THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 11—No. 8 "THERE IS NO SUBSTITUTE FOR WATER" January 1965

West Texas Water Institute Scheduled For February

The third annual West Texas Water Conference will concentrate on the future of West Texas water according to Dr. Gerald W. Thomas, Texas Tech agriculture dean and chairman of the sponsoring West Texas Water Institute.

Headlining the Feb. 5 meeting in the Tech Union will be Dr. Marion Clawson of Washington, director of Resources for the Future, Inc. His address will be "Natural Resource Problems and Opportunities for the Future."

Dr. Clawson has written many books dealing with soil and water conservation, including "Land for the Future," "Western Range Livestock Industry," and "Land and Water for Recreation."

Dr. Clawson is a former Chief of the Bureau of Land Management in the U. S. Department of the Interior. His address will be during the conference luncheon in the Tech Union.

First on the conference agenda will be a 9:15 a.m. report on Gov. John Connally's statewide water study by J. J. Vandertulip, chief engineer with the Texas Water Commission.

Dr. J. Wayland Bennett, associate dean of agriculture at Tech, is another morning session speaker. His 9:45 a.m. talk will be on "Economic Influences of Irrigation on the Central Economy."

Frank Rayner, a member of the Texas Water Commission, will discuss "Ground Water Supply in West Texas."

State Rep. Bill Parsley of Lubbock will be the final morning speaker. He will present the Texas water legislation picture and give his views on possible water legislation to come out of the next Texas legislature.

The conference's afternoon session will feature reports from water resources institutes at the University of Texas and Texas A&M University Institute, and Dr. Ernest T. Smeardon, director of the one at A&M.

Dr. Walter Rogers, associate professor of agricultural economics, and Robert Rubel of Lubbock, Tech agricultural economics graduate student will join forces to present a discussion on the socio-economic changes brought about by depleting water supplies.

This tandem report will be taken from a case study made in Lynn County.

Final item on the conference's agenda will be a panel discussion concentrating on water use.

Tom McFarland, manager of the High Plains Water Conservation District in Lubbock, will discuss playa lakes as a potential water supply source.

Recharge is the topic assigned to Jim Valliant, of the High Plains Research Foundation at Halfway near Plainview.

Shelby Newman of the South Plains Research and Extension Center in Lubbock is scheduled to discuss subirrigation and other irrigation application practices which are designed to make water use more efficient.

Final panel member will be Victor Hauser of the Agricultural Research Service in Amarillo. He will outline farm systems which bring about more efficient use of water.

Dr. Thomas said, in announcing the conference agenda, that its topics "will interest not only people involved in agriculture but also members of the business and industrial communities as well.

"Water is of vital concern to everyone regardless of where they happen to live," he continued.

Overall chairman of the conference is Dr. H. W. Grubb, assistant professor of agricultural economics at Tech. Herbert Hilburn, editor of the Plainview Daily Herald, will act as moderator of the first morning session. Moderator for the second morning session will be J. W. Buchanan of the North Plains Water District.

Drs. Keith Marmion and Rex Johnston will act as moderators for the two afternoon sessions. Dr. Marmion is head of civil engineering at Tech while Dr. Johnston is director of the Southwestern Great Plains Field Station.

The annual West Texas Water Conference is sponsored jointly at Tech by 30 governmental agencies and private businesses concerned with the future of West Texas water.

WATER IS YOUR FUTURE CONSERVE IT

Election Results For High Plains Underground Water District

District Director from Precinct 3 (Bailey, Castro and Parmer Counties).

ELECTED: Ross Goodwin of Muleshoe. Goodwin replaces John Gammon of Lazbuddie who has served on the Board for six years. Gammon has recently moved out of the state.

Goodwin is very familiar with the policies and workings of the Water District, having served as a county committeeman from Bailey County in previous years.

District Director from Precinct 4 (Armstrong, Deaf Smith, Potter and Randall Counties).

ELECTED: Andrew Kershen of Route 4, Hereford. Kershen replaces Earl Holt who had to resign as district director after being elected a county commissioner in Deaf Smith County.

Kershen has been very active in water conservation circles and is presently chairman of the water conservation committee of the Hereford Chamber of Commerce.

County Committeemen Elected

ARMSTRONG COUNTY

1. Cordell Mahler, Wayside, Texas
2. Guy Watson, Wayside, Texas

Hold over County Committeemen: Foster Parker, Dewitt McGehee and Jack McGehee.

BAILEY COUNTY

1. Marvin Nieman, Route 1, Box 107, Muleshoe, Texas
2. Homer W. Richardson, Box 56, Maple, Texas

Hold over County Committeemen: James P. Wedel, W. L. Welch, and J. W. Witherspoon.

CASTRO COUNTY

1. Donald Wright, Box 65, Dimmitt, Texas
2. Morgan Dennis, Star Route, Hereford, Texas

Hold over County Committeemen: Ray Riley, Frank Wise and Lester Gladden.

COCHRAN COUNTY

1. Ira Brown, Morton, Texas
2. E. J. French, Sr., Route 1, Morton, Texas

Hold over County Committeemen: D. A. Ramsey, Willard Henry, and H. B. Barker.

DEAF SMITH COUNTY

1. Billy Wayne Sisson, Route 5, Hereford, Texas
2. Billy Bob Moore, Wildorado, Texas

Hold over County Committeemen: L. E. Ballard, J. E. McCathern, Jr., and Charles Packard.

FLOYD COUNTY

1. M. J. McNeil, 833 W. Tennessee, Floydada, Texas
2. M. M. Julian, Route Q, Lockney, Texas

Holdover County Committeemen: Bill Sherman, J. S. Hale, Jr. and Tate Jones.

HOCKLEY COUNTY

1. P. L. Darby, Route 1, Ropesville, Texas
2. H. R. Phillip, Route 4, Levelland, Texas

Hold over County Committeemen: Bryan Daniel, Leon Lawson and S. H. Schoenrock.

LAMB COUNTY

1. Troy Moss, Route 1, Littlefield, Texas
2. Roger Haberer, Earth, Texas

Hold over County Committeemen: Willie Green, W. B. Jones and Raymond Harper.

LUBBOCK COUNTY

1. W. O. Roberts, Route 4, Lubbock, Texas
2. Bill Hardy, Route 1, Shallowater, Texas

Hold over County Committeemen: Weldon Boyd, Bill Dorman and Edward C. Moseley.

LYNN COUNTY

1. Harold G. Franklin, Route 4, Tahoka, Texas
2. Reuben Sander, Route 1, Slaton, Texas

Hold over County Committeemen: Hubert Tienert, Roy Lynn Kahlich and Oscar Lowrey.

PARMER COUNTY

1. Ralph Shelton, Friona, Texas
2. Carl Rea, R. F. D., Bovina, Texas

Hold over County Committeemen: Wendol Christian, Henry Ivy and Walter Kaltwasser.

POTTER COUNTY

1. L. C. Moore, Bushland, Texas
2. Jim Line, Bushland, Texas

Hold over County Committeemen: E. L. Milhoan, W. J. Hill, Jr., and Eldon Plunk.

RANDALL COUNTY

1. R. B. Gist, Jr., Route 3, Box 43, Canyon, Texas
2. Carl Hartman, Jr., Route 1, Canyon, Texas

Hold over County Committeemen: Paul Dudenhoeffer, Lewis A. Tucek, and Ed Wieck.

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BILL J WADDLE
Editor

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Donald Wright, 1968 .... Box 65, Dimmitt
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Morgan Dennis, 1968 .... Star Rt. Hereford
Committee meets on the last Saturday of each month at 10:00 a.m., City Hall, Dimmitt, Texas.

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Western Abstract Co., Morton

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E. J. French, Sr. 1968 .... Rt. 1, Morton, Texas
Committee meets on the second Wednesday of each month at 8:00 p.m., Western Abstract Co., Morton, Texas.

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High Plains Water District
317 N. Sampson, Hereford

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Billy Wayne Sisson,, 1968 .... Rt. 5, Hereford
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Billy B. Moore, 1968 .... Wildorado, Texas
Charles Packard. 1967 .... Rt. 3, Hereford
Committee meets the first Monday of each month at 7:30 p.m., High Plains Water District office, Hereford, Texas.

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325 E. Houston St., Floydada

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J. S. Hale, Jr., 1966 .... Rt. 1, Floydada, Texas
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M. J. McNeil, 1968 .... 833 W. Tennessee, Floydada, Texas
Committee meets on the first Tuesday of each month at 10:00 a.m., Farm Bureau Office, Floydada, Texas.

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917 Austin Street, Levelland

Bryan Daniel, 1967 .... Rt. 2, Levelland
Preston L. Darby, 1968 .... Rt. 1, Ropesville
Leon Lawson, 1967 .... Rt. 3, Levelland
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Committee meets first and third Fridays of each month at 1:30 p.m. 917 Austin Street, Levelland, Texas.

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1628 15th Street, Lubbock

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Bill Hardy, 1968 .... Rt. 1, Shallowater, Texas
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1628 15th Street, Lubbock

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Harold G. Franklin, 1968 .... Rt. 4, Tahoka
Roy Lynn Kahlich, 1966 .... Wilson, Texas
Oscar H. Lowery, 1967 .... Rt. 4, Tahoka
Reuben Sander, 1968 .... Rt. 1, Slaton, Texas
Committee meets on the third Tuesday of each month at 10:00 a.m., 1628 15th Street, Lubbock, Texas.

