



Published monthly by High Plains Underground Water Conservation District No. 1, 2930 Avenue Q, Lubbock, Texas 79405

Volume 24—No. 1

Publication number 564920, Second Class Postage paid at Lubbock, Texas

January, 1978



A. WAYNE WYATT

Board Appoints General Manager

The Board of Directors of the High Plains Underground Water Conservation District No. 1 takes great pleasure in announcing the appointment of A. Wayne Wyatt to the position of General Manager of the District.

In making the announcement on January 10th, Board President A. W. Gober stated, "We are pleased that Mr. Wyatt has consented to join with us in the vitally important task of working toward solutions to all of the many West Texas water problems. His unique work background and experience will provide valuable assets to the District and to the Board in management and administration".

Mr. Wyatt has been a consultant in groundwater hydrology since February 1977, based in Austin. He began his career in 1957 as a Field Representative for the High Plains Water District. In 1967 he resigned his position to become Manager of the newly created South Plains Underground Water Conservation District No. 4 at Brownfield, Texas. Wyatt joined the Texas Water Development Board in 1968 where he served in succession as Chief—Water Level Section, Chief—Groundwater Quality Monitoring Section, Chief—Groundwater Data Branch, and from

April 1976, to February 1977, as Director of the newly created Water Importation Division.

Wyatt is a native of Girard in Kent County and continues to maintain agricultural interests in the area. He is married to the former Linda Barton who is a native of New Mexico.

Wyatt received his formal education in the Girard Public School system and Texas Tech University. In his professional field, he is a member of the Austin Geological Society, Texas Water Conservation Association, West Texas Water Institute (past member of the Board of Directors) and the National Association of State Groundwater Officials where he served as Chairman for 1975 and 1976.

He is author or co-author of approximately 20 substantial papers and published reports. He is the senior author of the High Plains county-by-county projection series of reports. This series of reports contains maps, charts and tabulations which reflect estimates of the volume of water in storage in the Ogallala Aquifer and the projected depletion of the supply by decade periods through the year 2020. The reports also contain current and

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1978 Election Results Announced

The complete but unofficial results of the January 21 election held by the High Plains Underground Water Conservation District No. 1 revealed that voters re-elected three members to the Board of Directors and voted 16 County Committeemen into office.

Elected to the Board of Directors were: James P. Mitchell of Wolfforth, Selmer H. Schoenrock of Levelland, and Malvin A. Jarboe of Floydada. They will again join A. W. Gober of Farwell and Ray Gerk of Hereford, who are currently beginning the second year of their present two-year terms.

The only contested race in the 1978 District election was for Director's Precinct One, involving voters in Lubbock, Lynn and Crosby counties. These returns show that the incumbent, James Mitchell, defeated former District Manager Frank A. Rayner of Lubbock for the Director's seat. Mitchell was voted into office for his second term by a count of 879 to 168, garnering approximately 84 percent of the ballots. During 1977 Mitchell served as Vice-President for the Board.

Selmer Schoenrock, who received 127 votes, will begin his fifth two-year term serving as Director for Precinct No. Two covering Cochran, Hockley and Lamb counties. Schoenrock served as Secretary-Treasurer during 1977.

The third position on the Board of Directors will be filled by Malvin Jarboe, who was re-elected by 70 votes to his second term in office. Jarboe has served in the capacity of Director for the past two years representing Director's Precinct No. Five involving Floyd and Hale counties.

County Committee Members Elected

Sixteen County Committeemen were elected from Director's Precincts One, Two and Five. These men will serve four-year terms, all to expire in January 1982. They are:

COCHRAN COUNTY
From Committeeman's Precinct east of Highway 214
Robert Yeary
Committeeman-at-large
Keith Kennedy

CROSBY COUNTY
Committeemen-at-large
Mike Carlisle and Alvin Morrison

FLOYD COUNTY
Commissioner's Precinct No. Two
Charles Huffman
Commissioner's Precinct No. Four
Gilbert Fawver

HALE COUNTY
Committeemen-at-large
Gaylord Groce and Bill John Hegi

HOCKLEY COUNTY
Committeeman-at-large
J. E. Wade

Commissioner's Precinct No. Three
Jack Earl French

LAMB COUNTY
Commissioner's Precinct No. One
Billy J. Langford

Commissioner's Precinct No. Four
Edward Fisher

LUBBOCK COUNTY
Committeeman-at-large
Owen Gilbreath
Commissioner's Precinct No. Three
Clifford Hilbers

LYNN COUNTY
Commissioner's Precinct No. One
Gary Houchin
Commissioner's Precinct No. Four
Freddie Kieth

The official canvassing of the votes will be conducted during the regular meeting of the Board on February 6, and at this time the Board will conduct the installation of new officers.

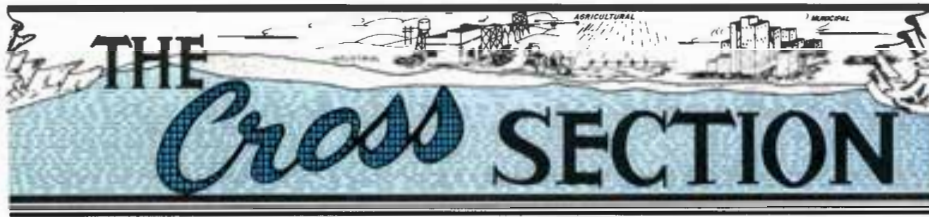
During the 1978 election a total of 1278 votes were cast. The District would like to extend our appreciation to the judges who participated in the election and to all the concerned citizens who voted.

DISTRICT DIRECTORS MEET

The Board of Directors met in their regular monthly meeting on January 10, 1978. In action concerning routine business, the Board approved travel vouchers, approved the payment of outstanding bills, approved 55 applications for water well permits, and discussed the financial status of the District.

Representatives from the U.S. Bureau of Reclamation, Emmett Gloyna, Planning Officer from Austin, and Darrell Mach, Regional Planning Officer from Amarillo, met with the District Directors to appraise them of the status of the Llano Estacado Total Water Management Study being conducted by the Bureau.

At two occasions during the meeting, the Directors convened in closed executive session to interview the remaining applicants for the position of Manager of the High Plains Underground Water Conservation District No. 1. After reconvening into open session at the conclusion of the meeting, the Board announced the appointment of Mr. A. Wayne Wyatt to the position effective February 1, 1978.



A MONTHLY PUBLICATION OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1
2930 Avenue Q, Lubbock, Texas 79405

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- Butch Bates _____ Field Representative
- Clifford Thompson _____ Head, Permit Section
- Kenneth Carver _____ Asst., Permit Section
- Mrs. Norma Fite _____ Secretary-Bookkeeper
- Miss Penny Newberry _____ Secretary

BOARD OF DIRECTORS

Precinct 1

(CROSBY, LUBBOCK and LYNN COUNTIES)
James P. Mitchell, Vice President _____ Wolfforth

Precinct 2

(COCHRAN, HOCKLEY and LAMB COUNTIES)
Selmer H. Schoenrock, Secy.-Treas. _____ Levelland

Precinct 3

(BAILEY, CASTRO and FARMER COUNTIES)
A. W. Gober, President _____ Farwell

Precinct 4

(ARMSTRONG, DEAF SMITH, POTTER and RANDALL COUNTIES)
Ray Gerk _____ Hereford

Precinct 5

(FLOYD and HALE COUNTIES)
Malvin A. Jarboe _____ Floydada

COUNTY COMMITTEEMEN

Armstrong County

Carroll Rogers, Secretary
Wayside, Texas

- Cordell Mahler, 1979 _____ Wayside
- James Bible, 1979 _____ Wayside
- Guy Watson, 1981 _____ Wayside
- Bill Heisler, 1981 _____ Wayside
- Leslie Adams, 1981 _____ Wayside

Bailey County

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

- Marshall Head, 1979 _____ Rt. 3, Muleshoe
- Harold Layton, 1979 _____ Rt. 2, Morton
- Eugene Shaw, 1981 _____ Rt. 2, Muleshoe
- David Stovall, 1981 _____ Rt. 2, Muleshoe
- Ernest Ramm, 1981 _____ Rt. 2, Muleshoe

Castro County

Garnett Holland, Secretary
City Hall, 120 Jones St., Dimmitt

- Anthony Acker, 1979 _____ Rt. D, Nazareth
- Harold Odum, 1979 _____ Rt. 4, Box 135, Dimmitt
- Jackie Clark, 1981 _____ Rt. 1, Box 33, Dimmitt
- W. A. Baldrige, 1981 _____ 608 W. Grant, Dimmitt
- Frank Wise, 1981 _____ Rt. 4, Box 10, Dimmitt

Cochran County

W. M. Butler, Jr., Secretary
Western Abstract Co., 108 N. Main Ave., Morton
Jessie Clayton, 1978 _____ 706 S. Main, Morton
Robert Yearly, 1978 _____ Route 2, Morton
Hershel M. Tanner, 1980, Route 2, Box 36, Morton
Danny Key 1980 _____ Star Route 2, Morton
H. H. Rosson, 1980 _____ Star Route 2, Morton

Crosby County

Clifford Thompson, Secretary
2930 Avenue Q, Lubbock

- Donald Aycock, 1978 _____ Lorenzo
- Alvin Morrison, 1978 _____ Box 6, Lorenzo
- Tommy McCallister, 1980 _____ 209 N. Van Buren, Lorenzo
- Edward S. Smith, 1980 _____ 102 N. Van Buren, Lorenzo
- Pat Yoakum, 1980 _____ Box 146, Lorenzo

Deaf Smith County

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

- George Ritter, 1979 _____ Rt. 5, Hereford
- Bill Cleavinger, 1979 _____ Route 1, Wildorado
- James E. Higgins, 1981 _____ 200 Star St., Hereford
- Garland Solomon, 1981 _____ 303 Sunset Dr., Hereford
- Tom Robinson, 1981 _____ 211 Cherokee Dr., Hereford

Floyd County

Verna Lynne Stewart, Secretary
Floyd Co. Abstract, 215 W. California, Floydada

- Joe Cunyus, 1978 _____ Lockney
- Gilbert L. Fawver, 1978 _____ Rt. 4, Floydada
- C. O. Lyles, 1980 _____ Route 4, Floydada
- Connie Bearden, 1980 _____ Route 1, Floydada
- M. M. Smitherman, 1980 _____ Silverton Star Rt., Floydada



Hale County

J. B. Mayo, Secretary

Mayo Ins., 1617 Main, Petersburg

- Henry Kveton, 1978 _____ Route 2, Petersburg
- Gaylord Groce, 1978 _____ RFD, Petersburg
- Clint Gregory, Jr., 1980 _____ Box 98, Petersburg
- Homer Roberson, 1980 _____ Box 250, Petersburg
- Henry Scarborough, 1980 _____ Route 2, Petersburg

Hockley County

Jim Montgomery, Secretary
609 Austin Street, Levelland

- J. E. Wade, 1978 _____ Route 2, Littlefield
- Jimmy Price, 1978 _____ Route 3, Levelland
- Billy Ray Carter, 1980 _____ Route 5, Levelland
- Leon Young, 1980 _____ Route 1, Ropesville
- Robert Phillips, 1980 _____ 218 Redwood, Levelland

Lamb County

Robert Richards, Secretary
509 Phelps Avenue, Littlefield

- Billy J. Langford, 1978 _____ Box 381, Olton
- Edward Fisher, 1978 _____ Box 67, Sudan
- P. A. Washington, 1980 _____ Box 124, Springlake
- Jack Stubblefield, 1980 _____ Box 397, Spade
- Larry Lockwood, 1980 _____ Star Rt. 2, Littlefield

Lubbock County

Clifford Thompson, Secretary
2930 Avenue Q, Lubbock

- Dan Young, 1978 _____ 4607 W. 14th St., Lubbock
- Clifford Hilbers, 1978 _____ RFD, Idalou
- Don Bell, 1980 _____ Box 114, Wolfforth
- Ronald Schilling, 1980 _____ Route 1, Slaton
- Granville Igo, 1980 _____ Route 1, Shallowater

Lynn County

Clifford Thompson, Secretary
2930 Avenue Q, Lubbock

- Orville Maeker, 1978 _____ Route 1, Wilson
- Freddie Kieth, 1978 _____ New Home
- S. B. Rice, 1980 _____ Route 1, Wilson
- W. R. Steen, 1980 _____ Route 2, Wilson
- Wendell Morrow, 1980 _____ Route 1, Wilson

Farmer County

Ken Horn, Secretary

Horn Insurance Agency, Bovina

- Floyd Reeve, 1979 _____ Box 876, Friona
- Ralph Roming, 1979 _____ 809 Ridgela Dr., Bovina
- Troy Christian, 1981 _____ Rt. 1, Farwell
- Dalton Caffey, 1981 _____ 15th St., Friona
- Ronald Elliott, 1981 _____ Rt. 3, Muleshoe

Potter County

- F. G. Collard, III, 1979 _____ Rt. 1, Box 433, Amarillo
- W. J. Hill, 1979 _____ 5503 Emil, Amarillo
- Jim Line, 1981 _____ Box 87, Bushland
- Albert Nichols, 1981 _____ Rt. 1, Box 491, Amarillo
- Weidon Rea, 1981 _____ Bushland

Randall County

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

- John F. Robinson, 1979 _____ 1002 7th St., Canyon
- Bill Dugan, 1979 _____ Rt. 2, Box 30, Happy
- Harry LeGrand, 1981 _____ 4700 S. Bowie, Amarillo
- Joe Albracht, 1981 _____ P.O. Box 81, Bushland
- Jack Brandt, 1981 _____ Rt. 1, Box 280, Canyon

Drought--Are We Prepared?

How long does a farmer keep farming during an extended drought? Will the dust ever blow again during future droughts, as it did in the dirty '30's? Do farmers have enough know-how about dryland farming? What is the economics of dryland farming?

These are important questions in assessing the impacts of future droughts and the answers may come from why and what happened during earlier droughts and what agriculturists have learned from past experience, according to Dr. Harold E. Dregne, Director of Texas Tech University's International Center for Arid and Semi-Arid Land Studies (ICASALS).

A representative of ICASALS contacted area farmers, bankers, real estate dealers, agronomists and agricultural engineers to find out what happened in the past and what the future holds. Area farmers obviously did not welcome the idea of an extended drought, but were willing to say that they will stay in the business as long as the 'banker keeps banking'. That may seem to be a simple relationship but it involves the entire gamut of economics.

"In the dust bowl days of the '30's this country had not recovered from the depression. Farmers abandoned their land in disgust and moved to areas where there was relief of any sort. During the drought of the '50's, however, the war was over and the national economy was already on the upswing which enabled farmers to keep their land and yet find jobs outside the agricultural sector", said Dub Rushing, a Lubbock real estate developer.

The drought during the '50's lasted for about seven years, four more than the drought of the '30's. But stronger economies during the '50's certainly helped reduce the impact, Rushing emphasized. The development of irrigation also played an important role during the '50's.

Rushing distinguishes between financial bankruptcy during a drought and

mental bankruptcy. The drought of the '30's, he said, produced so much misery in the semi-arid Southwest "that farmers could not even think straight". That unfortunate state of mind resulted in a lot of farmers becoming mentally bankrupt long before they declared that financial state.

"A future drought in the semi-arid Southwest", according to a Lubbock farmer, "will result in a majority of the farmers having to switch from irrigated farming to dryland agriculture."

H. C. Barrette, an area farmer, said that producers will have to accept the idea of reduced yields "although more difficult than that would be the mental adjustment required to stop irrigation pumps".

According to an agricultural engineer at Texas Tech, the switch to dryland farming may indicate that the Southwest is likely to see the Dust Bowl days again. That is speculative, though, as long as the drought does not last for more than two or three years. After that, without any significant plant residue from previous years, soil erosion may start. "The drought of the '30's lasted only for three years, but back then it was almost impossible to stop the dust from blowing once it started. Today there is equipment that can cover the land faster and help prevent excessive soil erosion", said Marvin J. Dvoracek of Texas Tech.

"But there is a trade off there. In some cases, in order to prevent the top soil from blowing away, the farmer will have to alter his land in such a way that it will affect yield", according to Dr. J. D. Bilbro, an agronomist at the USDA Agriculture Research Center in Lubbock. "But it is better to alter the land and grow something than to allow the top soil to blow away and not grow almost anything at all", he explained.

Some farmers are concerned though that it does not help for them to protect their land if their neighbor does not protect his; however, farmers

continued on page 4... DROUGHT



UGLY REMINDER—Repeated droughts, dust storms, and crop failures in the Southwest reduced this once productive farm to a barren land mass during the drought of the '30's. This may happen again during future droughts, especially if preparations are not made in advance. (USDA-SCS photo)

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 W. J. Hill.

Three Directors Re-elected To Board For 1978-1980

JAMES P. MITCHELL

On January 21, residents of Director's Precinct No. One (Crosby, Lubbock and Lynn Counties) re-elected James P. Mitchell of Wolfforth to his second two-year term of office on the District's Board of Directors.

Mitchell, 44, was originally elected to the Board of Directors in January 1976, and during 1977 served as Vice-President of the Board.

The Director, raised north of Wolfforth, graduated from Frenship High School in 1952 and studied Agriculture for two years at Texas Tech University. In November 1954, Mitchell married the former Sylvia Wright of New Deal. He and his wife have been married for 23 years and have two children, Cindy, 19, a student at West Texas State University in Canyon; and Kevin, 17, a student at Frenship High School in Wolfforth.

The Mitchells presently farm 1,500 acres of cotton and milo and have 22 irrigation wells in operation. Mitchell has been very active in his community in the past serving as Director of the Frenship School Board and the Wolfforth City Council. He is also presently a Director of the Frenship Co-Op Gin, Director of the Plains Co-Op Oil Mill, and is active with the 4-H and the F.F.A.

In 1976, when Mitchell was elected to the Board of Directors, he said he wanted to represent the producers and irrigators in his area in the best way he could. During a recent talk, Director Mitchell stated, "I now recognize that we need not just the agricultural segment, but all of the public, municipal and industrial elements, working together, to find solutions to the area water problems. To this end, I dedicate my service to working toward effective solutions".



JAMES P. MITCHELL

MANAGER . . . continued from page 1

projected estimates of pumpage, pumping lifts and well yields. Nine of the individual county reports have been published and approximately seven additional ones are at the printers.

Mr. Wyatt (he requests that his friends call him Wayne) will assume his new duties on February 1st. The Staff joins the Directors in welcoming Wayne aboard and look forward to working with him.

SELMER H. SCHOENROCK

Selmer H. Schoenrock of Levelland, Member of the Board of Directors since January 1970, was recently re-elected to his fifth consecutive two-year term, January 21. Schoenrock represents District Director's Precinct Two (Cochran, Hockley and Lamb Counties).

The Director served during 1977 as Secretary-Treasurer for the Board. He has also served the District as President of the Board, 1976, and Vice-President of the Board, 1975. Previous to being elected to the Board, Schoenrock served as Hockley County Committeeman from 1963, until 1969.

Schoenrock is a native of Clifton, Texas, and in 1934 he moved with his family to the Levelland area. After graduating from Levelland High School in 1941, he then served two years in the U. S. Navy.

The Hockley County farmer and his wife, Maurine, have been married since November 22, 1946, and have been farming in the Levelland area since that time. The Schoenrocks have three children and two grandchildren.

Their eldest daughter, Donna Kay Taylor, 29, is married and lives in Corpus Christi, with her husband, Mike. Donna teaches Special Education at Lozano Elementary School. She and her husband have two children, Heather, 7, and Cody, 3. Mike is also an elementary school teacher.

The Schoenrock's other daughter,

Lynn Pudney, 28, is also married and lives in Brownfield. She and her husband, Greg, are expecting their first child in May. They are both employed as teachers.

Jerrell, the Schoenrock's son, is a 1977 graduate of Texas Tech University with a degree in Micro-biology. At the present time he is working on the farm with his father.

The Director presently farms 1,650 acres of cotton and milo and has 20 irrigation wells in operation.



SELMER H. SCHOENROCK

Applying Herbicides Through Sprinkler Irrigation System

Applying herbicides through a sprinkler irrigation system is a new technology that works for certain herbicides in corn. Dr. Allen Wiese, Texas Agricultural Experiment Station researcher, pointed this out at the Southern Weed Science Society in New Orleans on January 18. Eradicane, Sutan+, and Lasso are labeled for this purpose. Mixtures of Sutan+ and Atrazine along with Lasso and Atrazine are also labeled. The Texas A & M University scientist also told Society members about 1977 research he conducted with Bill Turner, a CIBA-Geigy researcher from Lubbock, Texas: Getting more herbicides labeled for application through center pivots was the object of the study.

The two scientists applied twelve preemergent treatments to corn through a center pivot irrigation system on the Charles Hough farm south of Friona, Texas. An untreated plot was included for comparison and each plot was about ten acres. Herbicides and pounds per acre active ingredient applied with 0.8 inch of water were Dual + AAtrex, 2 + 1.6 and 2.5 + 2.5; a prepackage mixture of the two herbicides at the same two rates; AAtrex, 3; Dual, 3; Lasso, 3; Lasso + AAtrex, 2.25 + 1.2; Eradicane, 6; Sutan+, 6; and Sutan+ + AAtrex, 6 + 1.5. In addition, Eradicane and Dual were applied in 1.3 inches of sprinkler irrigation. The 0.8 inch of water wet the soil two to three inches and largely evaporated. The 1.3 inch application wet the soil deeper and met residual moisture.

The quarter section field had been no-till planted to corn in 1976 and treated with AAtrex. Stalks had been shredded and the field was tandem disked prior to planting corn on April 27, 1977. There were several tons of crop residue on the soil surface when herbicides were applied from May 3 to May 6. The fine textured soil was one-third sand, silt and clay with 1.5 percent organic matter. Volunteer corn and a few weeds were cultivated about May 15.

About two weeks after application, the scientists took soil samples at zero to two and two to four inches deep and planted them to millet and wheat to measure how deep herbicides leached. AAtrex, Eradicane and Dual applied with 0.8 inch of water along with Dual and Eradicane applied in 1.3 inches of water were sampled.

AAtrex injured wheat at both depths, but had little effect on millet. Dual did not leach below two inches when applied in 0.8 inch of water, but leached below two inches when 1.3 inches of sprinkler irrigation was used. Eradicane did not kill millet or wheat when applied in 0.8 inch, but injured both when applied in 1.3 inches of water. "More of the Eradicane must have persisted when applied in the high rate of water", the scientists said.

The researchers checked weed control on June 30, when corn was five feet tall. Neither untreated nor treated areas had many weeds and by harvest the entire field was weed free. Herbi-

MALVIN A. JARBOE

The Director representing Director's Precinct No. Five (Floyd and Hale Counties) will be Malvin A. Jarboe. The Director was re-elected to the position on the Board on January 21, and will begin his second two-year term in office.

Jarboe began serving as Director after being elected in January 1976. Prior to that time, he had served as Floyd County Committeeman for seven years.

Born in Floydada in 1921, the Floyd County farmer graduated from Floydada High School in 1939 and has farmed in the area since 1941.

Jarboe and his wife, FloElla, were married in January 1943, and have one daughter, Vickie, 30. Vickie and her husband, Kenneth, farm in the Floydada area and have two daughters; Kelley, 10, and Kerrie, 5.

Serving as Vice-President of the Federal Land Bank Association of Floydada and as Secretary of the Board of Consumers Fuel Association are two of the ways Jarboe stays active in his community.

The Jarboes farm approximately 1,700 acres of wheat, milo and cotton and operate 13 small irrigation wells. He also maintains several recirculation systems which he feels are more valuable than any well he pumps. Director Jarboe has long been involved in conservation of the soil and water resources on his land.



MALVIN A. JARBOE

cides did not injure corn and all plots produced about 10,000 pounds per acre of grain.

Wiese concluded his presentation by stating that the information gained from the experiment will help obtain labels for AAtrex and Dual. He also pointed out that occasional poor weed control with Eradicane, when applied with sprinkler irrigation to fine textured soil, may be the result of insufficient water application.

* Bushland Research News Report. For additional information contact Dr. A. F. Wiese, Texas Agricultural Experiment Station, USDA Southwestern Great Plains Research Center, Bushland, Texas.

Hockley County Report Released

A study of the amount of water in the Ogallala Aquifer and projections for future years in Hockley County has been completed by the Texas Department of Water Resources.

Report 214, "Analytical Study of the Ogallala Aquifer in Hockley County, Texas" charts the impact and future course of underground water depletion through the next 44 years and its effect on irrigation water production. The study and report were made by staff members Ann E. Bell and Shelly Morrison.

Copies of Report 214 are available without charge from the Texas Department of Water Resources, P. O. Box 13087, Austin, Texas 78711.

Generally, the study shows that if

present water use and irrigation practices are continued, the aquifer will decline by about 43 percent by the year 2000 and about 63 percent by the year 2020.

Most High Plains residents are well informed on the continuing decline of the region's groundwater, and know that this is the lifeblood of the area's agriculture where some 70 percent of the State's irrigated food and fiber is grown.

Guidelines provided in the report were obtained by the use of electronic computers that simulate the aquifer's behavior and should provide the groundwater user in the county with reasonably good estimates by which future management decisions can be made.

Hockley County had about 3.5 million acre-feet of groundwater in storage in 1974. The computer study shows that 57 percent of this total, or about 2.0 million acre-feet, will be left in storage in 2000 if past water-use patterns and aquifer behavior are continued in the future. Only 1.3 million acre-feet, or 37 percent, will remain in storage by the year 2020.

Pumping lifts in wells throughout Hockley County range from about 50 to 275 feet. The study indicates that the range in pumping lifts in the county during the study period 1974 through 2020 will remain essentially the same because of decreasing saturated thicknesses and consequent diminished well yields.

With the thinning of the aquifer's saturated thickness, annual pumpage of water in the county will decline significantly. Compared to the 142,000 acre-feet of water produced in 1974, the amount expected to be produced in the years 2000 and 2020 is about 113,000 and 85,000 acre-feet respectively, an overall decline of 40 percent.

During the past three decades, the withdrawal of groundwater has greatly exceeded the natural recharge of the aquifer. If this overdraft continues, the aquifer ultimately will be depleted to the point that it may not be economically feasible to produce water for irrigation, the authors state.

These findings, the authors emphasize, are based on the continuation of past trends. Future events can be very different if these trends change. The most determinative factor may be the



In 1896 William Jennings Bryan said it best, "Burn down your cities and leave our farms, and your cities will spring up again as if by magic, but destroy our farms and the grass will grow in the streets of every city in the country." As long as the North American farmer can supply our food at a price that allows us to spend the greatest part of our income for our cars and TVs and recreational items, our high standard of living can continue. But, when our farmers can no longer produce our low-cost food, or when they have no economic incentive or ability to produce this food—truly, again, "the grass will grow in the streets of every city in the country."

Submitted by Mr. E.T. Evans, Boise, Idaho, in response to a request from Ipsston Corporation to the membership of the American National Cattlemen's Association (now the National Cattlemen's Association).

DROUGHT . . . continued from page 2

apparently have the technology for effective soil conservation measures.

Dryland farming will obviously mean reduced yields, but the investment in production will also be relatively less as there will be little or no energy costs for pumping water, and there will be a reduction in labor required for managing the irrigation systems.

As John Arnn puts it: "Ultimately, we will cope with dryland farming, drought or no drought". Arnn, Director of the Food and Fiber National Institute of Achievement in Lubbock, is convinced that farmers should always be aware that the Southwest is dry more often than it is wet and that droughts are a way of life, especially in the Southern Great Plains.

Once they accept that idea, it will be easier to prepare for droughts rather than wait and respond to them, according to Dregne. "During the years with good rainfall it is easy to believe that droughts are a thing of the past. That is when complacency sets in", Dregne emphasized. Dregne is concerned about the complacency and the lack of systematic preparations for future droughts. The technology may be available, he says, but it has been 20 years since the last extended drought occurred and conditions have changed considerably since then. "We have to revise our ideas of what we can do to prepare for the future", he concludes.

decisions of the water users themselves.

Report 214 contains maps, charts, and tabulations which reflect estimates of the volume of water in storage in the Ogallala Aquifer in Hockley County and the projected depletion of this water supply by decade periods through the year 2020. The report also contains estimates of pumpage, pumping lifts, and other data related to current and future water use in the county.

The maps in the report are intended for use as general guidelines only and are not recommended for use in determining water availability when buying and selling specific tracts of land. It is recommended that a qualified groundwater hydrologist be consulted to make appraisals of groundwater conditions when such transactions are contemplated.

* Texas Department of Water Resources News Release

THE Cross SECTION

Published monthly by High Plains Underground Water Conservation District No. 1, 2930 Avenue Q, Lubbock, Texas 79405

Volume 24—No. 2

Publication number 564920, Second Class Postage paid at Lubbock, Texas

February, 1978



Directors for 1978 are, seated, A. W. Gober, President, James P. Mitchell, Vice-President. Standing (from left to right) are Selmer H. Schoenrock, Secretary-Treasurer, Malvin A. Jarboe, Member, and Ray Gerk, Member.

Board Of Directors Meet

The District's Board of Directors met on February 6th, to review the recent election, canvass the votes and declared the results to be official.

During the swearing-in ceremony, Judge Denzil Bevers of the 72nd Judicial District Court, administered the oath of office to Directors Schoenrock, Mitchell and Jarboe. The District staff and Board members wives were privileged to witness the ceremony.

In other business the Board elected officers for 1978 with a unanimous motion by Mr. Gerk seconded by Mr. Jarboe to retain 1977 officers in the same capacity (i.e.) President Gober, Vice-President Mitchell and Secretary-

Treasurer Schoenrock.

In routine business, the Board authorized the payment of outstanding bills, reviewed the financial report, approved water well permits for 51 wells and heard a five year comparison report from Clifford Thompson indicating completion of 128 wells in January 1977, 135 wells in January 1976, 90 wells in January 1975, 222 wells in January 1974 and 59 wells in January 1973. Mr. Wyatt reported to the Board on several activities of the Manager and various staff members gave brief outlines of the status of various programs and projects requiring District participation.

Wyatt Appointed To Governor's Task Force

A. Wayne Wyatt, General Manager of the High Plains Underground Water Conservation District No. 1 was recently notified of his appointment as a member of the Governor's Water Resource Conservation and Development Task Force by Governor Dolph Briscoe.

The Membership of the Task Force is made up of representatives of the major water authorities, commissions,

districts and agencies involved in water regulation in Texas. In requesting Wyatt's service on the Task Force, Governor Briscoe stated, "I feel that your leadership and insights would be highly valuable towards the goal of conserving our existing water resources as well as planning for the future growth of our state".

Saturated Thickness Maps Displayed

By A. Wayne Wyatt

A map illustrating the approximate saturated thickness of the Ogallala Aquifer in the High Plains of Texas in 1974 and a similar map illustrating an approximation of what the saturated thickness of the aquifer will be in the year 2000 can be found on pages two and three of this month's issue of The Cross Section. These maps are being reproduced courtesy of the Texas Department of Water Resources.

A comparative study of these maps should illustrate to the water users in the High Plains the need to utilize both the precipitation and groundwater supplies in the most prudent manner with the least amount of waste.

Although these maps are generalized

and the projections as illustrated by the map for the year 2000 are based on a projection of an average of conditions which occurred between 1962 and 1974, the maps are believed to provide reasonable estimates of recent conditions and of what might be expected in the future on a regional basis. Caution should be exercised in the use of the maps as guidelines for checking groundwater conditions for specific tracts of land inasmuch as the maps are generalized and do not illustrate many local conditions. Individual County reports which provide more detailed data are available from the Texas Department of Water Resources and the Water District for Bailey, Briscoe, Castro, Crosby, Deaf Smith, Floyd, Hale, Hockley, and Parmer Counties.

Limited-Tillage And No-Tillage Evaluated

Farmers would profit by taking a hard look at no- or limited-tillage farming methods. Research at the USDA Research Center at Bushland shows that reduced tillage is the greatest breakthrough in soil and moisture conservation since the sweep plow. These remarks were made by Dr. A. F. Wiese during the High Plains Agricultural Seminar at Panhandle State University in Goodwell, Oklahoma on February 1. "Limited tillage not only conserves soil but cuts production costs and increases yields", The Texas Agricultural Experiment Station Scientist from Bushland said.

Chemical fallow studies were started on dryland at Bushland in 1958. Atrazine and 2,4-D did a good job of controlling weeds in the fallow between wheat harvest and sorghum planting. Soil moisture storage and sorghum yields were not increased over sweep tillage. "The system was not practical because herbicides cost more than sweep tillage", Wiese said.

Limited tillage research proved fruitful in 1968 when Dr. Paul Unger, USDA Soil Scientist, controlled weeds in irrigated wheat stubble with Atrazine and 2,4-D during a ten month fallow. He compared this to disk tillage, sweep tillage and a combination of sweep tillage and chemical weed control. There were about 10,000 pounds per acre of wheat stubble on the soil surface. Previous dryland experiments had less than 4,000 pounds per acre of crop residue. After the ten month fallow, no-till plots still had 4,100 pounds per acre of straw. Disk areas had little or no stubble left. Soil moisture storage on the disk area was 2.8

inches or 20 percent of the precipitation. No-tillage stored 5.6 inches or 39 percent of the rainfall.

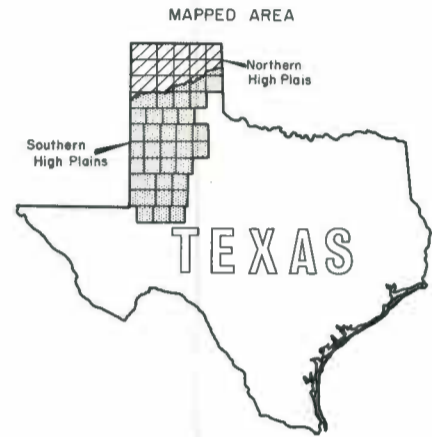
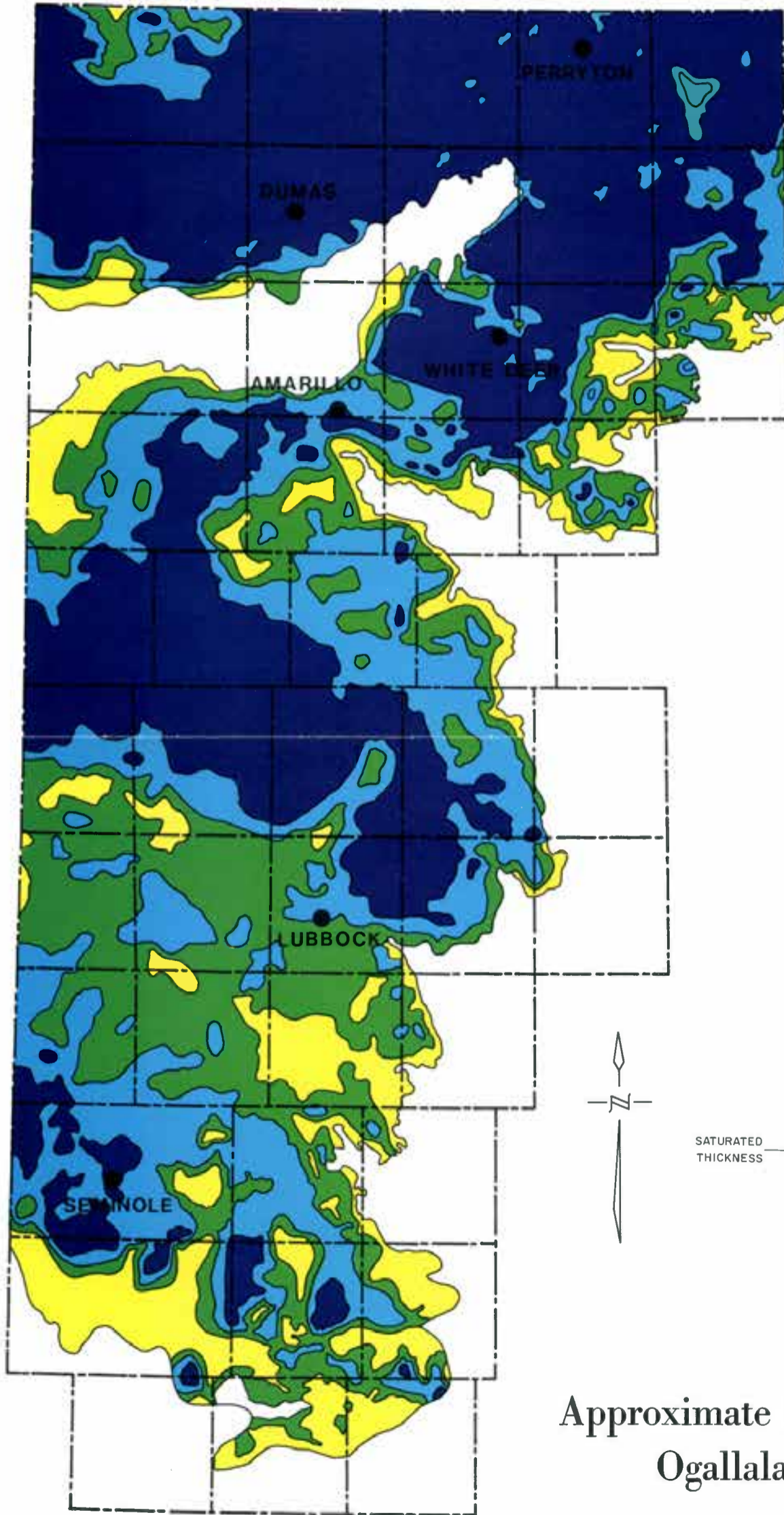
"This experiment proved to be the magical Pandora's Box of conservation research in the Southern Great Plains," Wiese said. Unger had unlocked the secret of improving soil moisture storage in the Oklahoma and Texas Panhandles. It took more mulch than could be produced on dryland.

