question is, has DOE addressed the problem of leakage through drips and spring flow into and out of the tunnels where the waste is to be stored? If so, how is it to be managed?

DOE RESPONSE: Salt beds lie deep beneath the water table and are technically in the "saturated zone." However, salt formations do not contain interconnected voids to transmit water and are thus dry. What little water is present (less than one percent) is in the form of microscopic bubble-like inclusions that lie within the interlocked crystals of salt. Any migration of the water is via dissolution of salt at one edge of the inclusion and precipitation at the opposite edge. Typically, any fluid inclusions in salt is in the form of saturated brine, so it tends to be in equilibrium with the salt. Therefore, there is little driving force and the inclusions of water (brine) move at an inexorably slow pace. Isotopic analysis indicates that the water droplets in these inclusions are remnants of the sea water trapped during deposition of the salt nearly 300 million years ago.

There is no evidence of any water leaking through the salt beds. Existing salt mines below the water table in comparable settings have remained remarkably dry.

WATER DISTRICT GEOLOGIST'S RESPONSE: The question raised concerned water free to move and not that water locked within crystal salt. Data collected from the DOE test hole drilling in Deaf Smith County indicates fluids within the San Andres Formation have hydraulic heads ranging from 3,500 to 4,000 feet above sea level. Since the repository constructed in these salt beds would be sited at the 1,000 to 1,500 feet altitude, there is obviously a very large "driving force" available.

Isotopic aging of the water within the crystal salt is not the water which needs to be dated.. Rather, our concern is with the water migrating along channelized or fracture features common to the inclusions within the bedded salt.

There is an abundance of evidence that water is moving through the Permian salt beds as is attested to by saline spring flow along the Canadian and Red River basins. It appears that DOE has not read its own consultants reports.

Conkwright summarized his observations to the Senator as follows: "We are concerned that DOE either does not understand their consultant's reports or that they are using highly skilled personnel to evade the questions and provide answers which are inaccurate, but sound reasonable to persons not trained in the field of geology or hydrology. We suspect the latter. Their inaccurate responses, quite frankly, scare the very devil out of us. If we can not obtain honest answers to legitimate questions, then we have no alternative but to fight to keep the project out of our area with all our strength and resources."

COMING SOON - - -

The Joint Texas House - Senate Natural Resources Committee invites you to a hearing on the water legislation package. Lubbock is their first stop statewide.

THURSDAY, NOV. 10—9 a.m.

Manual Reports On Water/Energy Efficiency

It's a how-to manual for irrigators serious about system and pump efficiencies. The Texas Department of Water Resources has just published a report on Irrigation System and Pumping Plant Efficiency Evaluations: 1978-1981. It is actually two reports in one. One summarizes the irrigation system efficiency testing on the Texas High Plains. The first was prepared by TDWR with considerable assistance from the Soil Conservation Service. The second was prepared by the High Plains Underground Water Conservation District with assistance from the SCS, the Texas A&M Agricultural Extension Service, and the Bailey County, Deaf Smith County, Swisher County, and the Lighthouse Electric Cooperatives.

These reports represent only the initial progress of these programs for irrigation efficiency testing and data collection. The programs are growing and expanding to other areas of the State.

Based on the number of requests for assistance received by the Soil Conservation Service, mobile field water labs have proven to be a popular and effective means to assist irrigation farmers in evaluating their irrigation systems. The report includes mini-lab engineering drawings for local fabrication. It also contains a Center Pivot Irrigation System Evaluation Training Guide and Example Evaluation, as well as Evaluation Summaries on furrow and sprinkler systems tested. Results of the 425 irrigation system evaluations performed during the 1978-81 period indicate that many irrigation systems are fairly efficient. However, improvements should be made on these as well as on systems which are considerably less efficient. Improvements of ten percent or more in overall efficiency can be expected in most systems when they incorporate improvements recommended by an efficiency evaluation.

In 832 electric powered pumping plant tests the average overall efficiency was 40.6 percent. The average cost per acre-foot of water was $41.44, with a $3.45 average cost per acre-inch. Fuel prices used to report all efficiency tests in the report were 6 cents per kilowatt-hour for electricity and $3.00 per thousand cubic feet of natural gas.

The natural gas powered pumping plants average overall efficiency was 11.3 percent. A total of 442 natural gas powered plants were tested. In 334 tests, the pump and motor efficiencies were separated. The average pump efficiency was 56.1 percent. The average efficiency of the natural gas powered engine was 20.1 percent. The average cost per acre-foot of water was $32.59, with a $2.72 average cost per acre-inch.

For a complete summary of the report findings, copies of Report LP-191 'Irrigation System and Pumping Plant Efficiency Evaluations: 1978-1981 are available from the Texas Department of Water Resources, P.O. Box 13087, Austin, Texas 78711; or from the High Plains Water District.

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SYMPOSIUM FOR 80s

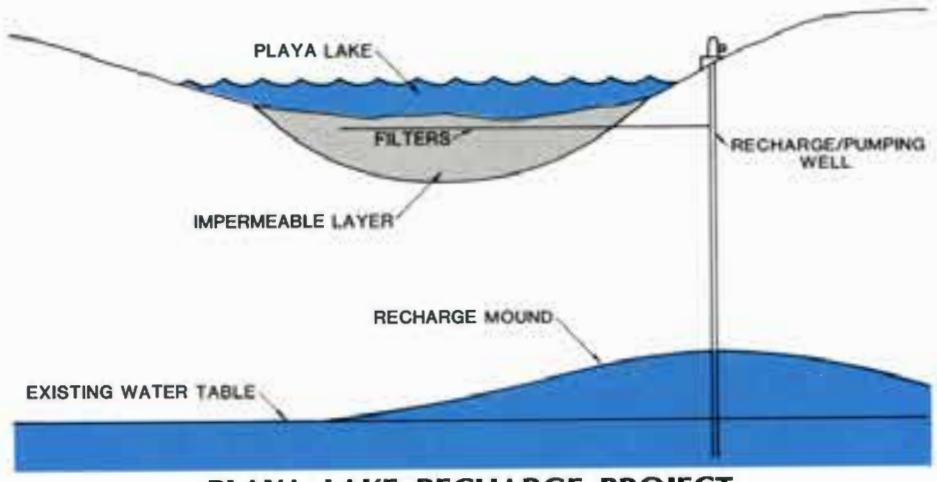
An event of the decade is on the planning board. The second Ogallala Aquifer Symposium will convene in Lubbock Texas during June of 1984. A call for papers is expected soon.

The symposium will be an opportunity to bring together all the individuals, organizations and agencies which have done work pertaining to the Ogallala in the last decade. It will also provide a summary of the major new research and discoveries related to the Ogallala.

The first Ogallala Aquifer Symposium was held over a decade ago in 1970. It was supported by the High Plains Water District, Texas Tech's Water Resources Center and Department of Geosciences, and by the International Center for Arid and Semi-Arid Land Studies.