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Aubrey Brock
Wilson & Brock Insurance Co., Bovina

Wendol Christian, 1966 .... RFD, Farwell, Texas
Henry Ivy, 1967 .... Rt. 1. Friona
Walter Kaltwasser, 1967 .... RFD, Farwell
Carl Rea, 1968 .... Bovina, Texas
Ralph Shelton, 1968 .... Friona, Texas
Committee meets on the first Thursday of each month at 8:00 p.m., Wilson & Brock Insurance Agency, Bovina, Texas.

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L. C. Moore, 1968 .... Bushland, Texas
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Randall County Farm Bureau Office, Canyon

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Paul Dudenhoeffer. 1966 .... Rt. 2, Canyon, Texas
Carl Hartman, Jr. 1968 .... Rt. 1, Canyon
Lewis A. Tucek, 1967 .... Rt. 1, Canyon
Ed Wieck, 1967 .... Rt. 1, Canyon
Committee meets on the first Monday of each month at 8:00 p.m., 1710 5th Ave., Canyon, Texas

500 DOLLAR INVESTMENT PAYS LARGE DIVIDENDS

A $500 investment has paid "great dividends" for a south Plains banker and his farm operator, Ralph Shelton of Friona.

Gabe Anderson, banker in Farwell, is well acquainted with normal returns on farm investments.

And he has one investment which has given him more than a "generous" return from an initial outlay of less than $500.

Anderson and Shelton, with the assistance of the High Plains Underground Water Conservation District, installed a small, but adequate gravity flow irrigation system in 1963.

The system was placed on the low end of an irrigated plot to eliminate loss of irrigation "tailwater" which escapes from cropland during periods of heavy watering.

Included in the system are a small concrete sump and 10-inch pipeline. Water is picked up in the sump and is transported by gravity under a county road to an adjoining 46-acre block of farm land.

Three irrigation wells contribute to the sump.

Prior to 1963 the 46-acre plot was farmed with a very small amount of irrigation. Shelton would water crops grown on this plot if he had available water and wasn't pressed for time to get water to crops being produced on more productive land.

During the first year of operation, in 1963, adverse weather conditions caused Shelton to have to plant a late crop of redtop cane on the 46-acre plot.

By using recovered tailwater for the first time, he produced a bulging 2,500 pounds of seed per acre.

Grain sorghum was planted on the same plot in 1964. Fertilizer was applied and, with the use of tailwater once again, the crop turned out 3,100 pounds of milo per harvested acre.

Dryland farms in Parmer County similar to this plot are reported to have averaged less than 1,000 pounds of grain sorghum per acre last year.

"Few investments in farming ventures have paid such dividends as this tailwater system has returned," Water District officials say. "This is a good example of why tailwater systems are a good investment."

TAILWATER LOSSES CAN BE BIG COST ITEM TO FARMER

Water losses from irrigation runoff are greater than the average irrigation farmer realizes.

Several hundred tailwater return systems are now in operation with the High Plains Underground Water District.

In 1963 and 1964 the district selected four of these installations to study the average amount of water salvage during the irrigation season.

Records of the High Plains Underground Water District reveal that an average of 78 acre feet of irrigation tailwater was recovered in each installation.

A total of nine irrigation wells contributed to the four systems studied. This gives an average recovery of 35 acre feet of water per irrigation well.

Values of irrigation tailwater are approximately forty dollars per arce foot. This would give the farmer a saving of $1400 in irrigation water from each well contributing to a tailwater return system.

For detailed information concerning tailwater return systems, contact the High Plains Underground Water Conservation District, 1628 15th Street Lubbock, Texas.

1964 WATER WELL DRILLING STATISTICS

1964 proved to be the most active year for drilling irrigation wells in the High Plains Water District since 1957. An unusually dry year has contributed greatly to the increased activity during the past year.

1,985 new wells were drilled within the district as compared to 2,137 in 1957. The record number of new wells recorded by the district since its existence was in 1955 when 3,998 wells were registered with the district.

During 1964 there were 109 replacement wells drilled, 93 wells were drilled that were dry holes or non-productive for other reasons.

Listed below by counties are the 1964 drilling statistics for the High Plains Underground Water District.

County	New Permits	New Wells Drilled	Replacement Wells	Dry Holes
Armstrong	18	20	0	0
Bailey	98	112	10	13
Castro	252	221	11	11
Cochran	86	71	1	4
Deaf Smith	372	290	10	3
Floyd	262	262	8	5
Hockley	291	211	1	6
Lamb	227	173	23	4
Lubbock	414	248	16	25
Lynn	122	82	0	4
Parmer	262	209	28	2
Potter	1	2	0	0
Randall	121	84	1	16

What does the future hold? Permits rolling into the county offices during January indicate 1965 may be the largest year for well development in the District. The district has 22,669 wells recorded in the offices of the High Plains Water District.

Texas Tech Joins State Water Commission In Research Program

Texas Tech and the Texas Water commission have joined forces in a sweeping cooperative agreement designed to further developmnt of the state's water resources.

Signing the agreement were Dr. R. C. Goodwin, Tech president; Joe D. Carter, chairman of the Water Commission; and John J. Vandertulip, chief enginer of the commission.

The cooperative venture is in line with Gov. John Connally's charge to the Texas Water Commission to prepare a master water plan with projections of water requirements through the year 2000.

This agreement states that the Water Commission will be able to utilize and benefit from the research and advanced concepts developed by Tech.

Likewise, Tech will be allowed to incorporate into its programs the advances and improvements in water resources research, management planning and design which come out of the agreement.

Dr. Goodwin said the agreement "will allow Texas Tech to have an important position in the development of a state-wide water plan for items relating to West Texas water resources."

Tech's agriculture dean, Dr. Gerald W. Thomas, emphasized that initial support for the study will be provided by the college's Institute of Science and Engineering.

In a letter of understanding to Dr. Thomas, a consultant on research to be done under the agreement, Vandertulip said the study would bring together data and information which previously had been developed on the reuse of effluents for agricultural, industrial, recreational-area development and maintenance.

"Studies . . . of High Plains groundwater recharge and of playa lakes and their use for surface storage and for recharge will be reviewed and analyzed," Vandertulip continued. "Problems of suspended solids, chemical pollution, and health—including encephalitie carriers and 'nuisance' insects and possible solutions to these problems—will also be covered in this report."

The Water Commission chief engineer added that an analysis will be made and a report prepared on the economic importance to the overall economy of the High Plains.

Information and reports developed under the studies outlined in the agreement between Tech and the Water Commission will be submitted in preliminary form in mid-June, for use in deliberations of hydrology and other planning task forces.

Final reports will be submitted by next September.

Dr. Thomas praised the agreement, saying, "Through the efforts of local legislators, Texas Tech was requested to participate in this important activity. We feel that this is understandable in that water generates more income in West Texas than in any other area in the state."

"Tech's participation in this study is recognition of our scientific capabilities," Dr. Thomas added. "As our research develops, all segments of the college will be drawn into studies relating to conservation and use of water resources."

The agriculture dean also said Tech's cooperation in these efforts with state and federal agencies is assured through the West Texas Water Institute, which is headquartered on the Tech campus.

Tech personnel to be involved in this study will include Dr. H. W. Grubb, resource economist; Dr. George Whitstone, civil engineer; Dr. Clark Harvey, agronomist; Dr. Ellis W. Huddleston, entomologist; William Schwiesow, agricultural engineer; and Dr. James Osborn, agricultural economist.

In addition to Dr. Thomas, other advisors will include Dr. John Bradford, dean of engineering at Tech, and Dr. Keith Marmion, head of the college's civil engineering department.

Near Uniform Water Penetration Achieved

All irrigators experience one common problem — uniform penetration of water throughout the entire irrigation block.

Annually many farmers produce large yields in certain areas of their fields and produce small amounts in other areas, where the irrigation water fails to penetrate the soil adequately. Lands with degrees of great slope run water so rapidly that it seldom has time to sufficiently wet the soil producing crops.

Walt Mabry, of Hub, in Parmer County, has taken a giant step in solving his problem of water penetration. In 1963 Mabry, with the aid of the High Plains Underground Water District, installed an irrigation tail water return system and put it to good use. During the initial year of operation he salvaged 62 acre feet of irrigation water.

Mabry discovered that by using larger heads of irrigation water and by re-circulating the water he could obtain uniform penetration of the block he was irrigating. He was also able to obtain the penetration in the same length of time that was normally required to just water the irrigation plot prior to installation of a tail water system.

In 1964 20 acres of grain sorghum were watered four times with this return system and twice with irrigation wells. The plot produced an average of 6800 pounds of grain sorghum per acre, which was a record for the farm.

Records of the High Plains Water District show that during the last two years the return system is recovering 20 percent of the water pumped from the irrigation wells.

Water Is Your Future, Conserve It!

Silt Loss Study Being Conducted By Water District

The High Plains Water District initiated a study on silt losses in irrigation water during 1964.

In areas where irrigation tail water has escaped in county bar ditches, large amounts of silt have been observed collecting in the ditches. Farmers were aware that valuable top soil was being lost but no one could estimate how much. Losses of silt not only cost the farmer many dollars in valuable land, but also pose a great problem for the county in maintaining roads and ditches.

Field representatives of the District realized the need for accurate records that would reflect the losses of silt by allowing it to escape and immediately initiated a water sampling program at one of their tail water return systems.

Samples of water were collected as they entered the pit and as the water was being discharged back into the field from the recirculating system. The illustrated table shows one group of samples obtained and the silt content.

Using the average pounds of silt per acre foot of water as a basis and by metering the amount of actual pumpage over the four hour period, it was discovered that one half an acre foot of water was recirculated. The amount of silt that entered the installation was 992 pounds and 1946 pounds was removed. The difference of 954 pounds of silt reflects that this amount was already present in the installation but was removed during the pumping cycle.