Unger continued his research in 1970 by planting wheat after irrigated corn. He planted some wheat without tillage, some with rototilling and some on clean ground. After wheat harvest, he again adjusted crop residue level from nothing to more than 10,000 pounds per acre with various amounts of tillage or controlling weeds with herbicides. Soil moisture storage from July 1971, to May 1972, varied from 2.0 to 8.2 inches. This was 11 to 45 percent of precipitation. In May 1972, grain sorghum was planted dryland without tillage and weeded with herbicides to save crop residue. Yields improved with increased surface residue and varied from 2,750 to 5,360 pounds per acre. "Yields were almost doubled and herbicide cost during fallow was the same as tillage," Wiese told students and farmers at Panhandle University.

After these initial successes, Jack Musick and Ron Allen, USDA Agricultural Engineers, conducted irrigation experiments with limited tillage. Limited tillage was compared to disk tillage in a wheat-sorghum-fallow cropping sequence on furrow irrigated land. Weed control from wheat harvest to sorghum planting was done with

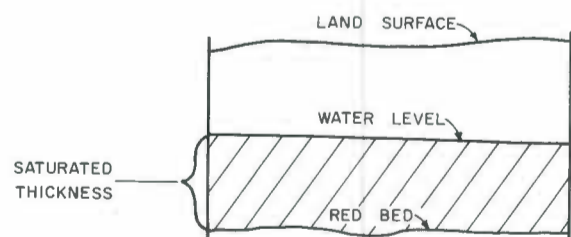
continued on page 4 . . . LIMITED-TILLAGE

HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1



EXPLANATION

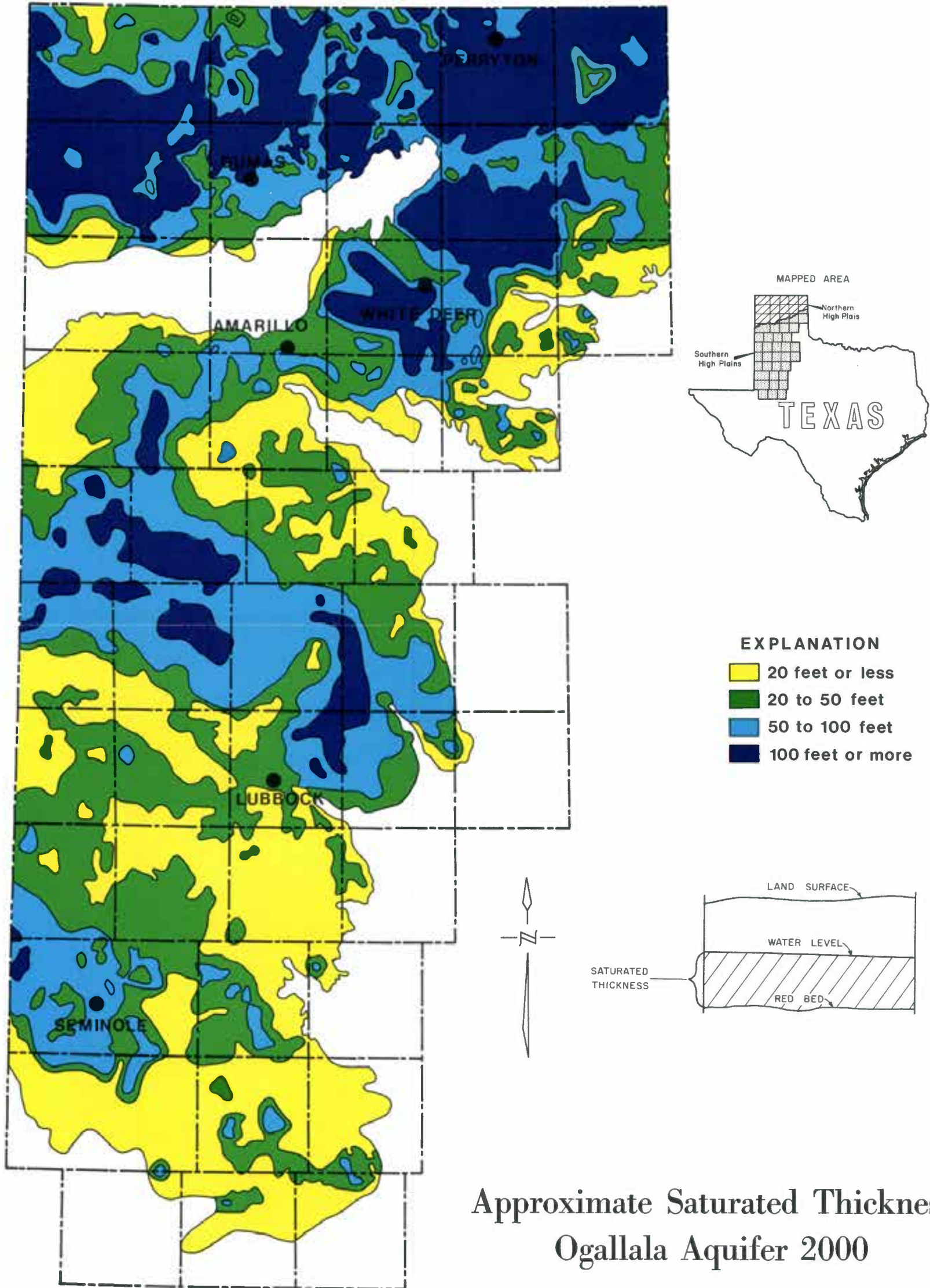
- 20 feet or less
- 20 to 50 feet
- 50 to 100 feet
- 100 feet or more



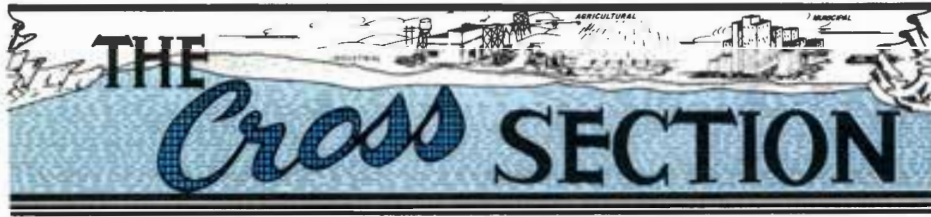
Approximate Saturated Thickness
Ogallala Aquifer 1974

From maps prepared by the Texas Department of Water Resources—A. Wayne Wyatt, Ann E. Bell and Shelly Morrison

HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1



From maps prepared by the Texas Department of Water Resources—A. Wayne Wyatt, Ann E. Bell and Shelly Morrison



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Troy Christian, 1981 Rt. 1, Farwell
Dalton Caffey, 1981 P.O. Box 488, Friona
Ronald Elliott, 1981 Rt. 3, Muleshoe

Potter County

- F. G. Collard, III, 1979 Rt. 1, Box 433, Amarillo
W. J. Hill, 1979 5503 Emil, Amarillo
Jim Line, 1981 Box 87, Bushland
Albert Nichols, 1981 Rt. 1, Box 491, Amarillo
Weldon Rea, 1981 Bushland

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Harry LeGrand, 1981 4700 S. Bowie, Amarillo
Joe Albracht, 1981 P.O. Box 81, Bushland
Jack Brandt, 1981 Rt. 1, Box 280, Canyon

Limited-Tillage And No-Tillage Evaluated . . . continued from page 1

Atrazine and 2,4-D. With disk tillage, beds were destroyed and rebuilt before planting. Yields were 4,550 and 3,640 pounds per acre with two irrigations after no-tillage and disk tillage. With four seasonal irrigations, yields were 5,760 and 5,320 pounds of sorghum grain per acre. No-tillage was the winner again.

After sorghum harvest, limited tillage consisted of disk bedding to rebuild beds, one sweep plowing to loosen beds and rodweeding to control weeds as necessary. Limited tillage increased wheat yield three bushels per acre compared with disk tillage when two summer irrigations were applied.

Other cropping systems with fallow periods have proven practical. Irrigated wheat planted immediately after sorghum harvest increased soil mulch level so that a following dryland crop of no-tillage sorghum yielded 1,000 pounds per acre more than where stubble was destroyed by disking.

No tillage, limited tillage and disk tillage were evaluated in continuous irrigated wheat. Paraquat or Roundup was used to control volunteer and weeds between crops for no-tillage. Limited tillage was one 2,4-D application, disk bedding and rodweeding. Yields were increased four bushels per acre with no-tillage. Herbicide cost destroyed the advantage. Limited tillage yielded the same as disking and was most profitable because of re-

duced cost. No-tillage of continuous irrigated sorghum was not practical because herbicides could not control volunteer that emerged after planting. Yields of forage were increased with no-tillage, but grain yield was less than with disking. Volunteer sorghum competed with the planted crop.

Double cropping sorghum after irrigated wheat proved practical and yields were increased 500 pounds per acre with no-tillage in a five year experiment. Sorghum was dry planted in wheat stubble and watered up. Weeds and volunteer wheat were controlled with Atrazine. Planting hybrid sudan after grazed out wheat was equally successful according to the weed researcher.

Wiese pointed out that similar research in Kansas and Nebraska had proven the value of no-tillage under irrigation in western parts of the states. Limited tillage also has proven profitable in central Kansas where dryland wheat produces enough straw to increase soil moisture storage.

The researcher concluded his presentation by telling farmers that limited tillage has a place in the Texas and Oklahoma Panhandles. "Water and soil will be conserved and profits will be increased," Wiese said.

Bushland Research News. For additional information contact Dr. A. F. Wiese, Texas Agricultural Experiment Station, Bushland, Texas.

WATER, INC., HOLDS ANNUAL MEETING

Amarillo attorney Jerome W. Johnson was elected President of Water, Inc., by the organization's Board of Directors at its annual meeting February 11, in Amarillo. Johnson succeeds J. W. Buchanan of Dumas, who served two years as President.

Joining Johnson as a new officer is Lloyd Calhoun of Hobbs, who was named First Vice-President. Rounding out the new slate of Water, Inc., officers are Second Vice-President A. C. Verner of Lubbock, Secretary Edward G. Weber of Amarillo and Treasurer Jim Ed Waller of Lubbock, all re-elected.

The meeting was dedicated to retiring Congressman George Mahon for his concern and action toward solving the High Plains water problems and for his outstanding 44-year Congressional record. Mahon was unable to attend the dedication ceremonies because of

illness, but Texas Water Development Board member George W. McCleskey attended on his behalf.



JEROME W. JOHNSON
(photo courtesy Preston Lewis)

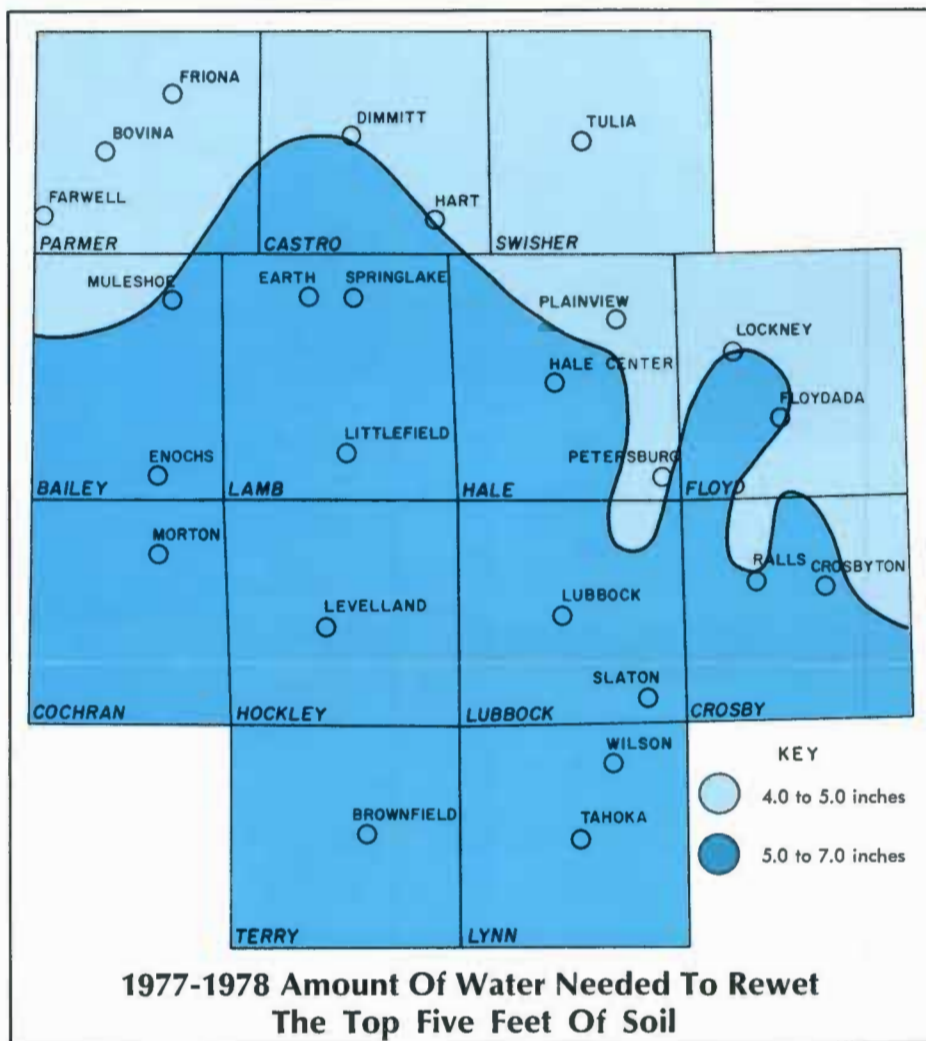
THE Cross SECTION

Published monthly by High Plains Underground Water Conservation District No. 1, 2930 Avenue Q, Lubbock, Texas 79405

Volume 24—No. 3

Publication number 564920, Second Class Postage paid at Lubbock, Texas

March, 1978



Well Yield Estimate Maps Published

By A. Wayne Wyatt

Estimates of the rate, in gallons per minute, at which the Ogallala Aquifer should be capable of yielding water to wells in various areas of the High Plains of Texas are presented on maps located on pages two and three of this issue of "The Cross Section".

These well-yield estimates are based on capabilities of the aquifer to yield to irrigation wells of prevailing construction as reflected by the very large number of pumping tests which have been conducted in various saturated-thickness intervals in the Texas High Plains. The map illustrating the potential of the aquifer to yield water to wells in the year 2000 was constructed to reflect the predicted decreases in well yields at that date due to the expected reduction in saturated thickness of the aquifer.

The well-yield estimates are subject to deviations caused by localized geological conditions. The Ogallala Aquifer is not a homogeneous formation; that is, the silt, clay, sand, and

gravel which generally comprise the formation vary from place to place in thickness of layers, layering position, and grain-size sorting.

The physical composition of the formation material can drastically affect the ability of the formation to yield water to wells. As an example, in areas where the saturated portion of the formation is comprised of thick beds of coarse and well-sorted grains of sand, the well yields probably will exceed the estimates shown on the maps. In other localized areas, the saturated portion of the formation may be comprised principally of thick beds of silt and clay which can be expected to restrict well yields to less than those shown on the maps.

The maps presented in this issue of "The Cross Section" are intended for use as general guidelines only and are not recommended for use in determining well yield potentials when buying and selling specific tracts of land. These maps are being reproduced courtesy of the Texas Department of Water Resources.

Directors and Committeemen Meet

The District's Board of Directors met in regular session on March 13, 1978, recessed and continued their meeting following the District-wide County Committee meeting held on March 14.

During the first day's session, the Board set the tax rate for 1978 operations at five cents per 100 dollar county/state evaluation. Since the District's creation in 1953, the five cent per 100 dollar county/state evaluation has been in effect with the exception of 1977 when the tax rate was lowered to three cents. At that time, the District had accumulated a surplus of funds; therefore, the Directors elected to lower the tax rate for one year to utilize these funds rather than to continue to build a surplus.

better crops could be produced if the soil was wet prior to spring planting. Years of crop production have not produced a substitute method and the need for a well saturated soil profile prior to planting still holds. Until recent years, farmers could only guess at the amount of water needed to wet the soil, but with modern techniques, it has been possible to make a reliable estimate of additional pre-season water needs. Farmers who irrigate in excess of that which is needed probably will lose money and valuable water and those having sandy soils could lose

continued on page 4... SOIL MOISTURE

The first district-wide County Committee meeting in many years was held Tuesday, March 14, at the offices of the High Plains Underground Water Conservation District No. 1.

The day-long meeting, which is to be an annual affair, brought together the Board of Directors, County Committeemen and professional staff of the District.

The meeting was highlighted by a keynote address by Mr. Bill Waddle, General Manager of the Texas Water Conservation Association. Mr. Waddle emphasized to the County Committeemen the far reaching effects of the Water District's activities and related some history as to how their actions in the past had influenced state water programs and policy. Waddle also commented on water related activities taking place on the state and Federal level.

Following the keynote speech, various professional staff members of the District presented information to the County Committeemen concerning activities in each of their staff areas. Ideas and information concerning some future programs being considered by the Directors were discussed and the meeting was opened for a question-and-answer session with the Committeemen and others in attendance.

Soil Moisture Survey Released

Soil moisture information collected during January and February shows that the top five-foot layer of soil is very dry over all sections of the South Plains. These findings were recently published in a Soil Moisture Survey compiled by Mr. O. H. Newton of the National Weather Service.

Only the four northern-most counties of the High Plains Underground Water Conservation District No. 1 were not covered by the survey but a spot-check with the county agents representing these counties found that the results of the survey were also applicable to those counties.

Although rainfall since last August has been only about an inch below normal, other factors have caused a significant loss of moisture. This loss was mainly due to the lateness of the fall freeze which allowed plants to extract soil moisture over a longer period of time. Probably the most critical period of dry weather was during September because it was during this period that maturing crops used

the moisture that fell during August. Some rain and snow has been received since the last fall rains but amounts have been too small to change the dry conditions.

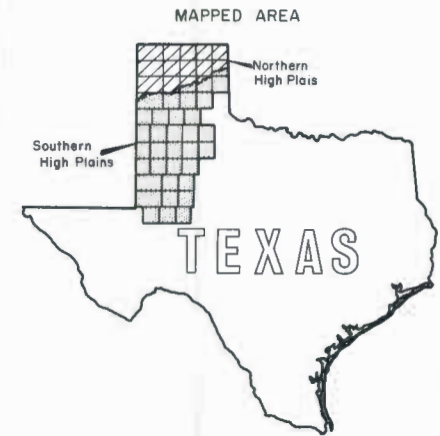
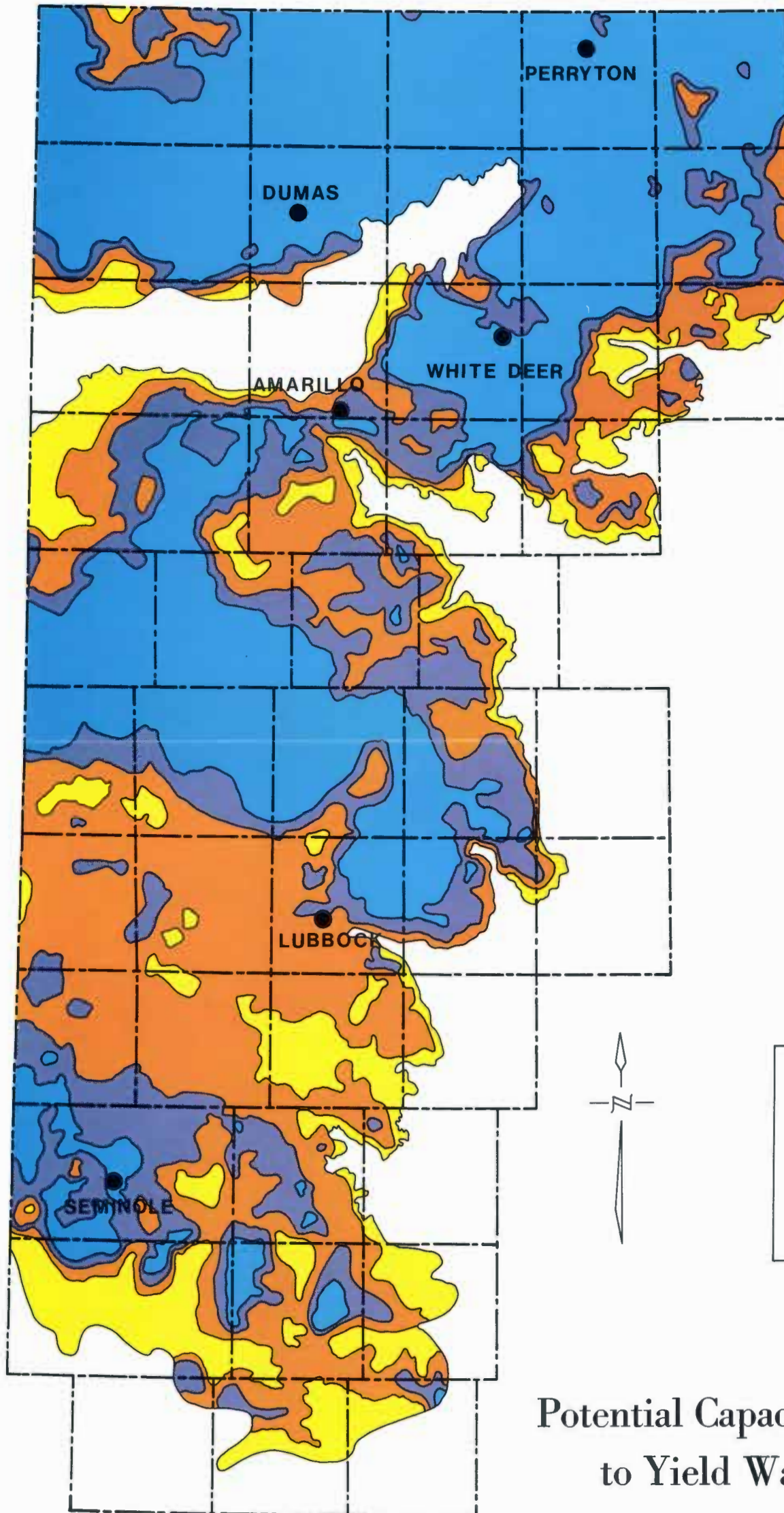
The accompanying chart shows the general soil moisture conditions in 14 South Plains counties. It should be noted that a very high percentage of this area needs from five to seven inches of moisture to rewet the top five feet of soil. It was found that shortages in the remainder of the area were from four to five inches.

Purpose Of Survey

The primary purpose of the annual fall and winter soil moisture survey is to determine the average amount of moisture that is held in the top five feet of South Plains soils. This in turn provides a basis for estimating the need for, and the amount of, preplant irrigation required to rewet the soil and give the farmer the best chance for a profitable crop.

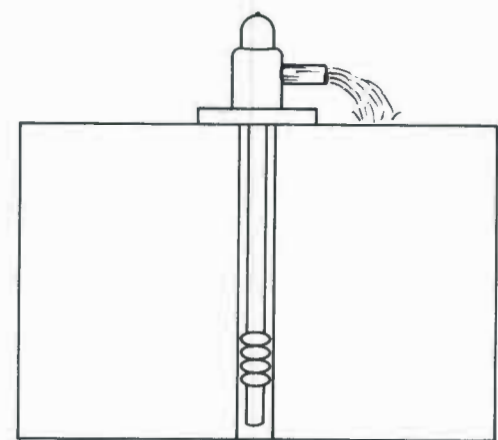
During the early years of South Plains irrigation, it was found that

HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1



EXPLANATION

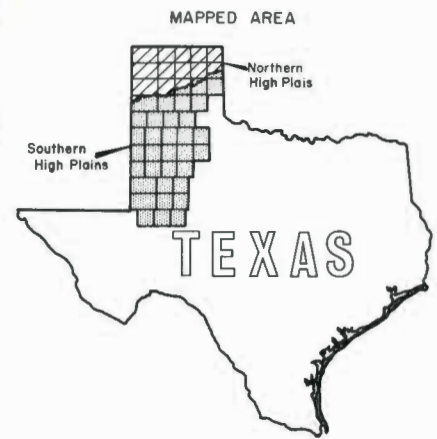
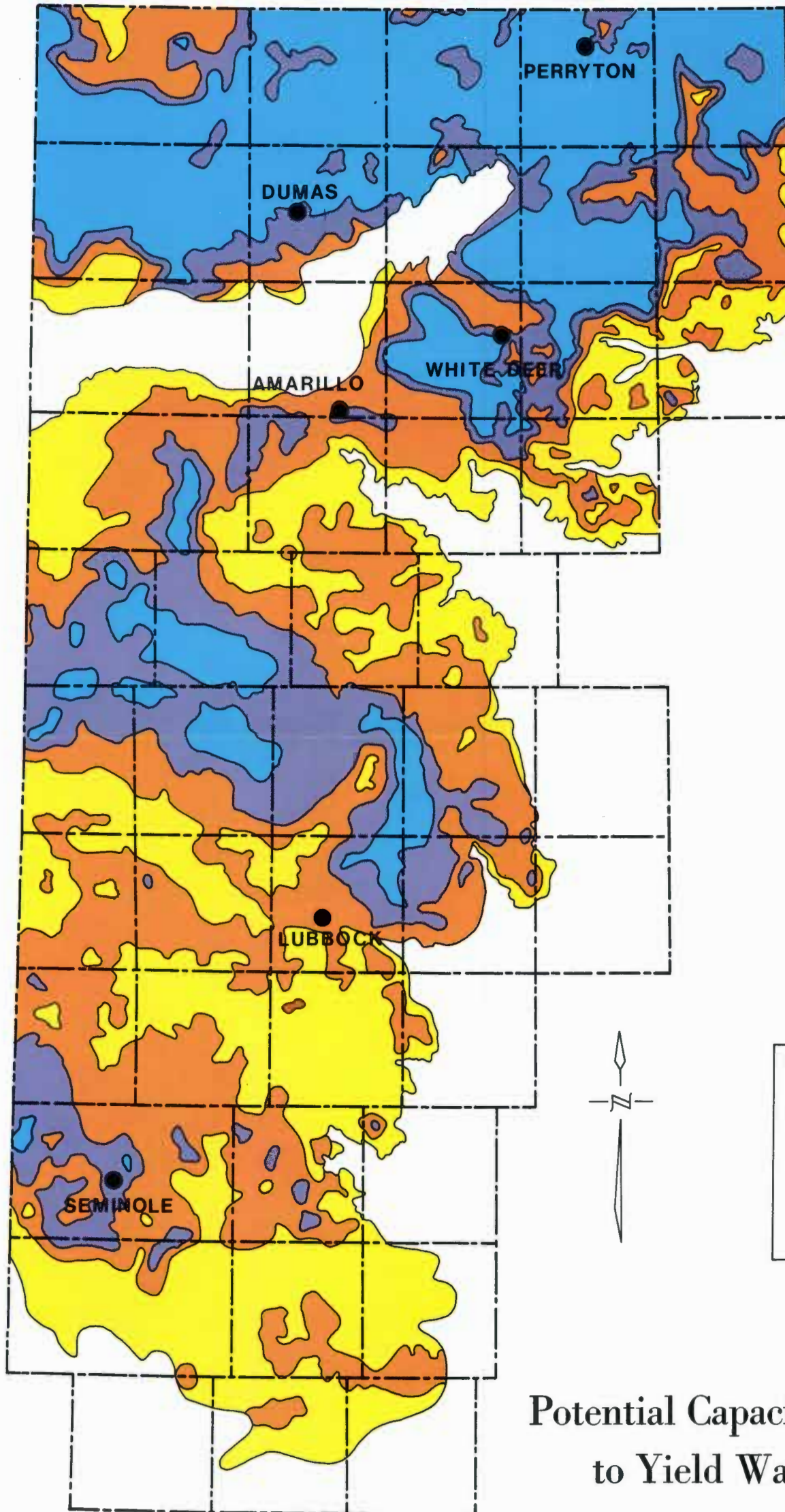
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- 1000 GPM or more



Potential Capacity of Ogallala Aquifer
to Yield Water to Wells-1974

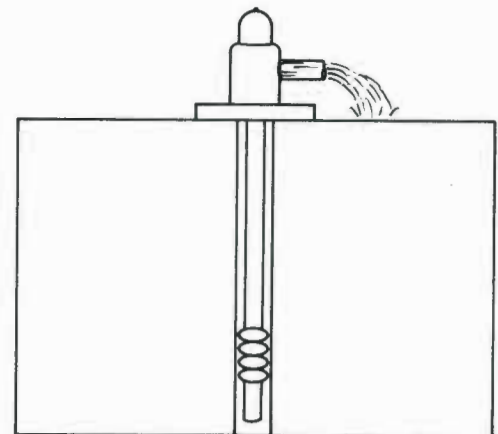
From maps prepared by the Texas Department of Water Resources—A. Wayne Wyatt, Ann E. Bell and Shelly Morrison

HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1



EXPLANATION

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Potential Capacity of Ogallala Aquifer to Yield Water to Wells - 2000

From maps prepared by the Texas Department of Water Resources—A. Wayne Wyatt, Ann E. Bell and Shelly Morrison



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Potter County

- F. G. Collard, III, 1979 Rt. 1, Box 433, Amarillo
W. J. Hill, 1979 5503 Emil, Amarillo
Jim Line, 1981 Box 87, Bushland
Albert Nichols, 1981 Rt. 1, Box 491, Amarillo
Weldon Rea, 1981 Bushland

Randall County

- Mrs. Louise Tompkins, Secretary
Farm Bureau, 1714 Fifth Ave., Canyon
- John F. Robinson, 1979 1002 7th St., Canyon
Bill Dugan, 1979 Rt. 2, Box 30, Happy
Harry LeGrand, 1981 4700 S. Bowie, Amarillo
Joe Albracht, 1981 P.O. Box 81, Bushland
Jack Brandt, 1981 Rt. 1, Box 280, Canyon

District's Information Director Named

The High Plains Underground Water District No. 1 is pleased to announce the addition of Mr. Dean Thompson to its staff. Mr. Thompson will serve as editor for The Cross Section as well as the Director of the District's Public Information Section.

A 1967 graduate of Texas A & I University in Kingsville, Texas, Thompson holds a BA degree in Journalism and Government.

After graduation he served approximately seven years in the United States Army. During his military career, he held many different positions and upon completion of his active duty requirement in September 1973, he concluded his military service as a Captain.

Since that time he has worked as a District Agent for the Prudential Insurance Company; as Publicity and Public Relations Manager for the Lubbock Chamber of Commerce; as Sales Manager for Thompson-Bond Real Estate in Lubbock and taught in the Lubbock Public School system.

Thompson recently married the former Sherry McClellan. Sherry is cur-



DEAN THOMPSON

rently employed as a Home Economics teacher at Spur High School.

The District is pleased to welcome Dean as the newest member of its Staff.

Soil Moisture Survey Released . . . (continued from page 1)

nutrients which may be leached below the root zone.

Value of Recent Snows

Significant amounts of snow have fallen over a large portion of the South Plains during the month of February. Much of this snow has fallen since the moisture readings were made. However, since the total amount of moisture from the snow was only around an inch or less, this amount was generally absorbed in the top foot of the soil and had little effect on the deeper layers. At the same time, even this small amount of moisture will remain in the soil for some time and will combine with any additional moisture to improve the wetting efficiency if such moisture comes before this is lost to evaporation.

What It Means

Since soil moisture measurements show that nearly all South Plains soils are very dry, this means that a preplant irrigation would be very beneficial. Otherwise, farmers must hope that rainfall will exceed normal and add the needed moisture.

As a general rule, the wetting efficiency of rainfall is about sixty percent (60%). This means that if six inches of moisture is needed in the soil, rainfall must total around ten inches. This far exceeds the amount normally expected before crops must be planted. The accompanying table shows the probability of the area receiving various amounts of rain between March 21 and April 20; March 21 and April 30; March 21 and May 10; March 21 and May 20; and March 21 and May 31.

PERCENT PROBABILITY FOR RAINFALL

RAINFALL (inches)	TIME INTERVALS				
	3-21/4-20	3-21/4-30	3-21/5-10	3-21/5-20	3-21/5-31
1.0	39	57	77	90	94
1.5	23	40	61	81	87
2.0	14	28	50	69	80
2.5	9	19	40	59	70
3.0	5	14	31	48	62
3.5	3	9	24	39	54
4.0	2	6	19	32	47

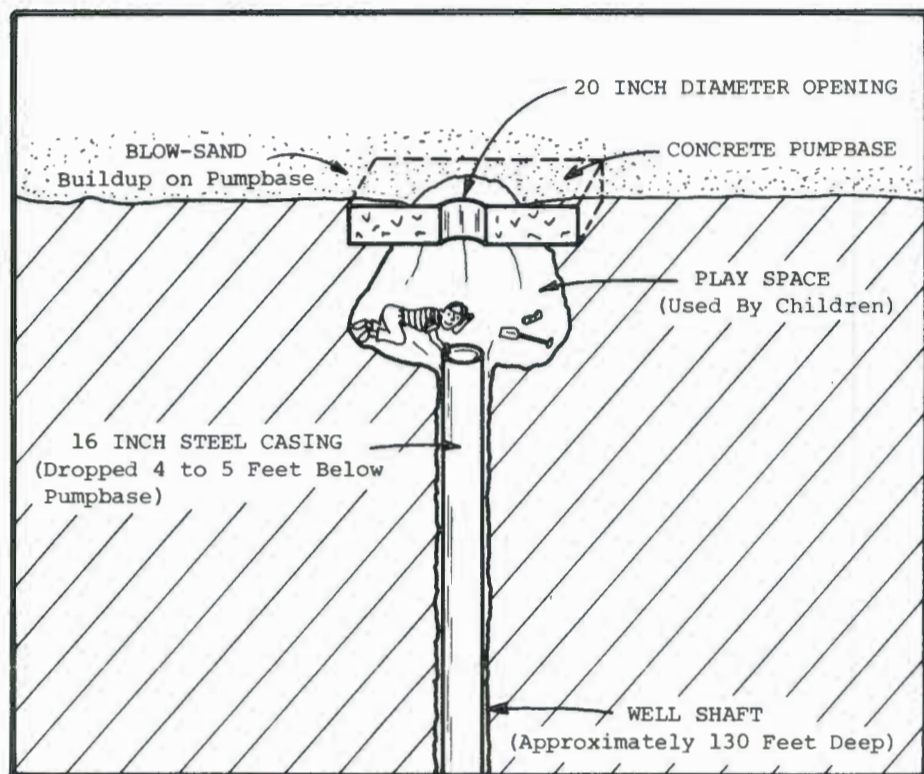
THE Cross SECTION

Published monthly by High Plains Underground Water Conservation District No. 1, 2930 Avenue Q, Lubbock, Texas 79405

Volume 24—No. 4

Publication number 564920, Second Class Postage paid at Lubbock, Texas

April, 1978



Drawing by Tony Schertz

Pumping Level Maps Displayed

by A. Wayne Wyatt

Estimate of pumping levels in 1974 in wells completed in the Ogallala Formation and projection of what pumping levels are expected to be in the year 2000 are illustrated by maps located on pages two and three of this issue of "The Cross Section".