Over twenty papers were presented before an audience of several hundred during the two and a half day program. Topics for discussion during the Symposium covered general and technical descriptions of the geologic and hydrologic factors related to or associated with the Ogallala.

For the second Symposium, Robert Sweazy, Director of the Texas Tech Water Resources Center, was named chairman, and Wayne Wyatt, Manager of the High Plains Water District, has been named vice chairman.



PLAYA LAKE RECHARGE PROJECT

FABRIC FILTERS TRIED IN PLAYA RECHARGE

A very promising new approach to recharge of playa lake water using "geotextiles" is under research on the High Plains. Drs. Bill Claborn and Lloyd Urban, principal investigators with the Texas Tech Water Resources Center, have already begun field work on a long term project to establish water quantity, water quality, and the economic feasibility of using fabric filters for playa lake recharge.

Any number of past studies have failed because of silt clogging of the porous media in the recharge zone of injection wells. Apparently, the silt must be removed before water reaches the recharge zone for any long term success.

This study proposes to use a system of fabric filter laid about six inches below the surface of the playa bottom. Once the water seeps below the natural filtering action of the soil, it is further filtered through the cellulose or polypropolene material of the geotextile's fabric outer layer and into its core where the water is conveyed laterally in tiny channels toward the recharge well. This filtered recharge system will bypass much of the playa's thick impermeable clay bottom and speed up the recharge process. That is a key advantage since a common feature of the playa is its impermeable clay bottom. This broad, shallow evaporative surface allows a tremendous quantity of water to be lost before it can be pumped for irrigation.

The study will examine the performance characteristics of several different filters, the effect of burying them at varying depths, and any decrease in filtration rates through time. It will analyze the basic concept to see how well it really works, design parameters, and most importantly the economic factors involved. That includes the cost of the material, installation, life expectancy, and its relation to the amount of water stored for future recovery. Water quality will also be a consideration.

A laboratory modeling phase of the study was completed last winter to test the basic concept and evaluate the characteristics of several types of filter material.

As the investigation moves into its second phase, a playa northwest of

continued pg. 2, col. 1 . . . GEOTEXTILES

THIS "MYSTERY" GRAPE came from the University of California at Davis to Dr. Lipe. Its true identity is still unknown. "It's the most complex, interesting wine I've ever tasted," says Lipe. "It looks like a Carnellian red."

JUICY CROP TAKES LOTS OF LABOR

Grapes are definitely not a quick, cheap, or labor saving cropping alternative for the High Plains irrigator. But, according to Dr. Bill Lipe, associate professor and researcher at the Lubbock Texas Agricultural Experiment Station, they are a high return, low water using crop with a big future in Texas.

Lipe's 13 year old research vineyards at TAES have attracted a brisk traffic in recent months. "Farmers are not making any money on cotton or grain so they're looking for something else," says Lipe.

He doesn't recommend growing grapes to everyone. The cost of putting in a vineyard is about $4,000 an acre, plus any land leveling or layout, any costs for an irrigation system or for drilling a well. It is cost and labor intensive. It takes six years to get a full crop. The third year may produce a first, light crop, but the investment is $1,000 an acre the first year, $2,000 an acre the second, and $1,000 per acre the third year. After that, the annual costs are about $500 to $600 an acre up to harvest. In labor, figure an average of about 40 man hours an acre each spring for pruning and weed control. The greatest labor requirement is in February and March. The second year requires one man fulltime for each four to five acres from May through August.

"That's the year most people get in trouble because they can't afford this much time if they have another job," Lipe says. "Break even should come by the fourth year, or never in some cases, because some of these guys haven't been able to take care of the crop. It is so labor intensive they just can't fathom it. One fella planted a hundred acres in grapes and he'll never be able to take care of them. It would take 20 men fulltime to train the vines the second year, and he hired four.

"Figure one man fulltime for each four to five acres because about every five days they need to go around and tie up the vines on a stake and pinch out the laterals to force the growth upward. If you don't force it, the vine keeps punching out laterally and by the end of the season you've got a little,

continued pg. 3, col. 1 . . . GRAPES

Plan A Wind Stripcropping System

by Dennis W. Neffendorf
Area Agronomist, Lubbock, Texas

Prior preparation prevents poor performance when setting up a Wind Stripcropping System. Wind Stripcropping is a method to reduce or eliminate sandfighting and provides excellent crop protection especially to young cotton. It can improve crop quality and quantity and saves precious soil moisture, and helps keep herbicides in place to provide a better weed management program.

If you are thinking about trying or utilizing a Wind Stripcropping System, a design (angle, interval of strip) to fit your objectives is a must. Each field can vary in the farmer's use of implements, soil type, terrain and the long range crop planning for the field. A proper design takes into account soil type, water availability, use of implements and the general lay of the field. The economic savings from a perennial Wind Stripcropping System has been proven by several innovative farmers in the Lubbock area. Through these farmer's efforts and Soil Conservation personnel, a special three year research project of $112,000 has been implemented with Texas Tech University to research and validate benefits and disadvantages of Perennial Wind Strips.

If you are planning to try a Wind Stripping System such as a perennial grass, proper equipment for planting is an important factor. Other items to consider are mulching and what chemicals have been applied to the land for good seeding emergence.

If you desire a Wind Stripcropping System or wish to have more information about this cost saving practice, contact your local Soil Conservation Service Office.

GEOTEXTILES USED . . .

(continued from page 1)

Lubbock has been located, surveyed and mapped. The basin's low points were located for instrumentation. Core samples were taken from the soil strata and clay layer, and instruments were placed near the lake's edge to begin collecting baseline data on rainfall, pan evaporation and the playa's general performance without modification.

The study is projected to take several years in order to get at least a year of typical base data and two years of experimental data. The results hoped for are a combination recharge-pumping well in which the irrigator could take back from the aquifer what was recharged into it, and recover more productive land from the playa lake bottom.

PERENNIAL WIND STRIPS were planted on the Roger Kitten farm east of Lubbock.

DRIP AND DROP will make their debut all around Lubbock this winter in the public schools. Kindergartners will hear the puppets (speaking through Lubbock Junior League volunteers trained by Jane Minkley) teach about the benefits of water and our dependence on the hydrologic cycle. Children will learn by seeing how a jar of sand and water is like the aquifer and how even the wise use of water for drinking will use up our limited supplies.

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NOTICE: Information regarding times and places of the monthly County Committee meeting can be secured from the respective County Secretaries.
Applications for well permits can be secured at the address shown below the respective County Secretary's name, except for Potter County; in this county contact Sam Line.

GRAPES USE LITTLE WATER . . .

(continued from page 1)

weak top that will freeze back. If that happens you had just as well cut it back to the ground and start over next year. You've lost a year and a lot of labor."

Lipe says, "It's not a part time job. But by the third year one man part time can probably handle ten to 15 acres. He'll need help harvesting and pruning, but he could handle the rest."