Based on this initial test, an average of 4.3 tons of silt was recirculated with each acre foot of water. Using this amount for the entire 132 acre feet of water salvaged by the system this year, approximately 567 tons of silt were recirculated with the water. This 567 tons of silt would be approximately 378 cubic yards of top soil replaced on the farm for the same cost of recirculating the "tail water".

If the farmer had cleaned out the bar ditch and hauled the soil back to his farm, it would have cost him at least fifty cents per yard to haul and spread it. Total cost for this would have been $184.00.

The soil was replaced on the farm through the us of tailwater so actually you could say that the top soil was replaced at no cost to the farmer.

Personnel of the Water District realize that silt will always be a problem where water runs over soil. It can be visualized though that by using return systems to pump water and silt, farmers can apply two conservation practices for the price of one.

District personnel will continue this study during 1965 and anticipate greater amounts of top soil being returned to farmers rather than losing it in the county bar ditch.

Number	Time	Location	Grms. Per Liter	Lbs. Per Gallon	Lbs. Per Acre-Foot
17	11 A. M.	Pit	5.36	4.43	1459
22	11 A. M.	Pipe	.78	6.50	2117
3	12 P. M.	Pit	.39	2.50	815
3	12 P. M.	Pipe	.73	6.0	1955
9	1 P. M.	Pit	2.50	20.80	6777
12	1 P. M.	Pipe	.36	4.67	1521
10	2 P. M.	Pit	.72	6.5	2117
15	2 P. M.	Pipe	.62	6.85	2332
30	3 P. M.	Pit	1.00	8.34	2717
11	3 P. M.	Pipe	.70	5.85	1906

Fuel Cost Lowered By Using Tailwater

Records of the High Palins Underground Water District reveal that farmers can save approximately one third of the fuel cost required to pump an acre foot of water from an irrigation well if they utilize available tailwater.

Cost records from farms conducting this study revealed that it required approximately $3.20 worth of natural gas to pump an acre foot of water from an irrigation well. The average cost of fuel (butane or electricity) of tailwater return systems was approximately $1.90 per acre foot of water recovered.

Wayne Wyatt, field representative of the Water District, states that, "An acre foot of tailwater recovered eliminates the need of pumping an acre foot of water from an irrigation well." He further states that, "By using the tailwater there has been a saving on fuel cost of $1.30 per acre foot of water by eliminating the need of pumping water from the irrigation well."

Water Well Found Producing Natural Gas

Field Representatives of the High Plains Water District recently inspected an irrigation well that is producing natural gas — enough to burn.

The well is located in one of the Slaughter farms in Hockley County.

Suspected source of the gas is an oil well located about 300 yards from the irrigation well.

The irrigation well is drilled to a depth of 200 feet and is a producing water well in the Ogallala formation.

Operators of the neighboring farm plan to drill a test hole near the water well to see if they can obtain natural gas. If gas is discovered, it will be used as fuel for irrigation engines on the water wells and will cut down on the operation cost of the farm.

WHEN YOU MOVE—

Please notify the High Plains Underground Water Conservation District, Lubbock, Texas on Post Office Form 22S obtainable from your local postmaster, giving old as well as new address, to insure no interruption in the delivery of "The Cross Section."

COULD THE PRIVATE OWNERSHIP OF UNDERGROUND WATER BE THROWN INTO JEOPARDY BY CARELESS WASTE

With the 59th Session of the Texas Legislature underway, problems of redistricting, and a water plan for Texas, seem to be two of the major topics of discussion around the State Capitol. Several bills have already been prepared to be introduced by the Interim Committee on Conservation and Reclamation. New uses of water, not too common to West Texas, are going to present problems that will take some keen thinking to work out. Pollution is another item on the agenda for legislative action by the new Legislature.

The habitual wasting of water, one of Texas' most precious resources is causing people all over the State to take a hard look at the water problems and the future development of our State.

In the High Plains, water removed from storage and allowed to run into bar ditches is certainly creating a wanton waste that makes some people wonder if the underground waters of Texas should not be declard a property of the State and subject to appropriation.

For ten years, Ground Water Districts have worked with the people in programs of education on a better application of water and what the ultimate result of promiscuous waste could mean to the landowners of the High Plains

The day of experimenting with water management and the handling of tailwater are not over, but more positive action will be taken in dealing with the habitual waster.

Rumors floating around the Capitol are that areas of Texas are interested in a general law giving the State control of all ground water not in operating Districts.

The use of fresh water for oil field flooding is a problem that, in all probability, will be discussed before the Water and Conservation Committees.

Certain legislators feel that the sale of ground water to be transported out of the State may become an issue this session.

Priorities in the use of ground water, correlative rights and the right to recharge and recovery of the recharge water could become issues of hard debate between industry, private owners and Districts.

Today, water is the largest raw resource used by American industry. It is a resource that can no longer be taken for granted. Year by year, its value is increasing. From the Panhandle to the Gulf the waste of water must be stopped if we are to continue to enjoy the economy our people have built for themselves. We will begin at home.

THE CROSS SECTION
1628 - 15th Street
Lubbock, Texas
Dear Sirs:

I do not now receive THE CROSS SECTION but would like to have it sent to me each month, free of charge, at the address given below.

Name ______________________

Street Address ______________ Zip Code ________

City and State ______________________

(Please cut out and mail to our address)

January is observation well measuring time. Shown measuring one of the many observation wells in the High Plains Underground Water District is Sam Gammon of the Texas Water Commission, Austin, David Cunningham of the District, Don Reddell, engineer of the District and Bernie Baker of the Commission.

DISTRICT CONDUCTS TRAINING SESSION FOR SECRETARIES

Secretaries of the County Committees of the High Plains Water District attended a training session in Lubbock December 18th.

Problems discussed by the group included abandoned wells, well exceptions, tail water problems, signing of permits by landowners, expired permits, well locations, completed well logs and proper well spacing.

Attending the session was Temple Rogers, Aubrey Brock, Mattie K. Robinson, Billie Downing, "Red" Butler, Peggy Cook, Jeantte Robinson, Phyllis Steel, Louise Knox, Doris Hagens, Melba Wright, Jayne Cobb, Dana Wacasey and Gerry Bartle.

Plans call for periodic meetings of this type to keep county personnel up to date on the workings of the Water District

DRILLING STATISTICS FOR DECEMBER

During the month of December 77 new wells were drilled within the High Plains Water District; 2 replacement wells were drilled; and 8 wells were drilled that were either dry or nonproductive for some other reason. The County Committees issued 202 new drilling permits.

Listed below by counties are permits issued and wells completed for December.

County	Permits Issued	New Wells Drilled	Dry Holes Drilled	Replacement Wells Drilled
Armstrong	0	0	0	0
Bailey	11	7	1	0
Castro	28	9	1	0
Cochran	0	3	0	0
Deaf Smith	25	3	0	0
Floyd	5	10	0	0
Hockley	25	5	1	0
Lamb	24	8	0	2
Lubbock	41	10	4	0
Lynn	13	5	0	0
Parmer	23	9	0	0
Potter	0	0	0	0
Randall	7	8	1	0
Total	202	77	8	2

High Plains Underground Water
Conservation District No. 1
1628 Fifteenth Street
Lubbock, Texas

Second Class Permit

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 11—No. 9 "THERE IS NO SUBSTITUTE FOR WATER" February 1965

Irrigation Return Systems Have Decided Advantage

Farmers who are fortunate enough to have an abundance of water can utilize several definite advantages if they install and use a tailwater recirculation system.

Economic, legal and moral pressures, as well as a good supply of water, have caused many high plains farmers to use recirculation systems to control irrigation "tailwater".

Recirculation systems consist of a drainage ditch to collect and convey the tailwater, a sump for temporary water storage, a pumping plant to pump the water back onto the farmland and a pipeline to convey the water from the pumping plant to the head ditch.

A system that recirculates the irrigation water prevents the ponding of water at the lower end of the field which interferes with plant development and reduces crop yields. It also prevents the flooding of adjoining neighbor's farmland, thereby reducing the threat of legal action. In some instances farmers have been sued for crop damage caused by escaping irrigation water.

Recirculation systems stop the flooding of public roads and eliminate a source of automobile accidents. During the 1964 irrigation season a very serious wreck occurred on the High Plains. The accident was caused by the accumulation of water and silt on a county road. The silt and water had entered the road from a nearby farm where irrigation was in progress. The owner of the farm could have suffered a great loss of income through the action of the courts.

County road maintenance expenses are cut by preventing irrigation water to flood public road drainage ditches. The cost of cleaning ditches, road maintenance and repairs are very expensive and they are practically eliminated in areas where return systems are used.

Public health is safe guarded by the prevention of water in the county road ditches. Mosquito breeding is eliminated by the absence of the shallow, tepid water necessary for mosquito breeding. Last summer several west Texas cities experienced a heavy mosquito infestation and public health officials accredited the infestation to large amounts of water collected in the ditches along roads.

Twenty to twenty-five percent increases in additional water for irrigation has been recorded by several operators of tailwater recirculation systems.

Many farmers improve the efficiency of their water distribution by using a return system. The system allows the farmer to use a large head of water to get the water to the end of the rows quicker. This provides for a more uniform moisture penetration by eliminating deep moisture penetration in the upper portion of the field, inadequate moisture in the middle of the field and deep penetration at the lower portion of the field where ponding occurs.

Labor is a primary factor in profit or loss situations for all farmers. Many farmers using recirculation systems state that one man can now irrigate as much land as two or three men before the recirculation system was installed.

Recirculation systems recover and re-apply nutrients carried from the farm in tailwater. Water District records revealed that about 30 pounds of nitrogen in the form of nitrates were being lost per acre foot of tailwater. The recirculation system salvages these nutrients as well as the tailwater.