The pumping lift (pumping level) is the depth from land surface to the water level in a pumping well; it is equal to the depth of the static water level plus the drawdown due to pumping. The amount of pumping lift largely determines the amount of energy required to produce the water, and thus strongly affects the pumping costs.

The formula for making estimates of pumping lifts was varied throughout the High Plains based on the results of the large number of pumping tests which have been conducted in the area.

In the Southern portion of the High Plains the following assumptions were made: (1) that the yield of each pumping well is 800 gpm except as limited by the capacity of the aquifer (this conforms with the historical trend of equipping new wells with eight-inch or smaller pumps); (2) that the specific well yield is ten gpm per foot of drawdown; and (3) that once the well yield equals the capacity of the aquifer, the well will continue to be produced at a rate near the capacity of the aquifer until pumping lifts are within ten feet

of the base of the aquifer. After that time, it is assumed that the pumping lift will remain constant because of greatly diminished well yields.

In the Northern portions of the High Plains the following assumptions were made: (1) that the yield of each pumping well is 900 gallons per minute except as limited by the capacity of the aquifer (this conforms with the historical trend of equipping new wells with eight-inch or smaller pumps); (2) that the specific well yield is 15 gallons per minute per foot of drawdown; and (3) that once the well yield equals the capacity of the aquifer the well will continue to be produced at a rate near the capacity of the aquifer until pumping lifts are within ten feet of the base of the aquifer. After that time, it is assumed that the pumping lift will remain constant because of greatly diminished well yields.

It should be noted that the ten-foot minimum was somewhat arbitrarily chosen, as one cannot predict accurately the minimum saturated thickness that will be feasible for producing irrigation water under future economic conditions.

The maps presented in this issue of "The Cross Section" are intended for use as general guidelines only and are not recommended for use in determining actual pumping lifts when buying and selling specific tracts of land. These maps are being reproduced courtesy of the Texas Department of Water Resources.

"Death Trap" Attracts Unwary Explorer

by Dean Thompson

The small hole in the ground (about 16 to 20 inches in diameter) seemed innocuous as we approached it, and I had a difficult time imagining it as the "death trap" that it really was. The old well site was a long way from Lubbock when it was drilled many years ago, but the city had finally grown around the farmer's field.

A housing area with hundreds of kids was less than three blocks away to the west and Lowery Field was within a hundred yards to the north-west of the abandoned site. It was an inviting target for kids to explore.

The old, solid concrete, well pump-base was about five feet long on its

four sides and about one foot thick, weighing about three thousand pounds.

Being rather brave (or extremely foolish) I stomped out onto the base and knelt down to look into the hole—not realizing the whole thing could easily have collapsed.

I don't know what I expected to see when I looked inside the hole, but what I saw shocked me! The old sixteen inch casing of the well had sunk into the earth, was now about five feet beneath the bottom of the concrete base and was still uncapped. But that wasn't the horrifying part.

What startled me most was the

continued on page 4... "DEATH TRAP"

District Acquires Educational Film

"Water On Demand", the title of a new film which illustrates well drilling techniques, well construction techniques, how water moves to a well and the importance of proper well spacing has recently been acquired by the High Plains Underground Water Conservation District.

The film, approximately twenty (20) minutes long, is available for showing by contacting the Public Information Section of the District at 2930 Avenue Q, Lubbock, Texas 79405, or by calling 806-762-0181. Any organization in the

Water District service area is eligible to have the film shown free of charge. Those organizations requesting a showing of the full color, 16 mm sound film, will be handled on a first-come, first-served basis.

After previewing the film, the District's Board of Directors suggested that it would make an excellent film for showing to young farmers organizations, 4-H and F.F.A. groups, various school, civic and social groups, and to any other organization interested in this area of farm operation.

Book Publication Announced By Board

The Board of Directors of the Water District authorized the printing of an educational booklet entitled, *Chief Running Water's Story of High Plains Water* at their March 1978, Board meeting. The booklet has been printed and is currently being distributed to elementary schools throughout the District.

The booklet illustrates basic information concerning the Texas High Plains water supply. It illustrates the origin of the water supply and also many of the ways we use our underground water (city, farm and industry). It takes children through a normal day's activities and shows them just how much water they really use each day. It also illustrates many different ways that water can be conserved.

The distribution of this comic book begins an educational program recently adopted by the Board aimed at school children in the area. The first phase of

the program is designed, through the use of the educational booklet, to reach children in elementary grades four through six.

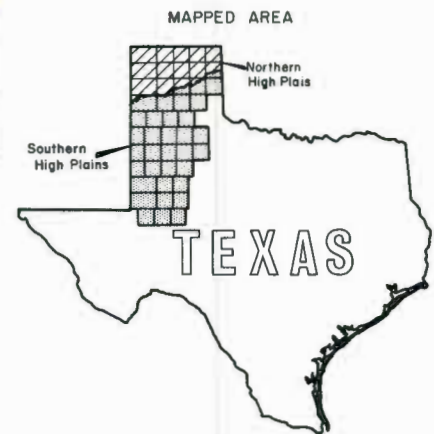
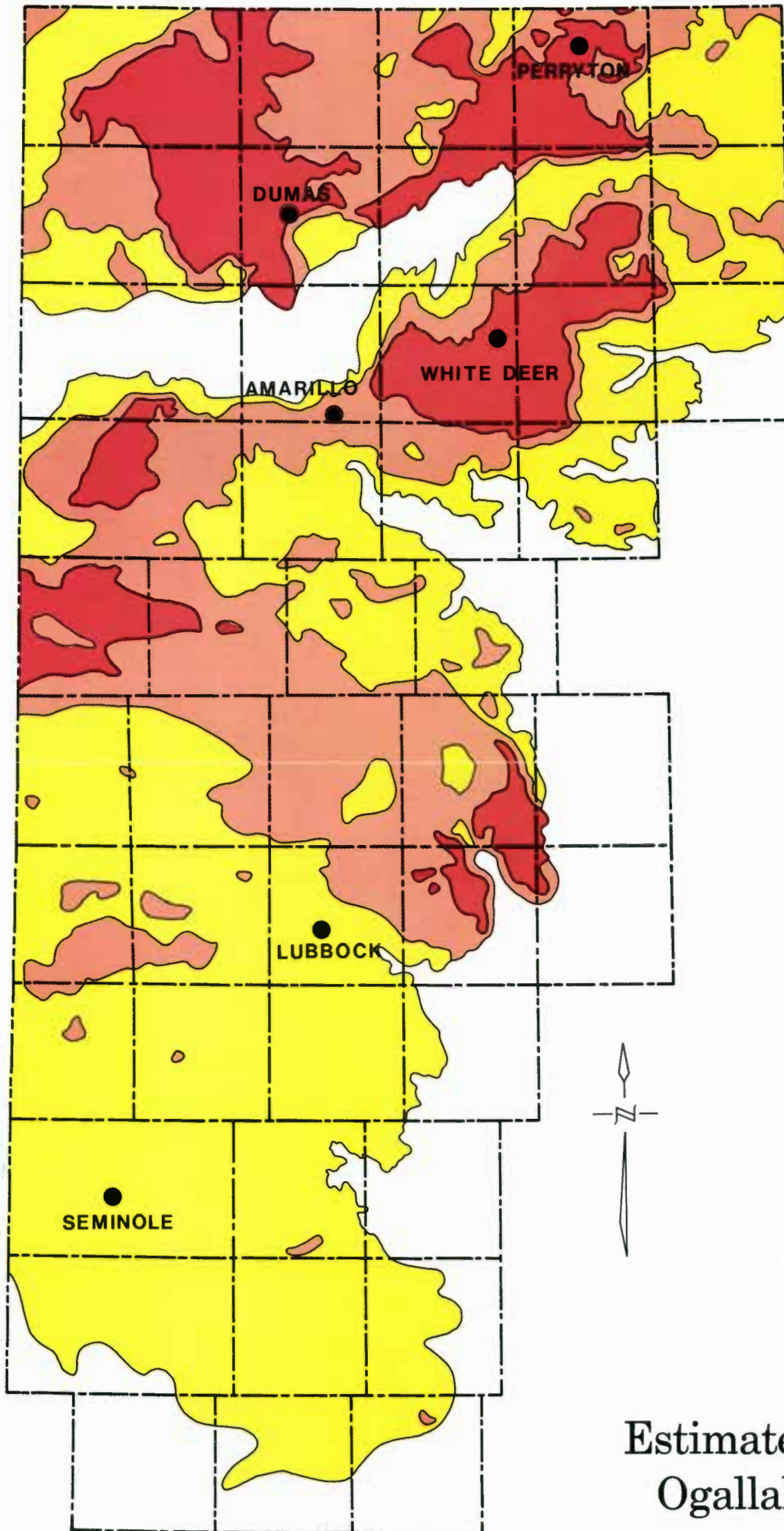
New Educational Tool

Through the use of *Chief Running Water's Story*, teachers in area schools will have a new educational tool to aid them in presenting a basic knowledge of water conservation to their students. In the comic book, *Chief Running Water* and his horse, *Thunderhead*, take two present day school children on a ride back in time to the dawn of history where the story begins. The book explains how the Ogallala got its water and retains it in its subsurface "sponge" area.

Irrigation history is touched on and is covered from the early settler's efforts, through the "dust-bowl" years and on up to today with its conservation practices. Such farm practices as

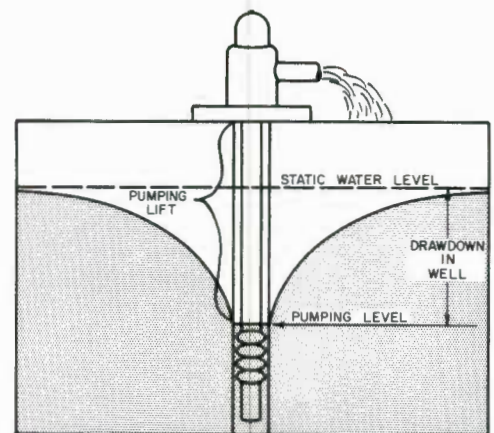
continued on page 4... CHIEF RUNNING

HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1



EXPLANATION

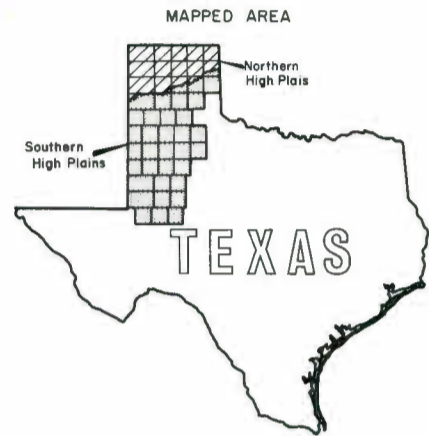
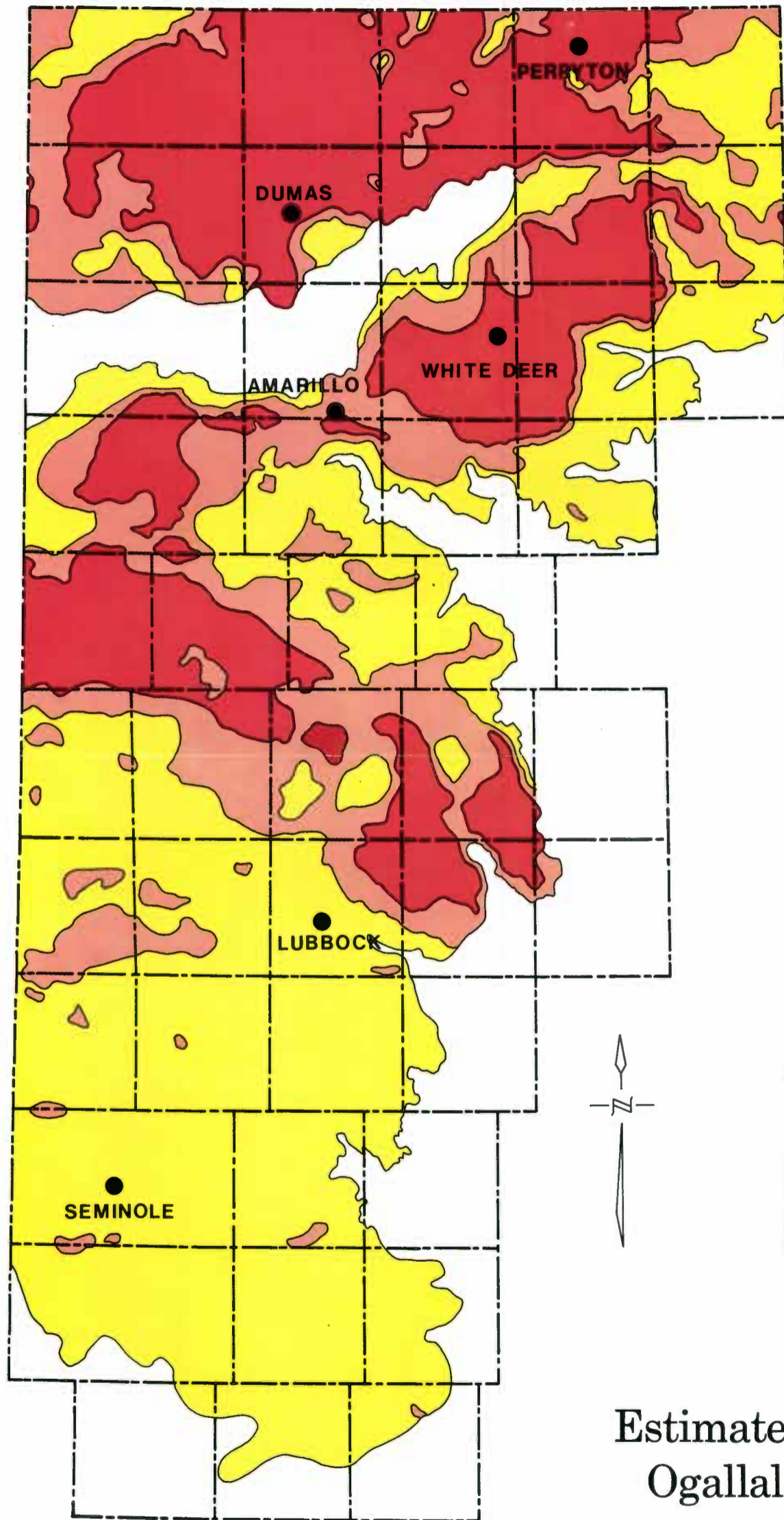
- 200 feet or less
- 200 to 300 feet
- 300 feet or more



Estimated Pumping Lifts
Ogallala Aquifer 1974

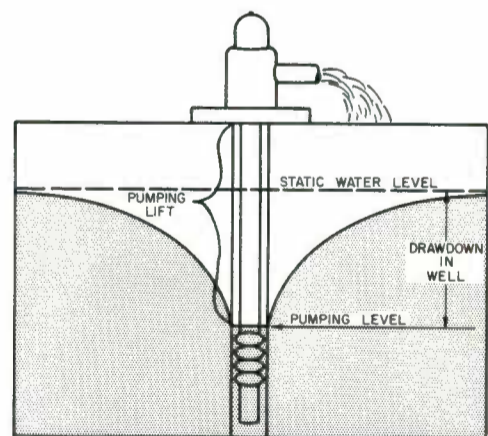
From maps prepared by the Texas Department of Water Resources—A. Wayne Wyatt, Ann E. Bell and Shelly Morrison

HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1



EXPLANATION

- 200 feet or less
- 200 to 300 feet
- 300 feet or more



Estimated Pumping Lifts
Ogallala Aquifer 2000

From maps prepared by the Texas Department of Water Resources—A. Wayne Wyatt, Ann E. Bell and Shelly Morrison



BOARD OF DIRECTORS

- Precinct 1**
(CROSBY, LUBBOCK and LYNN COUNTIES)
James P. Mitchell, Vice President Wolfforth
- Precinct 2**
(COCHRAN, HOCKLEY and LAMB COUNTIES)
Selmer H. Schoenrock, Secy.-Treas. Levelland
- Precinct 3**
(BAILEY, CASTRO and PARMER COUNTIES)
A. W. Gober, President Farwell
- Precinct 4**
(ARMSTRONG, DEAF SMITH, POTTER and RANDALL COUNTIES)
Ray Gerk Hereford
- Precinct 5**
(FLOYD and HALE COUNTIES)
Malvin A. Jarboe Floydada

COUNTY COMMITTEEMEN

- Armstrong County**
Carroll Rogers, Secretary
Wayside, Texas
- Cordell Mahler, 1979 Wayside
James Bible, 1979 Wayside
Guy Watson, 1981 Wayside
Bill Heisler, 1981 Wayside
Leslie Adams, 1981 Wayside
- Bailey County**
Doris Wedel, Secretary
H&R Block, 224 W. 2nd, Muleshoe
- Marshall Head, 1979 Rt. 3, Muleshoe
Harold Layton, 1979 Rt. 2, Morton
Eugene Shaw, 1981 Rt. 2, Muleshoe
David Stovall, 1981 Rt. 2, Muleshoe
Ernest Ramm, 1981 Rt. 2, Muleshoe
- Castro County**
Garnett Holland, Secretary
City Hall, 120 Jones St., Dimmitt
- Anthony Acker, 1979 Rt. D, Nazareth
Glenn Odom, 1979 Rt. 4, Box 135, Dimmitt
Jackie Clark, 1981 Rt. 1, Box 33, Dimmitt
W. A. Baldrige, 1981 608 W. Grant, Dimmitt
Frank Wise, 1981 Rt. 4, Box 10, Dimmitt
- Cochran County**
W. M. Butler, Jr., Secretary
Western Abstract Co., 108 N. Main Ave., Morton
- Hershel M. Tanner, 1980, Route 2, Box 36, Morton
Danny Key, 1980 Star Route 2, Morton
H. H. Rosson, 1980 Star Route 2, Morton
Keith Kennedy, 1982 Star Route 2, Morton
Robert Yearry, 1982 Route 2, Box 66, Morton
- Crosby County**
Clifford Thompson, Secretary
2930 Avenue Q, Lubbock
- Tommy McCallister, 1980 209 N. Van Buren, Lorenzo
Edward S. Smith, 1980 102 N. Van Buren, Lorenzo
Pat Yoakum, 1980 Box 146, Lorenzo
Mike Carlisle, 1982 Route 1, Box 274, Lorenzo
Alvin C. Morrison, 1982 Box 6, Lorenzo
- Deaf Smith County**
B. F. Cain, Secretary
County Courthouse, 2nd Floor, Hereford
- George Ritter, 1979 Rt. 5, Hereford
Bill Cleavinger, 1979 Route 1, Wildorado
James E. Higgins, 1981 200 Star St., Hereford
Garland Solomon, 1981 303 Sunset Dr., Hereford
Tom Robinson, 1981 211 Cherokee Dr., Hereford
- Floyd County**
Verna Lynne Stewart, Secretary
Floyd Co. Abstract, 215 W. California, Floydada
- C. O. Lyles, 1980 Route 4, Floydada
Connie Bearden, 1980 Route 1, Floydada
M. M. Smitherman, 1980 Silvertown Star Rt., Floydada
Charles Huffman, 1982 Route 1, Lockney
Gilbert L. Fawver, 1982 Route 4, Floydada

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 W. J. Hill.

Hale County

- J. B. Mayo, Secretary
Mayo Ins., 1817 Main, Petersburg
- Clint Gregory, Jr., 1980 Box 98, Petersburg
Homer Roberson, 1980 Box 250, Petersburg
Henry Scarborough, 1980 Route 2, Petersburg
Gaylord Groce, 1982 Box 314, Petersburg
Bill John Hegl, 1982 Route 2, Petersburg

Hockley County

- Jim Montgomery, Secretary
609 Austin Street, Levelland
- Billy Ray Carter, 1980 Route 5, Levelland
Leon Young, 1980 Route 1, Ropesville
Robert Phillips, 1980 218 Redwood, Levelland
J. E. Wade, 1982 Route 2, Littlefield
Jack Earl French, 1982, Rt. 3, Box 125, Levelland

Lamb County

- Robert Richards, Secretary
509 Phelps Avenue, Littlefield
- P. A. Washington, 1980 Box 124, Springlake
Jack Stubblefield, 1980 Box 397, Spade
Larry Lockwood, 1980 Star Rt. 2, Littlefield
Billy J. Langford, 1982 Box 381, Olton
Edward Fisher, 1982 Box 67, Sudan

Lubbock County

- Clifford Thompson, Secretary
2930 Avenue Q, Lubbock
- Don Bell, 1980 Box 114, Wolfforth
Ronald Schilling, 1980 Route 1, Slaton
Granville Igo, 1980 1304 8th Street, Shallowater
Owen Gilbreath, 1982 3302 23rd St., Lubbock
Clifford Hilbers, 1982 Route 1, Box 14, Idalou

Lynn County

- Clifford Thompson, Secretary
2930 Avenue Q, Lubbock
- S. B. Rice, 1980 Route 1, Wilson
W. R. Steen, 1980 Route 2, Wilson
Wendell Morrow, 1980 Route 1, Wilson
Gary Houchin, 1982 Box 54, Wilson
Freddie Kieth, 1982 Box 283, New Home

Parmer County

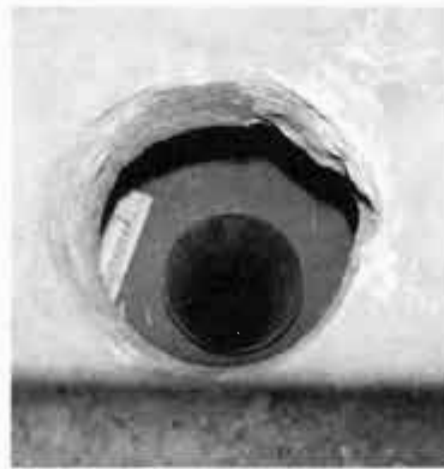
- Ken Horn, Secretary
Horn Insurance Agency, Bovina
- Floyd Reeve, 1979 Box 876, Friona
Ralph Roming, 1979 809 Ridgley Dr., Bovina
Troy Christian, 1981 Rt. 1, Farwell
Dalton Caffey, 1981 P.O. Box 488, Friona
Ronald Elliott, 1981 Rt. 3, Muleshoe

Potter County

- F. G. Collard, III, 1979 Rt. 1, Box 433, Amarillo
W. J. Hill, 1979 5503 Emil, Amarillo
Jim Line, 1981 Box 87, Bushland
Albert Nichols, 1981 Rt. 1, Box 491, Amarillo
Weldon Rea, 1981 Bushland

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Bill Dugan, 1979 Rt. 2, Box 30, Happy
Harry LeGrand, 1981 4700 S. Bowie, Amarillo
Joe Albracht, 1981 P.O. Box 81, Bushland
Jack Brandt, 1981 Rt. 1, Box 280, Canyon



"DEATH TRAP" ATTRACTS . . . (continued from page 1)

cavern under the pumpbase. No doubt occurred over the years since the well a lot of erosion by natural causes had been abandoned, but not all of it—much of it had been excavated by human hands.

To be sure of what I saw, I took a flashlight and very carefully edged my way back onto the pumpbase and peered into the hole again. Sure enough, the scrape-marks on the walls were clearly visible where someone, probably small children, had been down in the small cavern mining it out to make it a larger and more comfortable hiding and playing area. Also found were old soft drink cans and a wooden window shutter that had apparently been used to cover the open hole of the casing.

How much more would it have taken before the pumpbase thundered down on its unsuspecting visitors? How much longer before the shutter disappeared down the over one-hundred



foot deep hole along with an unwary child? The "double death trap" was set and baited for an adventurous child.

We'll never know what is down in the bottom of that hole. Probably lots of rocks, soda-pop cans, candy wrappers, and many other similar items. But are there other things, too?

Thankfully nothing else will be put down its "death tube". The owner of the land has had it permanently sealed. You can't even see where it was anymore, thanks to the levelling of two mounds of earth.

This "death trap" won't be sprung but there are others. Over fifty have already been found in a small area of northern Lubbock County and others will not doubt be found—some like this one, inside the city limits.

The trap is set and baited and the unwary prey is about to be released—for a summer of vacation fun and exploration?

CHIEF RUNNING WATER . . . (continued from page 1)

contour plowing, bench-leveling, stubble mulching and using cotton burrs to help soak up and hold more water are briefly discussed.

The book introduces the students to the hydrologic cycle and brings information about city dweller's use of water into the story by means of average gallons used for various activities.

The main thrust of the book is at the conservation practices needed to insure that we will continue to have water for agricultural, business, industrial and recreational uses in the future.

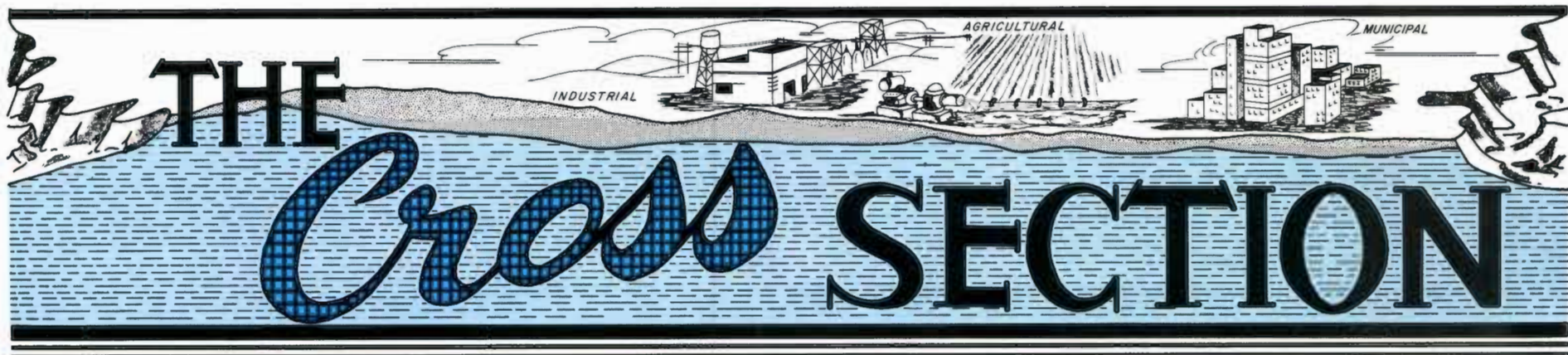
Booklet Delivered

During the month of April members of the District staff delivered copies of *Chief Running Water's Story of High Plains Water* to 25 schools in the District's service area.

Schools requesting copies of the booklet which have been delivered

include: Amherst, Anton, Bledsoe, Crosbyton, Dimmitt, Friona, Hale Center, Hereford, Lazbuddie, Lubbock State School, Morton, New Deal, Olton, Petersburg, Plainview, Ralls, River Road Independent School District in Amarillo, Roosevelt, Slaton, Spade, Sudan, Sundown, Tahoka, Whiteface, and Whitharral. All of these schools have indicated that these booklets will be used in classes before the end of the current school term.

These books are being distributed free of charge to those school districts within the Water District's boundaries. Other school districts or individuals wishing to receive copies of *Chief Running Water's Story of High Plains Water* are asked to contact the District office at 2930 Avenue Q, Lubbock, Texas 79405, so that arrangements for such distribution can be made.



Published monthly by High Plains Underground Water Conservation District No. 1, 2930 Avenue Q, Lubbock, Texas 79405

Volume 24—No. 5

Publication number 564920, Second Class Postage paid at Lubbock, Texas

May, 1978

General Soil, Irrigable Land Maps Displayed

by A. Wayne Wyatt

Page two of this issue of *The Cross Section* contains a generalized soils map of the High Plains of Texas which was compiled by the Texas Agricultural Experiment Station and the Soil Conservation Service. The map illustrates the various soils groups which can be found in the High Plains of Texas. Generally, each soils group has different characteristics such as its thickness, infiltration rates, the water holding capacity, and its susceptibility to wind and water erosion.

Some characteristics of the soil types shown on the accompanying map are as follows:

- 1) Amarillo—Acuff—Mansker
- 2) Sunray—Conlen—Gruver
- 3) Dallam—Sunray—Dumas

Soils mostly loamy throughout with lime accumulation in the subsoil, some with clayey subsoils.

- 1) Pullman—Olton—Mansker
- 2) Sherman—Gruver—Sunray
- 3) Kimbrough—Slaughter

Mostly soils with loamy surface layers and clayey subsoils; some soils with indurated to powdery lime within 20 inches of the surface.

- 1) Mansker—Berda—Potter
- 2) Woodward—Quinlan—Vernon

Mostly shallow and moderately deep soils over limy earths, red beds or limestone; some deep soils with loamy surface layers and clayey subsoils.

- 1) Miles—Springer—Woodward
- 2) Miles—Brownfield—Olton

Soils mostly loamy throughout but some with sandy surface layers and some with clayey subsoils.

- 1) Abilene—Tillman—Vernon
- 2) Abilene—Rowena—Miles

Soils with loamy surface layers and clayey or loamy subsoils; cracking clayey soils; and some shallow soils over indurated caliche.

- 1) Ector—Conger—Rock outcrop
- 2) Reagan—Conger—Ector

Shallow and deep loamy soils; rock outcrops.

- 1) Kermit—Pyote—Wickett

Hummocky and dunny soils mostly sandy throughout; some have loamy subsoils with indurated to powdery lime accumulations.

- 1) Patricia—Brownfield—Tivoli

Soils with sandy surface layers and loamy subsoils; and soils sandy throughout.

- 1) Triomas—Jalmar—Penwell

Usually dry soils with sandy surface layers and loamy subsoils; and usually dry soils sandy throughout.

A full size soils map for the State of Texas can be obtained from the Department of Agriculture Communications, Texas A & M University, College Station, Texas 77843.

Detailed soil surveys for most counties in the Texas High Plains have been compiled by the Soil Conservation Service in cooperation with the Texas Agricultural Experiment Station. Copies of the *Soil Surveys* may be ordered from the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402. The individual county *Soil Surveys* contain very valuable detailed information that can be applied in managing farms and ranches, in selecting sites for roads, ponds, buildings and other structures, and in judging the suitability of tracts

of land for farming, industry and recreation.

Page three contains a generalized map showing three classifications of the suitability of soils in the Texas High Plains for irrigation. The principal data source used in constructing these maps were first order U. S. Geological Survey 7½ minute topographic maps. These maps illustrate the elevation of the land surface. Those areas which were rough and could not be irrigated without a large expenditure for land leveling were given the lowest rating. Lands which were moderately sloping were given the second higher rating, and flat lands were given the highest rating.

In addition to surface topography, soil types and their susceptibility to wind and water erosion were used as key factors in constructing the map. Generally, the sandier soils areas were given a lower value and the tighter soils a higher value. The area covered by this map contains approximately 17,000 playa lakes. The lake area and much of the land sloping into the lake were not classified as being suitable for irrigation in this study.

District's Annual Water Measurements Completed

The annual depth-to-water measurements were completed in January 1978, in approximately 800 water level observation wells located within the boundaries of the High Plains Underground Water Conservation District No. 1. These privately owned wells are documentally maintained and measured each year by District employees.

Information in the accompanying tables concerning water level changes and depths-to-water are indicative only of that portion of the county within the District.

The table, "Average Decline of the Water Table" presents a comparison of the average changes in water levels of the observation wells within the District area of each of the counties for the period 1977 to 1978 (one year change) and for the average annual changes for the period 1969 to 1978 (ten year average annual change). It is interesting to note that eleven of the fifteen District Counties have one year county averages in excess of the average annual values for the ten year period. The differences for these eleven counties ranged from a mini-

imum of 0.02 feet for Armstrong to a maximum of 1.96 feet for Crosby. The significance of these observations would be to verify the continued decline of the water table during 1977 in most counties at a rate which approximates, and in some cases exceeds, the historical ten year average annual rate for corresponding counties.

The table, "Summary of Water-Level Measurements" presents county averages for depths to water in feet below land surface. The "Number of Wells" columns for both 1969 and 1978 refer only to those wells currently in the program in 1978 that were also being measured in 1969.

To somewhat clarify the average depths to water, tabulations of the minimum and maximum depths to water reported in individual wells in each of the counties is also presented. Inspection of this data reported for the District Counties in 1978 develops appreciation of the extreme variables in these figures within individual counties. Thirteen of the fifteen reported differences in excess of 200 feet. The difference between the minimum and

maximum depth-to-water for the District area is over 350 feet. Although these depth-to-water figures do not totally parallel availability of groundwater in storage, they do serve to demonstrate the great variability in aquifer conditions inherent in the Ogallala of the Southern High Plains.