If all that sounds discouraging, the good news is the profit potential. Kim McPherson at Lubbock's Llano Estacado winery thinks that if we can maintain the quality we've been getting the last few years, he sees no limits to how much we can sell. Lipe says that Kim sold a 1980 Cabernet for $14. "The farmer who grows the grapes right now can get $1,000 a ton and can probably grow three to five tons per acre."

"The key," says Lipe, "is to maintain high quality. The risk is simply that of getting greedy and trying to produce too much yield at lower quality."

In other words, sacrificing quality for quantity will undermine the marketing edge Texas could enjoy. Apparently, this is what is hurting the California vineyards. Dr. Lipe explained that California is overproducing several poorer quality varieties. Their markets are saturated with low quality grapes and they can hardly give them away, while their premium wines are overpriced.

In contrast, grape production is increasing every year on the High Plains because this area offers some real advantages for vineyards. Grape quality is affected by temperatures. West Texas has hot, sunny days and cool nights which are conducive to good quality grapes with high acidity which makes good wines. This area is relatively disease free compared with the eastern United States and even the rest of Texas. Cotton root rot, which is devastating to grapes does not occur on the caprock.

Land costs in the grape growing areas of France are becoming prohibitive at 20 to 40 thousand dollars an acre and at over 20 thousand in California. Add to that the high costs of water and taxes and West Texas land can begin to compete very favorably for vineyards.

Another reason West Texas could produce grapes more cheaply than most areas, according to Dr. Lipe, is the low water demand of the grape. This year Lipe's vineyard produced a good, high quality crop with plenty of vigor on 2½ inches of applied irrigation water. That is perhaps less than optimum, says Lipe, but he has never applied over six inches in a growing season. In general two or three inches of additional water to a full soil profile is all that is needed.

Dr. Lipe explained he could add more water and get more yield, but it might hurt quality. "We generally want to stress grapes when they are maturing, so after the first of July, we don't water to try to develop some stress by harvest. We can stand a lot lower yields as long as the quality is better."

The target range for optimum quality in grapes is a sugar level of approximately 20 percent, acids above .65 to .85, and a pH below 3.6.

Dr. Lipe thinks we'll have thousands of acres of grapes here in the next few years. He commented that the French and Swiss are moving into Texas and looking right now. There are 700 acres of vineyards in the Lubbock and Olton areas. A Swiss outfit has bought ten thousand acres in Las Cruces. A Frenchman is looking into 15 thousand acres in the Valentine, Texas area. The University of Texas has 700 acres near Bakersfield and is planning to build a $15 million winery. There are now 14 wineries in Texas. Lipe believes there will be some export market as well.

WINE GRAPE VARIETIES MOST SUITED FOR THIS AREA

Variety	*Yield Per Acre*	*Comments*	*1983 Per Ton Selling Price*
Chenin Blanc	8-10 tons	most productive but lowest quality	$600.
White Riesling	5-6 tons	most winter hearty	$750.
Cabernet Sauvignon	3-5 tons	most easily marketed red	$1000.
Sauvignon Blanc	4-6 tons	excellent quality white wine	$950.
Chardonnay	3 tons	insufficient data but currently the highest priced white	$1200.

Ag Water Conservation Loan Plan

The future of water legislation proposing a Texas agricultural water conservation loan program is being shaped by the grass roots opinions of Texas farmers, bankers and business leaders.

They discussed whether an agriculture water conservation loan program was warranted, in three meetings with Charles Nemir, Executive Director of the Texas Department of Water Resources, Lewis Beecherl, Chairman of the Texas Water Development Board and George McCleskey, TWDB Vice Chairman, Senator J. T. Montford, and Steve Stogner, assistant to the Lieutenant Governor. Under consideration is a plan such as the one proposed during the last Legislative session. Senator Montford introduced a bill to issue $200 million of State general obligation bonds with the proceeds to be made available for loans to farmers to finance various agricultural water conservation equipment.

The panel wanted to know if farmers would participate in such a program, if bankers would be willing to administer the funds under a program with a 50% guarantee by the State, and if the program could be uniformly accepted throughout the State.

They learned that water conservation techniques are just beginning to be developed and made known to various farming interests throughout the State. The use of center pivot sprinkler systems equipped with drop lines and surge irrigation techniques are currently the most prominent new methods. There are about 20,000 center pivot units now in operation in the High Plains and an additional 40,000 could be installed there. Furrow irrigation and conventional sprinklers have a water application efficiency of about 60 percent. Equipping the existing sprinkler systems with drop lines would cost about $7,500 per quarter-mile span and would result in increased water efficiencies from 60% to 90%, a significant savings. The purchase of a new system equipped with the water-saving drop lines would cost about $35,000 and provide the same increase in water efficiency.

Adopting surge irrigation techniques for furrow watering would increase water use efficiency to 80 percent.

The farmers indicated that costs could be recovered through reduction in operating costs, fuel and other pumping costs. Their concensus was that under the current economic situation, the interest rate on loans would need to be 10% or less with financing extended for a period of at least seven years in order to be economically beneficial to farmers. Most have an existing debt load that would preclude taking on additional indebtedness under present conditions.

The bankers group suggested that financing the installation of efficient irrigation conservation equipment would not be of help to farmers unless funds could be made available at a significantly lower rate (at least 4% to 5%) than currently available to farmers through their usual financing sources. Current bank loan rates range from 12% to 15%. There was agreement that new financing for conservation equipment must be as low as 9% to be acceptable. Bankers indicated, however, that an interest spread of from 3% to 3½% in addition to administrative costs would be needed to make this type of financing attractive to them. Banks would like a loan guarantee of 75% to 90% to reduce their ultimate financing risk and allow a smaller interest spread of only 2½%. Higher guarantees are also necessary where reasonable collateral is not provided. Bankers agreed they should share the risk at some level in order to assure proper screening of the borrower.

The business/industrial group questioned how banks would address the total borrowing capacity of any individual farmer and whether the addition of loans for financing conservation equipment would reduce the total borrowing power of the farmer for operations and generally lower the operational loan limit.

An overall keen interest in such a program was clear. These conclusions were expressed by Charles Nemir in his written assessment of the meetings:

1. the program is worthwhile to pursue and would result in significant water conservation;
2. once the technology is developed and made known to farmers, it will be acceptable to the farmers and they will be willing to participate as long as economics are favorable;
3. additional education and demonstration of economics and benefits to the farmers are needed and may best be accomplished by a strong role of the water conservation districts and other administrative districts that may be available to support the program;
4. although economic conditions may not be favorable at the present time, the mechanism should be placed in effect by legislation so that implementation could begin immediately when economic conditions improve;
5. in order to be utilized, the program must offer loans at an interest rate at least 4%-5% lower than are available through regular financing sources; and the payout period should be extended to at least seven years;

continued page 4, col. 1 . . . LOAN

Area Targeted For Funds

by Tim Dybala, Civil Engineer
Lubbock Area SCS

Twenty-eight counties on the Texas High Plains have been in a special targeted area by USDA since 1982. These included most of the counties on the caprock from Lubbock north. The purpose of identifying these special areas is to "target" additional funds to them to accelerate treatment of a conservation problem common to the region. The major problem being addressed here is the impact of a declining water table shortening the life of the Ogallala aquifer. The primary objective is to conserve our soil and water resources through the most efficient use of water and energy to provide the greatest and longest lasting conservation benefits to support stable agricultural production.