Valuable rich top soil carried from the farm in tailwater is reduced. Tests by the district show that an average of nine to ten tons of soil are carried from the farm in each acre foot of tailwater. Recirculation systems are reclaiming approximately 50 percent of this top soil and returning it to the farm.

Plant growth is improved by the use of a recirculation system. Tailwater is much warmer than water pumped from wells. Cold ground water causes a temporary cooling of the soil and reduces the rate of plant growth for a few days. Warm tailwater does not lower the soil temperature appreciably, and allows the plant to continue its normal growth rate.

Operators of recirculation systems all give many different advantages, none have many complaints.

Edwin Lide, who farms in Parmer County, installed a system on a cooperative agreement with the district several months ago. When asked by his neighbors how he liked his installation he replied, "I haven't paid the District for the cost of my pump, but when I do, it won't owe me a cent." Lide figures he has more than paid for his return system by being able to salvage and use his irrigation tailwater.

Officers of the 1965 Board of Directors of the High Plains Underground Water Conservation District No. 1 were elected in January. Shown above, left to right, are: (standing) Andrew Kershen of Hereford and Ross Goodwin of Muleshoe. Seated are Weldon Newsom, secretary-treasurer of Morton, Russell Bean, president from Lubbock and Chester Mitchell, vice president of Lockney.

ED REED

DISTRICT EMPLOYS HYDROLOGIST

Ed Reed, well known hydrologist, has been employed by the Water District.

Reed has done much work in the West and North Texas areas as well as New Mexico and Arizona. He has assisted in developing city water plans for Midland, Andrews, Crane, Big Lake, Pecos, Monahans, Alpine, and Sweetwater.

Reed is a 1939 graduate of Texas Technological College and is a licensed professional engineer. His professional affiliations include the Geological Society of America, American Society of Civil Engineers, Texas Society of Professional Engineers, American Water Works Association, and the West Texas Geological Society.

Reed was employed for several years by the oil industry but since 1952 he has operated his own ground water consulting hydrologist office.

THE Cross SECTION

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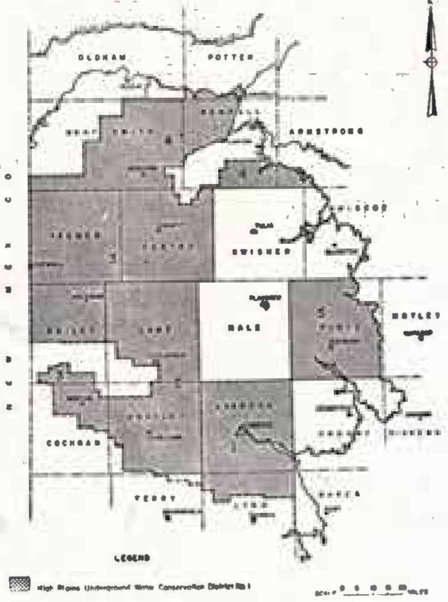
BILL J WADDLE
Editor



Irrigation Well Development In Cochran County

By F. A. RAYNER, Texas Water Commission

Cochran County, named after Robert Cochran an early settler, was created in 1876 and organized in 1924 from the Bexar District. This county, containing 782 square miles, is located in about the center of the Southern High Plains physiographic province of Texas and borders on the state of New Mexico.

The area's income is dependent upon rapidly expanding irrigation and dryland farming and the production of oil, primarily from the large Levelland and Slaughter oil fields in the southern and southeastern portion of the county.

Cochran County can be roughly divided into two almost equal but distinctly different areas. North of a line extending from near Whiteface, on the eastern county line, to Bledsoe, near the western county line, the sandy loam soils are conductive to the production of cotton, grain sorghum, and other row crops. South of this line the soils are very sandy and in many areas are characterized by shinnery-covered sand hills. It is these sandy soils that have, in the past, primarily restricted farm land development to the northern part of this county. It should be noted, however, that income derived from the production of oil, in areas in the southern portion of the county, has probably influenced the comparatively restricted cultivation of the soils in these areas.

The machinery available to the early-day farmers limited farm sizes to the low multiples of tens of acres. The modern-day, highly mechanized, plains farmer is able to manage farms in the multiples of hundreds of acres. Primarily as a result of this newly acquired, highly advanced mechanization, the sand-hill areas in the southern portion of Cochran County, long the habitat of the western prairie chicken, are rapidly disappearing under the bite of the large "brake" plows.

Prior to 1953 the majority of the cultivated land in Cochran County was confined to that area which is now within the High Plains Underground Water Conservation District. At that time the irrigation well development was also mainly restricted to the nearly 205 square-mile District portion of the county.

A 1960 irrigation well inventory indicated that there were about 1,040 equipped irrigation wells within the County, with about 680 of these wells being located within the District. A survey conducted in June of 1964 revealed that the county contained about 1,520 equipped irrigation wells with 917 of these wells located within the District. On a county-wide basis this represents a 46 percent increase or some 480 new wells completed during this four-year period.

In 1960 there were four wells supplying water for municipal purposes and about 10 wells supplying water for various industrial processes. In 1964 there were seven municipal supply wells and approximately 35 wells supplying industrial water needs. The irrigation and municipal wells mapped during the 1964 survey are shown on Figure 1.

In 1960 there were 78 completed wells that were not equipped with pumps; 82 such wells were mapped during the 1964 survey.

During the 1960 irrigation well inventory it was determined that 212 irrigation wells were using butane for fuel, about 334 wells were using natural gas, and the remaining 494 wells were equipped with electrical motors. Approximately 30 percent of the wells within the county were equipped with 4-inch pumps, 40 percent were equipped with 6-in. pumps, and approximately 22 percent were equipped with 8-inch pumps. This survey indicated that there were about five wells equipped with 10-inch pumps while some 43 wells within the county were equipped with pumps smaller than four inches in diameter.

As shown on Figure 1, about 58 percent, or approximately 290,000 acres, of the county was under cultivation. The remaining area, in excess of 210,000 acres consists of ranching or other grasslands, city property, and other noncultivated lands

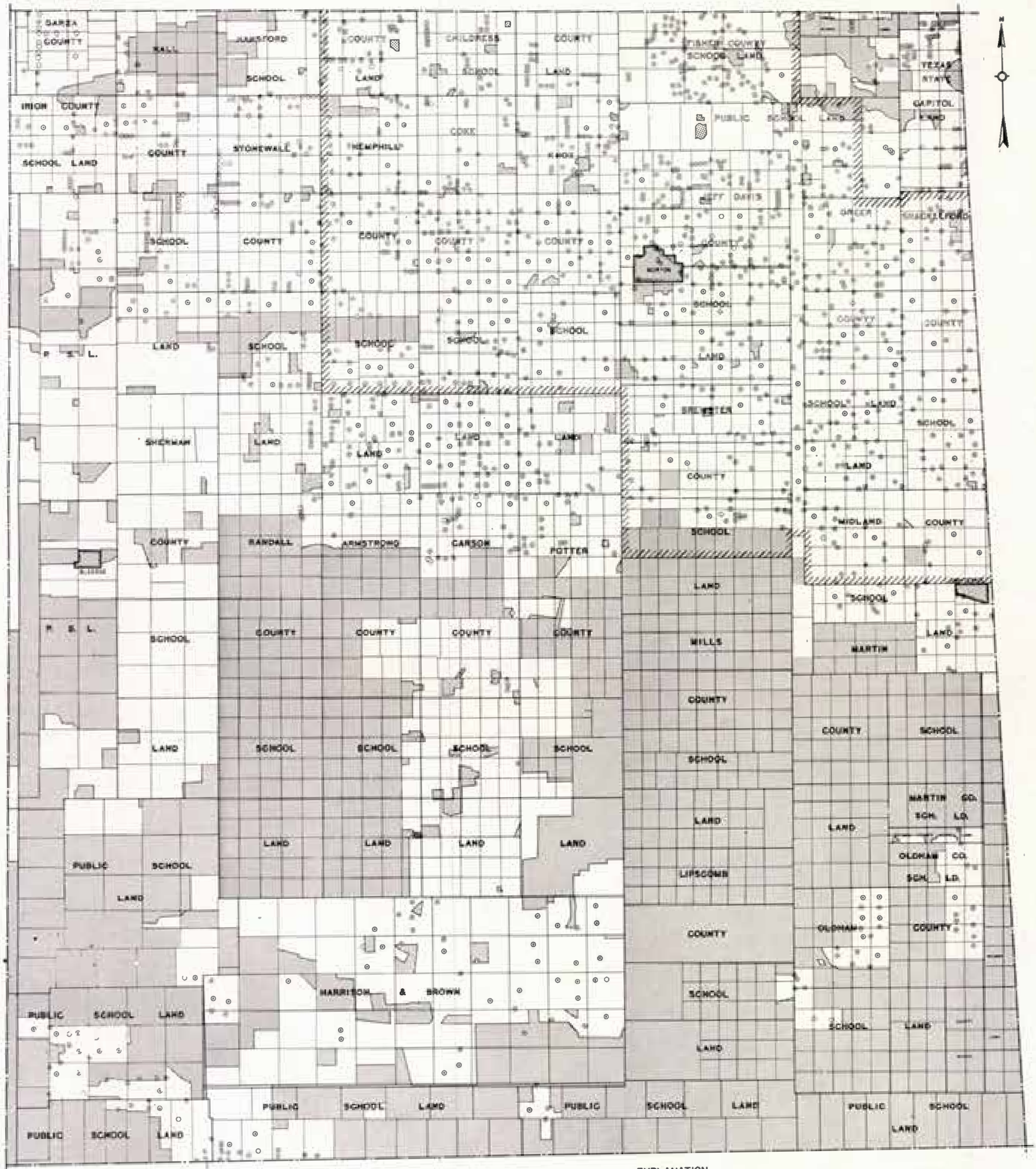
It is apparent that farm-land development within the county is increasing at an accelerated pace; there is no reason to expect a reversal in this trend within the near future.