The District average depths-to-water figures are somewhat nebulous data, but their significance probably lies in

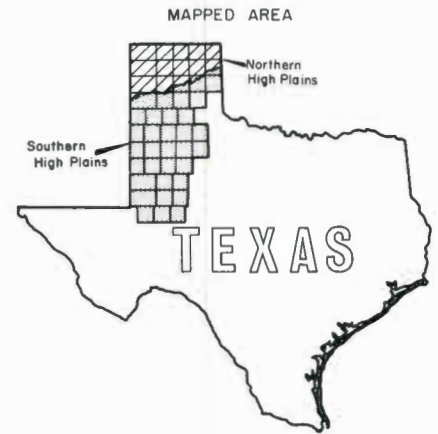
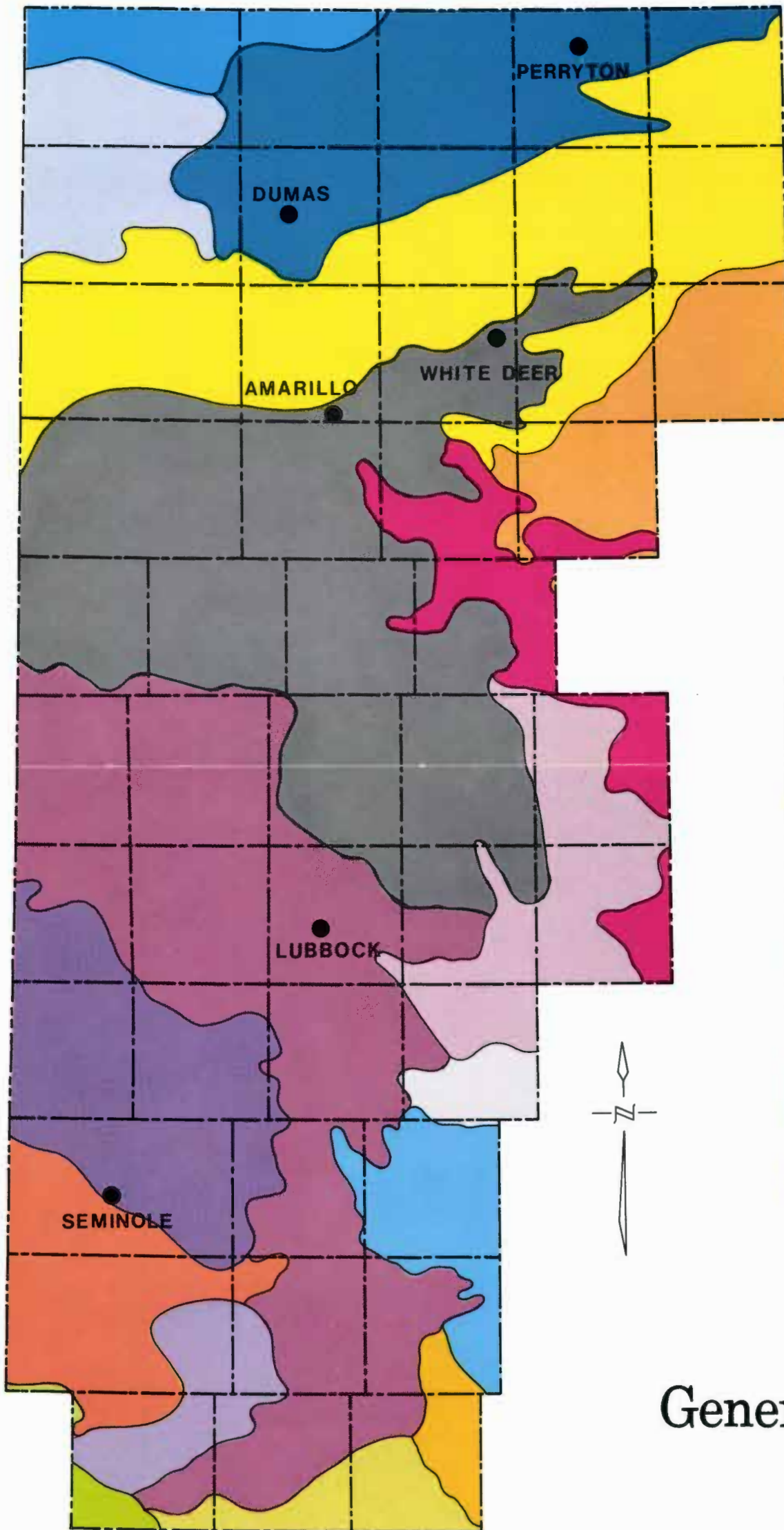
their mathematical difference. This difference is specifically 18.77 feet which, with reservations, can be interpreted as the total average change in the average depth to water from 1969 to 1978 for the entire District area. Use of this specific figure, however, to describe any particular area of the District probably should be discouraged.

continued on page 4... WATER

SUMMARY OF WATER-LEVEL MEASUREMENTS

County	1978				1969			
	No. of Wells Measured	Depth to Water (Feet)			No. of Wells Measured	Depth to Water (Feet)		
		Min.	Max.	Avg.		Min.	Max.	Avg.
Armstrong	9	116.56	162.88	137.87	9	106.22	145.04	125.55
Bailey	57	24.77	166.21	97.37	46	22.56	137.17	83.26
Castro	64	83.30	303.37	195.42	44	121.98	254.30	171.08
Cochran	52	78.62	198.61	141.94	49	70.81	194.78	140.42
Crosby	18	134.87	248.44	200.74	11	119.13	199.90	178.18
Deaf Smith	79	59.15	335.30	197.42	54	57.11	309.29	169.43
Floyd	89	63.43	316.98	211.99	70	60.59	294.50	191.58
Hale	16	86.69	206.48	142.10	14	83.30	186.82	136.19
Hockley	75	44.95	193.55	126.96	72	41.44	190.42	124.39
Lamb	71	36.96	223.43	130.88	58	32.25	193.61	113.64
Lubbock	112	15.44	213.66	131.54	105	4.90	212.20	121.44
Lynn	30	26.16	152.42	88.42	30	31.66	145.52	90.45
Parmer	60	174.62	368.62	262.29	44	146.70	324.28	235.84
Potter	4	197.06	233.30	218.84	3	197.77	216.82	206.94
Randall	31	102.66	248.29	176.86	23	106.49	200.70	156.35
District	767	15.44	368.62	163.39	632	4.90	324.28	144.62

HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1



EXPLANATION

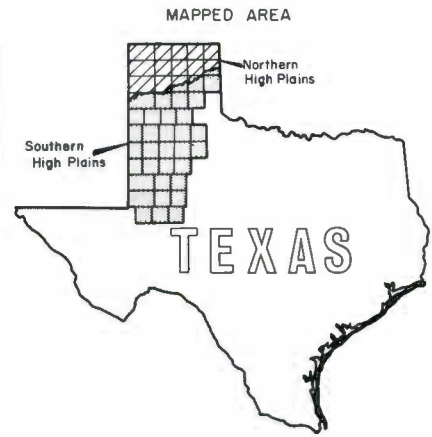
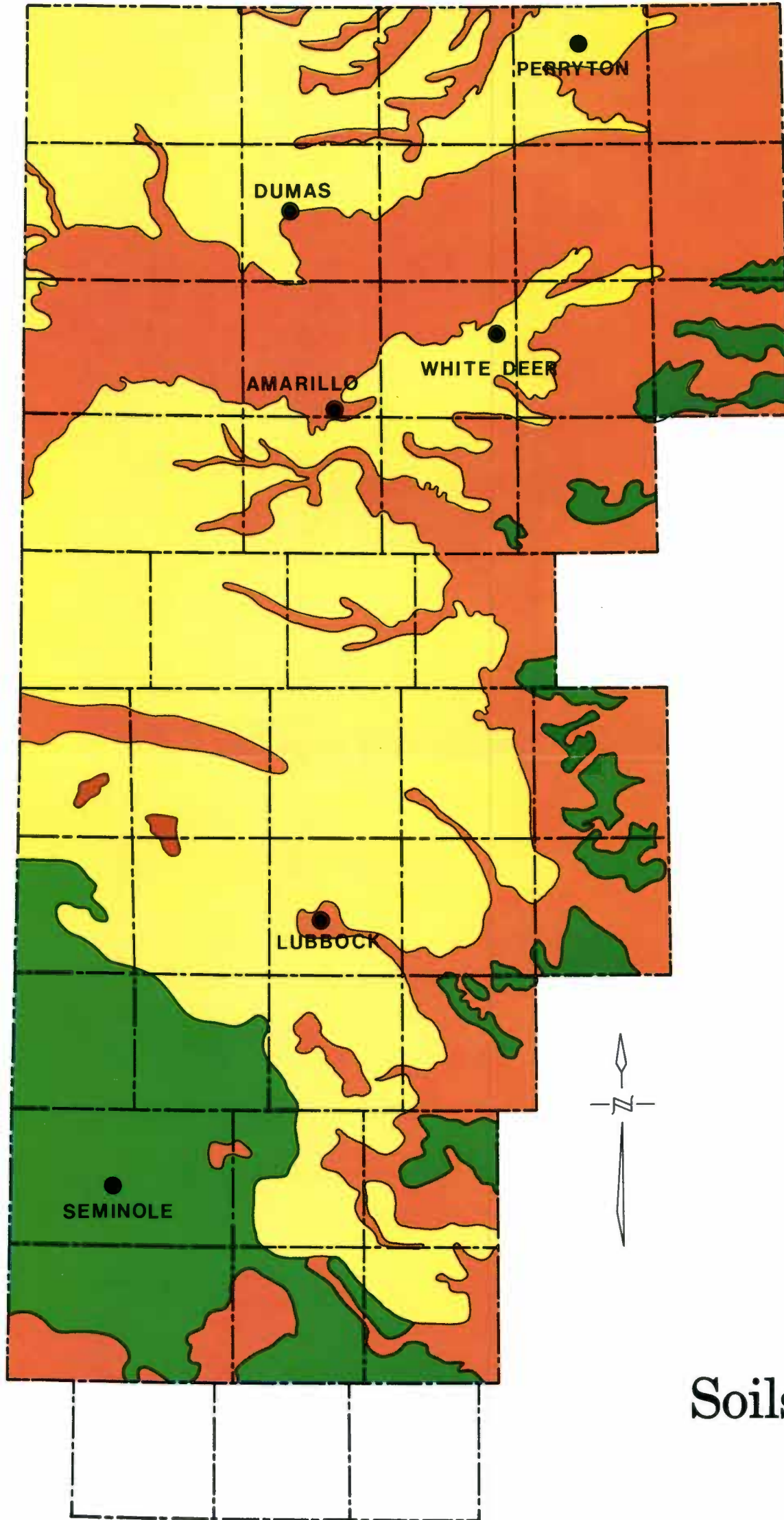
- SUNRAY—CONLEN—GRUVER
- DALLAM—SUNRAY—DUMAS
- SHERM—GRUVER—SUNRAY
- MANSKER—BERDA—POTTER
- MILES—SPRINGER—WOODWARD
- PULLMAN—OLTON—MANSKER
- WOODWARD—QUINLAN—VERNON
- MILES—BROWNFIELD—OLTON
- AMARILLO—ACUFF—MANSKER
- PATRICIA—BROWNFIELD—TIVOLI
- ABILENE—TILLMAN—VERNON
- ABILENE—ROWENA—MILES
- TRIOMAS—JALMAR—PENWELL
- ECTOR—CONGER—ROCK
- KIMBROUGH—SLAUGHTER
- KERMIT—PYOTE—WICKETT
- REAGAN—CONGER—ECTOR



General Soil Map

From maps compiled by the Texas Agricultural Experiment Station and the Soil Conservation Service—Godfrey, McKee & Oaks.

HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1



EXPLANATION

- 50%-75% Suitable for Irrigation
- 25%-50% Suitable for Irrigation
- Less than 25% Suitable for Irrigation



Soils Suitable For Irrigation

Compiled from maps and other data from the U. S. Bureau of Reclamation, Texas Agricultural Experiment Station, U. S. Department of Agriculture, Texas Department of Water Resources, and U. S. Geological Survey.



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- Garnett Holland, Secretary
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Harry LeGrand, 1981 4700 S. Bowie, Amarillo
Joe Albracht, 1981 P.O. Box 81, Bushland
Jack Brandt, 1981 Rt. 1, Box 280, Canyon

District Engineering Technician Resigns

District employee Oscar Riemer recently resigned from his position as Engineer Technician to enter private business. Oscar had completed more than four years of service with the District and had extensive contact with many of the landowners and operators throughout the area. His principal work activities had involved aid and assistance in solving water control and management problems, well spacing, water conservation techniques, and the safety programs.

The District's Board and Staff regret losing Oscar's talents, but understand his desire to have his own business and wish him and his family every success in the future.



OSCAR RIEMER

New Draftsman Hired By District

The High Plains Underground Water Conservation District No. 1 is pleased to announce the addition of Mr. Keith Whitworth to its staff. Whitworth has joined the District's Support Section as a draftsman.

Whitworth is a native of Lubbock and comes to the Water District from the Engineering Department of the City of Lubbock. Prior to his job with the City he was employed in private business.

The District is pleased to welcome Keith as its newest staff member.



KEITH WHITWORTH

"Water Measurements" . . . (continued from page 1)

There are areas which exceed this decline for the ten year period and other areas which would not approach this figure. The significance of the average decline lies in the fact that declines are occurring in individual observation wells to the extent that an average of their changes for the ten year period approaches 19 feet of water table decline.

The complete records of the individual wells in the District water-level observation well program, as previously discussed, are maintained in the District files in the Lubbock office. This information is available for public inspection and is currently being used in preparation of a reproducible permanent file to provide copies of the information to interested persons. If additional information is needed, please contact the District office at 2930 Avenue Q, Lubbock, Texas.

AVERAGE DECLINE OF WATER TABLE

County	Avg. Decline in ft. 1977-1978	Avg. Annual Decline in ft. 1969-1978
Armstrong	1.39	1.37
Bailey	1.58	1.28
Castro	3.15	2.99
Cochran	+0.46	0.25
Crosby	4.28	2.32
Deaf Smith	1.88	2.56
Floyd	2.99	2.64
Hale	1.72	1.15
Hockley	+0.02	0.33
Lamb	2.83	2.09
Lubbock	1.04	0.79
Lynn	0.51	+0.23
Parmer	3.20	3.23
Potter	1.89	1.05
Randall	2.11	1.52



Published monthly by High Plains Underground Water Conservation District No. 1, 2930 Avenue Q, Lubbock, Texas 79405

Volume 24—No. 6

Publication number 564920, Second Class Postage paid at Lubbock, Texas

June, 1978

Maps Depict Nitrate And Fluoride Concentrations

by Don McReynolds

Two maps in a series of water quality graphic representations for the Ogallala Aquifer are presented on pages two and three of this issue of "The Cross Section". The data represents the results of an accumulation of water quality analyses of groundwater samples collected from the Ogallala Aquifer and provided graciously by the Texas Department of Water Resources. The High Plains Underground Water Conservation District No. 1, and the

Texas Department of Water Resources, and its predecessor agencies, have cooperated in this data acquisition for a number of years. The District has collected samples at the request of the State agency and received copies of these analysis results. Over a thousand analysis results have been accumulated by this program in the District counties.

The specific parameters illustrated by the included maps are concentrations in milligrams per liter (mg/l) of nitrate

(NO³) and fluoride. Each of these substances, when present beyond certain concentrations, may produce detrimental effects upon those persons consuming such water. The parameters above which these detrimental effects are expected to occur, will be discussed later.

The significance of the dissolved solids in groundwater and other water used for human consumption has, in recent years, received considerable publicity as a result of the passage of the Safe Drinking Water Act (Public Law 93-523) in 1974 by the United States Congress. It has long been known that some detrimental effects result from consumption of water containing certain concentrations of various dissolved substances. Previous attempts to set recommended limits for concentration of certain substances dissolved in drinking water were made by the United States Public Health Service. After passage of the Safe Drinking Water Act on December 16, 1974, the National Interim Primary Drinking Water Regulations were set up on December 24, 1975, as guidelines for quality considerations in water consumption by humans. Most of these interim regulations are based upon the guidelines established by the Public Health Service in 1962. These interim regulations went into effect on June 24, 1977, and are addressed primarily to public water systems, but the guide-

lines established by these regulations would be expected to have validity for private water systems as well.

Maximum contaminant levels (MCL's) for certain dissolved solids were established by the National Interim Primary Drinking Water Regulations. The MCL for nitrate has been set at 45 mg/l while the MCL for fluoride is somewhat more complicated. The MCL for fluoride is expressed as a range of from 1.4 to 2.4 mg/l. This range is tied directly to the annual average maximum air temperature of the area in which the drinking water is consumed. As the effects of fluoride consumption are related to the total intake of fluoride, the amount of water and thus the dissolved fluoride in water that a person drinks is greatly influenced by climatic conditions. Historically, it has been speculated that an area of warmer climate produces greater consumption of drinking water by the inhabitants and may increase the risk of accumulation of fluoride in bodies of persons drinking water that contains fluorides over extended periods of time. Speculation by some other recognized authorities has somewhat diluted this hypothesis. It is believed that this previously recognized cause-effect relationship has been complicated by modification of climatic influences by the use of air conditioning. It may be assumed that this phenomenon has

continued on page 4 . . . "MAPS"

Randall County Reimbursement Approved By Board Of Directors

A. W. Gober, President of the Board of Directors of the High Plains Underground Water Conservation District No. 1, said that the District's plan to survey and report on water quantities for the municipalities in the Water District area "is one of the finest services we can perform for our constituents".

Gober made the remark following Board discussion of the project at the regular monthly meeting of the District's Board of Directors in Lubbock on June 13.

In outlining the program A. Wayne Wyatt, Manager of the Water District, used charts, graphs and maps from an actual water supply survey of a town in the District. The survey depicted problems in the future for the unnamed community. Wyatt said that he was withholding the name of the town until he has talked with the community's leaders about their dwindling water supply, which he said could possibly be exhausted as early as 1986 with no more growth in population, or as soon as 1984 with continued expansion. Wyatt emphasized that there was adequate groundwater reserves within reach of the city to sustain their needs for several decades; however, he felt the city needed to implement a plan to acquire and develop these reserves at an early date to avoid a water crisis.

Wyatt further explained the program by saying that the District would offer this service to any municipality within the fifteen county area it covered. He said that the program would be "strictly voluntary; they can call on us to help them in their water planning anytime they feel we might be able to lend them assistance or give them some technical advice in this area of expertise".

In other business at the meeting the Directors approved reimbursement of over two thousand dollars to the Randall County Tax Collector. The reimbursement was made for expenses incurred by the collector's office in collecting and refunding taxes outside the District's boundary. The erroneous collections were made as a result of a misinterpretation of the boundary of the District in the City of Amarillo.

Also approved by the Directors was a "special" extension of seven well drilling permits of the City of Lubbock. The seven wells, located in Bailey County, will be completed within a month according to a letter received by the District from Gordon Willis, Superintendent of Water Treatment for the City of Lubbock. The Directors issued the special extension for the six month period allowing ample time for all contingencies and associated works to be completed.

Other items of business before the Directors included reviewing and accepting the annual audit of the District; hearing reports on the Lubbock County well inventory and open holes in Lubbock and Hockley County, received a progress report on the USGS-Texas Water Development Board contract and on the progress of the District's water quality program.

Don Smith, Assistant Manager of the District, reported to the Board on the recent Interagency Task Force meeting in Amarillo on Irrigation Efficiencies, the Soil and Water Conservation District meetings resulting from the Resources Conservation Act of 1977 and on a recent meeting with the U. S. Bureau of Reclamation concerning the "Llano Estacado Total Water Management" study.

District Audit Results Available

The High Plains Underground Water Conservation District No. 1 has announced that the annual audit of the District and County offices has recently been completed.

In announcing the results of the audits, A. Wayne Wyatt, District Manager, said that everything appeared to be in good order. The District office audit was conducted by Edwin E. Merriam and Company and found the office to be in a basis consistent with that of the preceding year. No major deficiencies were noted during the audit.

The audit of the County Secretaries was handled by Mr. Clifford Thompson, Chief of the District's Permit Section, and Mrs. Norma Fite, the District's Bookkeeper.

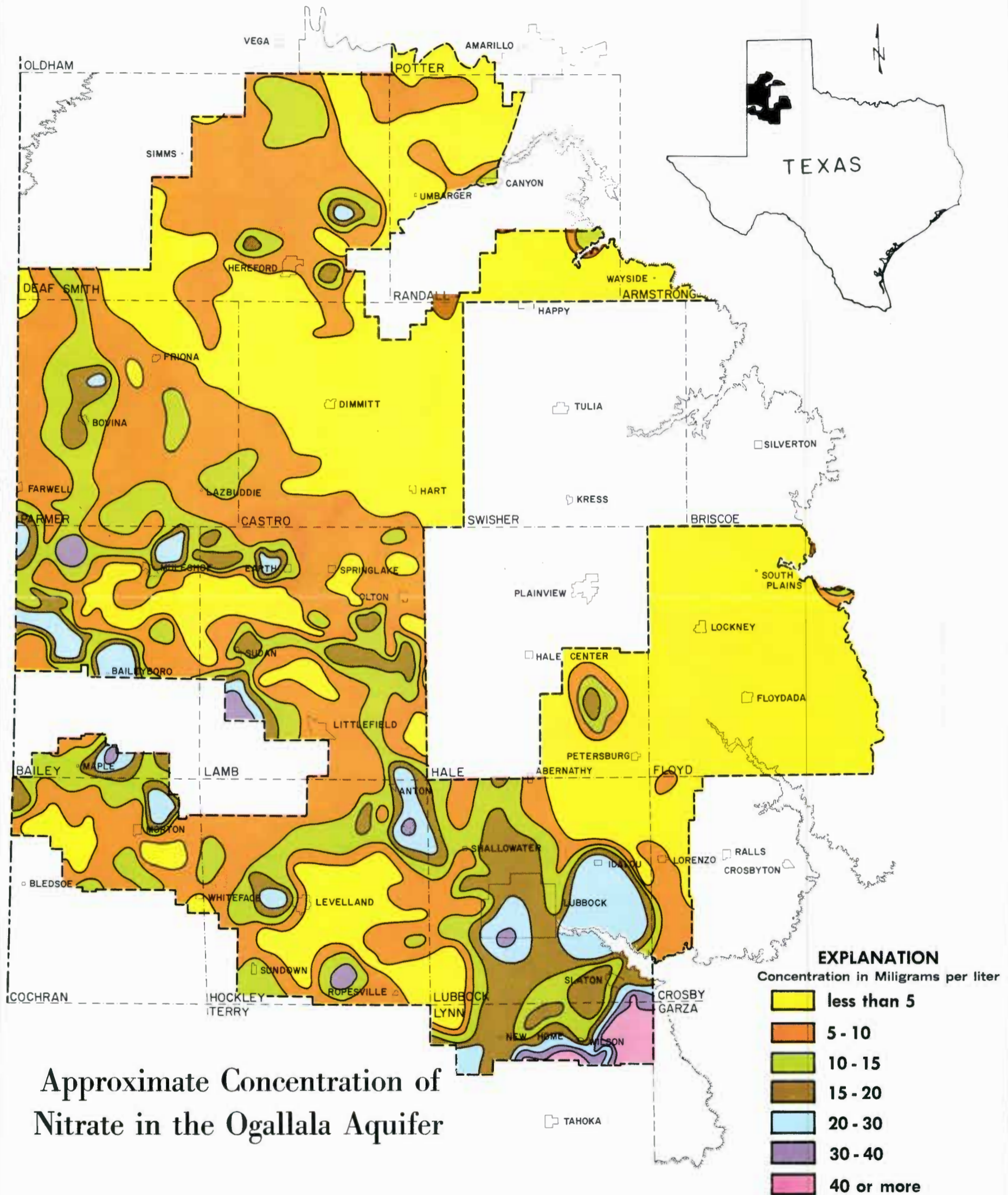
In conducting the county audits emphasis was placed on insuring that all monies were accounted for properly

and on checking to see that the following eight principal duties and services were performed. The eight duties and services are: (1) issuance of permits and logs to drill wells, (2) maintenance of water well application permit journal, (3) maintenance of active and completed well permit and log files, (4) acceptance and refund of permit deposits, (5) transmitting documentation to the District office, (6) conducting county committee meetings, (7) balance the check book each month and (8) helping anyone desiring information contained in the county office files.

Errors noted in the audit were normally minor and were corrected at the time of each county office's audit.

The results of the audits of the District office, and each county office, are available for review in the District office at 2930 Avenue Q, Lubbock, Texas.

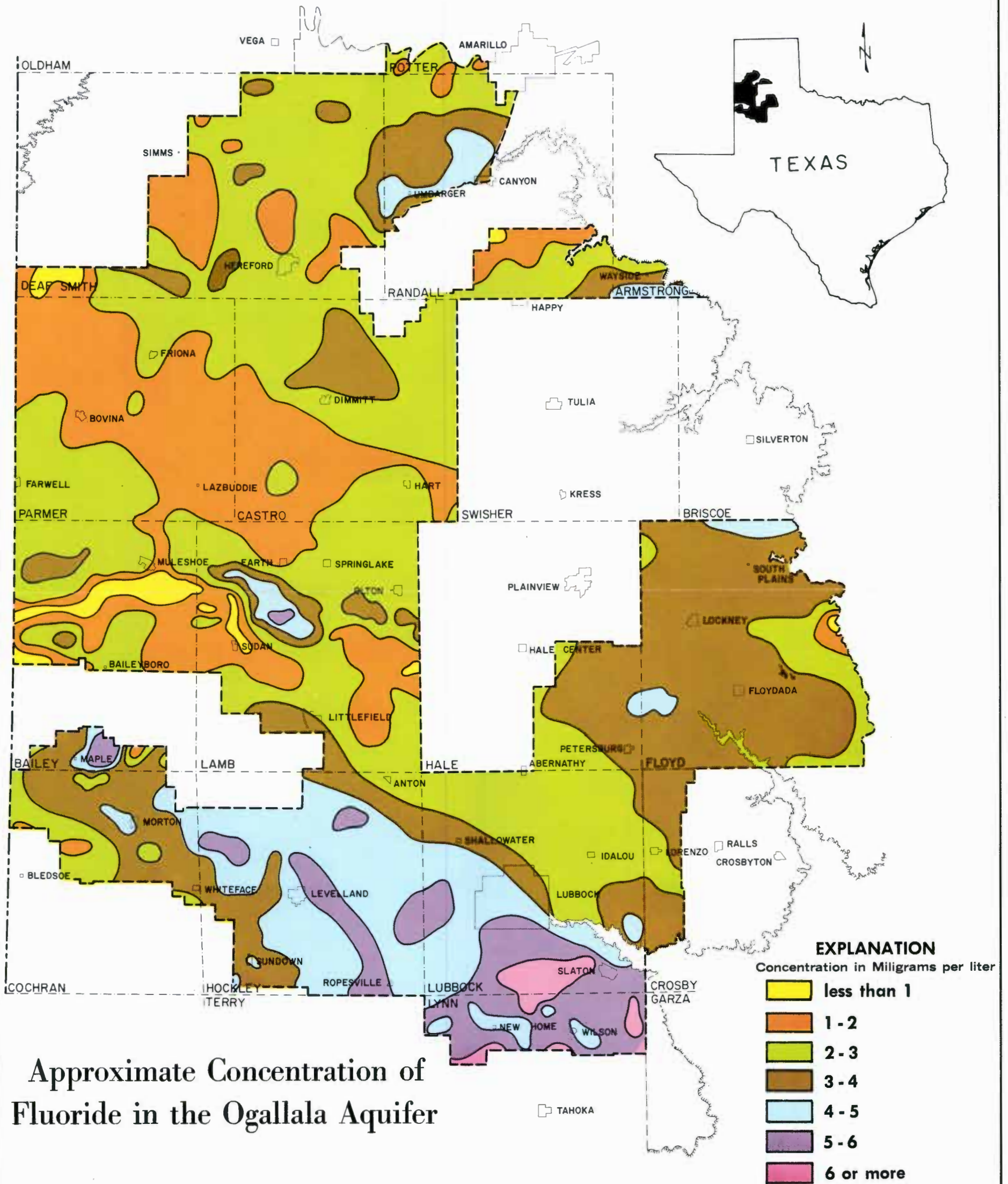
HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1



Approximate Concentration of Nitrate in the Ogallala Aquifer

From computer drawn maps produced from the Groundwater Quality Retrieval System, a part of the Texas Natural Resources Information System maintained by the Texas Department of Water Resources.

HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1



Approximate Concentration of Fluoride in the Ogallala Aquifer

From computer drawn maps produced from the Groundwater Quality Retrieval System, a part of the Texas Natural Resources Information System maintained by the Texas Department of Water Resources.



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Joe Albracht, 1981 P.O. Box 81, Bushland
Jack Brandt, 1981 Rt. 1, Box 280, Canyon

District's Agricultural Economist Named

The High Plains Underground Water Conservation District No. 1 is pleased to announce that Mr. Jack Richards has joined its staff. Jack's primary duties will involve calculating cost benefits of water conservation practices. Jack also will assist in performing the many field tasks performed by the District.



JACK RICHARDS

A recent graduate of Texas Tech University, Richards received a Bachelor of Science degree in Agricultural Economics.

Richards recently married the former Susan Schwarz of Abilene. Susan is currently working on her degree in Food and Nutrition at Texas Tech.

The District is pleased to welcome Jack as its newest member.

"MAPS" . . . continued from page 1

caused a reduction in the daily consumption of water and has probably reduced the potential for accumulation of fluoride in humans who consume water containing this substance.

The effects of consumption of humans of certain contaminants contained in their drinking water has been documented by various researchers. In the case of nitrates, it has been observed by recognized authorities that drinking water containing nitrate at levels in excess of 45 mg/l can cause a health defect in infants known as methemoglobinemia or "blue baby disease" as it is commonly known. This condition results when the infant's blood is inhibited in its oxygen transporting capability by the ingestion of nitrates. This condition is admittedly rare, but the potential for such a condition exists in the use of nitrate contaminated water in excess of 45 mg/l.

Drinking water containing dissolved fluoride can have both beneficial and detrimental effects. The difference results from the quantity of dissolved fluoride present in the ingested water. A beneficial effect that can result from ingestion of drinking water containing concentrations of fluoride of about one mg/l may be a reduction of the incidence of dental caries, particularly for children. Above this concentration there is potential for development of dental fluorosis or mottling of children's teeth. This condition may be undesirable more from an aesthetic viewpoint than a true health hazard. High intakes of fluoride for long periods of time may be responsible for skeletal fluorosis as reported by some

investigators, but at the concentrations found in most analyses of Ogallala groundwater as depicted on the following map, it seems unlikely for this affliction to result from this source of drinking water.

In summary, drinking water supplied from the Ogallala Aquifer in its natural state is generally pleasing both from an aesthetic and quality standpoint in spite of the present concern over concentrations of fluoride reported from some analyses of samples from the aquifer.

DISPLAY BOOTHS TO BE SET UP AT TWO EVENTS

Action has been taken by the District's Board of Directors to approve setting up display booths for the Water District at two upcoming major events.

The first event will be the High Plains Agribusiness Exposition which will run for three days at the Lubbock Memorial Civic Center. The show will be for the public at large and no admission fee will be charged for attending. The gates will open at 11:00 a.m. and close at 9:00 p.m. on Friday, Saturday and Sunday, August 25, 26 and 27. The display booth for the District will be a manned booth.

An unmanned display booth will be set up for the District at this year's Panhandle South Plains Fair. This year's fair will run from September 23rd through September 30th. The display will be set up in the Agriculture Building and will remain for the duration of the Fair.

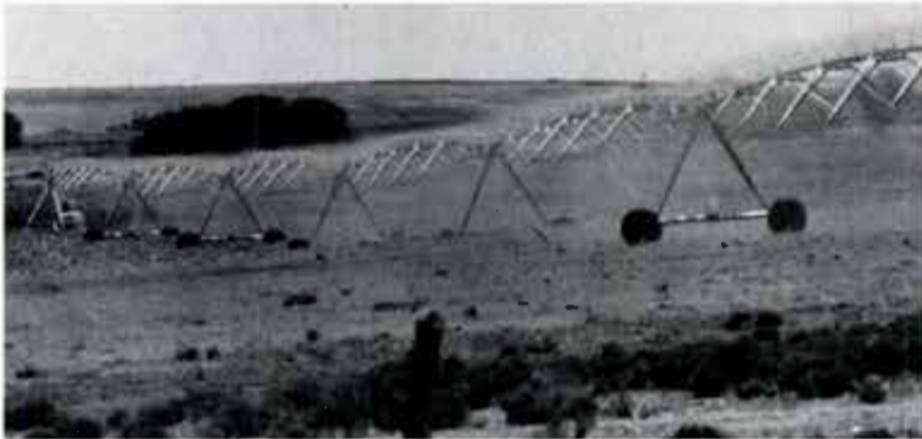
THE Cross SECTION

Published monthly by High Plains Underground Water Conservation District No. 1, 2930 Avenue Q, Lubbock, Texas 79405

Volume 24—No. 7

Publication number 564920, Second Class Postage paid at Lubbock, Texas

July, 1978



CENTER PIVOT IRRIGATION on terraced land can be accomplished, as shown in the above picture. Note how the tires of the second and third towers from the right have disappeared from view behind the terrace. This picture was taken of a highly sloping field located north of Olton on FM 168.

Center Pivot Irrigation On Terraced Land Is Possible

By Patric W. Neil*

Can cultivated land that has been terraced be successfully watered with a center pivot sprinkler irrigation system? The answer to this question can be yes. There are problems but these can be overcome. Two such terraced fields are being irrigated with center pivots in Castro County, Texas.

One of these fields is on the Kemp farm about two miles east of Dimmitt

IDALOU COUNCIL VOTES GROWTH MORATORIUM

Idalou city councilmen voted unanimously in their July 11 meeting to deny any new requests for land annexation to the City of Idalou "until the city's water problem has been corrected."

The decision does not mean that the city can't grow or develop on land already inside the city limits, but it does put a temporary moratorium on the city having anymore outward growth.

The decision was prompted by recent low water pressure problems in Idalou and by a growing concern that residents may run low on available water.

Councilman Larry Work, reminding councilmen of the low pressure situation, said that unless steps are taken to prevent it, "we will wake up some morning without water and it won't be a temporary situation. Our need is critical."

In clarifying the vote the council said that the need was to take care of those people already living in Idalou and not to add to the current problem.

on State Highway 86. The Soil Conservation Service technicians at Dimmitt assisted in the design and layout of a parallel terrace job with necessary waterways on a 125 acre field on the Kemp farm in 1967. This field had been irrigated with a water driven pivot system before the terraces were installed. Since the terraces were installed, this field has been irrigated and planted either in wheat and corn or grain sorghum every year. The same pivot system is used on this field and another 125 acre field. By having one field in sorghum or corn and the other field in wheat, the sprinkler system can water both fields at different times of the year. Mr. Johnson, who manages the Kemp farm, is well satisfied with this arrangement.

The other terraced field in Castro County being irrigated with a pivot sprinkler system is south of Dimmitt on the Gene Brown farm. A parallel terrace job was installed on this farm in 1977 with help from Soil Conservation Service technicians assisting the Running Water SWCD. A pivot sprinkler system was also installed on the Brown farm to water about 125 acres in 1977. This sprinkler system is an electric powered system and is being used for the first time this year.

In this type of irrigation set-up, all terraces need to be maintained. Where a field has been terraced and is irrigated with a pivot system some extra maintenance may be necessary. The wheels on any pivot system leave tracks and this could cause a problem on terraced land if the terraces are not

continued on page 4 . . . CENTER PIVOT

Maps Depict Chloride And Total Dissolved Solids Levels

By C. Don McReynolds

Two additional maps in a series illustrating chemical water quality of the Ogallala aquifer are presented on pages two and three of this issue of "The Cross Section". The parameters illustrated on the maps are concentrations in milligrams per liter (mg/l) of chloride and total dissolved solids (TDS).

Chemicals dissolved in water can be either beneficial or detrimental depending upon the relative quantities of substances present in solution and the usage to which the water will be placed. Water containing certain chemicals could be undesirable for human consumption, but might be quite beneficial or exhibit no detriment for irrigation or industrial usage. The reverse of this situation is also a possibility. Virtually everywhere natural groundwater from the Ogallala aquifer is of good chemical quality and suitable for most uses.

The present limits for concentration of chloride and total dissolved solids in drinking water for public supplies were established by the United States Public Health Service in 1962. The recommended limit for chloride is 250 mg/l and 500 mg/l is the recommended limit for total dissolved solids. There are, however, drinking water supplies being utilized successfully in several areas of the United States which contain these substances far in excess of the recommended limits.

The recommended limits for irrigation water concentration of chloride are subject to considerable speculation and variation. A generally quoted maximum acceptable limit of 350 mg/l of chloride may need some qualification. The interaction of chlorides with other constituents of the irrigation water may cause this limit to be higher or lower. The soil type, cropping practices, irrigation methods and other factors may also make this limit subject to variation.

Detrimental aspects of chloride and similar substances for application on crops is the effect such salts exert on the crop's ability to collect water from the soil through the plant roots. Directly tied to this problem is the leaching ability of the soil. If the soil leaches well, the chloride and other soluble substances will probably be flushed out of the root zone and become less of a problem to the plant's metabolism. If leaching is impaired, excessive chloride and other substances may accumulate in the root zone and retard the water collecting ability of the plant roots to such an extent that yields are diminished.

Total dissolved solids, as the name implies, includes the sum of all the dissolved chemical constituents in a water supply. As such, it is quite difficult to set exact limits for this parameter upon agricultural crops. The constituents of this total with their individual effects as well as their combined effects would be subject to wide variations. The principal constituents which make up total dissolved solids and their relative proportions would be the primary consideration. Each plant type may exhibit some reaction to soil water salinity or be affected by individual constituents of irrigation water. It would be difficult to set exact standards when so many variables are involved.

In summary, exact standards of acceptability for water containing chlorides and for total dissolved solids must be established for the expected uses of the water. The range of variable conditions affecting such a process can be extensive and it would seem appropriate to recommend that each use should be individually evaluated as to water quality requirements. The table "Classifications of Irrigation Waters" is a generalized depiction of the ranges and criteria suggested as upper limits for normal plant, soil and application conditions.