Last year for the first year, the Agricultural Stabilization and Conservation Service administered $720,000, the High Plains share of the targeted funds. The Soil Conservation Service provided additional technical assistance through the hiring of two new staff engineers and several field staff in the Lubbock and Pampa areas.

Three administrative areas of the Soil Conservation Service were initially included in this special target area on the High Plains. Nine counties in the Lubbock area, thirteen counties in the Amarillo area, and six counties in the Pampa area all fell under USDA's targeting concept during 1982. In October of 1983 the region was expanded to

continued page 4, col. 1 . . . TARGET

LOAN PLAN . . .

(continued from page 3)

6. fixed rate financing is preferable to variable rate;

7. the spread of interest for banks to administer the program should be in the range of 2%-3½% plus administrative costs;

8. it would be helpful for State administrative costs to be provided through General Revenue Appropriations rather than by adding interest to the loans.

9. short-term State bonds should be sold in order to obtain lower interest rates rather than long-term (20 years or more) bonds;

10. conservation opportunities exist statewide and not just in the High Plains area, including the rice-growing areas near the Coast.

11. bank participation should be required in order to assure adequate screening of loans and the State guarantee should range from 50%-90%, with guarantee of over 50% desirable where collateral is not provided through tangible recoverable items;

12. paperwork and reporting must be kept to a minimum to reduce administrative cost;

13. the program should not reduce credit limits otherwise available for farming operations;

14. the possibility of administration of funds by an entity other than banks, such as Production Credit Association, should be explored;

15. benefits in addition to water conservation include economic benefits and energy conservation;

16. the items eligible for loan assistance should be defined broadly to leave discretion with the Board;

17. other water conservation techniques, such as brush eradication, should be allowable; and

18. all three groups expressed generally favorable views about such a program.

TARGET FUNDS . . .

(continued from page 3)

include one additional county in the Pampa area and five counties in the Big Spring SCS area. There are approximately 5.4 million irrigated acres in this thirty-four county region, all of which are subject to groundwater depletion. One million 860 thousand acres of this irrigated land is contained in the Lubbock area alone.

The ASCS received additional agricultural conservation program funds in 1983 that were used exclusively for water management. The dollar amount received was determined by using the total ASCS cost-share payments made to farmers for irrigation practices in the previous fiscal year in each designated county.

Although the SCS started placing greater emphasis on water conservation on the High Plains before the inception of a special target area, the additional funding has helped increase the assistance available to the public. SCS water management assistance during the past year has resulted in an estimated 53,853 acre feet of water savings through increased irrigation efficiencies on 208,419 acres. There was an average of a ten percent irrigation system efficiency improvement on 96,190 acres as a result of SCS assistance. Based on a conservative figure of $4 per acre inch for fuel costs to pump water, $2,584,944 were saved by irrigators this year in pumping costs alone. Assuming this conserved water was reserved for use 20 to 40 years from now for agricultural production, it could mean the difference in having ample food and fiber for the nation.

These water savings were realized through better management by individuals after receiving some type of technical assistance. This aid may have taken one of several forms. Evaluations of pumping plants and irrigation systems, as well as planning assistance for conservation tillage, furrow diking, contour farming, and level terraces allowed SCS personnel to make recommendations on how to conserve water. A summary of irrigation system evaluations for the Lubbock area during the past year include:

- 13 furrow irrigation systems evaluated
- 28 center pivot irrigation systems evaluated
- 15 stationary sprinkler systems evaluated
- 229 pumping plants checked for efficiency and cost
- 24 pumping plants checked for cost

There is additional cost-share money available for farmers in the 34 county target area. The USDA designated water conservation practices eligible for the cost share program in this area include installing underground irrigation pipeline, irrigation land leveling, and tailwater recovery pits.

Joint House/Senate Committee Set Water Legislation Hearings

Next time a Texas water legislation package comes before the Legislature, it will pass. At least that's the objective of a series of special Joint House and Senate Water Committee hearings scheduled in the coming months. The Special Joint Committee's members (SJC), named by Lieutenant Governor Bill Hobby and Speaker Gib Lewis, are also the key figures who will be responsible for navigating any new water bills through the law making process in their respective chambers. For example, SJC Chairman Senator Tati Santiesteban is also Chair of the Senate Natural Resources Committee, and Bob Vale is Chair of the Senate Natural Resources Subcommittee on Water. Senator John Montford is Vice Chair of Bob Vale's Subcommittee.

The final focus of the controversy that undid the whole eight piece water legislation package in the final hours of the last session was the bays and estuaries bill. SJC member Senator John Sharp introduced that bill.

Tom Craddick, SJC Vice Chair, is also the Chairman of the House Natural Resources Committee and his House Vice Chair is SJC member Rodney Tow. Hill Kemp and J. W. "Buck" Buchanan of the SJC are also members of the House Natural Resources Committee.

These same lawmakers who are convening to smoothe out the folds and spindles that derailed the previous water legislation package, will be responsible for molding any new water legislation introduced during the next session.

The Special Joint Committee's first hearing is set for Thursday, November 10 in Lubbock.

A morning tour of water conservation measures in use on the James Mitchell farm at Wolfforth is planned to provide committee members with concrete examples of furrow dikes, a drop-line center pivot sprinkler system, and a surge furrow irrigation system. They'll also get a close up look at soil moisture monitoring devices such as gypsum blocks and tensiometers, the use of underground pipeline, and water and energy system efficiency tests results measured using the mobile field water conservation mini-labs.

Next they will be bussed to the site of the water level rises at the secondary recovery air injection test site at Idalou to observe water level measurements being recorded.

The Committee will reconvene at 1:30 p.m. at the Texas Tech University Center Theater to define its organizational goals and to hear a review of current planning, comments, questions or testimony from interested individuals or groups. The public is encouraged to attend and participate. (Campus parking will be provided in the band/music lot south of the University Center.)

FAIR ENTERTAINMENT—An estimated thousand South Plains Fair goers stopped at the District's computer fair booth this year and took the Water IQ test.

THE CROSS SECTION (USPS 564-920)
HIGH PLAINS UNDERGROUND WATER
CONSERVATION DISTRICT NO. 1
2930 AVENUE Q
LUBBOCK, TEXAS 79405

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THE Cross SECTION

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Joint Committee Tours Farm

The Texas House and Senate Joint Committee on Water Resources came to Lubbock last month prepared to get their boots muddy on the turnrow and their hands on equipment during a farm tour demonstrating the state-of-the-art in efficient agricultural water conservation equipment.