DRILLING STATISTICS FOR JANUARY

During the month of January 116 new wells were drilled within the High Plains Water District; 12 replacement wells were drilled; and 5 wells were drilled that were either dry or non-productive for some other reason. The County Committees issued 439 new drilling permits.

Listed below by counties are permits issued and wells completed for the month of January:

County	Permits Issued	New Wells Drilled	Replacement Wells Drilled	Dry Holes
Armstrong	0	0	0	0
Bailey	11	8	1	0
Castro	20	7	3	0
Cochran	23	3	0	0
Deaf Smith	40	16	0	1
Floyd	54	17	0	0
Hockley	46	14	0	1
Lamb	25	7	2	0
Lubbock	113	27	3	2
Lynn	37	4	0	0
Parmer	45	11	3	1
Potter	0	0	0	0
Randall	25	2	0	0
TOTALS	439	116	12	5



EXPLANATION

Irrigation well

Irrigation well location, not equipped with pump

Municipal well

Cultivated land. Includes land in the U. S. Department of Agriculture Soil Bank Program

Noncultivated land

Boundary of the High Plains Underground Water Conservation District No. I

Location of Irrigation and Municipal Wells and Cultivated and Noncultivated Land, Cochran County, Texas

0 1 2 3
MILES

FIGURE 1

TEXAS WATER COMMISSION

JUNE 1964

TEXAS WATER LEGISLATION

Several bills concerning water are now being considered by the State Legislature. Representatives of the High Plains Water District are very interested in many of the bills and the effect they could have on the West Texas area.

To inform our readers of this pending legislation we are printing this brief description of the bills. The bill number and the sponsor or sponsors are also listed.

We hope you will take an interest in this pending legislation and will confer with your elected representatives.

The CROSS SECTION plans to keep its readers up to date on all water legislation that will affect West Texas.

3. Legislation pending in Texas Legislature.

(a) Bills to implement Governor's Water Program.

(1) S. B. 98—Krueger and Herring—State Recreation Development Act—Report of Governor's Statewide Water Recreation Study Committee.

(2) S B. 126—Krueger—Water Resources Institute of Texas. Reported favorably by Senate Committee on Water and Conservation 2/3/65.

(3) S. B. 144—Parkhouse, Krueger, et al. Authorizing issuance of additional $100,000,000.00 in Texas Water Development Bonds—Texas Research League recommendation. Reported favorably by Senate Comittee on Water and Conservation 2/3/65.

(4) S. B. 145—Parkhouse, Krueger, et al. "Texas Water Rights Commission Act". Sent to Subcommittee by Water and Conservation Committee 2/3/65. Texas Research League recommendation.

(5) S. B. 146—Parkhouse, Kreuger et al. Amending Texas Water Development Board Act re: transfer of water resources planning from Water Commission to Water Development Board. Was heard before Senate Committee on Water and Conservation 2/17/65. Texas Research League recommendation.

(6) S. J. R. 19—Parkhouse, Bates, et al. To amend Financial Aid Amendment to the Constitution, Section 49-d, Article III, to permit use of the Texas Water Development Fund by the Texas Water Development Board for "any system or works necessary for the filtration, treatment and transportation of water from storage to points of treatment, filtration and/or distrubition, including facilities for transporting water therefrom to wholesale purchasers, or for any one or more of such purposes or methods". Texas Research League recommendation.

(7) H. B. 112—Markgraf & Brooks—relating to taxing certain property owned by conservation and reclamation districts and authorities.

(8) H. B. 225—Heatly—regulating withdrawal of underground water for use in another state by drilling a well in Texas.

(9) H. B. 319—Shannon, Tommy—authorizing counties, cities, towns, villages, authorities, districts and other political subdivisions of the State to establish Regional Planning Commission.

(10) S. J. R. 9—Word—to provide for a State Parks Fund to be used for the acquisition, development and maintenance of state parks.

(11) H. B. 469—Cain and Cavness—relating to the uses of water in the jurisdiction of the Lower Colorado River Authority. House Committee on Conservation and Reclamation .

(12) H. B. 100—Cowles and Hinson—Creating "Caddo Lake Navigation District". Committee on Conservation and Reclamation.

(13) H. B. 116—Connally—relating to the creation of an underground water conservation district in Atascosa and Wilson Counties. Committee on Conservation and Reclamation.

(14) H. B. 176—Floyd—relating to action by State or local government officers or employees that discriminate against persons because of the person's race, religion, color or national origin. Committee on State Affairs.

(15) H. B. 336—Eckhardt—providing for determination, establishment and payment of prevailing scale of wages to all workers who perform labor on public works, etc. Committee on Labor.

(16) S. B. 172—Watson—to grant and convey to City of Waco the bed, banks and islands in the Brazos River and that part of the Bosque River downstream from Waco Dam which is within the city limits of the City of Waco. Committee on Counties, Cities and Towns.

(17) S. B. 194 — Strong—creating the Sabine River Navigation District in Gregg, Rusk, Harrison and Panola Counties, Committee on Water and Conservation.

(b) Bills Recommended by Clayton Committee:

(1) H. J. R. 21—Clayton — To amend Constitution to provide for six year terms of office for directors of all conservation and reclamation districts, water districts, river authorities, etc.

(2) H. B. 231—Clayton, Murray & Wayne—extending the benefits of the Texas Water Development Bond Program to the development of subsurface water resources.

(3) H. B. 234—Murray and Watson—relating to the power and authority of the Texas Water Pollution Control Board and the Railroad Commission to regulate disposals of oil and gas well wastes.

(4) H. B. 235—Murray and Clayton—relating to the conditions for obtaining permits to use injection wells for industrial and municipal wastes.

(5) H. B. 236—Murray and Clayton—relating to the kind of wells for which permits to inject into the ground must be obtained from the Texas Water Commission.

(6) H. B. 237—Murray and Clayton—relating to the power and authority of the Texas Water Pollution Control Board and the Railroad Commission to regulate disposals of oil and gas well waste.

(7) H. B. 265—Murray and Clayton—relating to the power to create, convert, and consolidate water improvement districts, water supply districts, etc. Prevents the creation of all types of water districts, except water control and improvement districts.

(8) H. B. 266—Murray and Clayton—relating to Texas Water Commission fees and repeal presentation statutes.

(9) H. B. 267—Murray and Clayton—relating to the power and duty to plug abandoned oil wells.

(c) Miscellaneous Bills:

(1) S. B. 110—Krueger and Moore—Watercraft Motor Fuel Tax Law.

(2) S. B. 165—Reagan—relating to developing outdoor recreation resources and facilities.

(3) H. B. 181—Floyd—to regulate the use and operation of watercraft upon the public waters of the State.

(4) H. B. 309—Atwell—to allocate and appropriate a certain portion of the unclaimed refunds of motor fuel taxes for use in purchasing and maintaining boat ramps and access ways to public waters.

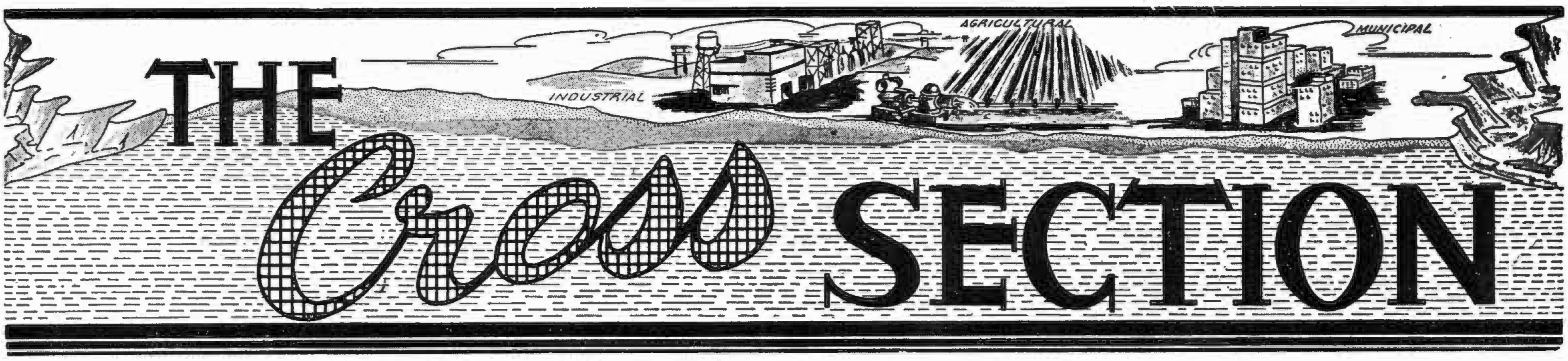
(5) H. B. 69 — Atwell — "Water Safety Act".

(6) H. B. 77—Clayton—relating to regulating the business conduct of persons drilling water wells.

Andrew Kershen and Ross Goodwin, newly elected board members were given their oaths of office in february by Judge Howard C. Davison.

Second Class Permit

High Plains Underground Water
Conservation District No. 1
1628 Fifteenth Street
Lubbock, Texas



A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 11—No. 10 "THERE IS NO SUBSTITUTE FOR WATER" *March 1965*

Ground Water Depletion

By DONALD L. REDDELL

The annual water level measurements of more than 800 observation wells in the High Plains Water District were recently completed. These measurements are made each year during January. The Water District, in cooperation with the Texas Water Commission, is attempting to provide the people of the High Plains area with the best water level information available anywhere. Numerous observation wells were established several years ago in what were then areas of heavy pumpage. During recent years, the areas of heavy pumpage have grown until today there is one vast area. Consequently, the observation well network has continued to expand to keep pace with the well development. Today there are more than 1700 observations wells in a 39-county High Plains area. Over 800 of these observation wells are in the 13-county area of the High Plains Water District.