CLASSIFICATIONS OF IRRIGATION WATERS¹

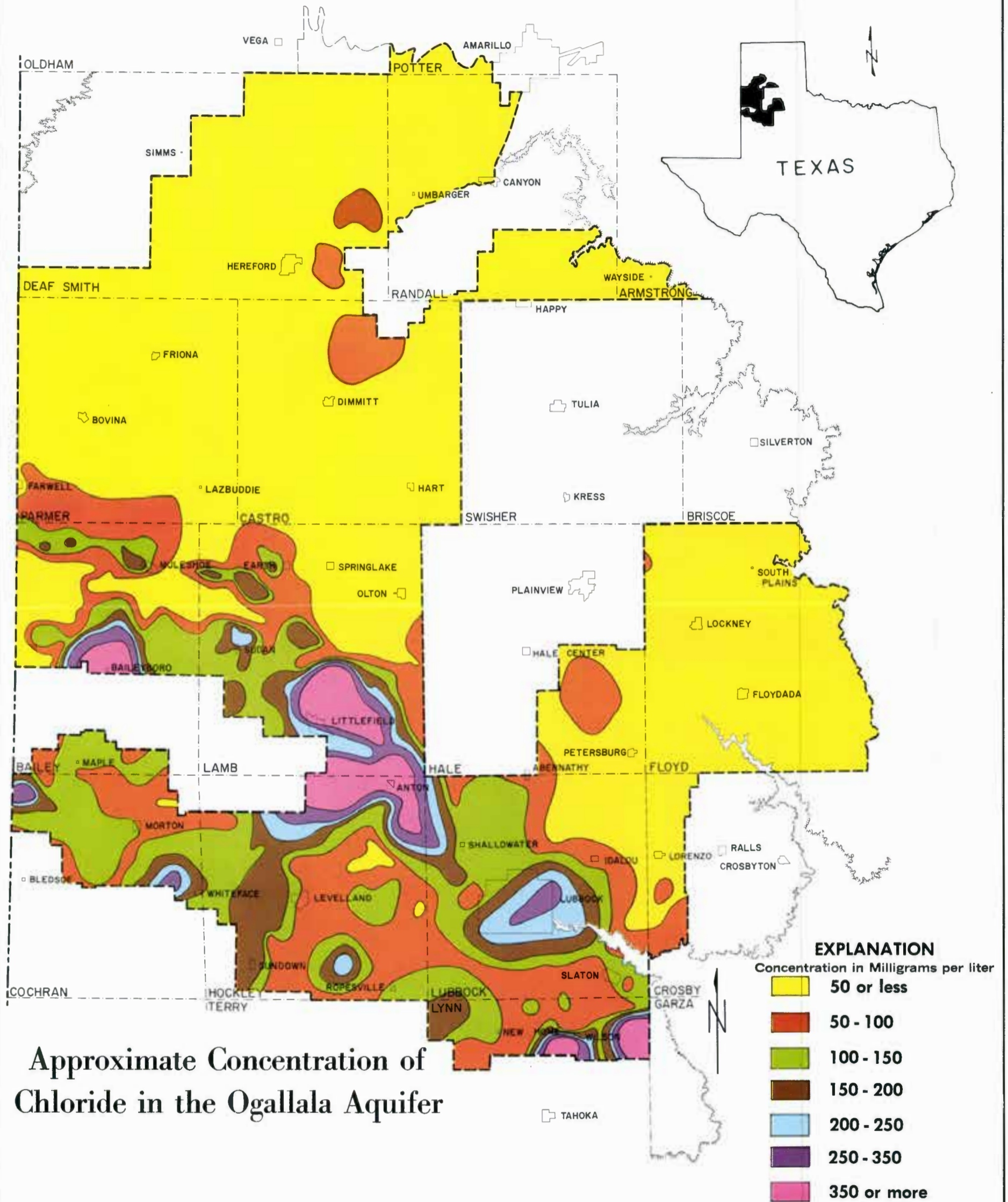
	Total Dissolved Solids (mg/l)	Chlorides (mg/l)
*Class I	350 - 700	70 - 250
*Class II	350 - 2100	70 - 700
*Class III	1500 - 2500	350 - 700

Class I Excellent to good, or suitable for most plants under most conditions.
Class II Good to injurious, harmful to some crops under certain conditions of soil, climate or practices.

Class III Injurious to unsatisfactory, unsuitable under most conditions.

¹McKee, J. E. and H. W. Wolf, "Water Quality Criteria". California State Water Quality Control Board Publication No. 3-A (1963).

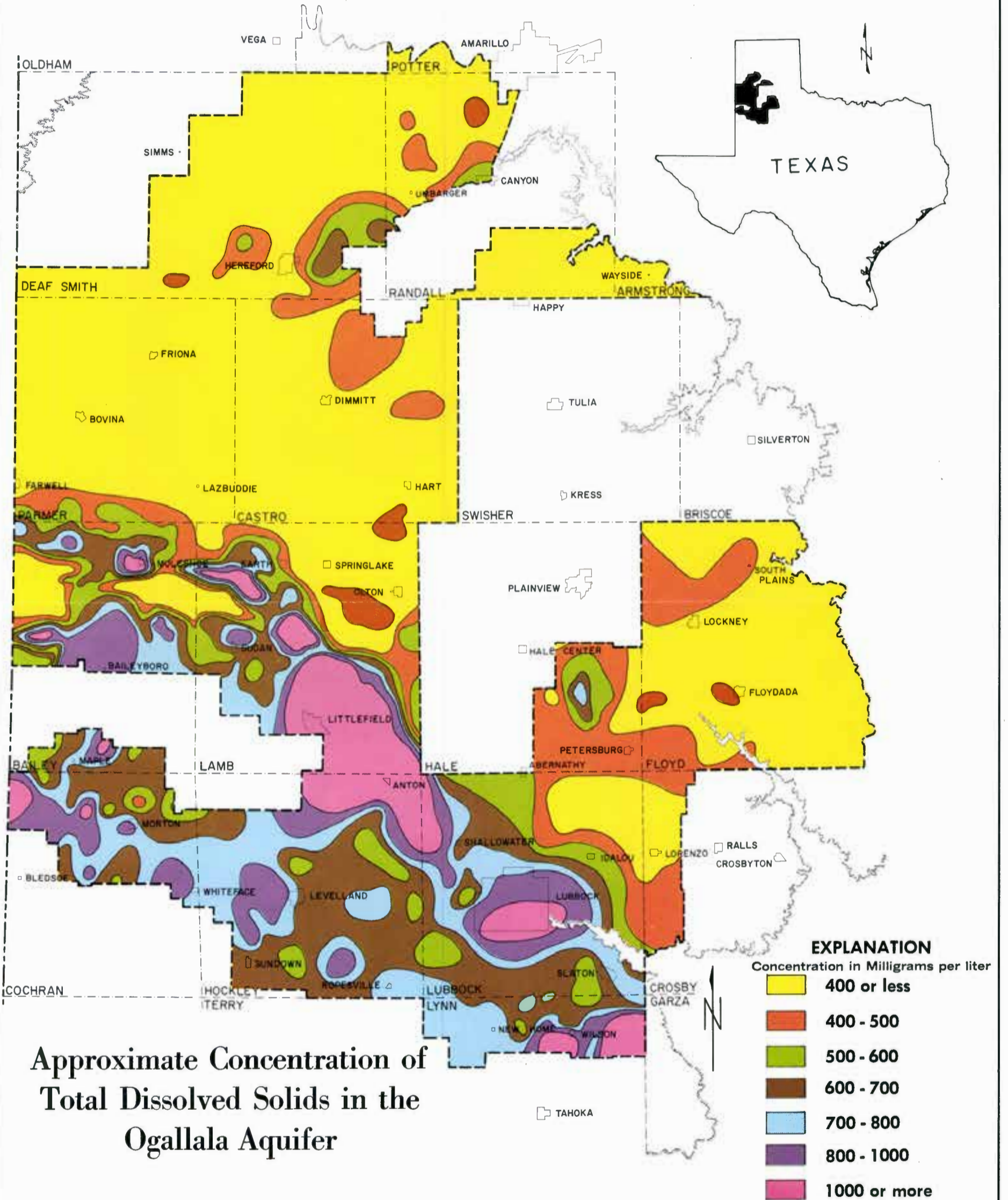
HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1



Approximate Concentration of Chloride in the Ogallala Aquifer

From computer drawn maps produced from the Groundwater Quality Retrieval System, maintained by the Texas Department of Water Resources, a part of the Texas Natural Resources Information System.

HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1



From computer drawn maps produced from the Groundwater Quality Retrieval System, maintained by the Texas Department of Water Resources, a part of the Texas Natural Resources Information System.



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- Precinct 2**
(COCHRAN, HOCKLEY and LAMB COUNTIES)
Selmer H. Schoenrock, Secy.-Treas. . . Levelland
- Precinct 3**
(BAILEY, CASTRO and PARMER COUNTIES)
A. W. Gober, President . . . Farwell
- Precinct 4**
(ARMSTRONG, DEAF SMITH, POTTER and RANDALL COUNTIES)
Ray Gerk . . . Hereford
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(FLOYD and HALE COUNTIES)
Malvin A. Jarboe . . . Floydada

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- Cordell Mahler, 1979 . . . Wayside
James Bible, 1979 . . . Wayside
Guy Watson, 1981 . . . Wayside
Bill Heisler, 1981 . . . Wayside
Leslie Adams, 1981 . . . Wayside
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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 W. J. Hill.

Hale County

- J. B. Mayo, Secretary
Mayo Ins., 1617 Main, Petersburg
- Clint Gregory, Jr., 1980 . . . Box 98, Petersburg
Homer Roberson, 1980 . . . Box 250, Petersburg
Henry Scarborough, 1980 . . . Route 2, Petersburg
Gaylord Groce, 1982 . . . Box 314, Petersburg
Bill John Hegl, 1982 . . . Route 2, Petersburg

Hockley County

- Jim Montgomery, Secretary
609 Austin Street, Levelland
- Billy Ray Carter, 1980 . . . Route 5, Levelland
Leon Young, 1980 . . . Route 1, Ropesville
Robert Phillips, 1980 . . . 218 Redwood, Levelland
J. E. Wade, 1982 . . . Route 2, Littlefield
Jack Earl French, 1982, Rt. 3, Box 125, Levelland

Lamb County

- Robert Richards, Secretary
509 Phelps Avenue, Littlefield
- P. A. Washington, 1980 . . . Box 124, Springlake
Jack Stubblefield, 1980 . . . Box 397, Spade
Larry Lockwood, 1980 . . . Star Rt. 2, Littlefield
Billy J. Langford, 1982 . . . Box 381, Olton
Edward Fisher, 1982 . . . Box 67, Sudan

Lubbock County

- Clifford Thompson, Secretary
2930 Avenue Q, Lubbock
- Don Bell, 1980 . . . Box 114, Wolfforth
Ronald Schilling, 1980 . . . Route 1, Slaton
Granville Igo, 1980 . . . 1304 8th Street, Shallowater
Owen Gilbreath, 1982 . . . 3302 23rd St., Lubbock
Clifford Hilbers, 1982 . . . Route 1, Box 14, Idalou

Lynn County

- Clifford Thompson, Secretary
2930 Avenue Q, Lubbock
- S. B. Rice, 1980 . . . Route 1, Wilson
W. R. Steen, 1980 . . . Route 2, Wilson
Wendell Morrow, 1980 . . . Route 1, Wilson
Gary Houchin, 1982 . . . Box 54, Wilson
Freddie Kieth, 1982 . . . Box 283, New Home

Parmer County

- Ken Horn, Secretary
Horn Insurance Agency, Bovina
- Floyd Reeve, 1979 . . . Box 876, Friona
Ralph Roming, 1979 . . . 809 Ridglea Dr., Bovina
Troy Christian, 1981 . . . Rt. 1, Farwell
Dalton Caffey, 1981 . . . P.O. Box 488, Friona
Ronald Elliott, 1981 . . . Rt. 3, Muleshoe

Potter County

- F. G. Collard, III, 1979 . . . Rt. 1, Box 433, Amarillo
W. J. Hill, 1979 . . . 5503 Emil, Amarillo
Jim Line, 1981 . . . Box 87, Bushland
Albert Nichols, 1981 . . . Rt. 1, Box 491, Amarillo
Weldon Rea, 1981 . . . Bushland

Randall County

- Mrs. Louise Tompkins, Secretary
Farm Bureau, 1714 Fifth Ave., Canyon
- John P. Robinson, 1979 . . . 1002 7th St., Canyon
Bill Dugan, 1979 . . . Rt. 2, Box 30, Happy
Harry LeGrand, 1981 . . . 4700 S. Bowie, Amarillo
Joe Albracht, 1981 . . . P.O. Box 81, Bushland
Jack Brandt, 1981 . . . Rt. 1, Box 280, Canyon

Comments From Dr. Jay Lehr

We thought perhaps our citizenry and elected officials (past and present) might not mind a small pat on the back, particularly from a highly respected member of the water industry, Dr. Jay H. Lehr.

Dr. Lehr is the Executive Director of the National Water Well Association and Editor-in-Chief of the *Water Well Journal*. In an essay published as an editorial in the July 1978 issue of the *Journal* entitled "How America Can Invest in Ground Water", Dr. Lehr wrote: "... But even in the worst of conditions, proper groundwater man-

agement can yield excellent results. Consider the Texas High Plains Water District, which pumps from the rapidly depleting Ogallala formation. Observers predicted twenty years ago that the entire supply would now be depleted. They even obtained IRS depletion allowances for falling water tables. Today's projections show another thirty years of water still remaining.

Such results are produced through intelligent management of resources. They can be repeated nationwide with accurate understanding of our groundwater resources..."

Well Permit Application Deposit Raised By Board Of Directors

In action at its July meeting, the Board of Directors of the High Plains Underground Water Conservation District No. 1 voted to approve amending the rules of the District to call for a fifty dollar well permit application deposit instead of the currently required ten dollars.

This new deposit amount will still be refundable to the applicant if (1) the application is denied by the Board, or (2) if the application is granted, upon timely receipt of correctly completed registration and log of well, or (3) if said permit location is abandoned without having been drilled, upon return and surrender of said permit marked "abandoned" by the applicant.

The change in the rules by the Directors requires the publishing of the rules change in one or more area newspapers at least once a week for two consecutive weeks. After meeting this legal requirement the new rule will become effective on September 1, 1978.

The Board also heard a report from Don Smith, Assistant District Manager, that 262 open holes have been found in Lubbock County as a result of a recent field survey taken by the District. Letters were sent to the owners of the land where the wells are situated advising them of the potentially hazardous situation and asking them to properly close the open well holes.

In the initial follow-up, 31 sites have been visited. Eighteen of the 31 were properly closed with 11 improperly sealed and two sites wide open.

Legal recourse to get the holes properly capped or closed can range from a lien against the land for the cost to cap the well, to a possible two

hundred dollar per day fine.

In other business, the Directors were briefed on the recent report given to the City of Shallowater concerning its water supply. In the report prepared by the District, A. Wayne Wyatt, District Manager, reported that Shallowater had approximately seven and one-half years of water supply left in the aquifer underlying the corporate limits of the city.

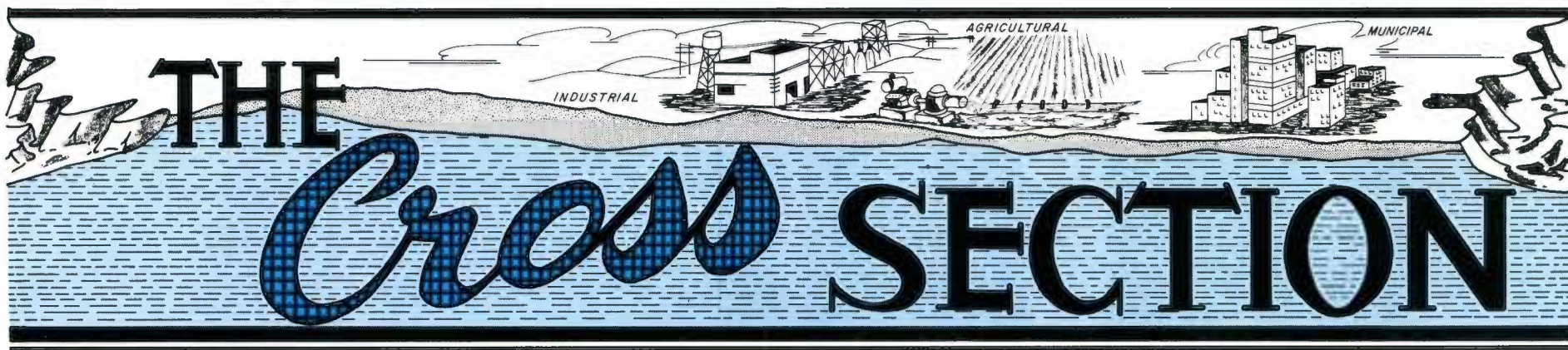
The Mayor and City Council members have already formed action committees to study various solutions that were recommended by the District. Wyatt said that there is "a definite need for early action; however, the Shallowater city leaders are already involved in considerations that should give them adequate time to come up with a long term solution".

CENTER PIVOT . . . continued from page 1

properly maintained. The pivot system itself should work satisfactorily on terraced land. At first some adjustment might be necessary.

Any sprinkler irrigation system needs a certain minimum amount of water to operate satisfactorily. A pivot system for 125 acres needs some where in the neighborhood of 600 gpm as a minimum. All of these systems are designed to operate at a certain pressure with a certain amount of water. Before purchasing any of these systems, it is very important to be certain that there is an ample supply of irrigation water. The amount of water applied to the land will depend on the water applied to the pivot and rate of travel of the pivot.

*Agricultural Engineer, Soil Conservation Service, Tulia, Texas.



Published monthly by High Plains Underground Water Conservation District No. 1, 2930 Avenue Q, Lubbock, Texas 79405

Volume 24—No. 8

Publication number 564920, Second Class Postage paid at Lubbock, Texas

August, 1978

Agricultural Water Quality Evaluated

by D. D. Smith

The High Plains irrigator has been blessed with water of such chemical quality as to be almost perfectly compatible with the various soils upon which it is applied. Natural recharge to the Ogallala aquifer must, and has in the geologic past, come from precipitation which has filtered down through the rocks of the Ogallala

TAES Field Day Set For Sept. 12

The public is cordially invited to attend the 69th Annual Field Day being conducted at the Halfway Texas Agricultural Experiment Station, which is located 14 miles west of Plainview, on September 12, 1978, according to Dr. Bill Ott, Superintendent of the Lubbock and Halfway Stations. Activities for the field day are scheduled to begin at 1:00 p.m.

This year's activities at the Halfway Station will highlight such topics as weed control, mobile trickle irrigation systems, corn irrigation, cotton varieties and a discussion on farm labor management. Station specialists will be on hand at demonstration locations for discussion of the demonstration as well as to answer questions related to specific problems within their area of expertise. There will also be agricultural implement displays and exhibits on the station grounds for public viewing following the field tour.

The field day program is a cooperative effort of the TAES, the High Plains Research Foundation, the Science Education Administration of the U. S. Department of Agriculture, the National Weather Service, the Texas Forest Service, and the Texas Agricultural Extension Service.

PARMER OFFICE MOVED

Mr. Clayton Williamson, City Manager of Bovina, will become the new County Secretary in Parmer County for the High Plains Underground Water Conservation District No. 1 effective August 21, 1978.

The new office location will be in the Bovina City Hall at 323 North Street, phone number 238-1116. All business pertaining to well permits, or other such activities, will be handled at this new office. The office will be open from 8:00 a.m. to 5:00 p.m. Monday through Friday.

Group. As the infiltrating water passes through the soil and rock column, it dissolves minerals from the rock matrix in such proportions as to establish a chemical equilibrium.

In making an assessment of the chemical compatibility of the water with the soil for sustained irrigated agricultural usage, potential problem development might be conveniently grouped into the broad categories of Salinity, Permeability and Toxicity.

In this issue of "The Cross Section" the maps presented on pages two and three depict the areal distribution and quantitative values for Specific Electrical Conductance and the Sodium Adsorption Ratio. Traditionally, the characteristics of water used to adjudge its suitability for irrigation have been the total concentration of salts indicated by the specific electrical conductance, the percentage of sodium, and the boron, chloride and sulfate concentrations. Since all of these factors may vary over considerable ranges independently of each other, the suitability of the water for irrigation must be judged on analysis of the specific chemical content as well as the total concentration.

A salinity problem related to water quality occurs if the total quantity of salts in the irrigation water is high enough that salts accumulate in the crop root zone. As excessive quantities of soluble salts build up in the root zone, the plant has added difficulty in extracting sufficient water from the soil solution. The electrical conductivities and total dissolved solids contents of soil solutions have been found to be sufficiently well related to

BOARD DISCUSSES "ABANDONED WELLS"

The Board of Directors of the High Plains Underground Water Conservation District No. 1 postponed action on defining terms and adopting procedures for declaring well sites abandoned at their August meeting.

In-depth discussions of the impact of declaring well sites abandoned filled much of the morning. The guidelines to be established by this action will be of increasing importance as new applications are made for wells at or near "abandoned well" sites. The Directors clearly stated that they do not want to approach a solution which would deprive any landowner of good and valuable property.

The Board concluded that they

their osmotic pressures to allow the substitution of electrical conductance for the more involved determination of osmotic pressure. Electrical conductance is defined as the ability of a substance to conduct an electric current. Specific Electrical Conductance is the capability to conduct electricity of a cube of the substance one centimeter on a side, and for uniformity of reporting (in the case of water) at a standard temperature (77 degrees F). Keeping in mind the probability that salinity of the soil moisture may be five to ten times higher than the salinity of the applied irrigation water, osmotic pressure = 0.36 x (electrical conductivity of the soil extract x 10³).

A permeability problem related to water quality occurs when the rate of water infiltration into and through the soil is reduced by the effect of specific salts or lack of salts in the applied water; therefore, the evaluation of the total salts in the water is essential. Low salt content can result in poor soil permeability due to the capacity of pure water to dissolve and remove calcium and other solubles in the soil. A comparison of the relative content of sodium to calcium and magnesium in the water is also essential. Calcium and magnesium in the proper proportions maintain soil in good condition

of tilth and structure, while the opposite is expected when sodium predominates.

The USDA Salinity Laboratory (1954) defined sodium-adsorption-ratio (SAR)

$$\text{of a water as } \text{SAR} = \frac{\sqrt{(\text{Ca}^{+2}) + (\text{Mg}^{+2})}}{(\text{Na}^{+})}$$

where ion concentrations are expressed in milliequivalents per liter. Experimentation indicates a good predictability of the degree to which irrigation water will tend to enter into cation-exchange reactions in soil. High values for SAR imply a hazard of sodium replacing adsorbed calcium and magnesium, such replacement having the potential to damage soil structure and tilth as previously outlined.

A diagram used widely for evaluating the potential of waters for irrigation was published by the USDA Salinity Laboratory (1954) and is reproduced with the maps. The specific conductance (used as an index of the dissolved solids concentration) is plotted on the horizontal scale and the SAR on the vertical scale. The diagram is divided into 16 areas which are used to rate the degree to which a

continued on page 4... WATER QUALITY

Number Of Permits Declines

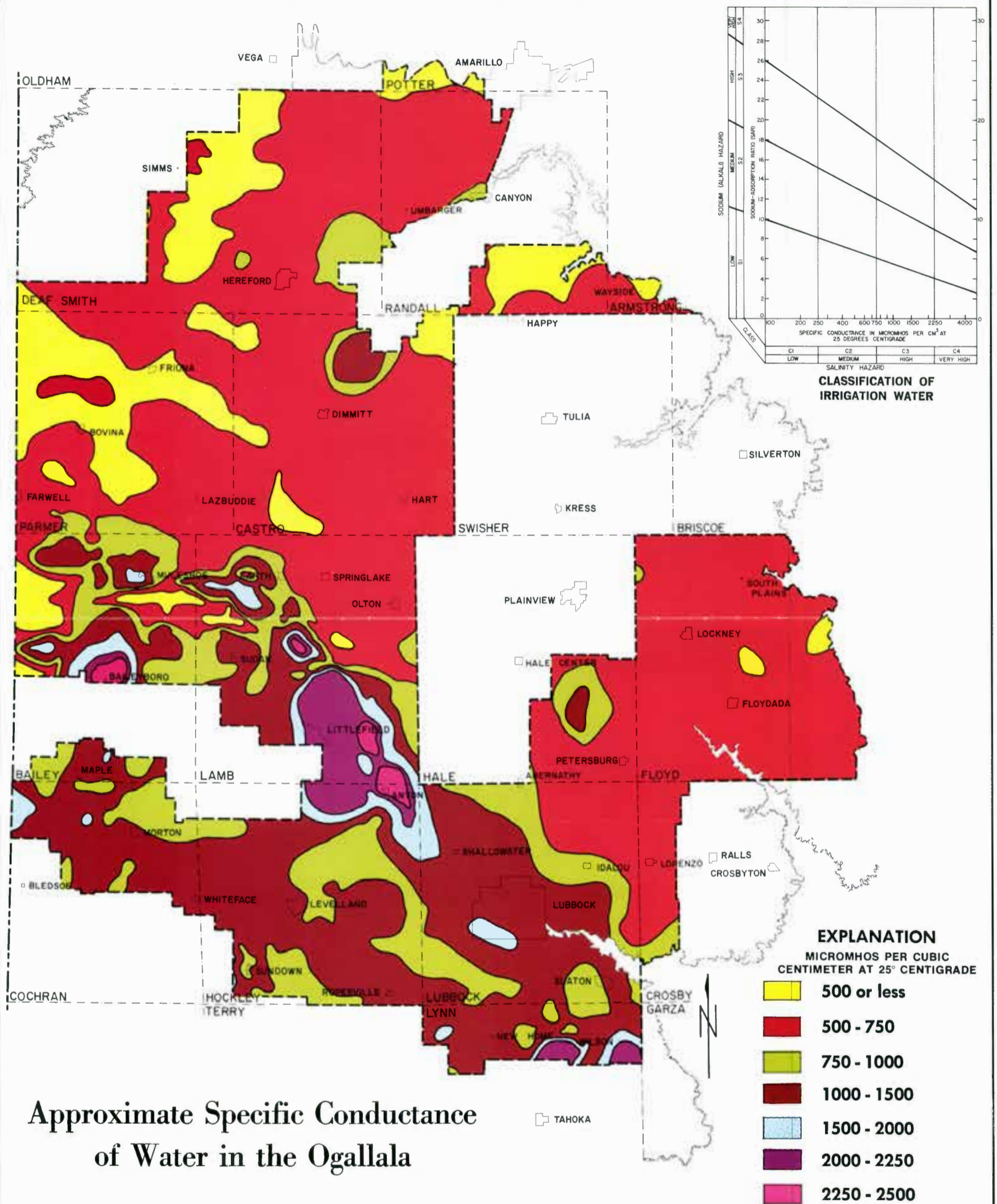
Through the first six months of 1978, only 350 well permits have been issued. This appears to be an extension of a trend. The number of permit applications closely parallels the condition of the general farm

economy. For instance, in 1977, only 819 permits were issued—the smallest number of permits since the District was formed in 1953. The following table shows the 1977 figures in detail.

County	Permits Issued in 1977	New Wells Drilled	Replacement Wells Drilled	Reported Dry Holes
Armstrong	1			
Bailey	76	60	8	3
Castro	113	101	4	1
Cochran	22	24	2	
Crosby	3	3		
Deaf Smith	127	102	9	
Floyd	83	67	11	1
Hale	26	23	2	
Hockley	39	39	1	2
Lamb	131	113	11	1
Lubbock	72	59	3	5
Lynn	16	6	1	2
Parmer	93	117	11	
Potter	—	—		
Randall	17	16	1	
TOTAL	819	731	64	15

continued on page 4... BOARD MEET

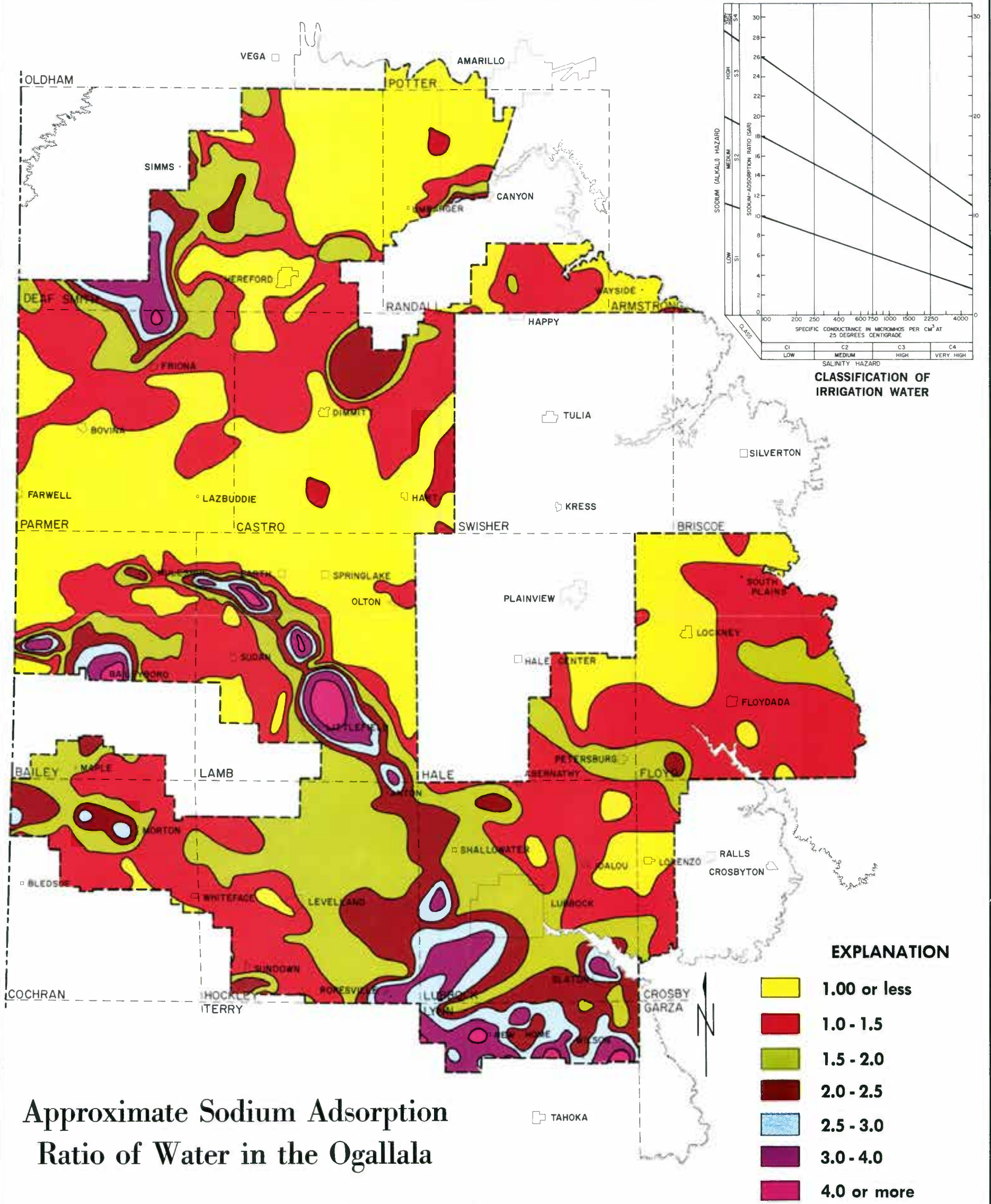
HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1



Approximate Specific Conductance of Water in the Ogallala

From computer drawn maps produced from the Groundwater Quality Retrieval System, maintained by the Texas Department of Water Resources, a part of the Texas Natural Resources Information System.

HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1



Approximate Sodium Adsorption Ratio of Water in the Ogallala

From computer drawn maps produced from the Groundwater Quality Retrieval System, maintained by the Texas Department of Water Resources, a part of the Texas Natural Resources Information System.



High Plains Irrigators Conserve Water

by Jack W. Richards

The High Plains Underground Water District covers approximately eight thousand square miles which is about 25 percent of the total area of the Texas High Plains. The Water District's service area contains about 47 percent of the total number of irrigated acres on the High Plains. The irrigation farmers within the District realize the importance of their underground water and each year are making steps toward increasing their conservation effort.

The Texas Agricultural Extension Service's High Plains Irrigation Survey conducted in 1976, reported that there were 10,500 miles of underground pipeline within the District. This is approximately 56 percent of the total miles of underground pipeline currently being utilized on the Texas High Plains. Also, the survey reported that 37 percent of the total number of acres irrigated by sprinkler systems on the Texas High Plains are within the District's boundaries. By utilizing under-

ground pipeline, both for the conveyance of water to sprinkler and gated pipe systems, the High Plains irrigation farmer is eliminating tremendous water losses by infiltration and evaporation from irrigation ditches.

From an assumption based on a 2,000 hour irrigation season, Water District farmers, by utilizing 10,500 miles of underground pipeline, are conserving approximately 700,000 acre feet of water per season. This fantastic savings would equal about 21.8 million gallons of underground water conserved per irrigated farm each year in the District. This enormous savings illustrates one fact very distinctly — that District farmers realize the value of conservation and have spent their hard earned dollars to practice conservation.



Mr. J. D. Smith, a High Plains farmer from Sudan, has recently been appointed as Texas State ASCS Committee Chairman.

BOARD MEET . . . continued from page 1

needed comments and suggestions from the District's 75 County Committeemen and their advisors as well as guidance from the District's legal counsel before adopting a definition for an abandoned well and determining the procedure which will be used in making an abandoned well declaration.

In other action the Board heard Jack Richards, staff Agricultural Economist, give a report on his study titled "Cost Analysis of Irrigation Ditch Losses" and Ken Carver, Agriculturalist, gave a progress report on the study "A Summary of Irrigation Practices and Techniques in the Southern High Plains of Texas." Carver's study is being done in cooperation with the Texas Department of Water Resources.

WATER QUALITY . . . continued from pg. 1

particular water may give rise to salinity problems and undesirable ion-exchange effects.

Water in the C1-S1 area of the diagram can be used on virtually all soils and almost all crops without detrimental effects. With increasing salinity, the tolerance for exchangeable sodium becomes more critical in the fine-textured soils.

The tolerance of different plants must also be determined to make decisions on the suitability of a given agricultural water supply. All of the preceding discussion has been predicated upon the assumption the waters are applied to the soil. Application by sprinklers offer a special hazard when using poor quality water upon sensitive crops.

WATER COMMISSION APPOINTMENTS GET SENATE APPROVAL

Chairman Joe Carter, and Members Dorsey Hardeman and Joe Carroll, were recently confirmed by the Texas Senate to positions on the Texas Water Commission. All three men were appointed by Governor Dolph Briscoe last September when the Department of Water Resources began operation. Each of the three had served previously as Commissioners of the Texas Water Rights Commission.

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THE Cross SECTION

Published monthly by High Plains Underground Water Conservation District No. 1, 2930 Avenue Q, Lubbock, Texas 79405

Volume 24—No. 9

Publication number 564920, Second Class Postage paid at Lubbock, Texas

September, 1978

Lubbock, Cochran County Analytical Studies Available

Dr. Lloyd V. Urban Appointed Assistant Director Of WRC

The Water Resources Center at Texas Tech University announced recently that Lloyd V. Urban, Ph.D., P.E., has been appointed as Assistant Director of the Center.

Dr. Urban, who has been at Texas Tech since 1974 in the Civil Engineering Department, has an outstanding background in research and work projects pertaining to water. He has written numerous textbooks, handbooks and manuals, and has had many articles and reports published in technical journals and magazines.