The tour bus lumbered out onto the turnrow and unloaded at the James Mitchell farm near Wolfforth, where SCS and Water District field technicians were lined up with nearly a dozen examples of on-farm water conservation practices. The Committee had come to learn more about what was available to farmers, how much it could improve their water and energy efficiency, and to hear why farmers needed a provision in the next water legislation package to guarantee loans for agricultural water conservation equipment.

Committee chair, Senator Tati Santiesteban, quizzed his hosts about the installation of furrow dikes and how they worked. He and Senator J. T. Montford stuck their fingers into a soil core sample taken to measure field crop moisture. Representative Hill Kemp of Manvel wanted to know the cost of things, and how much water they saved.

Several committee members asked questions about how many farmers were already using these techniques

continued pg. 3, col. 1 . . . WATER

THE LINE-UP—Ruth Lauer, Lubbock League of Women Voters, Rep. Hill Kemp, Harry Bradley with the Governor's office, Sen. J. T. Montford, Robert King with Texas Department of Agriculture, Rep. Rodney Tow, Ken Kramer of the Sierra Club, Sen. Tati Santiesteban, and Rep. Tom Craddick listen to an explanation of how surge equipment works. (Below) Santiesteban studies a water flow gauge. TDWR Director Charlie Nemir and Wayne Wyatt read water levels in a monitoring well at the Idalou test site.

WATER RIGHTS IN QUESTION

In what has been described as a landmark case in Texas water law, the Texas Supreme Court heard oral arguments on October 26 on the Court of Civil Appeals ruling granting a permit to the Colorado River Municipal Water District (CRMWD) to construct Stacy Reservoir. It would povide a municipal water supply for the Midland/Odessa area. The Lower Colorado River Authority (LCRA) opposed the permit on the basis that there is insufficient unappropriated water in the Colorado River to satisfy the Stacy permit without detriment to prior downstream appropriators and without reduction in the yields of Lakes Buchanan and Travis.

The appeals court, in dismissing LCRA's contentions, ruled that appropriative permits did not constitute a water right until perfected by three years beneficial use. While the case primarily involves a dispute between two water authorities on the same river, the appeals court ruling was interpreted by many to jeopardize appropriative rights throughout the state in cases where the right holder had not put the entire amount of the right to beneficial use for three years. The fear was that if permits were granted to newer applicants who immediately put the full amount of their right to beneficial use, this would cast doubt on the validity of the rights of the prior appropriators who had not fully perfected their rights by beneficial use.

Chief Justice Jack Pope questioned attorneys whether the appeals court interpretation would not encourage permit holders to protect themselves by using 100% of the water granted them under their permit, whether actually needed or not. Otherwise, the whole concept of providing water for future growth would be negated.

continued pg. 4, col. 1 . . . STACY

More Tests On Capillary Water Set

The next test site for field research on the secondary recovery of capillary water from the Ogallala aquifer is Wolfforth, Texas. The High Plains Water District is working with the City of Wolfforth to establish a test site for injecting compressed air into the formation to measure water table rises. This will be the fourth air injection test conducted by the Water District.

The first field tests were at Slaton and Idalou in 1981 and 1982. In Field Test No. 1 (Slaton Test I), air was injected at the rate of 660 cubic feet per minute (cfm) at a pressure of 10 pounds per square inch (psi) for 21.5 hours. The air injection rate was then increased to 1000 cfm at 12 psi for an additional eight days. An estimated 12.69 million cubic feet of air was injected. After four months, a second test (Slaton Test II) was run for three and a half days. During this test air was initially injected at 850 cfm and increased incremently to 2100 cfm. Injection pressures reached 180 psi and a total of 8.5 million cubic feet of air was injected. A third test (Idalou I) was initiated at a second site one month after the Slaton II test. Air was injected for almost six days. The initial injection rate was 250 cfm at 27 psi and gradually increased to 2200 cfm at 160 psi. A total of ten million cubic feet of air was injected.

The net result of the air injection tests at these two sites is that after two pumping seasons, water levels are still above the pre-air injection water levels. At the Slaton test site, November 1983 water levels in the six nearest wells averaged 1.93 feet above pre-test levels. The November 1983 water levels in 16 wells at the Idalou site averaged 3.63 feet above pre-air test levels. While the significant rises in water levels at the two sites are extremely positive, there are other data that are not fully understood. For instance, field test data are difficult to correlate with present theories of flow in the unsaturated zone.

Additional extensive research is now being conducted by Texas Tech University and the Texas Agricultural Experiment Station of the Texas A&M University involving numerical, physical and laboratory modeling. Mathematical and physical models are being constructed to describe the physics of two phase flow in a porous medium such as the unsaturated zone of the Ogallala, where both air and water appear to be moving simultaneously.

The Wolfforth site field test will be conducted to determine whether injection of low volumes of air, approximately 250 cfm, under low pressures

continued pg. 3, col. 4 . . . AIR

Program Adopted

Senator Lloyd Bentsen, a member of the Senate Environment and Public Works Committee, recently announced the defeat of a federal land use planning measure which would have allowed the Environmental Protection Agency to impose a mandatory compliance program on the states. Under this program, landowners who failed to comply with the management practices specified by the EPA could have been denied participation in farm programs or any other federal assistance.

Senator Bentsen explained, at his urging, the Committee set aside this proposal and held hearings which gave agricultural groups the opportunity to share their expertise on this issue. The Committee then adopted a program providing for voluntary control of nonpoint pollution. Bentsen said, "I believe the Committee's decision is a step forward in resolving this important environmental problem."

The Committee amendment eliminates the cross-compliance provisions of the measure and allows states to establish a nonregulatory program of control. Federal assistance will consist of grants for education, technical assistance, and demonstration programs. States are encouraged to make use of existing organizations, such as local soil and water conservation districts, in carrying out these programs. Such innovative solutions to control nonpoint pollution will allow states the flexibility to react to local and regional considerations.

ACTION PLAN COMING

AUSTIN—A projected timetable for completion of staff work on an amended Texas Water Plan was presented to the Texas Water Development Board by the Executive Director of the Texas Department of Water Resources.