The records of water levels in wells and their interpretation have long formed an important part of ground water work. Time is required to obtain reliable results in ground-water investigations. Ground water work does not deal with definite events that occurred in the past and can be studied at any time. Ground water work deals with events that are always changing. Therefore, past records that were not recorded are gone forever, and future records can be obtained only with the passing of time. For this reason, periodic observations should be made and records of ground water changes should be kept so that reliable data will accumulate for use in the future.

The value of a continuous record of water-level measurements increases greatly with the length of the record. Many of the present observation wells have records of water level measurements since the late 1930's. Numerous wells around Lockney, in Floyd County, and Plainview, in Hale County, have water records as far back as 1914 and 1915. A stark realization of the magnitude of the depletion occurs when one measures a well in which it was 40 feet to water in 1914 and 160 feet to water in 1965.

Even though the Ogallala formation extends throughout the entire Water District, the hydrologic conditions within this aquifer are varied and sometimes complex. Therefore, a large number of observation wells is needed to pick up the various changes in the aquifer. On the other hand, to make these water level measurements and have them properly filed and analyzed is expensive and time-consuming. Good judgment is required in order to keep the number of observation wells within feasible limits while providing the maximum of useful information. It is impossible to have an observation well on every farm. Therefore, the distribution of observation wells is a compromise between what is feasible and what will yield the maximum information.

The observation well program allows a better analysis of the effects which heavy pumping has upon the water table. In this issue of The Cross Section we are supplying the people of the Water District with their annual "Water Statement". By studying the water level measurements on the adjoining pages, the effects of pumpage during the year of 1964 can be determined.

The effects of the hot dry summer of 1964 are reflected in the decline of the water table from 1964 to 1965. Table 1 shows that the average decline of the water table for the entire Water District was 3.99 feet in 1964; a 60 percent increase over the decline for 1963 and 67 percent greater than the five year average decline. The annual decline for 1964 was the greatest of any year since 1956.

If we continue to use ground water in the High Plains we eventually will reach a point of economic exhaustion. This has already happened in some areas. Other areas of the High Plains have enough ground water to last for many years to come. A practical method for meeting the water depletion problem is the improvement of water conservation practices. However, this will at best only serve to extend the life of the area's water supply. Therefore, some long range thinking and planning are needed if the High Plains is to have adequate water to maintain its economy in the future.

In a democracy, adequate public understanding is essential to the support of any desirable public program. The development of informed public opinion about water resources would do more toward getting what the High Plains needs in water resource policy, and implementing that policy in the long run, than any other specific item. But public understanding involves something more than widespread interest and anxiety. It must be based on a recognition of (1) the dimensions of the problems and how they vary from area to area, and (2) the range of possible solutions that the people can adopt.

If the urgent requirements for additional water supplies are to be met, vigorous and enlightened leadership must be provided by the leaders of each and every community. The people of the High Plains should take to heart the words engraved on the speaker's stand in the House of Representatives. These words by Daniel Webster are, "Let us develop the resources of our land, call forth its power and build its institutions, promote all its great interests and see whether we also, in our day and generation, may not perform something worthy to be remembered."

PLEASE CLOSE THOSE ABANDONED WELLS ! ! !

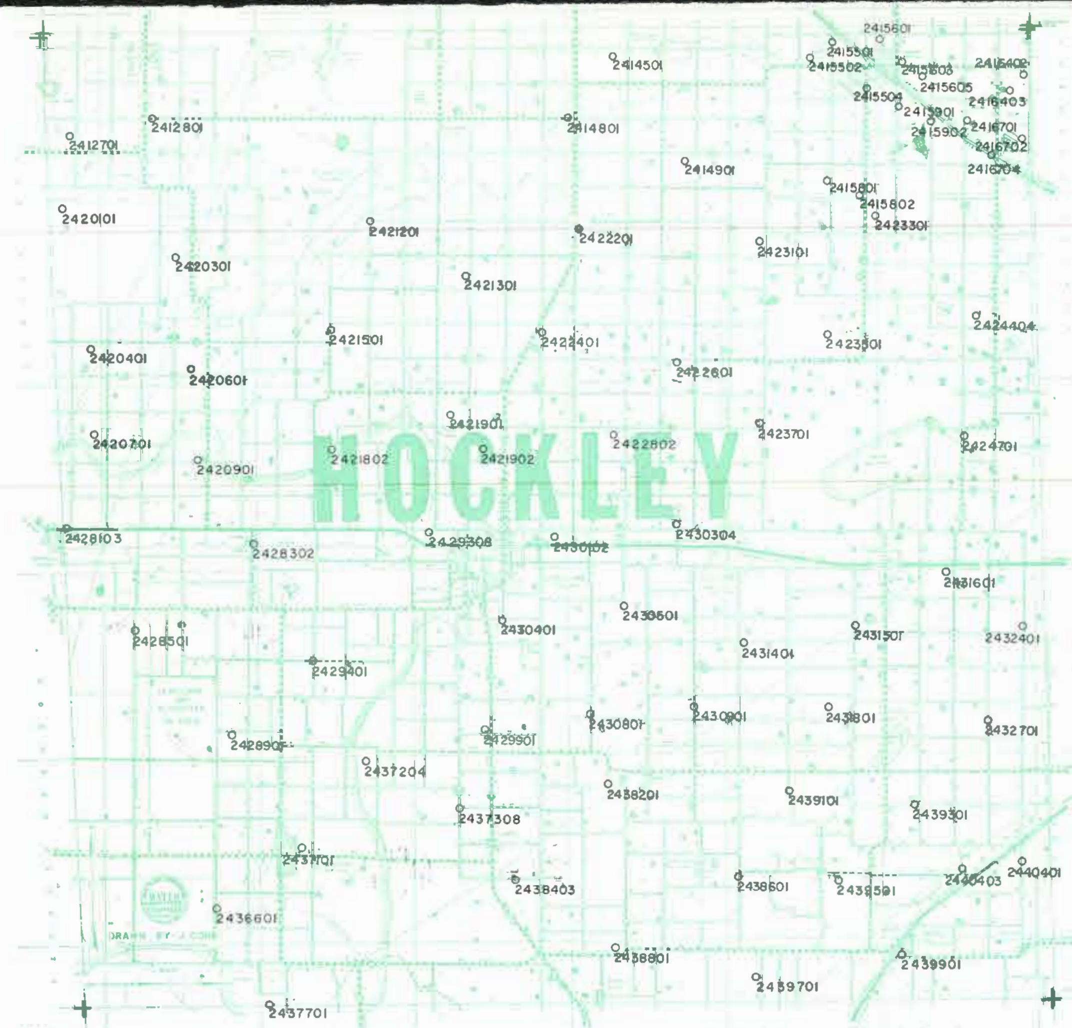
Average Change In Water Levels In High Plains Water District By Counties

Table 1. Average Change of Water Levels in the High Plains Water District for the Five Year periods 1959—1964 and 1960—1965 and for the one year periods 1963—1964 and 1964—1965.

County	1959 — 1964 Number of Wells	1959 — 1964 Average Decline Per Well in Feet	1960 — 1965 Number of Wells	1960 — 1965 Average Decline Per Well in Feet	1963 — 1964 Number of Wells	1963 — 1964 Average Decline Per Well in Feet	1964 — 1965 Number of Wells	1964 — 1965 Average Decline Per Well in Feet
Armstrong			8	7.82	8	2.99	8	2.71
Bailey	25	7.89	27	8.44	35	1.88	55	2.33
Castro	22	17.61	24	16.87	57	4.27	54	3.61
Cochran	43	4.30	45	6.92	54	1.23	52	2.90
Deaf Smith	33	10.47	31	15.88	66	3.04	59	5.93
Floyd	61	17.52	61	18.83	92	4.55	89	5.05
Hockley	31	4.84	29	8.24	70	0.66	68	4.81
Lamb	33	10.92	32	11.43	50	1.62	71	4.26
Lubbock	93	9.28	80	10.64	98	2.17	82	4.02
Lynn	28	+0.14	24	2.64	28	+0.95	26	3.31
Parmer	35	18.01	38	17.16	36	3.88	50	3.64
Potter					4	5.22	4	5.98
Randall	13	8.27	12	7.42	33	2.45	32	1.49
Totals for High Plains Water District	417	10.34	411	11.94	634	2.49	650	3.99
Average Decline Per Year Per Well		2.07		2.39		2.49		3.99

10 55 902	109.97	120.96	126.32	16.35	5.36
10 55 904	107.00	115.87	123.17	16.17	7.30
10 56 102	....	158.08	165.64	....	6.96
10 56 403	131.77	145.28	151.75	19.98	6.47
10 56 404	142.67	157.79	165.58	22.91	7.79
10 60 101	111.53	111.83	117.38	5.85	5.55
10 60 304	....	68.66	70.24	....	1.58
10 60 401	....	123.47	130.25	....	6.78