Dr. Urban has been honored with a number of awards including the Hawley Fellowship from the Texas Section of the American Society of Professional Engineers in 1967, the Outstanding Engineering Professor award from Tau Beta Pi for 1975-76 and the Amoco Foundation Distin-



DR. LLOYD V. URBAN

guished Teaching Award and Honorarium in 1977. He is a member of several professional organizations including Sigma Xi, the ASCE Environmental Engineering Research Council and the Registered Professional Engineers of Texas.

Three Groundwater Educational Films Made Available By District Directors

The Board of Directors of the High Plains Underground Water Conservation District No. 1 has approved the purchase of two new films to be added to the other educational material in the Water District's growing educational library. The library, which has hundreds of published volumes concerning underground water and other related subjects, is a professional library for use in researching this type of subject and it is open for general use for students and professionals in this field of endeavor.

The two new films, both approximately twenty minutes in length, are titled, "Groundwater: America's Hidden Reservoir" and "Groundwater: America's Buried Treasure." Both films are sixteen millimeter, full color, sound films.

Depicted in the "Hidden Reservoir" film, by means of live photography and animation techniques, is the story of the hydrologic cycle and how water has gotten into the underground water reservoirs known as "aquifers." The existence and functioning of such natural phenomena as geysers and artesian wells are explained along with

normal wells and natural spring formation.

"Buried Treasure" looks at the many uses of our groundwater and how we have been trying to find ways to make it last longer. It takes a look at a number of different practices being tried to recharge and conserve our treasure and at the constant search for new reservoirs, and at the danger we pose to our underground water because of pollution from farms and industries and city run-off.

According to Board President A. W. Gober of Farwell, the films would "make an excellent tool for use in our schools, for showing to business, civic, and social groups, or for anyone to view who would like a basic understanding of where groundwater comes from."

The films, along with the previously purchased film, "Water on Demand—The Basics of an Irrigation Well", are available for use by any organization in the District interested in these areas. The films will be shown free of charge by the District, if you will contact the District's Public Information Section at 2930 Avenue Q, Lubbock 79405, or by calling 806-762-0181.

Studies of the amount of water in the Ogallala Aquifer and projections for future years in Lubbock and Cochran Counties have been completed by the Texas Department of Water Resources (TDWR).

Report 216, "Analytical Study of the Ogallala Aquifer in Lubbock County, Texas" and Report 217, "Analytical Study of the Ogallala Aquifer in Cochran County, Texas" chart the impact and future course of underground water depletion and its effect on irrigation water production in these two counties through the next 44 years. The reports were compiled by TDWR staff members Ann E. Bell and Shelly Morrison.

Guidelines provided in the reports were obtained by the use of electronic computers that simulate the aquifer's behavior and should provide the groundwater user in each of the counties with reasonably good estimates by which future management decisions can be made.

Lubbock County had about 5.5 million acre-feet of groundwater in storage in 1974. The computer study shows that 67 percent of this total, or 3.7 million acre-feet, will be left in storage in 2000 if past water-use patterns and aquifer behavior are continued in the future. Only 2.6 million acre-feet, or 47 percent, will remain in storage by the year 2020.

Nowhere within Lubbock County is the water expected to be totally exhausted, but yields of wells will decrease and expense of irrigation pumpage will increase. Pumping lifts in wells in Lubbock County now range from less than 100 feet to about 300 feet. By the year 2020 pumping lifts are expected to approach 350 feet in some local areas. The increased lifts will require more energy and thus greater cost in bringing the water to the surface.

With the thinning of the aquifer thickness, annual pumpage of water in Lubbock County will decline significantly. Compared to the 161,000 acre-feet of water produced in 1974, the amount expected to be produced in the years 2000 and 2020 is about 131,000 and 111,000 acre-feet respectively, an overall decline of 31 percent.

Cochran County had about 2.9 million acre-feet of groundwater in storage in 1974. The computer study shows that 55 percent, or 1.6 million acre-feet, will be left in storage in 2000 if past water-use patterns and aquifer behavior are continued in the future.

Only 1.0 million acre-feet, or 34 percent, will remain in storage by the year 2020.

Nowhere within the county is the water expected to be exhausted, but yields of wells will decrease and expense of irrigation pumpage will increase. Pumping lifts in wells in Cochran County range from about 100 to 275 feet. The study indicates that the range of pumping lifts in the county will remain about the same during the study period, 1974 through

continued on page 2—STUDIES

Center For Public Service To Offer Water Symposium

Dr. Frank Baird, Professor of Political Science at Texas Tech University, has announced that the Texas Tech Center for Public Service will sponsor a symposium on November 8 and 9, 1978, with the theme being "The Multifaceted Water Crisis of West Texas." The program will be held at the Lubbock Civic Center in Rooms 108-109.

The symposium is designed to inform officials of government entities (municipalities, school districts, water districts, other special districts, governmental agencies, and the like) in the vast West Texas region from Wichita Falls to El Paso and from San Angelo northward to the Panhandle.

Dr. Baird, project director for the symposium, said that the purpose of the symposium is to provide information, insights, and possible alternatives in coping with the various aspects of the region's severe water problems. The program will focus on the following four areas, 1) Public Water Supplies: Quality and Quantity, 2) Stretching the Water Supplies of West Texas, 3) Federal Studies Related to Water Resources of the High Plains, and 4) The Carter Administration's National Water Policy and State Efforts.

Anyone interested in attending the symposium should contact the Division of Continuing Education, Room 104 Administration Building, Texas Tech University, 79409. For those persons attending and requesting it, the Division of Continuing Education will award a Continuing Education Certificate if all four sessions of the symposium are attended. The registration fee for the two-day symposium is \$25.00.



A MONTHLY PUBLICATION OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1
 2930 Avenue Q, Lubbock, Texas 79405
 Telephone 762-0181

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 Freddie Kieth, 1982 Box 283, New Home
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 Harry LeGrand, 1981 4700 S. Bowie, Amarillo
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Artificial Recharge Techniques Described In TDWR Publication

The Texas Department of Water Resources has published a new report by the U.S. Geological Survey which describes methods and techniques that can be used to artificially recharge the Ogallala Formation of the Southern High Plains of Texas with water obtained primarily from the playa lakes.

Supporting artificial groundwater recharge as a water management technique significant to the area, the report presents case histories of recent recharge experiments on the Southern High Plains, the results of laboratory studies of sediment flocculation of playa lake water, and a cost analysis of described recharge systems.

Under specific conditions, artificial groundwater recharge by use of either water-spreading basins or injection wells is a substantiated means of storing water available from the playa lakes.

Use of the water-spreading basins from which water infiltrates to the water table is the most economical method of recharge in the area. The report cites an idealized spreading-basin installation as one where water is pumped from a playa lake, treated with a chemical flocculant to speed up settling of the suspended sediment material, held in a settling basin to allow sedimentation, and pumped into one of three spreading basins.

Recharge through injection wells may be the most feasible method at sites where layers of low permeability soils occur between the land surface and the water table. Injection wells

STUDIES—continued from page 1

2020, because of decreasing saturated thickness of the aquifer and consequent diminishing well yields.

With the thinning of the aquifer thickness, annual pumpage of water in the county will decline significantly. Compared to the 117,000 acre-feet of water produced in 1974, the amount expected to be produced in the years 2000 and 2020 is about 94,000 and 69,000 acre-feet respectively, an overall decline of 41 percent.

The reports contain maps, charts, and tabulations which reflect estimates of the volume of water in storage in the Ogallala Aquifer in each county and the projected depletion of this water supply by decade periods through the year 2020. The reports also contain estimates of pumpage, pumping lifts, and other data related to current and future water use in each county.

The maps in the reports are intended for use as general indicators only and are not recommended for use in determining water availability when buying and selling specific tracts of land. It is recommended that a qualified groundwater hydrologist be consulted to make appraisals of groundwater conditions when such transactions are contemplated.

Copies of Report 216 (Lubbock County) and Report 217 (Cochran County) are available without charge from the Texas Department of Water Resources, P. O. Box 13087, Austin, Texas 78711.

provide a means of placing water directly into an aquifer at a location and depth from which it can be recovered.

The report contains in detail the U.S. Geological Survey's documented explanation of how water-spreading basins or injection wells can be used for recharging the available playa-lake water into the Ogallala aquifer in the Southern High Plains.

Copies of this report are available without charge from the Texas Department of Water Resources, P. O. Box 13087, Austin, Texas 78711. The Report Number is 220 and the title is "Artificial Groundwater Recharge as a Water Management Technique on the Southern High Plains of Texas and New Mexico."

Directors Approve TDWR Contract

In its September meeting the Board of Directors of the High Plains Under-ground Water Conservation District No. 1 gave Board President A. W. Gober the authority to sign a contract with the Texas Department of Water Resources that calls for the District to conduct certain geohydrological studies for the Department.

The studies are being conducted as a part of the overall United States Geological Survey study of the Ogallala aquifer. The signed contract will call for the District to conduct the studies during a period of two years and will bring the District over \$180,000 in income.

During the next two years, the District staff will construct maps of the base of the Ogallala aquifer underlying the District area, construct maps reflecting the 1980 elevation of the water table, construct maps reflecting the 1980 saturated thickness of the aquifer and monitor neutron logging test sites to obtain information for calculating natural recharge and irrigation recirculation.

The Directors also heard staff reports on some of the District's on-going projects and recent activities. Of particular interest was the request from the City of Bovina for the District to provide a water assessment study similar to those done for the Cities of Shallowater and Idalou.

The staff also reported that the District's educational program centered around the publication "Chief Running Water's Story of High Plains Water" has been deemed successful. As of the date of the meeting of the Directors, 19,187 copies had been hand delivered to schools throughout the District, and many more had been mailed or picked up at the Water District office.

The current program of testing wells in the District for bacteriological contaminants was explained to the Directors. The initial stage of this program is currently underway with the members of the Water District staff learning sampling and testing techniques.

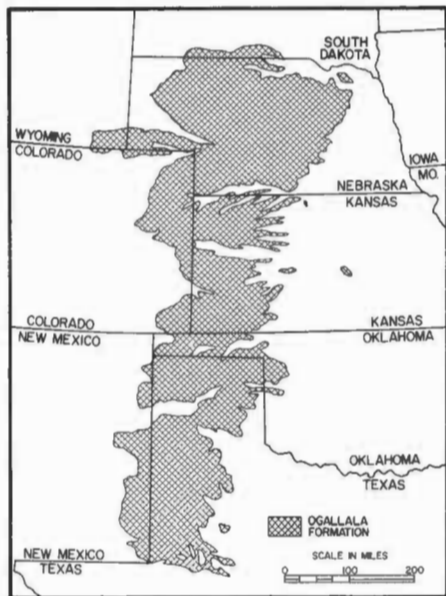
The Directors also approved a motion setting aside its normal October meeting unless circumstances dictated that a meeting be held.

Federal Studies To Have Major Impact On High Plains

Three Federal studies are currently underway that will have as the center of their focus the High Plains and/or the Ogallala Aquifer. These studies are being funded principally by the Federal government, with some financial support by State and local agencies. When the studies are finished any actions or recommendations resulting from these studies will be felt directly by all residents in the geographical area of the High Plains Underground Water Conservation District No. 1.

USGS Ogallala Study

The U. S. Geological Survey has planned an extensive study centering on the High Plains and the Ogallala Aquifer. The total project is expected to be completed in five years and will include the development of a computer model of the entire Ogallala Aquifer which underlies varying portions of the States of Texas, Oklahoma, New Mexico, Kansas, Nebraska, Colorado, Wyoming and South Dakota (see the accompanying map). The area of the study encompasses some of the finest food and fiber producing areas of the United States.



The purposes of the study, as outlined in the official work plan for the study, are to: 1) describe the water resource and the operation of the hydrologic system; 2) develop a regional water-resources (and related) data storage and retrieval system; 3) design and develop a digital computer model (or models) of the High Plains aquifer system; and 4) evaluate selected groundwater management alternatives to demonstrate the applicability of the model (or models) and provide a hydrologic basis for the economic evaluation of management alternatives.

EDA Study

In October, 1976, the United States Congress passed the Water Resources Development Act and authorized a \$6 million study generally referred to as the High Plains-Ogallala Study. This authorization designated the Economic Development Administration of the U. S. Department of Commerce to work with other governmental agencies and departments of all levels, and with private interests, to study the natural resources of the areas of the States of Colorado, Kansas, New Mexico, Okla-

homa, Nebraska and Texas that are using the water of the Ogallala Aquifer and to develop a means of increasing the water supplies of or to those areas.

The main thrust of this EDA study will be the determination of the effect of declining groundwater supplies on the economic growth or stabilization of the areas overlying the Ogallala Aquifer. The study will cover the states directly affected by mining groundwater, and its impact on other areas of the country that depend on the High Plains states to supply raw materials and food supplies and on the ability of the High Plains states to continue as ready markets for products and services from the other states of the Nation. The study will also assess the impact to the area of going from an irrigated agricultural base to a dry-land farming base, with a resultant decline in the yields of crops.

The EDA, with an initial Congressional appropriation of \$3 million for the first year of the study, is preparing to contract out most of the work to a general contractor who will be responsible for the major portions of the study. The general contractor will contract with the individual states for certain portions of the study pertaining to their particular areas of state farm-level research, energy production impacts and overall state impacts. Approximately one million dollars will be allocated to the six states for state-level research.

Of particular interest to residents of the High Plains area will be the work of the Corps of Army Engineers as it takes a new look at water importation to the study area. The Corps' work will include a reconnaissance level study looking at alternate water sources and conveyance routes which have been previously identified, attempt to identify new sources and conveyance routes as well as updating studies previously completed. The Corps has been awarded \$750,000 of the \$6 million appropriation for its study effort.

Bureau of Reclamation Study

The third Federal study currently being conducted is the Bureau of Reclamation's "Llano Estacado Total Water Management Study". The area covered by this study encompasses the High Plains of eastern New Mexico and northwest Texas and those portions of Colorado, Kansas, and Oklahoma lying south of the Arkansas River (shown in accompanying illustration).

The principal water supply for the study area is ground water pumped from the Ogallala Aquifer. Because this supply is rapidly being depleted, the Bureau of Reclamation will evaluate conserving and augmenting the present water supplies. The study will place special emphasis on quantifying water supplies that may be available from the playa lakes of the area.

The main objectives of the study are to: 1) identify water supply problems and needs; 2) determine the quantity and quality of surface water resources (emphasizing playa lake water availability); 3) evaluate the possible uses of playa lake water; 4) study related water supply concepts; 5) and the

economic impacts due to the declining groundwater.

This is an ongoing study with the first status report being published in November, 1977.

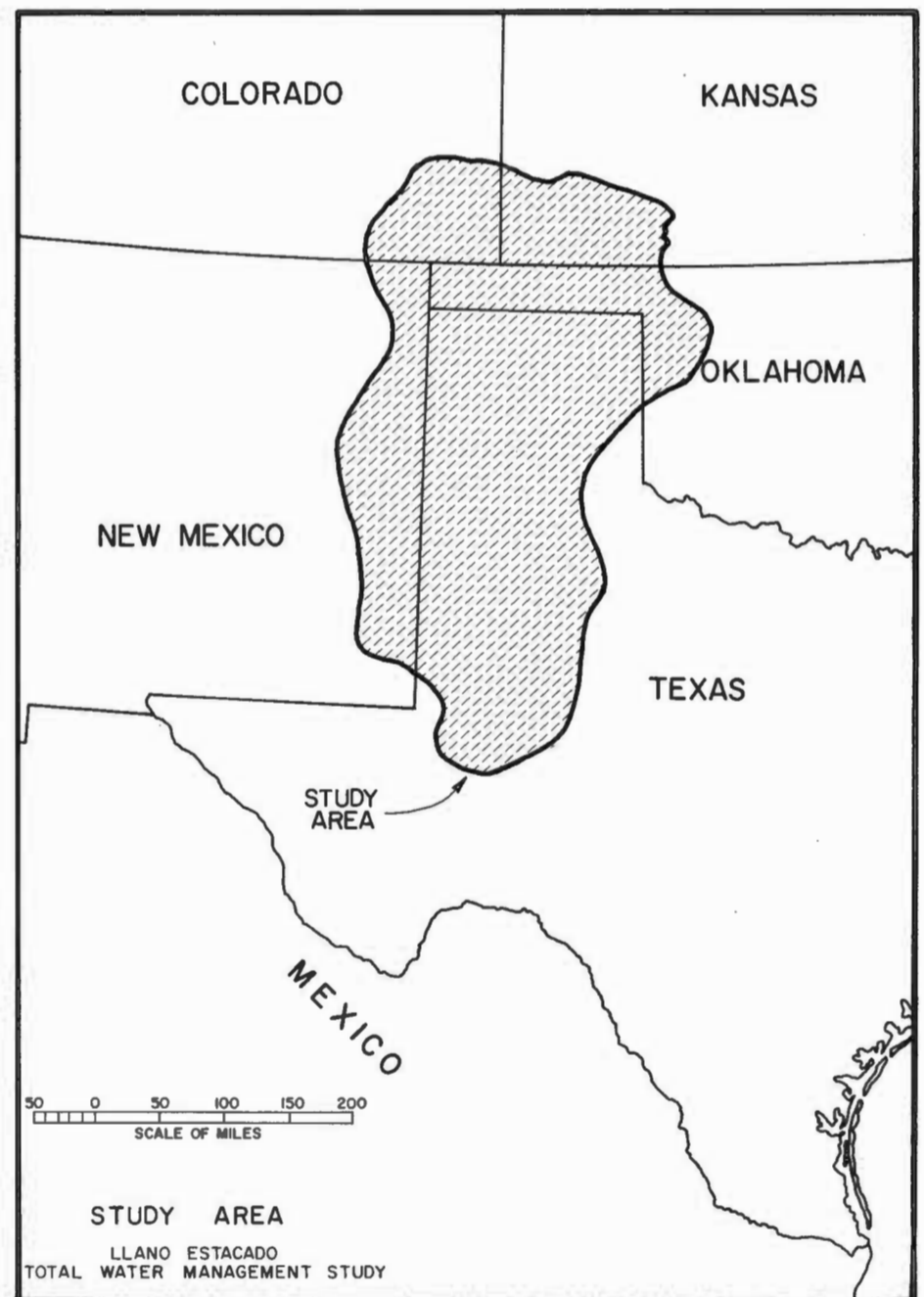
EDITOR'S NOTE

(These three Federal studies will in all probability strengthen the High Plains' chances for water importation to the area. For example, the "Llano Estacado Total Water Management Study" will quantify the amount of water collected in playa lakes and will in all probability document that there is in fact not a substantial amount of water collected in these playa lakes. Also, that the water which is collected in the playa lakes is being utilized almost completely by the High Plains irrigator. This documentation should, prove very important to correct a misconception of the many visitors to the area. This misconception has resulted at times when visitors to the area have flown over the area following a rain. They have observed hundreds of lakes which contained what appeared to be huge amounts of water. Aerial observations of playas can be very deceiving, even though the playa has a large water surface area, the depth of the water in the lakes is generally only a

few inches. Consequently, what appears to be a large quantity of water is in fact very little. Congress needs to be assured that we do not in fact have a large source of surface water which is not being fully utilized before they can in good conscience pass legislation necessary for the importation of water to the High Plains. This study should document this fact.

The U. S. Geological Survey Study to quantify the groundwater reserves and project the likely depletion of these reserves will to some extent duplicate studies already conducted by state and local agencies in Texas; however, the same types of studies have not been made for the remainder of the Ogallala aquifer in the other Great Plains States. This study is extremely necessary to illustrate to Congress that our water supplies are being mined and that if the High Plains area is to remain a highly productive food and fiber production area, that water will have to be brought to the area from some other source. Even though local and state studies in Texas have documented this fact, Congress is more prone to rely on studies made by their own agencies when making large, long term commitments.

continued on page 4—FEDERAL



"Mr. Gus" A Friend To All Residents Of Texas High Plains

"Mr. Gus."

It's a name that's not really unusual enough to be remembered long but one that has remained in the minds of many farmers and ranchers throughout the High Plains of Texas, eastern New Mexico, western Oklahoma and hundreds of miles in all directions from Earth, Texas.

"Mr. Gus" is Mr. Gus Parish, one of the original founders of the KMP Lake Pump Manufacturing Company of Earth, Texas.

A former Director of the High Plains Underground Water Conservation District No. 1, and long-time promoter of water conservation, Mr. Gus created this family business in the early 1960's basically as the result of complaints he heard everywhere concerning poorly made tailwater and lake pumps. Some of the loudest complaints came from the Water District's Engineer Technicians who complained to him that even though they could get High Plains irrigators to agree to install irrigation tailwater return systems, there were no pumps available which could

handle the unique problems associated with irrigation tailwater.

Mr. A. Wayne Wyatt, the current District Manager, was one of those Engineer Technicians. "Mr. Gus sort of took it as a personal challenge to come up with a workable solution to the lake pump problem," according to Wyatt. "One of our biggest complaints to him was that most irrigators didn't like to pump irrigation tailwater from the playa lakes because the centrifugal pumps used then had two major drawbacks of having to be primed and they didn't have the ability to handle trash of any appreciable size and continue to work."

The District's technicians continued to frequently express their frustrations to Mr. Parish. He then decided, in the early 1960's, that he could build a pump which was self-priming and capable of handling large amounts of trash and silts. After numerous trials, and many tribulations, Mr. Gus began producing the first of his successful pumps in 1962.

The first of his pumps was sold to a farmer in Edmonson, Texas, and was used as a test to see if the pump would work under normal conditions. It worked well enough to let Gus make a few more as tests and these early pumps led to the first of the regular production models in 1963. Mr. Shirley Chaney bought the first of the models, which had several minor improvements, and it is still operating today.

"The development of the pump went through a lot of changes to get where it is now," according to Doug Parish, the son of Mr. Gus, and the manager of the firm today. "The pump employs a large, open-impeller cast aluminum bowl assembly that is basically the same today as it was in the first production model," continued Doug, "and we made the pump with the ability to be easily modified and modernized by exchange of new parts."

Today the manufacturing firm is working on a new idea for an old piece of equipment - - - they are producing windmills. The company holds a patent on its unique windmill that works on a chain and sprocket drive system, which totally does away with the need



Doug Parish, manager of the KMP Lake Pump Manufacturing Company, carries on the tradition of service started by his father, Mr. Gus Parish. Doug is showing the construction of one of the 27 different types of pumps made at the shop located in Earth, Texas.

for a gear box. It runs on sealed ball-bearings (eliminating the oil bath) and has a new tail design which keeps the mill balanced at all times.

Mr. Gus had accepted the challenge again and is continuing to work on improvements to his windmill.

"The windmill is going to become more and more important at the company as time goes by and the energy prices keep rising," said Doug. He continued "we started the windmills about ten years ago as a favor to a rancher-friend who was having too high energy costs, and we started production on them about five years ago. We now produce and sell between two and three hundred every year."

Two challenges came his way and Mr. Gus met them head on. The first came when he was already comfortably semi-retired with no financial need to start a new business. However, he saw a need that wouldn't go away by itself and it concerned something he was totally involved with — water conservation. His second challenge was the new windmill, and with typical West Texas perseverance and ingenuity he came up with the patented machine they now use.

Though he is now "somewhere in his 80's", Mr. Gus works every day in

NWRA TO MEET IN SAN ANTONIO

The National Water Resources Association will hold its 47th Annual Convention in San Antonio, Texas, from October 8 through October 12, 1978.

The theme of the convention is to be "Natural Resources Policy Adrift." There are to be many activities for conventioners and their spouses.

Anyone interested in attending the convention should contact the NWRA, 955 L'Enfant Plaza North, S.W., Washington, D.C., 20024, immediately.

FEDERAL—continued from page 3

The Economic Development Administration study should illustrate the effects on the economy and the anticipated decline in population in this area as a result of their study. Even more important will be the estimated effects of the decline in the availability of food and fiber for the people of this nation and possibly even more important, the loss of agricultural products to be used in world trade to offset trade deficit. We at the Water District are very pleased that these studies are being conducted and hope that the ultimate result will lead to the importation of water to the area.

High Plains residents should not assume that these studies will automatically result in water being imported to the area. They should help in our efforts on this behalf, however, much work will have to be done on a local and state level to achieve this objective. The people of the area should continue to manage their water supplies as if water importation to the area will never come to pass and that every drop must count.)

the shop trying to improve on current machinery and give advice and ideas in new areas. The company now produces a large assortment of irrigation tailwater and playa lake pumps (27 different ones to be exact) and the windmill. They are currently working on a device to make harvesting easier, safer and more practical on land that has been furrow diked.

The people of the High Plains owe a debt of gratitude to Mr. Parish, and other's like him, who have invested so much of their time and resources in serving their fellow man and in promoting water conservation.

Thank you!
"Mr. Gus."



"Mr. Gus" stands by the patented windmill drive from one of the new windmills produced at his company. The chain and sprocket drive on these windmills eliminates the need for a gear box of any kind, thus keeping down possible future repair costs.

THE Cross SECTION

Published monthly by High Plains Underground Water Conservation District No. 1, 2930 Avenue Q, Lubbock, Texas 79405

Volume 24—No. 10

Publication number 564920, Second Class Postage paid at Lubbock, Texas

October, 1978

"Foremost Water Authority" Dies

Mr. Joe D. Carter, Chairman of the Texas Water Rights Commission for many years, died Tuesday, October 3, after a prolonged illness.

Mr. Carter, a former lawmaker in Texas had served on the three-man commission that decides on water rights cases since 1961. He was reappointed to the Commission by former Governor John Connally in 1968 and Governor Dolph Briscoe reappointed him to the Commission last year following the reorganization of the State's various water agencies into the Texas Department of Water Resources.

continued on page 2... FOREMOST



JOE CARTER

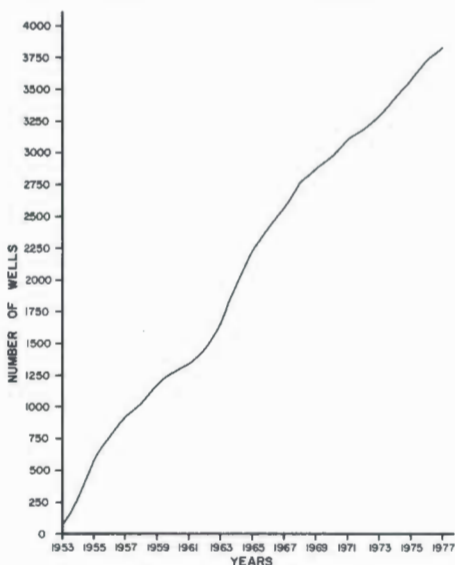
First Deaf Smith Well In 1911

by A. W. Wyatt and Jack Richards

Early settlers in Deaf Smith County undoubtedly obtained their water from stream flows in Tierra Blanca Creek and Frio Draw, as well as from the rainfall runoff water which collected in the

playa lakes. The first windmills in the county are thought to have been drilled in the 1880's or 1890's. The first irrigation wells were drilled between 1910 and 1920. The following is a list of ten of the first irrigation wells completed in the county.

Owner	Driller	Dist. from Hereford	Date of Comp.
1. D. L. McDonald	D. L. McDonald	4 miles North	1911
2. Alfred May	D. L. McDonald	12 miles Northeast	1914
3. E. V. Holman	D. L. McDonald	9 miles Northeast	1917
4. Ernest May	D. L. McDonald	12 miles Northeast	1917
5. Western National Bank of Hereford	D. L. McDonald	7 miles Northeast	1917
6. E. R. Biggs	D. L. McDonald	8 miles Northeast	1917
7. Thompson and Blackmore	Jim Mauk	6½ miles North	1917
8. Dr. G. W. Heard	D. L. McDonald	3 miles North	1917
9. R. G. Wiseman Estate	D. L. McDonald	14½ miles Northeast	1918
10. J. L. Johnson	J. L. Johnson	3½ miles North	1918



CUMULATIVE NUMBER OF WELLS COMPLETED UNDER PERMITS IN DEAF SMITH COUNTY FROM 1953-1977

The inefficiency of the first irrigation pumps and motors discouraged the development of irrigation wells in the county. Therefore, progress of irrigation development in the county was rather slow until the late 1930's and early 1940's when more efficient pumps and motors became available.

An inventory of irrigation wells in Deaf Smith County in 1938 revealed that there were 171 wells in use at that time. A second inventory was conducted in 1946 at which time 404 wells were counted. In 1947, 528 wells were inventoried. No further physical inventory of irrigation wells was conducted in Deaf Smith County until 1976 at which time the Water District inventoried 3,806 wells.

The Water District began issuing permits for wells in 1953. The attached graph illustrates the cumulative number of wells drilled under permit in Deaf Smith County since 1953.

Deaf Smith County Information Highlighted In This Month's Issue

by Dean Thompson

Deaf Smith County was created from the Bexar District in 1876 with Tascosa named as the county seat. It was attached to Oldham County for law and court purposes. It was because of this lack of close law protection, and because the ranchers did not like going the long distance to Tascosa for official business, that the people from the area now known as Deaf Smith County signed a petition for an independent county. The petition was granted and on October 3, 1890, an election was held and the County was organized. Hereford was legally incorporated as a city in 1906 and is the County seat of Deaf Smith County.

Since its incorporation as a City, Hereford has enjoyed almost continual growth. Through the years since the first farmer broke the earth with a wooden plow, the destiny of Deaf Smith County has been tied to an agricultural base. Its rich soil, abundant groundwater supply, wide-open flat land, naturally abundant wild grasses and good climate have made it a natural for crop and livestock production.

The growth of cattle feeding, spurred by an ever-increasing demand for meat, has made this a major industry in Deaf Smith County, particularly around Hereford. Annual capacities of feedlots within a 50 mile radius of Hereford are more than three million head of beef cattle. Feedlot facilities for thousands of hogs and sheep are also beginning to be of major importance. The annual average value added to the economy of Deaf Smith County by its livestock industry is estimated to be well over \$125 million. A major example of this industry is the Armour Company. Armour's Hereford plant slaughters about 6,000 cattle each week which are valued at approximately 3.7 million dollars. The company is the major industrial employer in the county with a work force of over four hundred people on a year-round basis.

Although the livestock activity (mainly feedlot operations) leads the way each year in revenue produced, the farming activities in the County have long been considered its most stable money producer.

The largest acreage crop produced in the County is wheat with production averaging about five million bushels from about 150,000 acres of land. Another large acreage crop in the county is grain sorghum. Grain sorghum production averages more than 12 million bushels annually. Much

of this grain sorghum is used in and around Hereford in commercial cattle feeding operations.

Grain processors in the area include elevators with storage capacities totaling well over 30 million bushels. Arrowhead Mills, producers of whole-grain natural products, has spread the fame of the fine wheat grown in the rich Deaf Smith soil, and is another one of the major employers in the County.

Sugar beets have been grown in Deaf Smith County for many years, but in recent years have become a major crop. The Holly Sugar Company's refinery located southwest of Hereford uses beets from a ten-county area and has produced as much as 200,000 tons of refined sugar in one year. The Company also is a leading employer in the County. It has approximately 75 full time employees at its Hereford plant and is reported to employ more than 250 seasonal employees.

Agriculture has provided an exciting and prosperous past for Deaf Smith County and the future appears to hold much the same in store for the citizens of one of the leading counties in the nation in the combined value of cattle and agriculture.

GMDA ANNUAL MEET

SET FOR DECEMBER 6, 7, 8

The Groundwater Management Districts Association 1978 Annual Conference is scheduled to begin December 6, 1978, at the Hilton Inn in Amarillo, Texas, and will last through December 8.

This year's conference is being co-hosted by the groundwater districts and management associations of Texas and Oklahoma with Ron Neighbors, the General Manager of the Harris-Galveston Coastal Subsidence District, serving as the conference Program Chairman. A full slate of educational and informational sessions is planned for the conferees along with a schedule of special activities for the spouses of those attending the conference.

Information and registration materials are being mailed to GMDA members and other persons connected with the field of groundwater. Anyone interested in attending the Conference can get complete details by contacting Kathy Redeker, GMDA Registration Coordinator, at the High Plains Underground Water Conservation District No. 1, 2930 Ave. Q, Lubbock, Texas, 79405, or by phoning at 806-762-0181.



Ogallala Aquifer Saturated Thickness Depicted On Deaf Smith County Map

by D. D. Smith

The map plate displayed on page three of this issue of *The Cross Section* depicts the Saturated Thickness of the Ogallala Formation in Deaf Smith County. "Saturated Thickness" in an unconfined aquifer is commonly described as the vertical distance from the water table to the relatively impermeable rocks (red beds) which form a base or bottom for the aquifer.

Throughout most of Deaf Smith County the base of the aquifer is formed by the Triassic shales of the Dockum Group. Apparently, the area was subjected to erosion throughout all or much of the subsequent 140 million years after deposition of the Triassic rocks and developed a mature landscape. The elevation relief on this old land surface controls the vertical variability (thickness) of the Ogallala Group deposition.

In Deaf Smith County, the Ogallala rocks range in thickness from a few feet, or near zero where the formation wedges out against older rock, southeast of Hereford, to near 600 feet in the ancient lake basin which appears to have extended from the area of Milo Center southward past the City of Hereford. The thickness of the saturated zone also varies from near zero to as much as 300 feet in the immediate Hereford vicinity. The zone of saturation is that interval of the formation where the pore spaces and voids in the rocks are filled with water.

In general, the composition of the Ogallala in Deaf Smith County consists of discontinuous beds of gravels, sand, silt, and clay with numerous caliche horizons. Well yield expectations average 10 to 15 gpm per foot of available drawdowns. There are, however, numerous areas in Deaf Smith County where thick beds of dense clay material exist with appreciable areal extent (for example the area surrounding the Hereford Airport) and at these locales, well yields are relatively small in proportion to the aquifer thickness. Pore spaces in clay and silt are generally very small, and do not readily yield water to wells even though they might contain large quantities of water in storage. Also, some local areas in the County have high percentages of fine sand and silt within the saturated zone making good well design and construction mandatory to prevent collapse, excessive sand pumping and/or catastrophic failure of the entire installation.

The prospects for future water availability are obviously much brighter in the areas with the thicker saturated sections. There are few, if any, areas of the county where water wells could be literally expected to go dry in the foreseeable future. Changes expected through future years will be a gradual reduction in well yields as the rate of demand at each installation exceeds the aquifer limitations at the site.

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

2930 Avenue Q, Lubbock, Texas 79405
Telephone 762-0181
DEAN THOMPSON, Editor
Second Class Postage Paid at Lubbock, Texas
District Office at Lubbock

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Danny Key, 1980 Star Route 2, Morton
H. H. Rosson, 1980 Star Route 2, Morton
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Edward S. Smith, 1980 102 N. Van Buren, Lorenzo
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Mike Carlisle, 1982 Route 1, Box 274, Lorenzo
Alvin C. Morrison, 1982 Box 6, Lorenzo
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- George Ritter, 1979 Rt. 5, Hereford
Bill Cleavinger, 1979 Route 1, Wildorado
James E. Higgins, 1981 200 Star St., Hereford
Garland Solomon, 1981 303 Sunset Dr., Hereford
Tom Robinson, 1981 211 Cherokee Dr., Hereford
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Floyd Co. Abstract, 215 W. California, Floydada
- C. O. Lyles, 1980 Route 4, Floydada
Connie Bearden, 1980 Route 1, Floydada
M. M. Smitherman, 1980 Silvertown Star Rt., Floydada
Charles Huffman, 1982 Route 1, Lockney
Gilbert L. Fawver, 1982 Route 4, Floydada

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 W. J. Hill.