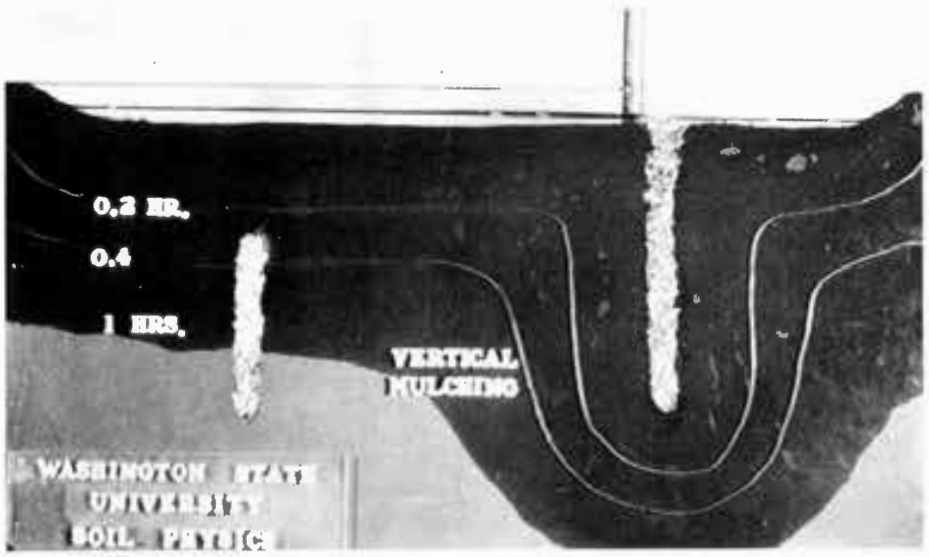
The Department intends to present the amended plan to the Board for consideration and adoption by September, 1984.

Currently, staff are revising the draft document, "Water for Texas: Planning for the Future" in response to comments made during a series of public meetings held during the summer of 1983.

Review of the draft plan is expected to be completed by the end of April, 1984, and a hearing on water rights issues associated with an amended plan is contemplated for June of 1984.

TWO VERY SPECIAL OCCASIONS FOR ONE MAN—A. Wayne Wyatt was honored twice this Fall as the recipient of two very special awards. (Left) Billy Griffin, SCS State Conservationist, presented a very unique plaque to Wayne on behalf of the heads of three major agencies including the Soil Conservation Service, Charlie Nemir of the Texas Department of Water Resources, and Harvey Davis of the Texas State Soil and Water Conservation Board. The three chiefs collaborated on the honors to Wayne "in recognition and appreciation for his efforts in implementing a cooperative irrigation water management program on the Texas High Plains. His leadership and enthusiasm in conserving water and energy resources were instrumental in establishing a special emphasis program which the three agencies elected to expand state-wide." (Right) Wayne's family shared his pride in being named as recipient of a Gerald W. Thomas Outstanding Agriculturalist Award for Public Service for 1983 by the Texas Tech College of Agricultural Sciences Ag Council. From left are his niece, Michelle, brother Ed, sister-in-law Patsy, mom Robbie, wife Linda and dad Jim.

MAKING A MOVE — Mickey Black, SCS Lubbock Area Conservationist, and James Mitchell (the great head of hair), President of the HPWD Board of Directors, congratulate Bob Arhelger, former SCS Lubbock District Conservationist, on his recent promotion to SCS Area Conservationist for Big Spring. Bob's Lubbock SCS co-workers will be inviting all his friends to a farewell reception on December 16 at 1:30 p.m. in Room 607 of the Federal Building downtown. Come on by and share our wishes for a successful new year.



SEEING IS BELIEVING—A vertical channel filled with straw or other organic material and maintained open to free water at the surface will help transmit water deep into the soil. If the stubble is covered with soil it does little or no good in transmitting water. To increase infiltration rates, avoid burying your stubble in the soil. Keep it near the surface as a channel for moisture to penetrate.

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THE CROSS SECTION (USPS 564-920)

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PATRICIA BRUNO, *Editor*

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Clifford Thompson, Secretary
2930 Avenue Q, Lubbock

Gary Houchin, 1986 ..... Rt. 1, Box 54, Wilson
Danny Nettles, 1986 ..... Rt. 4, Tahoka
Leland Zant, 1984 ..... Rt. 1, Wilson
David R. Wied, 1984 ..... Box 68, Wilson
Wendell Morrow, 1984 ..... Rt. 1, Wilson

Parmer County
Pat Kunselman, Secretary
City Hall, 323 North Street, Bovina

Wendal Christian, 1985 ..... Rt. 1, Farwell
John Cook, 1985 ..... Box 506, Friona
Ronald Elliott, 1985 ..... Rt. 3, Muleshoe
Billy Lynn Marshall, 1987 .... 903 8th Street, Bovina
Jerry London, 1987 ..... 1210 Jackson, Friona

Potter County
Frank T. Beanar, 1985 ..... Box 41, Bushland
Ronnie Johnson, 1985 ..... Box 127, Bushland
Weldon Rea, 1985 ..... Bushland
Sam D. Line, 1987 ..... Box 143, Bushland
Mark Menke, 1987 ..... Rt. 1, Box 476, Amarillo

Randall County
Mrs. Louise Tompkins, Secretary
Farm Bureau, 1714 Fifth Ave., Canyon

Gary Wagner, 1985 ..... Box 219, Bushland
Jack Brandt, 1985 ..... Rt. 1, Box 280, Canyon
Johnny Sluder, 1985 ..... Box 56, Bushland
Roger B. Gist, III, 1987 ..... Rt. 1, Happy
Tom Payne, 1987 ..... Rt. 1, Box 306, Canyon

NOTICE: Information regarding times and places of the monthly County Committee meeting can be secured from the respective County Secretaries.
Applications for well permits can be secured at the address shown below the respective County Secretary's name, except for Potter County; in this county contact Sam Line.

IN THE FIELD, the questions were about how many farmers use furrow dikes, back in the board room the questions were about the risks involved in providing state guaranteed agricultural equipment loans for water conservation. Dr. Neville Clark (right) identified the scope of water conservation research work progressing at Texas A&M Experiment Stations.

WATER RESOURCES . . . contd. from pg. 1

and the cost of the different pieces of equipment.

Back at the conference table that afternoon the Committee discussed concern for the State's risk and "exposure" in guaranteeing agricultural loans. They questioned the resale value of repossessed collateral and wondered whether loans to water conserving irrigators would also benefit their neighbors.

They listened to several state, local and educational water agency representatives testify to the economic benefits which an agricultural water conservation measure would accrue to the State and region. In particular, Dr. Neville Clark, Director of the Texas A&M University System Agricultural Experiment Stations, unfolded a picture of ongoing research and new technology being developed for agricultural water conservation. His list included drought tolerant crop varieties, conservation tillage, crop rotation systems, crop moisture sensing, surge and drip irrigation technology, modifications for multi-function low energy precision application sprinkler systems, secondary recovery of capillary ground water, and even use of saline water for crops.

Dr. Clark added that a concentrated program of loans and education for agriculture water conservation could significantly speed up the time now lagging in the transfer of these advanced technologies to the farm.

AIR . . . continued from pg. 1

of 10 to 15 psi, over a long time period of 30 days, is adequate to release capillary water from the wet sands of the Ogallala formation. The District will use a 40 horse power electric motor as its power unit.