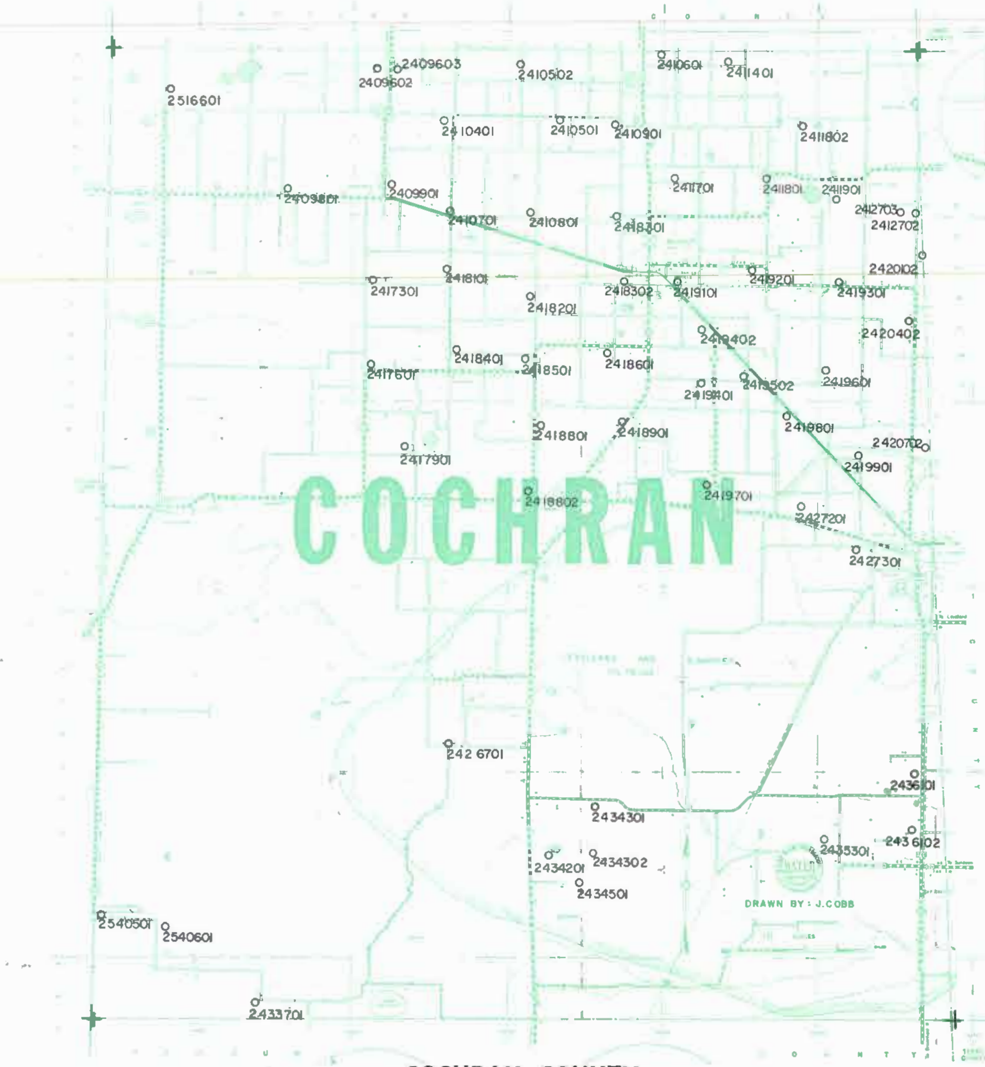
24 12 101	....	69.92	71.69	....	1.77
24 15 201	....	105.16	110.44	....	5.28
24 15 506	72.58	72.77	78.16	5.58	5.39
24 15 609	113.24	118.94	....	....	....
Number Of Wells				32	71
Average Decline Per Well				11.43	4.26
Ave. Decline Per Yr Per Well				2.29	4.26



HOCKLEY COUNTY

Well No.	1960	1964	1965	Decline 60-65	Decline 64-65
24 12 701	77.71	78.57	79.48	1.77	0.91
24 12 801	....	125.99	139.40	....	13.41
24 14 501	....	105.65	107.72	....	2.07
24 14 801	55.59	50.10	55.82	0.23	5.72
24 14 901	....	96.37	102.68	....	6.31
24 15 501	62.18	66.06	68.44	6.26	2.38
24 15 502	70.34	73.13	85.80	15.46	12.67
24 15 504	60.22	64.10	65.70	5.48	1.60
24 15 601	92.59	94.26	101.44	8.85	7.18
24 15 603	97.69	105.17	108.74	11.05	3.57
24 15 605	79.56	....	89.50	9.94	....
24 15 801	130.16	133.00	135.88	5.72	2.88
24 15 802	170.90	171.29	172.68	1.78	1.39
24 15 901	45.38	42.00	46.00	0.62	4.00
24 15 902	39.83	43.09	48.60	8.77	5.51
24 16 402	117.93	124.22	127.00	9.07	2.78
24 16 403	90.82	98.17	106.14	15.32	7.97
24 16 701	....	60.70	62.74	....	2.04
24 16 702	84.80	88.65	93.08	8.28	4.43
24 16 704	101.09	105.50	....	....	....
24 20 101	130.00	138.30	156.82	26.82	18.52
24 20 301	....	121.60	137.41	....	15.81
24 20 401	....	114.30	118.98	....	4.68
24 20 601	132.59	....	143.82	11.23	....
24 20 701	....	144.30	....	....	....
24 20 901	....	....	132.14	....	....
24 21 201	....	39.66	43.50	....	3.84
24 21 301	84.11	84.94	88.60	4.49	3.66
24 21 501	137.78	143.20	155.22	17.44	12.02
24 21 802	....	144.72	....	....	....
24 21 901	140.35	146.52	149.64	9.29	3.12
24 21 902	150.37	152.78	153.64	3.27	0.86
24 22 201	....	75.08	80.62	....	5.54
24 22 401	....	82.80	84.48	....	1.68
24 22 601	....	96.80	96.78	....	+0.02
24 22 802	....	116.55	121.74	....	5.19
24 23 101	....	105.78	107.44	....	1.66
24 23 301	178.30	182.97	187.32	9.02	4.35
24 23 501	....	102.99	105.60	....	2.61
24 23 701	....	98.67	101.46	....	2.79

Well No.	1960	1964	1965	Decline 60-65	Decline 64-65
24 24 404	....	142.18	....	....	....
24 24 701	....	124.75	126.64	....	1.89
24 28 103	....	138.87	143.66	....	4.79
24 28 302	....	126.14	129.20	....	3.06
24 28 501	....	143.40	159.54	....	16.40
24 28 901	....	150.55	156.96	....	6.41
24 29 308	....	133.80	138.99	....	5.19
24 29 401	....	138.82	148.92	....	10.10
24 29 901	173.64	175.30	181.82	8.18	6.52
24 30 102	....	125.96	130.00	....	4.04
24 30 304	....	97.11	....	....	....
24 30 401	118.98	121.14	124.76	5.78	3.62
24 30 501	....	114.27	117.42	....	3.15
24 30 801	....	161.67	165.33	....	3.66
24 30 901	....	146.87	151.02	....	4.15
24 31 401	....	119.45	123.40	....	3.95
24 31 501	....	75.51	77.76	....	2.25
24 31 601	112.55	116.78	118.94	6.39	2.16
24 31 801	....	142.31	143.47	....	1.16
24 32 401	95.64	101.15	105.56	9.92	4.41
24 32 701	....	111.78	116.44	....	4.66
24 36 601	....	143.24	159.05	....	15.81
24 37 101	....	135.29	140.34	....	5.05
24 37 204	....	137.71	140.82	....	3.11
24 37 308	....	131.75	138.24	....	6.49
24 37 701	151.34	150.25	151.66	0.32	1.41
24 38 201	....	156.67	159.70	....	3.03
24 38 403	....	153.35	156.54	....	3.19
24 38 601	120.89	124.09	125.10	4.21	1.01
24 38 801	....	157.15	162.82	....	5.67
24 39 101	....	148.30	150.84	....	2.54
24 39 301	....	142.79	144.64	....	1.85
24 39 501	....	130.81	133.50	....	2.69
24 39 701	....	107.84	115.80	....	7.96
24 39 901	89.57	91.89	....	....	....
24 40 401	123.08	135.00	137.02	13.94	2.02
24 40 403	....	141.30	141.77	....	0.47
No. of Wells				29	68
Average Decline Per Well				8.24	4.81
Ave. Decline Per Yr Per Well				1.65	4.81



COCHRAN COUNTY

Well No.	1960	1964	1965	Decline 60-65	Decline 64-65
24 09 602	105.93	....	112.70	6.77	....
24 09 603	101.88	....	108.65	6.77	....
24 09 801	121.76	122.40	123.75	1.99	1.35
24 09 901	94.18	96.50	100.32	6.14	3.82
24 10 401	107.17	108.45	110.16	2.99	1.71
24 10 501	94.37	94.35	94.69	0.32	0.34
24 10 502	87.90	87.23	87.78	+0.12	0.55
24 10 601	88.42	90.17	91.45	3.03	1.28
24 10 701	151.18	153.14	....	....	....
24 10 801	....	126.76	130.06	....	3.30
24 10 901	92.48	93.48	94.04	1.56	0.56
24 11 401	127.81	....	....	....	....
24 11 701	121.79	124.05	126.20	4.41	2.15
24 11 801	103.72	105.38	107.14	3.42	1.76
24 11 802	97.54	101.81	105.51	7.97	3.70
24 11 901	112.93	118.17	120.37	7.44	2.20
24 12 702	115.94	130.26	135.30	19.36	5.04
24 12 703	114.36	126.00	128.89	14.53	2.89
24 17 301	130.03	131.00	134.85	4.82	3.85
24 17 601	134.38	140.60	146.45	12.07	5.85
24 17 901	162.89	162.26	164.30	1.41	2.04
24 18 101	141.98	145.31	147.10	5.12	1.79
24 18 201	155.09	161.78	166.80	11.71	5.02
24 18 301	131.06	128.40	130.92	+0.14	2.52
24 18 302	142.90	147.30	153.27	10.37	5.97
24 18 401	137.56	141.65	147.28	9.72	5.63
24 18 501	181.70	183.62	....	....	....
24 18 601	155.06	160.00	168.07	13.01	8.07
24 18 801	171.80	180.80	193.50	21.70	12.70
24 18 802	163.43	165.05	167.66	4.23	2.61
24 18 901	117.45	117.03	117.60	0.15	0.57