- Hale County**
J. B. Mayo, Secretary
Mayo Ins., 1817 Main, Petersburg
- Clint Gregory, Jr., 1980 Box 98, Petersburg
Homer Roberson, 1980 Box 250, Petersburg
Henry Scarborough, 1980 Route 2, Petersburg
Gaylord Groce, 1982 Box 314, Petersburg
Bill John Hegl, 1982 Route 2, Petersburg
- Hockley County**
Jim Montgomery, Secretary
609 Austin Street, Levelland
- Billy Ray Carter, 1980 Route 5, Levelland
Leon Young, 1980 Route 1, Ropesville
Robert Phillips, 1980 218 Redwood, Levelland
J. E. Wade, 1982 Route 2, Littlefield
Jack Earl French, 1982, Rt. 3, Box 125, Levelland
- Lamb County**
Robert Richards, Secretary
509 Phelps Avenue, Littlefield
- P. A. Washington, 1980 Box 124, Springlake
Jack Stubblefield, 1980 Box 397, Spade
Larry Lockwood, 1980 Star Rt. 2, Littlefield
Billy J. Langford, 1982 Box 381, Olton
Edward Fisher, 1982 Box 67, Sudan
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2930 Avenue Q, Lubbock
- Don Bell, 1980 Box 114, Wolfforth
Ronald Schilling, 1980 Route 1, Slaton
Granville Igo, 1980 1304 8th Street, Shallowater
Owen Gilbreath, 1982 3302 23rd St., Lubbock
Clifford Hilbers, 1982 Route 1, Box 14, Idalou
- Lynn County**
Clifford Thompson, Secretary
2930 Avenue Q, Lubbock
- S. B. Rice, 1980 Route 1, Wilson
W. R. Steen, 1980 Route 2, Wilson
Wendell Morrow, 1980 Route 1, Wilson
Gary Houchin, 1982 Box 54, Wilson
Freddie Kieth, 1982 Box 283, New Home
- Parmer County**
Clayton Williamson, Secretary
City Hall, 323 North Street, Bovina
- Floyd Reeve, 1979 Box 876, Friona
Ralph Roming, 1979 809 Ridglea Dr., Bovina
Troy Christian, 1981 Rt. 1, Farwell
Dalton Caffey, 1981 P.O. Box 488, Friona
Ronald Elliott, 1981 Rt. 3, Muleshoe
- Potter County**
F. G. Collard, III, 1979 Rt. 1, Box 433, Amarillo
W. J. Hill, 1979 5503 Emil, Amarillo
Jim Line, 1981 Box 87, Bushland
Albert Nichols, 1981 Rt. 1, Box 491, Amarillo
Weldon Rea, 1981 Bushland
- Randall County**
Mrs. Louise Tompkins, Secretary
Farm Bureau, 1714 Fifth Ave., Canyon
- John F. Robinson, 1979 1002 7th St., Canyon
Bill Dugan, 1979 Rt. 2, Box 30, Happy
Harry LeGrand, 1981 4700 S. Bowie, Amarillo
Jack Brandt, 1981 Rt. 1, Box 280, Canyon

Deaf Smith County Farmers Practice Excellent Conservation Techniques

by Jack W. Richards and Kenneth Carver

The farmers in Deaf Smith County are very water conservation minded and are to be commended for their conservation efforts. Examples of some of the conservation practices being utilized in the county are as follows:

There are 280 playa lakes in Deaf Smith County in the Water District service area. Of these 280 lakes, rainfall runoff water and irrigation tailwater is being captured in and utilized from 151 of these lakes. Assuming an average of 150 acre feet of water salvaged annually from each lake, this conservation effort would amount to an annual water savings of about 22,500 acre feet.

Irrigators in the county have installed and utilize about 1,128 miles of underground pipe to distribute water on their farms. The use of this pipe is estimated to save about 33,000 acre feet of water annually which, otherwise, would be lost to evapotranspiration and seepage.

Additionally, there are about 125 center pivot sprinkler systems being operated in the county. The utilization of these sprinkler systems also represents a substantial water conservation effort.

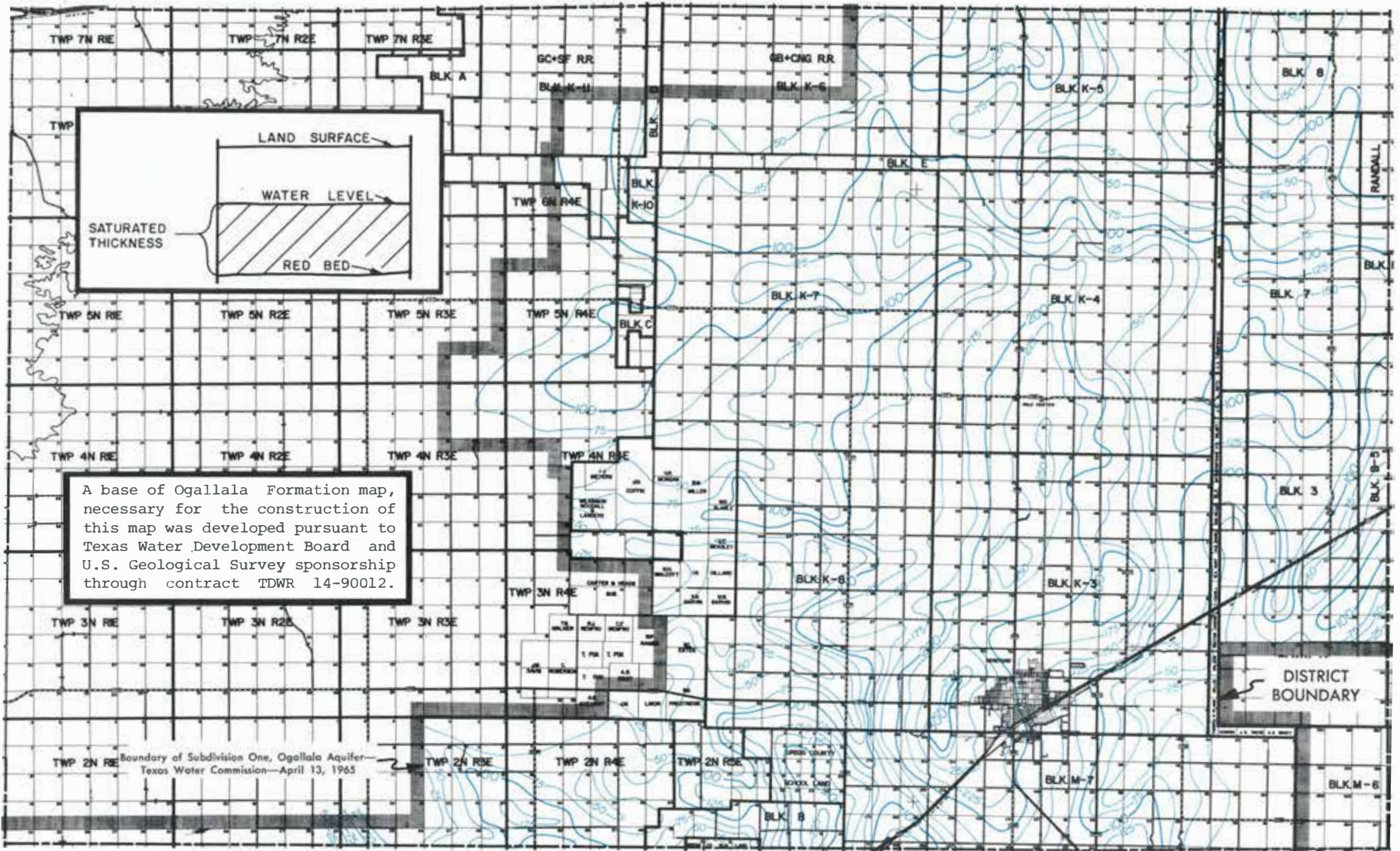
Furthermore, there are 376 irrigation tailwater return systems in use in the county. The utilization of these tailwater return systems represents an estimated savings of 32,000 acre feet of water annually.

There are numerous other water conservation measures being employed by irrigators in the county. However, if one judges only by these four major efforts the effectiveness of water conservation being practiced by irrigators in the county, he should be truly impressed. A conservative estimate of water savings by these practices of 100,000 acre feet of water conserved annually represents at least a savings of 20 percent of the total water necessary to irrigate the 380,000 acres of normally irrigated farmland in the county. This 20 percent savings could be viewed as extending the life of the aquifer at least one year for every five that these conservation measures are employed.

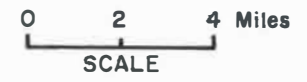
FOREMOST . . . continued from page 1

"He established a lengthy, distinguished record of service to the people of this state as a Member of the Texas Legislature and as a Member of the Texas Water Rights Commission," Briscoe said. "His death will be mourned by many. We have lost a fine public servant and a foremost water authority."

Carter's public service began in Sherman when he was elected as a State Representative in 1949-50 and as Senator in 1951-52. He continued his service as Attorney for the Texas Water Rights Commission from 1953 through 1957 and was Executive Director of the Water Development Board from 1958 through 1961.



CONTOUR INTERVAL 25 FEET
 PREPARED BY D. D. SMITH, GEOLOGIST



Approximate Saturated Thickness of the Ogallala Formation, 1976



Former State Representative Felix McDonald of Edinburg has recently been named by Governor Dolph Briscoe as the new Chairman of the Texas Water Rights Commission. His term of office will expire August 31, 1983.

General Contractor Selected By EDA For Ogallala Study

Camp, Dresser & McKee, Inc., of Austin was selected by the Economic Development Administration of the U. S. Department of Commerce, as general contractor for the 42-month, six million dollar study of the economic future of the six-state High Plains region that draws water from the Ogallala Aquifer.

Camp, Dresser & McKee announced that a detailed plan of the study should be put together by December 15, 1978. Harvey Banks is to serve as overall projects director; Larry Davis, from Camp, Dresser & McKee's Walnut Creek, California office, will be project manager.

WATER OFFICIALS FROM DEAF SMITH COUNTY

Since the formation of the High Plains Underground Water Conservation District No. 1 the people of Deaf Smith County have been well represented at the proceedings of the Board of Directors by the men from Deaf

Smith who have served as members of the Board. Ray Gerk is currently serving as the Board Member from Deaf Smith County. Past members of the Board and the years they served are listed below.

MEMBERS OF BOARD OF DIRECTORS

V. E. Dodson	1954-59	John Pitman	1969-71
T. L. Sparkman, Jr.	1959-63	Billy Wayne Sisson	1971-77
Earl Holt	1963-65	Ray Gerk	1977-
Andrew Kershen	1965-69		

The backbone of the District's support is its 75 elected County Committeemen and its County Secretaries. Listed below are those who have

served Deaf Smith County in this capacity since the first election in 1954 with the year they were first elected.

COUNTY COMMITTEEMEN

Frank J. Benzer	1954	J. E. McCathern, Jr.	1961
Pete Carmichael	1954	Charles Packard	1961
Paul Corbett	1954	Billy B. Moore	1962
J. N. Fish	1954	Billy Wayne Sisson	1965
Floyd Walton	1954	W. H. Gentry	1966
Ed Dziuk, Sr.	1955	Frank Zinser	1967
Ralph Hastings	1955	L. B. Worthan	1967
George-K. Muse	1956	Harvey Fuqua	1968
George T. Turrentine	1956	W. L. Davis, Jr.	1969
Austin Rose, Jr.	1957	George Ritter	1971
Earl Holt	1958	James E. Higgins	1973
Raymond Higginbotham	1959	Garland Solomon	1973
Jack Higgins	1959	Bill Cleavinger	1975
Clinton Jackson	1959	Tom Robinson	1977
L. E. Ballard	1960		

COUNTY SECRETARIES

Nadean Hulse	1954	Mrs. Pauline Lovan	1956
Elna Bishop	1955	Mrs. B. F. Cain	1960
Kay Jowell	1955	Mrs. Mattie K. Robinson	1960
Mrs. Pat Loerwald	1955	B. F. Cain	1969



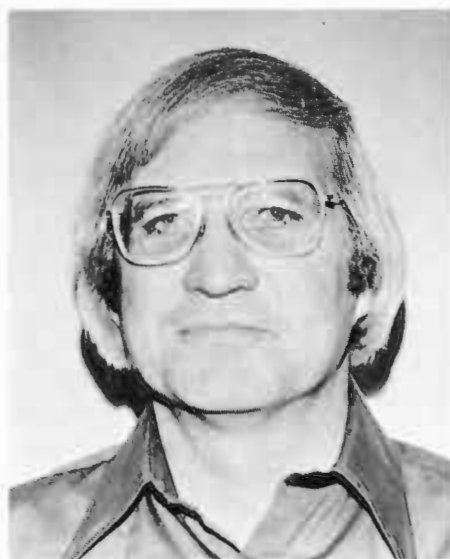
RAY GERK



GARLAND SOLOMON



B. F. CAIN



JAMES E. HIGGINS



TOM ROBINSON



BILL CLEAVINGER

THE Cross SECTION

Published monthly by High Plains Underground Water Conservation District No. 1, 2930 Avenue Q, Lubbock, Texas 79405

Volume 24—No. 11

Publication number 564920, Second Class Postage paid at Lubbock, Texas

November, 1978

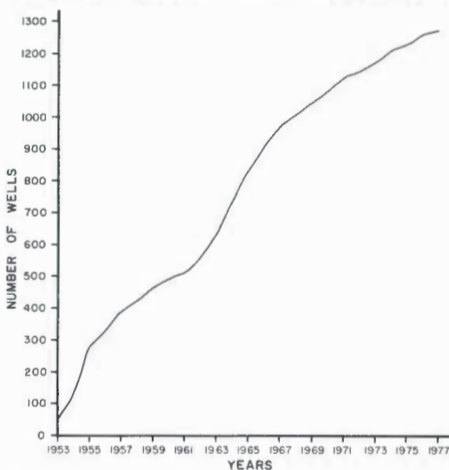
MANY CONSERVATION TECHNIQUES TRIED IN RANDALL COUNTY

by Kenneth Carver

The farmers in Randall County are practicing many water conservation techniques and are to be commended for their efforts. Examples of some conservation methods being utilized are as follows:

There are 108 playa lakes in Randall County in the Water District service area. Of these 108 lakes, rainfall runoff water and irrigation tailwater are being captured in and utilized from 42. Assuming an average of 150 acre feet of water salvaged annually from each lake, this conservation effort would amount to an annual water savings of about 6,300 acre feet.

CUMULATIVE NUMBER OF WELLS COMPLETED UNDER PERMITS IN RANDALL COUNTY FROM 1953-1977



Agriculture And West Texas State University Are Economic Leaders For Randall County

Canyon, the approximate geographic center of Randall County, was originally settled in 1880. Surveyed on Christmas Day of 1887, the townsite of "Canyon City," Texas, consisted of the one-family dugout home of the late L. G. Conners, and a partially completed blacksmith shop. A year and a half later on July 27, 1889, Randall

Irrigators in the County have installed and utilized about 431 miles of underground pipe to distribute water on their farms. The use of this pipe is estimated to save about 12,500 acre feet of water annually which otherwise would be lost to evapotranspiration and seepage.

Additionally, there are 75 irrigation tailwater return systems in use in the County. The utilization of these tailwater return systems represents an estimated savings of 6,000 acre feet of water annually.

Furthermore, Randall County farmers

County was organized and Canyon was chosen as the county seat. Settlers began arriving almost immediately and by 1910 there were approximately 1400 persons living there.

"Canyon City" became "Canyon" upon incorporation and by 1976 the population had reached 9,936. The nearly 200 retail and professional out-

lets in the city reported a sales volume of \$6.5 million, and the two banks had over \$30 million on deposit in that year.

made very good use of rainfall with such practices as minimum tillage, residue management, and terracing. There have been over 675,000 linear feet of terrace installed in the County. Efficient irrigation water management is a normal practice in the County with water being applied on many farms only during the critical stages of crop growth.

Irrigators are doing a good job in extending the life of the aquifer by using effective water conservation practices on the 93,000 acres of normally irrigated farmland in the County.

lets in the city reported a sales volume of \$6.5 million, and the two banks had over \$30 million on deposit in that year.

The focus of the economy of Randall County and Canyon is agriculture and West Texas State University. Agriculture in the county contributed over 70 million dollars income in 1977, with over half of this coming from custom cattle feeding operations.

Farm production in Randall County is predominantly tied to producing sorghum grains to serve the vast livestock feeding industry, although income from wheat farming topped 12 million dollars in 1977.

The leading non-agricultural revenue producer in Randall County is West Texas State University. Known as the "University of the Golden Spread," WTSU has served its region as the leader in education and research, and has assisted in the beneficial utilization of the human and natural resources of the region. The University maintains an enrollment of approximately 6,500 students and has a staff and faculty that numbers over 600 members with a budget that is well over ten million dollars.

In addition to the revenue produced by agriculture and West Texas State, Canyon also derives income as the gateway to Palo Duro Canyon State Park, which is the tourist center of the Panhandle. Each year, many thousands of tourists come to the park to see the musical production of "Texas," which has twice been named the "Number One" tourist attraction in the nation by the National Association of Travel Organizations.

Some of the First Irrigation Wells in Randall County			
Owner	Driller	Dist. from Canyon	Date of Comp.
G. W. Cox	?	3 miles Northwest	1930
George Schaeffer	Bill Glover	16 miles Southeast	1930
Travis Gilliam	Peerless Co.	18½ miles Southeast	1935
C. M. Dowlen	C. M. Dowlen	In Canyon	?
G. W. Cox	?	3 miles Northwest	?
L. Thomas	?	2½ miles East	?
J. R. Hicks	?	3 miles Southwest	?
Bill Black	?	6 miles West	?

WTSU "University of the Golden Spread"

The center of much of the economic, civic, educational and social life in Randall County is West Texas State University, the "University of the Golden Spread."

West Texas State is the oldest state-assisted institution of higher education west of Fort Worth. WTSU was the first college in the West Texas area to receive university status.

The University is organized into six schools and colleges encompassing the Arts and Sciences, Agriculture, Business, Education, Fine Arts and Graduate Schools. The curriculum is constantly changing in order to provide educational experiences that are in keeping with today's needs.

West Texas offers nineteen undergraduate and graduate degrees encompassing traditional academic disciplines

and career programs. It also provides pre-professional programs in the major professions. Students may prepare for careers in education, agriculture, business, industry, the performing arts, allied health sciences, nursing, social work, journalism, radio-television and public administration.

Though it continues to add new programs from many educational areas, the School of Agriculture continues to be its most widely known school. Average class size for agriculture students is approximately 26 individuals with about 100 agriculture majors graduating each year.

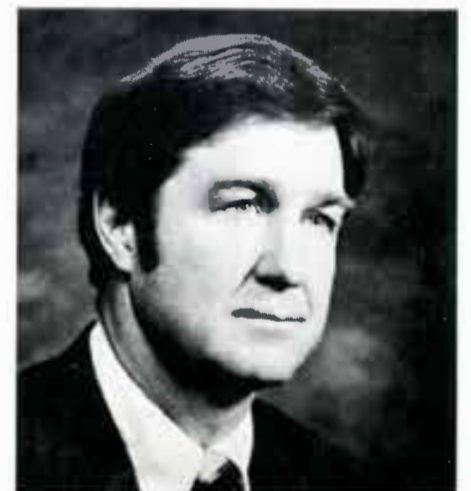
The WTSU School of Agriculture offers nine Bachelor of Science degrees through its Animal Science, Plant Science and Agriculture Business and Economics Departments. Degree plans

are offered in agricultural business and economics, animal science, agriculture communications, general agriculture, mechanized agriculture, wildlife science, plant science, horticulture, and agricultural education.

Pre-veterinary medicine and pre-forestry programs are also available to prepare students for specialized study.

Master's degrees are available in agricultural business and economics, animal science, plant science and general agriculture.

To enable students to enter any of a variety of agricultural careers, the Agriculture Business and Economics Department offers instruction in agricultural finance, agricultural marketing, agricultural land use and appraisal and agricultural management, among others.



MAX SHERMAN, President
West Texas State University

continued on page 4... WTSU



A MONTHLY PUBLICATION OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1
2930 Avenue Q, Lubbock, Texas 79405
Telephone 762-0181

DEAN THOMPSON, Editor

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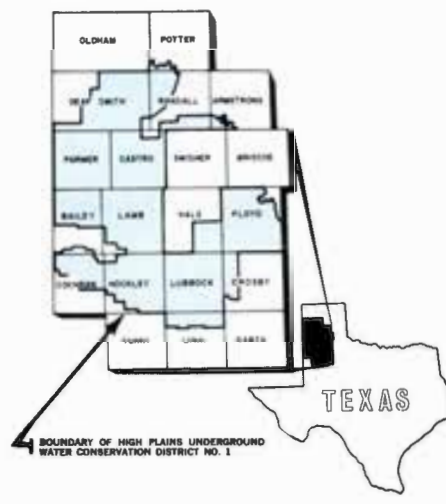
BOARD OF DIRECTORS

- Precinct 1**
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- Precinct 5**
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Malvin A. Jarboe Floydada

COUNTY COMMITTEEMEN

- Armstrong County**
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Wayside, Texas
- Cordell Mahler, 1979 Wayside
James Bible, 1979 Wayside
Guy Watson, 1981 Wayside
Bill Heisler, 1981 Wayside
Leslie Adams, 1981 Wayside
- Bailey County**
Doris Wedel, Secretary
H&R Block, 224 W. 2nd, Muleshoe
- Marshall Head, 1979 Rt. 3, Muleshoe
Harold Layton, 1979 Rt. 2, Morton
Eugene Shaw, 1981 Rt. 2, Muleshoe
David Stovall, 1981 Rt. 2, Muleshoe
Ernest Ramm, 1981 Rt. 2, Muleshoe
- Castro County**
Garnett Holland, Secretary
City Hall, 120 Jones St., Dimmitt
- Anthony Acker, 1979 Rt. D, Nazareth
Glenn Odum, 1979 Rt. 4, Box 135, Dimmitt
Jackie Clark, 1981 Rt. 1, Box 33, Dimmitt
W. A. Baldridge, 1981 608 W. Grant, Dimmitt
Frank Wise, 1981 Rt. 4, Box 10, Dimmitt
- Cochran County**
W. M. Butler, Jr., Secretary
Western Abstract Co., 108 N. Main Ave., Morton
- Hershel M. Tanner, 1980, Route 2, Box 36, Morton
Danny Key, 1980 Star Route 2, Morton
H. H. Rosson, 1980 Star Route 2, Morton
Keith Kennedy, 1982 Star Route 2, Morton
Robert Yearly, 1982 Route 2, Box 66, Morton
- Crosby County**
Clifford Thompson, Secretary
2930 Avenue Q, Lubbock
- Tommy McCallister, 1980 209 N. Van Buren, Lorenzo
Edward S. Smith, 1980 102 N. Van Buren, Lorenzo
Pat Yoakum, 1980 Box 146, Lorenzo
Mike Carlisle, 1982 Route 1, Box 274, Lorenzo
Alvin C. Morrison, 1982 Box 6, Lorenzo
- Deaf Smith County**
B. F. Cain, Secretary
County Courthouse, 2nd Floor, Hereford
- George Ritter, 1979 Rt. 5, Hereford
Bill Cleavinger, 1979 Route 1, Wildorado
James E. Higgins, 1981 200 Star St., Hereford
Garland Solomon, 1981 303 Sunset Dr., Hereford
Tom Robinson, 1981 211 Cherokee Dr., Hereford
- Floyd County**
Verna Lynne Stewart, Secretary
Floyd Co. Abstract, 215 W. California, Floydada
- C. O. Lyles, 1980 Route 4, Floydada
Connie Bearden, 1980 Route 1, Floydada
M. M. Smitherman, 1980 Silverton Star Rt., Floydada
Charles Huffman, 1982 Route 1, Lockney
Gilbert L. Fawver, 1982 Route 4, Floydada

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 W. J. Hill.



- Hale County**
J. B. Mayo, Secretary
Mayo Ins., 1617 Main, Petersburg
- Clint Gregory, Jr., 1980 Box 98, Petersburg
Homer Roberson, 1980 Box 250, Petersburg
Henry Scarborough, 1980 Route 2, Petersburg
Gaylord Groce, 1982 Box 314, Petersburg
Bill John Hegl, 1982 Route 2, Petersburg
- Hockley County**
Jim Montgomery, Secretary
609 Austin Street, Levelland
- Billy Ray Carter, 1980 Route 5, Levelland
Leon Young, 1980 Route 1, Ropesville
Robert Phillips, 1980 218 Redwood, Levelland
J. E. Wade, 1982 Route 2, Littlefield
Jack Earl French, 1982, Rt. 3, Box 125, Levelland
- Lamb County**
Robert Richards, Secretary
509 Phelps Avenue, Littlefield
- P. A. Washington, 1980 Box 124, Springlake
Jack Stubblefield, 1980 Box 397, Spade
Larry Lockwood, 1980 Star Rt. 2, Littlefield
Billy J. Langford, 1982 Box 381, Olton
Edward Fisher, 1982 Box 67, Sudan
- Lubbock County**
Clifford Thompson, Secretary
2930 Avenue Q, Lubbock
- Don Bell, 1980 Box 114, Wolfforth
Ronald Schilling, 1980 Route 1, Slaton
Granville Igo, 1980 1304 8th Street, Shallowater
Owen Gilbreath, 1982 3302 23rd St., Lubbock
Clifford Hilbers, 1982 Route 1, Box 14, Idalou
- Lynn County**
Clifford Thompson, Secretary
2930 Avenue Q, Lubbock
- S. B. Rice, 1980 Route 1, Wilson
W. R. Steen, 1980 Route 2, Wilson
Wendell Morrow, 1980 Route 1, Wilson
Gary Houchin, 1982 Box 54, Wilson
Freddie Kieth, 1982 Box 283, New Home
- Parmer County**
Clayton Williamson, Secretary
City Hall, 323 North Street, Bovina
- Floyd Reeve, 1979 Box 876, Friona
Ralph Roming, 1979 809 Ridgela Dr., Bovina
Troy Christian, 1981 Rt. 1, Farwell
Dalton Caffey, 1981 P.O. Box 488, Friona
Ronald Elliott, 1981 Rt. 3, Muleshoe
- Potter County**
F. G. Collard, III, 1979 Rt. 1, Box 433, Amarillo
W. J. Hill, 1979 5503 Emil, Amarillo
Jim Line, 1981 Box 87, Bushland
Albert Nichols, 1981 Rt. 1, Box 491, Amarillo
Weldon Rea, 1981 Bushland
- Randall County**
Mrs. Louise Tompkins, Secretary
Farm Bureau, 1714 Fifth Ave., Canyon
- John F. Robinson, 1979 1002 7th St., Canyon
Bill Dugan, 1979 Rt. 2, Box 30, Happy
Harry LeGrand, 1981 4700 S. Bowie, Amarillo
Jack Brandt, 1981 Rt. 1, Box 280, Canyon
Johnny Sluder, 1981 Box 56, Bushland

Randall County Map Shows Approximate Ogallala Aquifer Saturated Thickness

by Don McReynolds

The map entitled "Approximate Saturated Thickness of the Ogallala Formation, 1976 — Randall County, Texas," presented on page three of this issue of "The Cross Section" represents a method of describing the probable amount of groundwater in storage in the Ogallala Aquifer beneath Randall County within the service area of the High Plains Underground Water Conservation District Number One. Saturated thickness as depicted on this map refers to the vertical interval, in feet, from the static water level downward to the relatively impermeable layer, consisting primarily of clays, which serves as the bottom of the aquifer. These clays and other fine grained material commonly referred to as the "red beds" are a part of the erosional land surface of Triassic age rocks on which the Ogallala sediments were deposited. Because this buried land surface undoubtedly had relief consisting of hills and valleys; the covering sediments of the Ogallala Formation were and remain today of varying thickness. This thickness variation is directly related to the variable thickness of the water saturated interval of the Ogallala Formation or saturated thickness which the map portrays.

Another aspect of the "red beds" is very important. Because of their relative impermeability, they serve as a barrier to further downward percolation of the water contained in the Ogallala Formation. If this percolation barrier were not present in this water table aquifer, it is likely that the water within the Ogallala Formation would have continued downward percolation to uneconomical levels for recovery and use.

The composition of the Ogallala Formation is quite variable in grain size and continuity both horizontally and

vertically. Beds of rock materials ranging in sizes of particles from gravels to clays of varying thickness combined with several levels of varying degrees of cementation by caliche characterize the Ogallala in Randall County.

Saturated thickness of the Ogallala Aquifer is not a static parameter. Most areas of the Ogallala Aquifer are experiencing changes and unfortunately, the change is usually one of a decrease in thickness. As the aquifer contributes water to wells, there is usually a decline or lowering of the water table. This water table decline reduces the saturated thickness. This process is being experienced in varying degrees in different portions of Randall County.

Of the over thirty water level observation wells measured annually by the Water District in Randall County, the average decline from January 1977, to January 1978, was just over two feet with a ten year average annual decline of about 1.5 feet. The range of these changes in water levels in individual measured wells from 1977 to 1978 varied from a small net rise in the static water level in a few wells to a maximum decline of over six feet in one well. The general relationship of water level declines to saturated thickness is such that, usually, relatively larger rates of water level declines are common in areas of greater saturated thickness and smaller rates of water level declines are common in areas of thinner saturated thickness.

The range of saturated thickness presented on the map within the service area of the Water District ranges from less than 25 feet to over 125 feet. The greater saturated thicknesses can be expected to be found in the extreme western portions of the northwest quadrant of Randall County near the Randall-Deaf Smith County line and the Randall-Potter County line.

RANDALL COUNTY WATER OFFICIALS

Since the formation of the High Plains Underground Water Conservation District No. 1 in the early 1950's the people of Randall County have been well represented by their County Committeemen and have had excellent help in handling the many functions involved in the office of County Secretary.

The County Committeemen are the most direct link that the Water District

has with the people of the High Plains of Texas. The amount of time and effort expended by the elected representatives of the counties is tremendous and is time and effort that they could well spend on their own farms, ranches, and businesses. Listed below are the people who have served Randall County in these important positions since the first election in 1954.

COUNTY COMMITTEEMEN

- | | |
|------------------------|------------------|
| D. L. Allison | 1954-56 |
| Frank Begert | 1954-56 |
| Neil Downing | 1954 |
| Donald Olson | 1954-56 |
| Marshall Rockwell, Jr. | 1954 and 1967-72 |
| W. C. Angel | 1955-57 |
| J. L. Weick | 1955-57 |
| L. E. Mason | 1956-58 |
| John Butler | 1956-58 |
| Leo Artho | 1956-60 |
| W. A. (Bill) Patke | 1958-60 |
| James B. Dietz | 1958-60 |
| A. C. Evers | 1959-63 |
| Jackie Meeks | 1959-61 |
| J. R. Parker | 1960-62 |
| Lewis A. Tucek | 1961-66 |
| Ed Wieck | 1961-67 |
| Harold Bryan | 1962-64 |

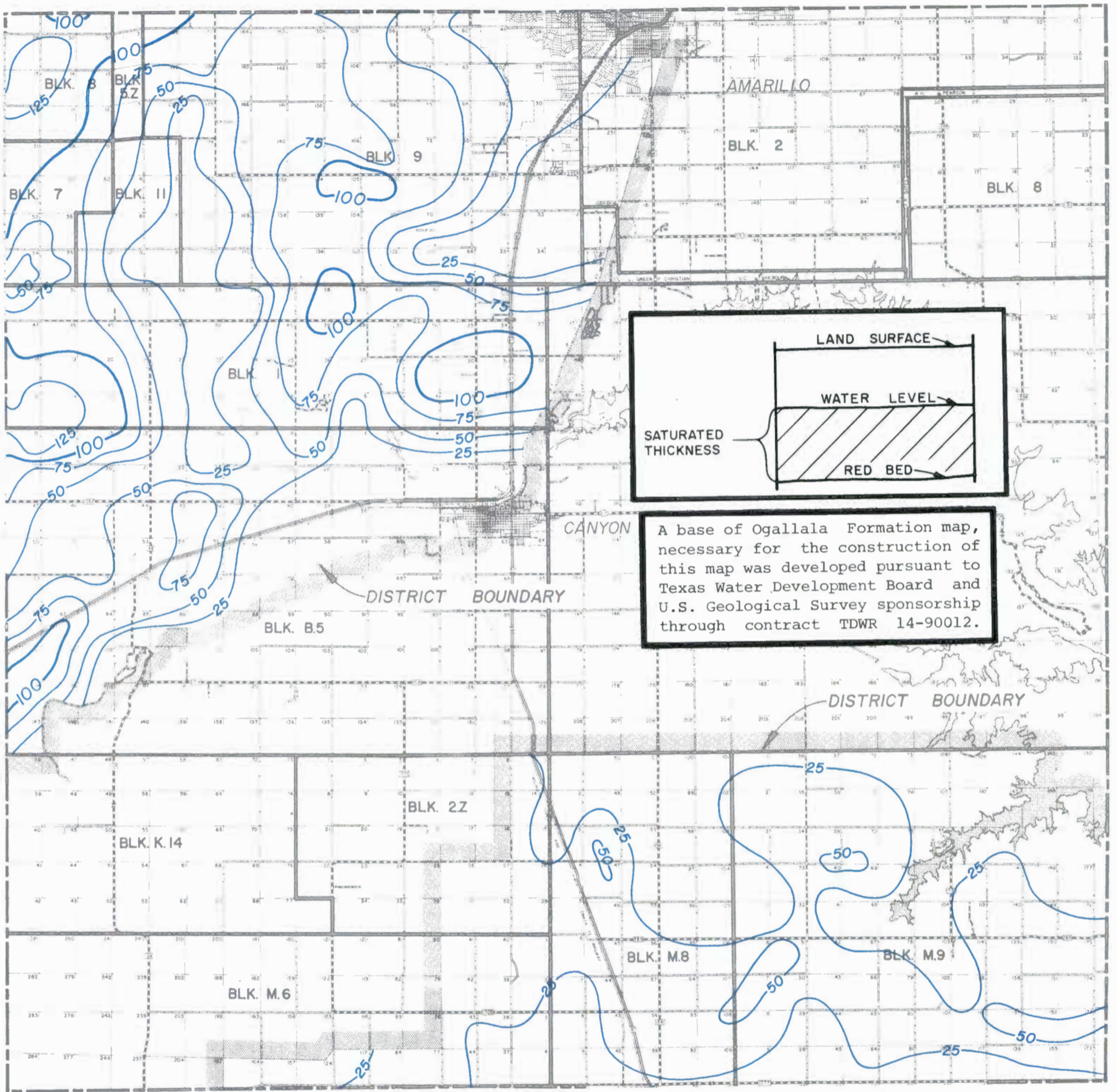
- | | |
|--------------------|---------|
| Paul Dudenhoefter | 1963-65 |
| R. B. Gist, Jr. | 1964-70 |
| Carl Hartman, Jr. | 1964-70 |
| Ralph Ruthart | 1966-68 |
| Richard Friemel | 1967-72 |
| Leonard Batenhorst | 1969-76 |
| Fred Begert | 1971-74 |
| Joe Albracht | 1973-78 |

PRESENT COUNTY COMMITTEEMEN

- | | |
|------------------|------|
| John F. Robinson | 1971 |
| Bill Dugan | 1975 |
| Harry LeGrand | 1973 |
| Jack Brandt | 1977 |
| Johnny Sluder | 1978 |

COUNTY SECRETARIES

- | | |
|----------------------|--------------|
| Mrs. Don Olson | 1954-55 |
| Mrs. Eutha Hamblen | 1955-60 |
| Mrs. Louise Tompkins | 1960-present |



CONTOUR INTERVAL 25 FEET
 PREPARED BY DON McREYNOLDS, GEOLOGIST

0 2 4 MILES
 SCALE

Approximate Saturated Thickness of the Ogallala Formation, 1976—Randall County, Texas

Proposed Changes In Federal Water Policy Listed

Implementation of the President's new water policy is in full swing as Congress is out of session. Nineteen task forces, comprising over 175 Federal employees, are now in the process of examining all Federal programs to determine how water conservation and "non-structural alternatives" can satisfy this Nation's future water requirements. "No growth" is a forbidding undercurrent of the process, and massive changes in regulations, guidelines, and pricing are likely results of this effort. A new definition of water conservation has been received "directly from the White House." For the first time, it is clear that the President does not consider impoundment and storage of water as a conservation measure. All task force leaders have been directed to use this definition as they proceed with their efforts to "determine potential administrative or legislative changes that could be made in agency programs in order to eliminate wasteful and unnecessary water use and to promote and achieve water conservation."