The objective will be to reduce the cost of releasing water from the vadose zone from previous test costs of $50 an acre foot to $10 to $15 per acre foot. The cost of this field test is estimated to be about $30 thousand dollars and will be shared by the Water District and the City of Wolfforth.

If the research continues to be successful, secondary recovery has the potential to add millions of acre feet to the available water supplies of water table aquifers. The program could have widespread impact, not only for water users in the Texas High Plains, but to water users dependent on similar depleting water table aquifers anywhere in the world.

Windbreak Trees For Sale

by Susan Alexander
Soil Conservationist, SCS, Levelland

Farm and homestead windbreaks are more than a bargain, they're a good investment. If properly oriented, a windbreak can help increase crop yields by providing a shield against wind and blowing dust. It can also reduce wind drift to increase irrigation sprinkler efficiencies. A shelter belt around livestock can reduce their winter weight and cut stock losses.

Windbreaks attract pheasant, quail and other birds. The trees thick canopy will isolate an area from excessive noise or activity, while adding beauty and value to a farm or home. Windbreaks around a homestead can reduce heating and cooling costs by as much as 30 percent and a two acre homestead windbreak can provide over 40 years of sandstorm protection.

Today's tree stocks don't require pruning and are very resistant to disease, insects, wind and ice damage. The price is low and the amount of land a windbreak takes out of production is minimal. A single row windbreak will take only 3 to 4½ acres per section.

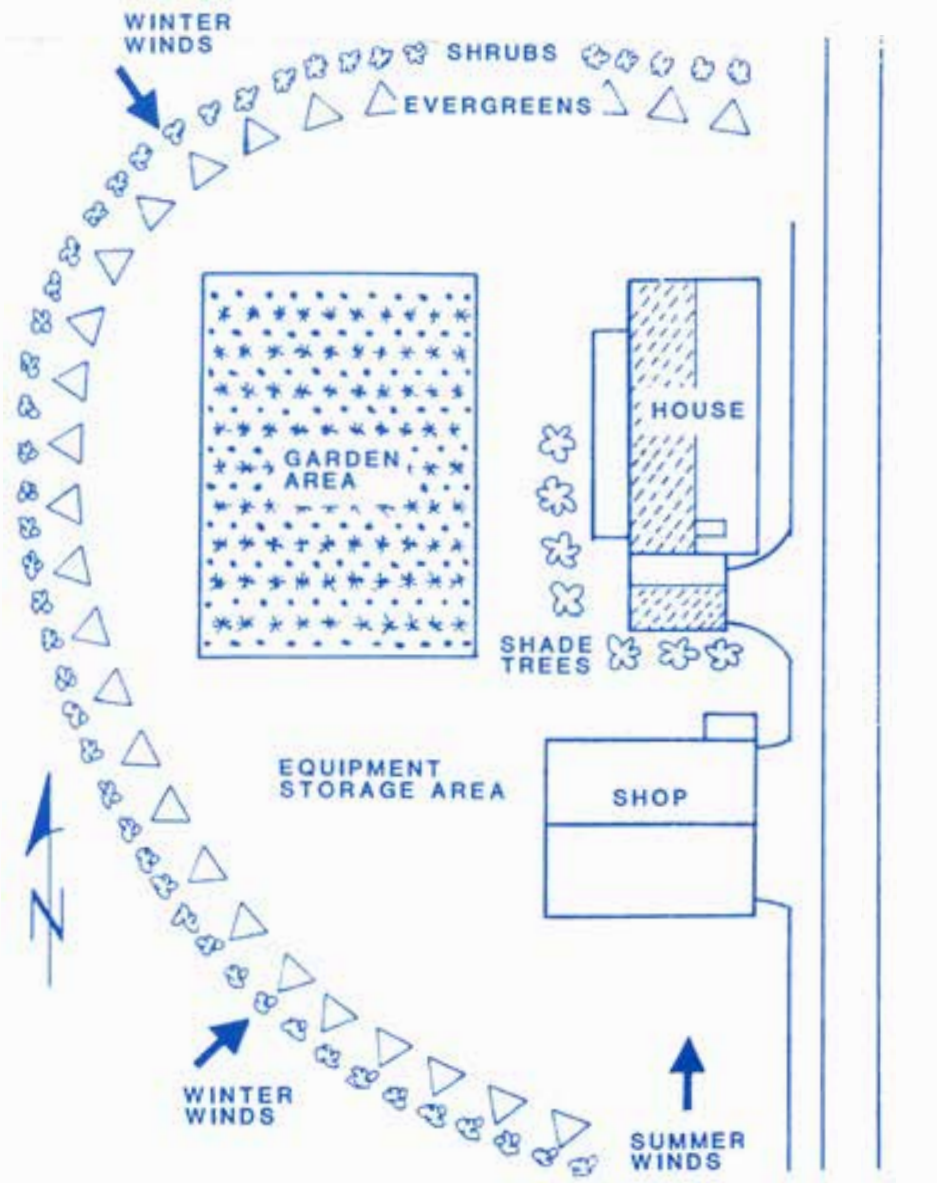
To encourage more farmers and ranchers to plant field and farmstead windbreaks, the Hockley County and other area Soil and Water Conservation Districts are again sponsoring a Windbreak Tree Program for area residents. These trees grown specifically for windbreak and conservation plantings are available in a number of sizes and species. Glen Borland, program chairman for the Hockley County SWCD, announced that this year's containerized evergreens include: Afghanistan pine, Arizona cypress, Austrian pine, Ponderosa pine, Redcedar and Arborvitae as well as Pfitzer and Keteleer junipers. Hardwoods offered as bareroot stock include: American plum, cottonless cottonwood, green ash, Russian olive, honey-locust, and pecan trees. These trees range from 20 inches to 6 feet depending on species. All of these trees are offered at a very nominal cost ranging from 35 cents a tree for bareroot seedlings to $11.25 for a more expensive five gallon containerized conifer.

As a new service the Hockley County District is offering a drip or trickle irrigation system for both field and farmstead windbreaks at substantial savings. Regular watering is the best insurance for tree survival on the South Plains, and a drip system is the most efficient and easiest way to water. Besides the obvious time and labor savings, a drip system provides energy and water savings since it is 75 percent more efficient than conventional irrigation methods. Limited water is not a problem since the trickle irrigation system uses only one to four gallons per hour per tree. For example, a two acre farmstear would need only 200 gph of 3 gpm.

A minimum windbreak should consist of a single row of conifers (evergreens) because they retain year round foliage which equals year round wind protection. Effective breaks should be placed at right angles to the prevailing winds. Breaks work to slow the velocity of the wind by 50 percent or more to a distance ten times their height. Farmstead windbreaks are more effective and pleasant if a row of hardwoods, which provide shade and color, is included. Conifers which have similar growth forms and rates can be interplanted for contrast, color and design. However, interplanting conifers with hardwoods is not recommended since faster growing hardwoods overtop and shade out the conifers. In addition, only one hardwood species should be planted in the hardwood row due to varying crown size and growth rate between species.

Cost share for farmstead and field windbreaks is available through the Great Plains Conservation Program administered by the Soil Conservation Service. In some counties on the South Plains ASCS provides cost share through the ACP program.

For more information or an order form, contact your local SWCD or the Hockley County Soil and Water Conservation District office in Levelland (806) 894-4774.



PROPER LAYOUT OF A FARMSTEAD WINDBREAK—This two-row windbreak protects the home from harsh winter winds and duststorms. The evergreens break the monotony and the shrubs add color and provide wildlife food and cover. The shade trees help cool the home during the summer.

STACY PERMIT . . . contd. from pg. 1

Assistant Attorney General Lambeth Hamilton responded that the person with the earlier permit can continuously perfect his rights to the full amount of his permit, and rights so perfected will be senior even to earlier perfected junior rights. The exception is as between use priorities under the Wagstaff Act (municipal use has priority over other uses such as irrigation).

Mr. Frank Booth, representing CRMWD, argued further that it would be improper and wasteful of a precious resource to deny permits on the basis of theoretical figures as to total appropriations versus total flows when it is evident much more water than would be covered by the Stacy permit is flowing out of the Colorado River into the Gulf of Mexico each year. In reply to Justice Pope's question as to what happens when there is not enough water for all permit holders, Mr. Booth stated that when downstream needs could not be met, any upstream holders of junior rights could not store water from inflows. They could, however, continue to use water from previously stored inflows.

If the Texas Supreme Court's decision supports the theory that permit holders can progressively perfect their rights, retaining the original priority date, but allows the Stacy permit to stand, Texas will enter a new era of water law similar to that of other Western states. Fuller utilization of a scarce resource will be possible, but holders of the junior rights must accept a risk of going short during a drought. Eventually, it will be necessary to appoint water masters for each river, having the authority to designate which permit holders may store water on a given date.

Until the Supreme Court ruling is made, which may take six to twelve months, all permit holders who have not perfected their rights by three years beneficial use continue to face an uncertainty.

(Reprinted from Update, Trinity Improvement Association, November 1983)

Gas Deregulation Hits Farm

COLLEGE STATION—Of all types of energy used by Texas farmers next year and beyond, natural gas will be the most costly due to deregulation.

Farmers can expect to pay 6 to 9 percent more for natural gas next year for crop irrigation and drying and 16 to 20 percent more by 1986. Fertilizer produced from natural gas is expected to cost 10 to 15 percent more by 1985 over this year's planting season prices.

Industrial prices for natural gas tripled from 1975 to 1982 and may double again by 1986, points out Dr. Forrest Stegelin, an economist with the Texas Agricultural Extension Service, Texas A&M University System. It's due in part to the current Natural Gas Policy Act for decontrolling gas prices.

Increases in natural gas prices have a major impact on farming, notes the economist. In 1981 U.S. farmers used about 80 billion cubic feet of natural gas for crop irrigation and drying while four times this amount went into fertilizer production.

Natural gas is the basis for more than 95 percent of the U.S. ammonia production and accounts for 75 percent of the variable cost of producing ammonia fertilizer. Doubling natural gas prices would increase the cost of producing ammonia about 75 percent but would boost production costs of urea and ammonium nitrate only 35 percent, Stegelin says.

Since the larger, newer, more efficient fertilizer plants along the Texas Gulf Coast are already paying higher prices for intrastate gas, they will not incur the substantial price increases from deregulation facing users of interstate natural gas, says Stegelin. Furthermore, they have access to cheaper imported ammonia from Canada, the Soviet Union, Mexico, the Caribbean and the Middle East. Import competition from these regions with surplus gas and a need for foreign exchange of U.S. dollars will hold down fertilizer prices.

Grass Wind Strips Pay Off

To convince a High Plains farmer to establish a stand of permanent grass wind strips in his cotton field, you need to show him two things: first, that he can keep his grass strips clean from weeds with chemicals, and second, that if he's patient it will pay off in crop yields and cost benefits. Patience is often the harder point for the farmer.

A conservation field trial by the Texas Tech University College of Agricultural Sciences and the Soil Conservation Service is aimed at showing area farmers the benefits on both points.

Three Lubbock County operators have agreed to cooperate in a two year feasibility study using their own cotton. Don Langston, past director of the Lubbock County Soil and Water Conservation District; Bill Piercy, director of the local Soil and Water Conservation District; and James Mitchell, chairman of the Board of Directors of the High Plains Underground Water District will plant weeping love grass on field settings in a strip crop system to reduce the velocity of wind hitting their cotton.

Richard Zartman, plant soil scientist at Texas Tech is the principal researcher for this field trial. "Young cotton is very sensitive to wind," he remarked. In addition to looking at wind erosion protection, his study will measure the effect of the grasses on the crop, yields, weeds, total soil loss and changes in populations of beneficial or harmful insects. The study will also determine if the windstrip grasses will be economical for operators.

"We want to provide data that farmers can use and know how it works and how much it will cost to plant," Zartman said.

Grass wind strips should not only prevent sand erosion and the burning or blowing out of a young cotton stand, they can also cut down on the number of sand fighting trips needed and reduce the plant's evapotranspiration loss rates by cutting the wind's velocity and exposure to the young leaves.

The two year study is being funded by the U.S. Soil Conservation Service under a $78,000 field trial. It is the first major project funded in Texas by the SCS, a division of the U.S. Department of Agriculture.

Moisture Survey

The High Plains Water District and Soil Conservation Service have begun their joint annual program of measuring soil moisture deficits over 18 High Plains counties. They will survey over 200 sites in December to measure how much water is still needed to wet the soil in the crop root zone to field capacity. In the past several years, those measurements have ranged from less than two inches to more than eight inches still needed in some areas to fill the soil profile.

The wide range of moisture deficits is generally due to differences in each soil's capacity to store moisture and to local rainfall patterns. Other factors affecting the amounts of deficit recorded include individual farm management practices, type of crops grown in the area, and the amount of water a particular farmer may have applied late in the growing season.

Crews are using a soil auger mounted on a small trailer to core the seven foot holes at new survey sites. At each site a neutron soil moisture probe is lowered down a two inch diameter, thin-walled aluminum tube which is set to a depth of seven feet below land surface. Readings are taken at one foot intervals at each site.

FROM ALL OF US to each of you, a Merry Christmas! Cliff, Don, Dan, Mike, Richard, "Mac," Ken, "Shorty," Obbie, Keith, Jerry, Patricia, Wayne, Kathy, Carole, and Kay (not pictured).

THE CROSS SECTION (USPS 564-920)
HIGH PLAINS UNDERGROUND WATER
CONSERVATION DISTRICT NO. 1
2930 AVENUE Q
LUBBOCK, TEXAS 79405

SECOND CLASS PERMIT