Here is the new definition: "Actions to implement the President's policy on

water conservation should consist of proposed changes that will (a) reduce the demand for water; (b) improve efficiency in use and reduce losses and waste; and (c) improve land management practices to conserve water. A clear contrast is drawn by the policy which distinguishes between the above conservation elements and storage facilities which are treated elsewhere in the President's policy and in Federal water development programs."

Some of the changes in regulations or legislation which have been proposed thus far are as follows: *Farmers Home Administration — Emergency Loans*: "Limit or refuse loan assistance to farmers who frequently violate water conservation practices." *Agricultural Conservation Program and Farmers Home Administration Loan Program*: "Disallow financing of projects or practices in water-short areas which... allow new irrigation land to be brought into production." *Federal Crop Insurance*: "Disallow crop insurance for water intensive crops in water-short areas." *Physical Disaster Emergency Loans*: "Disallow emergency relief

which increase the level of water utilization in water-short areas." *Income Support Program*: "The incentive to use or develop irrigation could be reduced through measures that would result in lower crop prices or higher production costs." *Resource Conservation and Development*: "Require a metering system and pricing structure that promotes water conservation."

National Water Line, November 1978.

Do You Know How Much Water You Are Really Using?

(UPI)—People are not aware of how much water they are really using, says Richard Weickart of the Water Quality Association.

Besides the eight ounces they drink in each glass of water, there's another 16 ounces that goes for washing and rinsing—a total of 24.

"But that's only the beginning," says Weickart. Pointing out that most household faucets deliver 400 to 600 ounces of water a minute—50 to 75 glassfuls, he adds, "If you let the water



JACK RICHARDS, the Agricultural Economist for the Water District, has left the District to take a position in private business. Jack's resignation became effective November 24.

run for 15 seconds before filling your glass, it means you may actually be wasting 15 or 20 glassfuls for every glass you drink. Is it any wonder the average person uses 160 gallons of water a day? They're unaware of how much they're using—and how much they could save by exercising just a little care."

WTSU... continued from page 1

In addition to regular classroom instruction, the department offers a management training course in which students are placed in jobs for the summer, perhaps staying with the job through several summers. This gives the student a chance to apply his academic education to events occurring in the business.

Undergraduate research is another advanced course in which students may perform a multitude of research in the areas of agriculture in which they are particularly interested.

Students also have access to computers and additional instruction in the Business and Economics Departments, as well as in the Animal Science and Plant Science Departments. The commodity news service provides current market information and data.

Another part of WTSU that is taking on more and more importance today is the Alternative Energy Institute. The recently created AEI highlights the alternative energy research, especially in the area of wind energy, underway at the University since the early 1970's.

"The purpose of the institute shall be to conduct research and development in the use of alternative sources of energy such as solar, wind and bio-

conversion," said Dr. Vaughn Nelson, head of the WTSU Department of Physics and Director of the Institute. "The primary objective will be the development of alternative energy systems for rural operations."

Aspects to be studied include: "irrigation, heating and cooling, electrical production, vehicular production, production of fertilizer and some closed system operations such as greenhouses," he said. "These are the objectives we set for ourselves and that is what we are continuing to do."

The program to date has been directed almost entirely toward developing the wind energy resource. Past projects included wind characteristic evaluations, theoretical and experimental airlift pumping studies, design of an experimental wind rotor and an irrigation feasibility study.

Present projects, including the ongoing portions of those already mentioned, include a cooperative agreement with the USDA on wind-assist irrigation, wind-power mapping of the State of Texas, and irrigation with off-season power generation.

Other prime members of the institute are Dr. Earl Gilmore, who is currently on leave of absence from Amarillo College, and Dr. Robert Barieau, WTSU research professor.

Wind energy research at West Texas State began with a state grant to Nelson and Gilmore to determine wind energy potential for Texas. Their report found that Texas winds, if adequately harnessed, could supply eight percent of the nation's anticipated demand for electrical power, and that the Texas Panhandle is one of the best spots in the United States for wind energy production.

Continued world prosperity requires geologists to discover new mineral deposits and develop new forms of energy, and West Texas State University's Geology Department is training students for this purpose.

"Our entire society is based solidly upon the utilization of mineral resources. If we did not utilize our mineral resources, we would be back in the Stone Age society. We need geologists to seek energy and metal resources and even things as commonplace and prosaic as sand and gravel," said Dr. Frank Daugherty, department head.

Concurrent with world demand, many of the career opportunities in geology are in the energy fields such as oil and gas. "Nuclear and coal geology are also important, especially in the next century or two," according to Daugherty.

To prepare students for geology careers, the department offers a practical, industry-oriented background in geology with bachelor of arts, bachelor of science and master of science degrees available.

The geology faculty members have varied backgrounds and teach a wide range of courses, with instructors specializing in sedimentology, mineralogy, petroleum geology and petrology, the study of rocks, mineral deposits and mining lore, plus a number of other disciplines.

West Texas State University, a growing and diversifying school, leads the way in education in the Panhandle area of Texas. Max Sherman, WTSU President said, "as I look around me, I see that now more than ever college graduates and universities are needed to help solve the manifold problems and ills that face us. We at West Texas State University are committed to the importance of education—a good, basic education that broadens the perspectives and aids the judgements of those who possess it."

Editor's Note: Thanks to Judy Tolk, West Texas State University News Service, for all the effort put forth in supplying material used in this story.

THE Cross SECTION

Published monthly by High Plains Underground Water Conservation District No. 1, 2930 Avenue Q, Lubbock, Texas 79405

Volume 24—No. 12

Publication number 564920, Second Class Postage paid at Lubbock, Texas

December, 1978

DISTRICT ELECTION SLATED FOR JANUARY 20

The annual election for the High Plains Underground Water Conservation District No. 1 will be held on January 20, 1979, to elect two members to the Board of Directors and fourteen (14) County Committeemen.

The election will be held only in those counties (or portions thereof) comprising Director's Precincts three and four. The counties involved are Armstrong, Bailey, Castro, Deaf Smith, Parmer, Potter and Randall. Director's precinct three is composed of Bailey, Castro and Parmer and Director's Precinct four is made up of Armstrong, Deaf Smith, Potter and Randall.

Directors are being elected to serve

two year terms and County Committeemen will serve four years.

To be qualified to vote in the District's election a person must have their own valid voter registration certificate and reside within the delineation of the District and within the county where a vote will be taken.

In voting for District Director, the qualified voter should cast a ballot only for the candidate for the Director's Precinct in which that voter resides and likewise each qualified voter will be allowed to vote only for the County Committeemen who are candidates from the County Commissioner's Precinct, County Committeemen's Pre-

cinct, or County Committeeman-at-large from such voter's county.

This election shall be held and conducted and returns made to the Board of Directors of the High Plains Underground Water Conservation District No. 1, for canvassing in accordance with the Election Code of the State of Texas.

The Order for Election was approved by the Board of Directors of the Water District on December 11, 1978, at the regular monthly meeting of the Directors.

For the 1979 election a total of 12 polling places have been established in the seven counties. Absentee balloting will be conducted from January 5,

1979, through January 16, 1979, at the following locations.

ARMSTRONG COUNTY
Wayside Grain Company,
Wayside, Texas 79094
Mrs. Lilla Vick, Clerk

BAILEY COUNTY
District Office, 224 W. 2nd,
Muleshoe, Texas 79347
Doris Wedel, Clerk

CASTRO COUNTY
District Office, 120 Jones, Box 146,
Dimmitt, Texas 79027
Dolores Baldrige, Clerk

DEAF SMITH COUNTY
District Office, 2nd Floor County
Courthouse, Hereford, Texas 79045
Wilma Clark, Clerk

PARMER COUNTY
District Office, 323 North Street, P. O.
Drawer KK, Bovina, Texas 79009
Clayton Williamson, Clerk

POTTER COUNTY
Bushland Grain Coop, Box 5,
Bushland, Texas 79012
J. R. Gill, Clerk

RANDALL COUNTY
County Clerks Office,
Canyon, Texas 79015
Phyllis Stull, Clerk

The following listing shows the nominees for each position being filled, and location of polling places and the election judge at each polling place.

The maps accompanying this article, on page three, show the polling places and the boundaries of the Director's Precincts involved in the election.

NOMINEES FOR DISTRICT DIRECTOR

The candidates for Director's Precinct No. 3, which is composed of that part of the territory of the District situated in Bailey, Castro and Parmer Counties, Texas, are:

A. W. Gober

The candidates for Director's Precinct No. 4, which is composed of that part of the territory of the District situated in Armstrong, Deaf Smith, Potter and Randall Counties, Texas, are:

James C. Conkwright

NOMINEES FOR COUNTY COMMITTEEMEN AT LARGE
Candidates for County Committeemen at large for each county in said Director's Precincts Three and Four are as follows:

In Armstrong County, Texas, all eligible Armstrong County voters may

Water Conservation Opportunities Are Abundant

by D. D. Smith

A favorite definition of Water Conservation is—the increased efficiency of use. The subject of conservation seems to be in vogue at this time for all of our depletable natural resources. Conservation of water offers an area where we can all practice and preach.

As most area residents are aware, a diminishing water supply is the single most critical problem in the region. The conservation and beneficial utilization of water remain critical choices, to which a large segment of the population has not yet made a commitment through personal adoption. Water-saving opportunities exist throughout the area. Even in use areas where con-

servation measures will not save large quantities of water, they may result in a saving of energy and/or provide opportunities for environmental improvement. For convenience, water use may be broken into three categories: Urban, Commercial, and Industrial and Agriculture.

Urban Water Conservation

A recent California study found statewide urban water use to be 68 percent residential, 14 percent commercial and 18 percent industrial. Of the residential, about 56 percent was interior use and the remaining 44 percent was used for landscape watering.

Interior residential water savings can be achieved when the following are

used in new construction projections:

- low-flush toilets
- low-flow showerheads
- low-flow kitchen and lavatory faucets
- pressure reducing valves
- insulated hot water lines
- low-water using clothes washers
- low-water using dish washers.

Adoption of all these measures could offer approximately a 50 percent savings on interior water use.

Existing housing can save by the following actions:

- plastic bottles or water displacement in toilet reservoir
- replace showerhead with low-flow or install flow restrictors
- replace kitchen and lavatory faucets or install low-flow aerators
- install pressure reducing valves
- insulate hot water lines.

These measures offer a potential 38 percent savings.

Exterior residential water savings can be realized by the following when landscape watering:

1. Reduce or eliminate runoff and deep percolation.
 - a. install automated sprinkler systems.
 - b. use soil moisture sensing devices.
2. Encourage use of drought-resistant and low-water-using plants.
 - a. public and nurserymen education programs.
3. Provide penalties for gutter flooding and other waste.

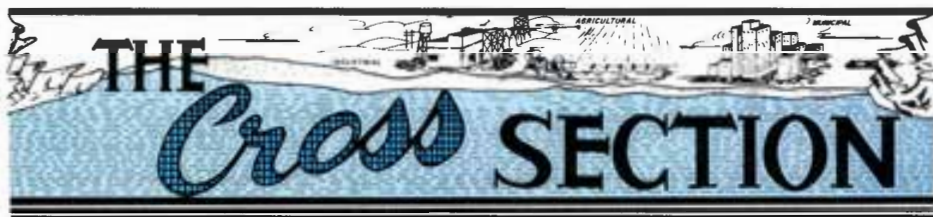
Urban Water Pricing

To be effective in reducing water use, the cost of water must be made a significant item in the user's budget, continued on page 3 . . . CONSERVATION



GROUNDBREAKING CEREMONIES were held on December 14, 1978, at the site of the Crosbyton Solar Power Project. Dignitaries from across the state attended to participate in launching this important project. Pictured above with shovels are (left to right) Mr. Roy Furr, Jr., of Lubbock; Mr. Norton Barrett, City Manager of Crosbyton; Dr. John D. Reichert, associate professor of Electrical Engineering at Texas Tech; and Kent Hance, newly elected U.S. Representative from Lubbock.

continued on page 3 . . . ELECTION



Water Transfer Possibility Reported To Canadian River Compact Commission

The following article is a copy of the report of the Canadian River Compact Commission made to the Seventh Annual Conference of Texas Interstate Compact Commissioners in Austin in mid-November by Mr. Arthur P. Duggan, Jr.

Commission are in favor of cooperating to work out the problems.

Each person in Austin, each person in the State of Texas, each person in the United States has an important interest in the Canadian River—the Canadian River that flows in an easterly direction across the high plains of Northeastern New Mexico, Oklahoma and Texas.

After all, it would be much less expensive to move the water to the land than to move the land to the water. And the State of California has had in operation for several years a project which moves six or seven million acre-feet of water each year a distance of some seven hundred miles with one lift of some two thousand nine hundred feet in an earthquake-prone zone. Russia has embarked on a water movement project that dwarfs that being contemplated.

That is to say, every person who eats food for enjoyment or to stay alive, every person who wears clothes for body protection or to conform to mores of society, and every person adversely affected by the continuing United States deficit in balance of payments in foreign trade—all these persons, whether they realize it or not, have an important interest in the Canadian River.

Right now, three Federal studies are underway to obtain basic information for the benefit of Congress and the Executive branch of the United States government. The U.S. Geological Survey has planned an extensive study centering on the High Plains and the Ogallala Aquifer, to be completed in five years. The Economic Development Administration of the U.S. Department of Commerce under the Water Resources Development Act of 1976 has been authorized to spend six million dollars in the High Plains-Ogallala Study and \$750,000 of this has been awarded to the Corps of Army Engineers to attempt to identify alternate water sources and conveyance routes, as well as updating studies previously completed. The third Federal study currently being conducted is the Bureau of Reclamation's "Llano Estacado Total Water Management Study". The area covered by this study encompasses the High Plains of eastern New Mexico and northwest Texas and those portions of Colorado, Kansas, and Oklahoma lying south of the Arkansas River.

The Canadian River traverses a vast and productive agricultural area which depends upon irrigation water pumped from under the surface for most production. The production includes a substantial portion of all cotton and grain sorghum harvested not only in the State of Texas but also in the United States. Much is exported to other nations for a real plus in balance of payments. The abundance of grain has resulted in Texas having more beef cattle on feed than any other state.

Progress is being made in developing a feasible project to make available the water necessary to continue indefinitely the abundant production of food and fiber in the High Plains of New Mexico, Oklahoma and Texas.

This underground water for a quarter of a century has been pumped and used under conservation measures recommended by ground water hydrologists designed to obtain the maximum economic benefit from the natural resource. Even so, the water is used faster than it is replenished, because there is little recharge.

Surely the tremendous benefits, including expanded exports to give the United States a healthy trade balance, eventually will overcome the objections of the small percent of the population working to prevent further development. The word "environment" to probably over 90% of the population, means adequate food, clothing, shelter, and a clean place to live, work and relax.

In order to continue production of enough food and fiber for the State, nation and world, it will become necessary to supplement the supply of water. Recommended has been transfer of water from water-rich areas to the high plains. Engineers have advised it is physically possible to transfer the water in quantities needed. Studies have shown there are areas containing more water than can be used there in the foreseeable future.

We all are children of the universe, no less than the TREES and the STARS; we have a RIGHT to be here!

Specifically, engineers report there exists good quality water much in excess of all needs in the state of Arkansas and downstream from Arkansas. In Eastern Oklahoma there is an abundance of water which some people in Oklahoma want to transfer to Western Oklahoma. From these water-rich areas to the High Plains of Oklahoma, New Mexico and Texas, it is likely the easiest gradient and shortest route lies along the Canadian River.

As stated by Mr. Duggan, the Texas Commissioner of the Canadian River Compact Commission, "maybe the last paragraph (of the report) can provide a rallying position" from which we can all work for this necessary action.

The expense of constructing a conduit system and pumping the water uphill will be considerable. Perhaps more difficult than paying for the project will be working out political matters. The need for the water transfer is extremely great, however, and the Oklahoma, New Mexico and Texas Commissioners of the Canadian River

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- Butch Bates Chief, Field Support Team
- Obbie Goolsby Chief, Permit Support Team
- Dan Seale Engineer Technician
- Keith Whitworth Draftsman
- Mrs. Norma Fite Bookkeeper-Librarian
- Miss Kathy Redeker Head Secretary
- Miss Pennye Newberry Clerk-Typist



BOARD OF DIRECTORS

- Precinct 1**
(CROSBY, LUBBOCK and LYNN COUNTIES)
James P. Mitchell, Vice President Wolfthorpe
- Precinct 2**
(COCHRAN, HOCKLEY and LAMB COUNTIES)
Selmer H. Schoenrock, Secy.-Treas. Levelland
- Precinct 3**
(BAILEY, CASTRO and PARMER COUNTIES)
A. W. Gober, President Farwell
- Precinct 4**
(ARMSTRONG, DEAF SMITH, POTTER and RANDALL COUNTIES)
Ray Gerk Hereford
- Precinct 5**
(FLOYD and HALE COUNTIES)
Malvin A. Jarboe Floydada

COUNTY COMMITTEEMEN

- Armstrong County**
Carroll Rogers, Secretary
Wayside, Texas
- Cordell Mahler, 1979 Wayside
- James Bible, 1979 Wayside
- Guy Watson, 1981 Wayside
- Bill Heisler, 1981 Wayside
- M. L. McGehee, 1981 Wayside
- Bailey County**
Doris Wedel, Secretary
H&R Block, 224 W. 2nd, Muleshoe
- Marshall Head, 1979 Rt. 3, Muleshoe
- Harold Layton, 1979 Rt. 2, Morton
- Eugene Shaw, 1981 Rt. 2, Muleshoe
- David Stovall, 1981 Rt. 2, Muleshoe
- Ernest Ramm, 1981 Rt. 2, Muleshoe
- Castro County**
Garnett Holland, Secretary
City Hall, 120 Jones St., Dimmitt
- Anthony Acker, 1979 Rt. D, Nazareth
- Glenn Odom, 1979 Rt. 4, Box 135, Dimmitt
- Jackie Clark, 1981 Rt. 1, Box 33, Dimmitt
- W. A. Baldrige, 1981 608 W. Grant, Dimmitt
- Frank Wise, 1981 Rt. 4, Box 10, Dimmitt
- Cochran County**
W. M. Butler, Jr., Secretary
Western Abstract Co., 108 N. Main Ave., Morton
- Hershel M. Tanner, 1980, Route 2, Box 36, Morton
- Danny Key, 1980 Star Route 2, Morton
- H. H. Rosson, 1980 Star Route 2, Morton
- Keith Kennedy, 1982 Star Route 2, Morton
- Robert Yearly, 1982 Route 2, Box 66, Morton
- Crosby County**
Clifford Thompson, Secretary
2930 Avenue Q, Lubbock
- Tommy McCallister, 1980 209 N. Van Buren, Lorenzo
- Edward S. Smith, 1980 102 N. Van Buren, Lorenzo
- Pat Yoakum, 1980 Box 146, Lorenzo
- Mike Carlisle, 1982 Route 1, Box 274, Lorenzo
- Alvin C. Morrison, 1982 Box 6, Lorenzo
- Deaf Smith County**
B. F. Cain, Secretary
County Courthouse, 2nd Floor, Hereford
- George Ritter, 1979 Rt. 5, Hereford
- Bill Cleavinger, 1979 Route 1, Wildorado
- James E. Higgins, 1981 200 Star St., Hereford
- Garland Solomon, 1981 303 Sunset Dr., Hereford
- Tom Robinson, 1981 211 Cherokee Dr., Hereford
- Floyd County**
Verna Lynne Stewart, Secretary
Floyd Co. Abstract, 215 W. California, Floydada
- C. O. Lyles, 1980 Route 4, Floydada
- Connie Bearden, 1980 Route 1, Floydada
- M. M. Smitherman, 1980 Silverton Star Rt., Floydada
- Charles Huffman, 1982 Route 1, Lockney
- Gilbert L. Fawver, 1982 Route 4, Floydada

Hale County

- J. B. Mayo, Secretary
Mayo Ins., 1617 Main, Petersburg
- Clint Gregory, Jr., 1980 Box 98, Petersburg
- Homer Roberson, 1980 Box 250, Petersburg
- Henry Scarborough, 1980 Route 2, Petersburg
- Gaylord Groce, 1982 Box 314, Petersburg
- Bill John Hegl, 1982 Route 2, Petersburg

Hockley County

- Jim Montgomery, Secretary
609 Austin Street, Levelland
- Billy Ray Carter, 1980 Route 5, Levelland
- Leon Young, 1980 Route 1, Ropesville
- Robert Phillips, 1980 218 Redwood, Levelland
- J. E. Wade, 1982 Route 2, Littlefield
- Jack Earl French, 1982, Rt. 3, Box 125, Levelland

Lamb County

- Robert Richards, Secretary
509 Phelps Avenue, Littlefield
- P. A. Washington, 1980 Box 124, Springlake
- Jack Stubblefield, 1980 Box 397, Spade
- Larry Lockwood, 1980 Star Rt. 2, Littlefield
- Billy J. Langford, 1982 Box 381, Olton
- Edward Fisher, 1982 Box 67, Sudan

Lubbock County

- Clifford Thompson, Secretary
2930 Avenue Q, Lubbock
- Don Bell, 1980 Box 114, Wolfthorpe
- Ronald Schilling, 1980 Route 1, Slaton
- Granville Igo, 1980 1304 8th Street, Shallowater
- Owen Gilbreath, 1982 3302 23rd St., Lubbock
- Clifford Hilbers, 1982 Route 1, Box 14, Idalou

Lynn County

- Clifford Thompson, Secretary
2930 Avenue Q, Lubbock
- S. B. Rice, 1980 Route 1, Wilson
- W. R. Steen, 1980 Route 2, Wilson
- Wendell Morrow, 1980 Route 1, Wilson
- Gary Houchin, 1982 Box 54, Wilson
- Freddie Kieth, 1982 Box 283, New Home

Parmer County

- Clayton Williamson, Secretary
City Hall, 323 North Street, Bovina
- Floyd Reeve, 1979 Box 876, Friona
- Ralph Roming, 1979 809 Ridgela Dr., Bovina
- Troy Christian, 1981 Rt. 1, Farwell
- Dalton Caffey, 1981 P.O. Box 488, Friona
- Ronald Elliott, 1981 Rt. 3, Muleshoe

Potter County

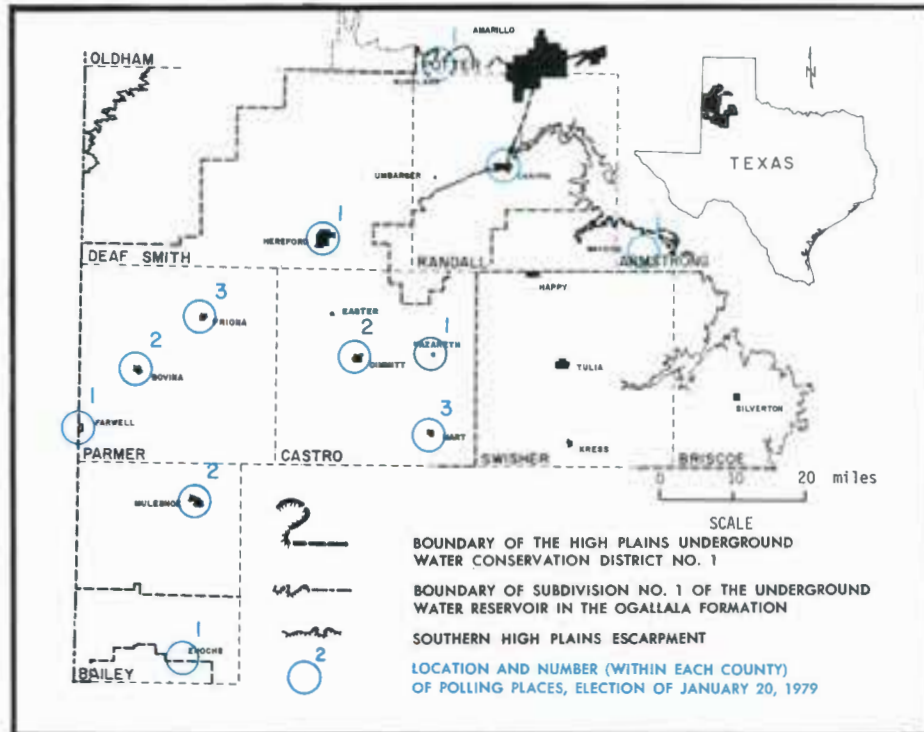
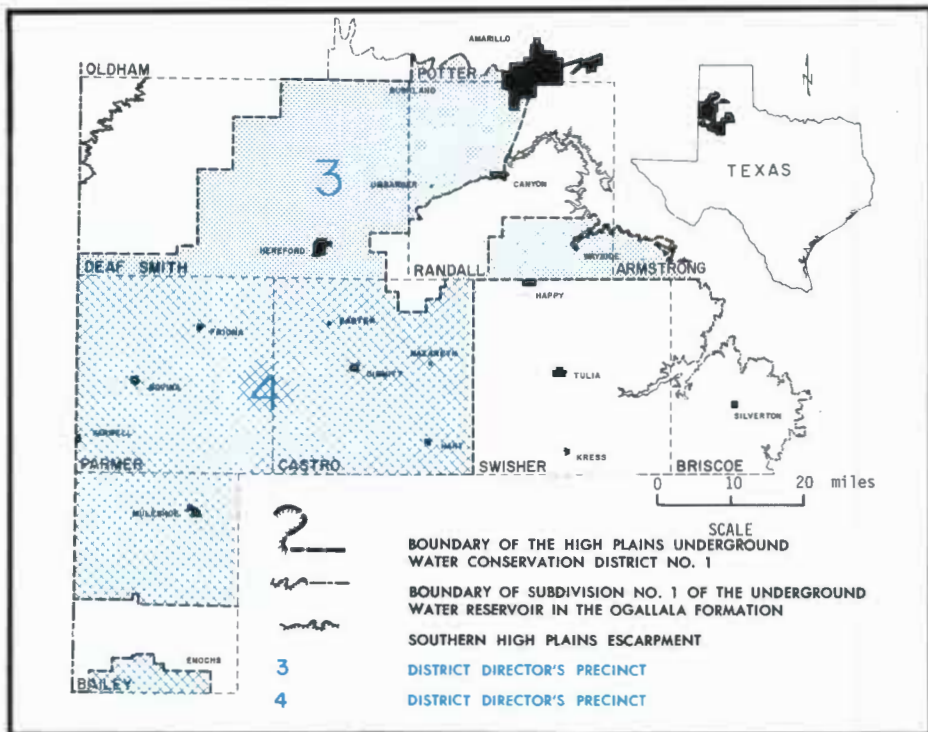
- F. G. Collard, III, 1979 Rt. 1, Box 433, Amarillo
- W. J. Hill, 1979 5503 Emil, Amarillo
- Jim Line, 1981 Box 87, Bushland
- Albert Nichols, 1981 Rt. 1, Box 491, Amarillo
- Weldon Rea, 1981 Bushland

Randall County

- Mrs. Louise Tompkins, Secretary
Farm Bureau, 1714 Fifth Ave., Canyon
- John F. Robinson, 1979 1002 7th St., Canyon
- Bill Dugan, 1979 Rt. 2, Box 30, Happy
- Harry LeGrand, 1981 4700 S. Bowie, Amarillo
- Jack Brandt, 1981 Rt. 1, Box 280, Canyon
- Johnny Sluder, 1981 Box 56, Bushland

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 W. J. Hill.

**VOTING IS YOUR
RIGHT
AND RESPONSIBILITY.
Vote January 20, 1979**



The maps above show the area—District Director's Precincts 3 and 4—wherein the January 20, 1979, election will be held, and the locations of polling places for the election.

ELECTION . . . continued from page 1

choose two Committeemen at large from among the following candidates:

- James Bible
- James E. Vick
- James Stockett
- Woodrow Wesley

In Potter County, Texas, all eligible Potter County Voters may choose two Committeemen at large from among the following candidates:

- Sam D. Line
- Mark Menke

In Randall County, Texas, all eligible Randall County voters may choose two Committeemen at large from among the following candidates:

- Roger B. Gist III
- Bill Dugan

Candidates for County Committeemen from the various County Commissioners' Precincts situated within District Director's Precincts Three and Four are as follows:

A. In Castro County, Texas

(1) In Commissioner's Precinct No. 3, one Committeeman from among the following candidates:

- George Elder

(2) In Commissioner's Precinct No. 4, one Committeeman from among the following candidates:

- Floyd Schulte

B. In Deaf Smith County, Texas

(1) In Commissioner's Precinct No. 3, one Committeeman from among the following candidates:

- W. L. Davis, Jr.

(2) In Commissioner's Precinct No. 4, one Committeeman from among the following candidates:

- Bill Cleavinger

C. In Parmer County, Texas

(1) In Commissioner's Precinct No. 1, one Committeeman from among the following candidates:

- Floyd Reeve

(2) In Commissioner's Precinct No. 2, one Committeeman from among the following candidates:

- Ralph Roming

D. In Bailey County, Texas

Candidates for County Committeemen from Bailey County Committeeman's precincts are as follows:

(1) In County Committeeman's Precinct 1, one Committeeman from among the following candidates:

- Marshall Head

(2) In County Committeeman's Precinct 3, one Committeeman from among the following candidates:

- D. J. Cox

POLLING PLACES AND OFFICERS FOR 1979 ELECTION

ARMSTRONG COUNTY

Polling Place No. 1: Wayside Community Center, Wayside, Texas
Presiding Judge: Estelle Rogers

BAILEY COUNTY

Polling Place No. 1: Enochs Gin Office, Enochs, Texas

Presiding Judge: W. R. Adams

Polling Place No. 2: Bailey County Courthouse, Muleshoe, Texas

Presiding Judge: B. H. Black

CASTRO COUNTY

Polling Place No. 1: American Legion Hall, Nazareth, Texas
Presiding Judge: Mrs. Leo Ehly

Polling Place No. 2: City Hall Community Room, Dimmitt, Texas

Presiding Judge: Noel Gollehon

Polling Place No. 3: City Hall, Hart, Texas

Presiding Judge: Percy Hart

DEAF SMITH COUNTY

Polling Place No. 1: Hereford Community Center, Park Avenue, Hereford, Texas

Presiding Judge: Mrs. Clinton Jackson

PARMER COUNTY

Polling Place No. 1: County Courthouse, Farwell, Texas

Presiding Judge: Albert H. Smith

Polling Place No. 2: City, Hall, Bovina, Texas

Presiding Judge: Aubrey Brock

Polling Place No. 3: Fire Station, Friona, Texas

Presiding Judge: J. L. Witten

POTTER COUNTY

Polling Place No. 1: Schoolhouse in Bushland, Texas

Presiding Judge: Mrs. Robert Lolley

RANDALL COUNTY

Polling Place No. 1: Richardson Farm Supply, Inc., Hereford Highway, Canyon, Texas

Presiding Judge: Marshall Rockwell, Jr.

Water Conservation Practices . . . continued from page 1

and the user must be made aware of the relationship between quantity used and cost. It is recommended that water utility agencies use uniform, peak/seasonal or increasing block rates in water pricing. In addition, eliminating ad valorem taxes for water and collecting the revenue through the rate structure, and similarly handling sewage treatment charges would further contribute to the user's awareness of the quantity-cost relationship. Any attempt to control water use through pricing must be mindful of the impact on low income segments of the population. The so-called lifeline rate concept recently implemented by some gas and electricity utilities, whereby discount rates on the first units delivered are made available to certain needy, could be included in the pricing system.

Commercial and Industrial Water Conservation

Most of the methods for reducing residential waste are also applicable to water users in the commercial and industrial sector. Inter-governmental programs should be instituted so that these agencies would set an example by implementing water saving practices at their facilities wherever possible.

In the industrial sector, recent water pollution laws have, and will to a larger extent in the future, provide incentives to reduce water use. Conservation measures include not only increased in-plant reuse and reduction of use, but also the use of treated sewage and industrial waste water. In considering the location of new industries, particular attention should be given to areas where treated effluent can be made available.

Current water pricing systems have commonly favored large users through a rate structure which includes reductions in unit price. Such pricing policies have been utilized to encourage economic development. Communities continue to be concerned with a healthy, viable economy; therefore, the inequity of reducing rates in water pricing to industry should be addressed in terms of the financial impact con-

sidering the cost of water compared with other manufacturing costs. Some reasonable balance should be achievable by equating supply available and community economic considerations.

Agricultural Water Conservation

The efficient use of irrigation water has been the subject of exhaustive research for more than 25 years in the High Plains area. On-the-farm implementation of study recommendations is wide spread and significant in its impact upon consumptive water use. Virtually every farm on the High Plains utilizes one or more water conservation practices, and the complexity of total water management integration on some farms is awesome.

A list of agricultural practices which offer an opportunity to conserve water would include:

- The method of application: sprinkler, drip, etc.
- Irrigation scheduling.
- Good drainage and re-use systems.
- Optimum rainfall utilization.
- Weed control.
- Use of flow line and seepage control.
- Suppression of evaporation and transpiration.
- Choice of crops grown.
- System automation-soil moisture sensing, etc.
- Cultivation practices.
- Land use capability and compatibility.

Obviously, a number of other measures have applicability under certain circumstances. Escalation of energy prices is providing additional incentives for innovative water management, and the penalty for non-adaptability may well be economic failure for some area irrigation farmers.

Each sector of water using populace must become involved in water conservation practices whenever the opportunity is available. Through dedication and perseverance, the water problems of the area can be met with constructive action aimed at alleviating, or pushing further into the future, the impact which water shortages will bring.

Water Development Board Chooses New Vice Chairman

John H. Garrett, from Deer Park, has been elected as Vice Chairman of the Texas Water Development Board. His election took place at the regular meeting of the TWDB on November 21 and came as a result of the resignation from the Board and that position of Mr. Robert B. Gilmore, a 14 year member of the Board.

Mr. Garrett's term as Vice Chairman will expire in 1980. In contrast to the Chairman of the TWDB who is appointed by and serves at the will of the Governor, the Vice Chairman is elected by vote of the Board members in March of even numbered years.

Garrett was originally appointed to the Board in January 1976, to a term expiring December 31, 1981.

In a related action, W. O. Bankston, a Dallas automobile dealer, was appointed by Governor Dolph Briscoe to serve on the TWDB, because of Mr. Gilmore's resignation, for a term expiring December 31, 1983. His appointment is subject to confirmation by the Senate.

Mr. Bankston, a long time Dallas resident and community leader, has served in various state appointments in the past including the Texas Law Enforcement Foundation and the Texas Motor

Vehicle Commission.

Other members of the TWDB are A. L. Black, a life-long farmer and rancher from Friona, first appointed to the Board in 1974; George W. McCleskey, a lawyer and recognized authority on water law, a long-time resident of Lubbock and Board member since 1976; Glen E. Roney, president of the McAllen State Bank, on the Board since 1976; and Milton T. Potts, manager and superintendent of the Sam Houston Electric Cooperative in Livingston, who is the senior member of the Board having been appointed to his first term in 1963.

Water Levels In Observation Wells To Be Measured

Don't be surprised if you see a blue and white vehicle traveling through your land or parked on some of your land near one of your irrigation wells beginning in January. It will in all probability be a Water District vehicle and staff member as the District will begin its annual measurement of the depth-to-water levels in the more than 800 observation wells scattered throughout the fifteen county District area.

Since most of the wells to be measured are operational irrigation wells the month of January was chosen to allow for a reading in wells that have not been utilized for quite some time. This dormant period allows for recovery from the cone of depression developed during the pumping season.

The wells will be measured to find the depth to the "static" water level. After measuring, a yellow identification tag will be attached to the well equipment for the owner's information.

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



JOHN H. GARRETT



W. O. BANKSTON



ROBERT B. GILMORE

The Board of Directors,
County Committeemen and Staff
wish each of you a
healthy, prosperous and
happy 1979!!