Well No.	1960	1964	1965	Decline 60-65	Decline 64-65
24 19 101	128.80	134.75	139.80	11.00	5.05
24 19 201	136.72	139.10	142.39	5.67	3.29
24 19 301	....	153.52	157.75	....	4.23
24 19 401	138.27	145.57	148.44	10.17	2.87
24 19 402	131.65	137.48	141.26	9.61	3.78
24 19 502	150.55	156.55	162.20	11.65	5.65
24 19 601	143.03	146.90	150.26	7.23	3.36
24 19 701	144.27	158.30	161.75	17.48	3.45
24 19 801	144.18	147.83	151.89	7.71	4.06
24 19 901	126.05	125.19	125.85	+0.20	0.66
24 20 102	117.33	128.80	134.74	17.41	5.94
24 20 402	134.48	138.36	143.20	8.72	4.84
24 20 702	142.60	146.13	150.10	7.50	3.97
24 26 701	181.33	181.20	181.41	0.08	0.21
24 27 201	170.48	170.50	175.44	4.96	4.94
24 27 301	176.93	178.40	179.70	2.77	1.30
24 33 701	130.40	150.72	138.98	8.58	+11.72
24 34 201	....	160.12	161.23	....	1.11
24 34 301	....	180.87	181.42	....	0.55
24 34 302	....	160.05	161.40	....	1.35
24 34 501	....	165.38	....	....	....
24 35 301	....	171.03	175.76	....	4.73
24 36 101	....	174.27	175.29	....	1.02
24 36 102	....	171.06	174.31	....	3.25
25 16 601	57.68	57.15	58.20	0.52	1.05
25 40 501	136.17	134.75	136.00	+0.17	1.25
25 40 601	....	146.55	149.64	....	3.09
No. of Wells				45	52
Average Decline Per Well				6.92	2.90
Aver. Decline Per Yr Per Well				1.38	2.90

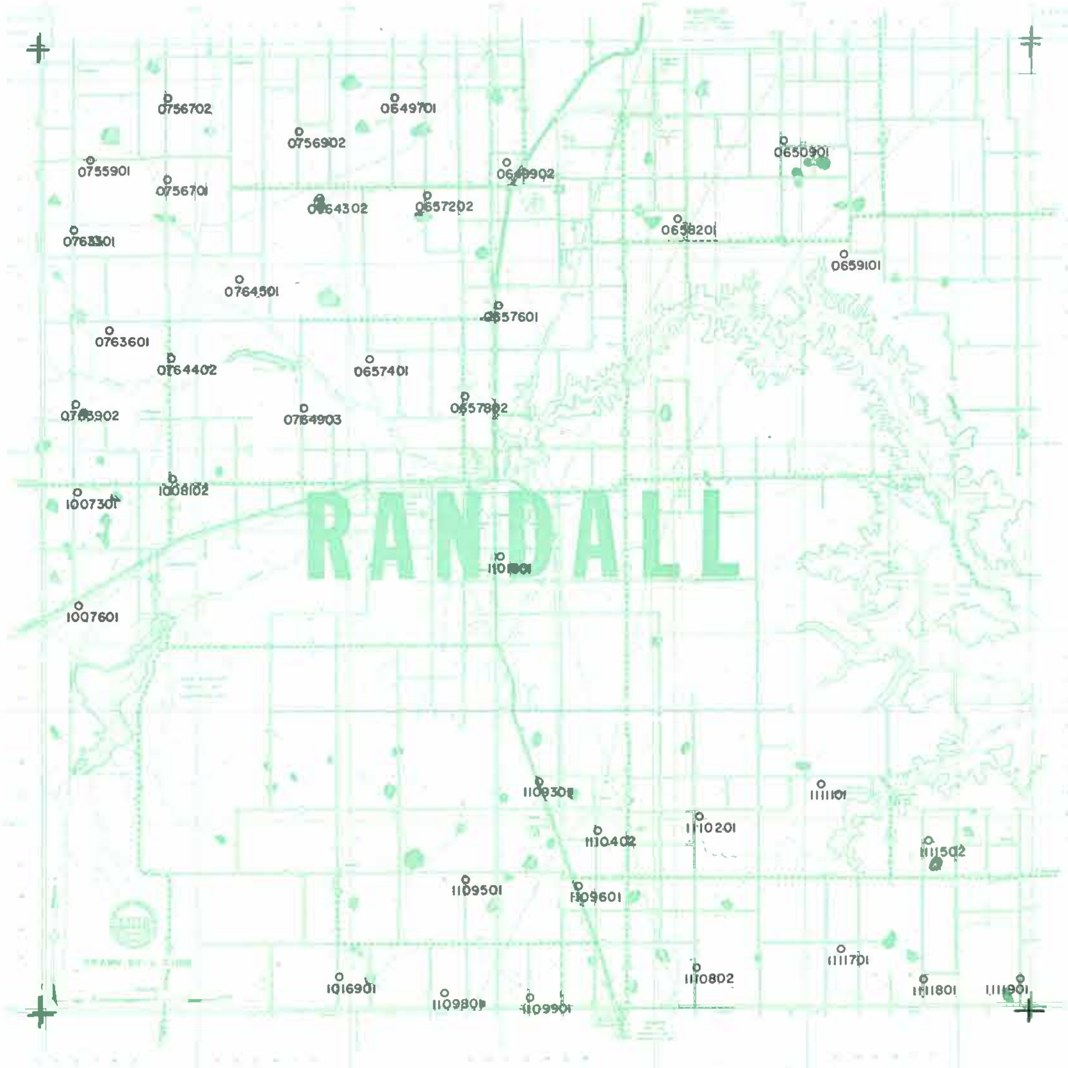
Water Level Measurements In Observation Wells In High Plains Water District

EDITOR'S NOTE: Official Water-level measurements for a majority of the observation wells within the High Plains Underground Water Conservation District are shown below. The measurements were made by the High Plains Water District in cooperation with the Texas Water Commission.

The accompanying maps show the approximate location of the observation wells together with identifying well numbers. Use of a data processing system by the Texas Water Commission in tabulating and maintaining the state-wide observation well program necessitates the use of a seven-digit number. All measurements shown in feet below land surface.

Measurements made in 1960, 1964 and 1965 are shown. Also the decline for the five-year period, 1960-1965 and the one-year period 1964-1965 are shown. The purpose of using these three years is to show what has been happening to the water-level over a several-year period, as well as during the past year.

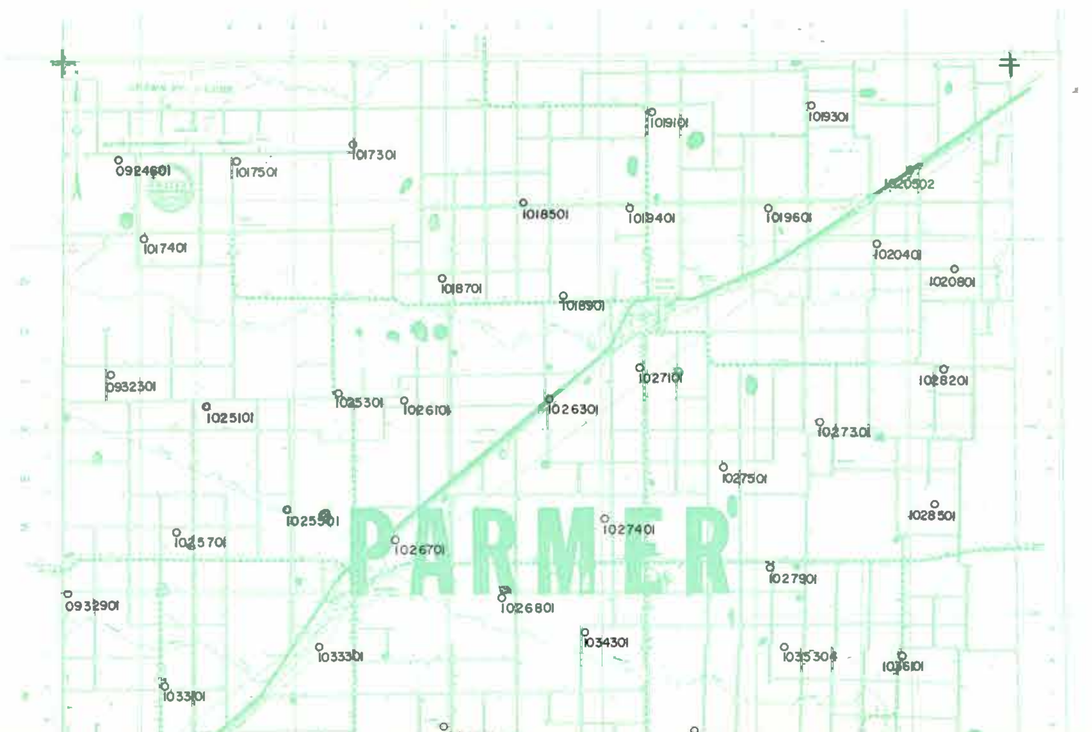
Measurements are made each year during January, prior to the beginning of extensive pumping for preplant irrigation. All measurements were made by personnel of the Texas Water Commission and the High Plains Underground Water Conservation District.

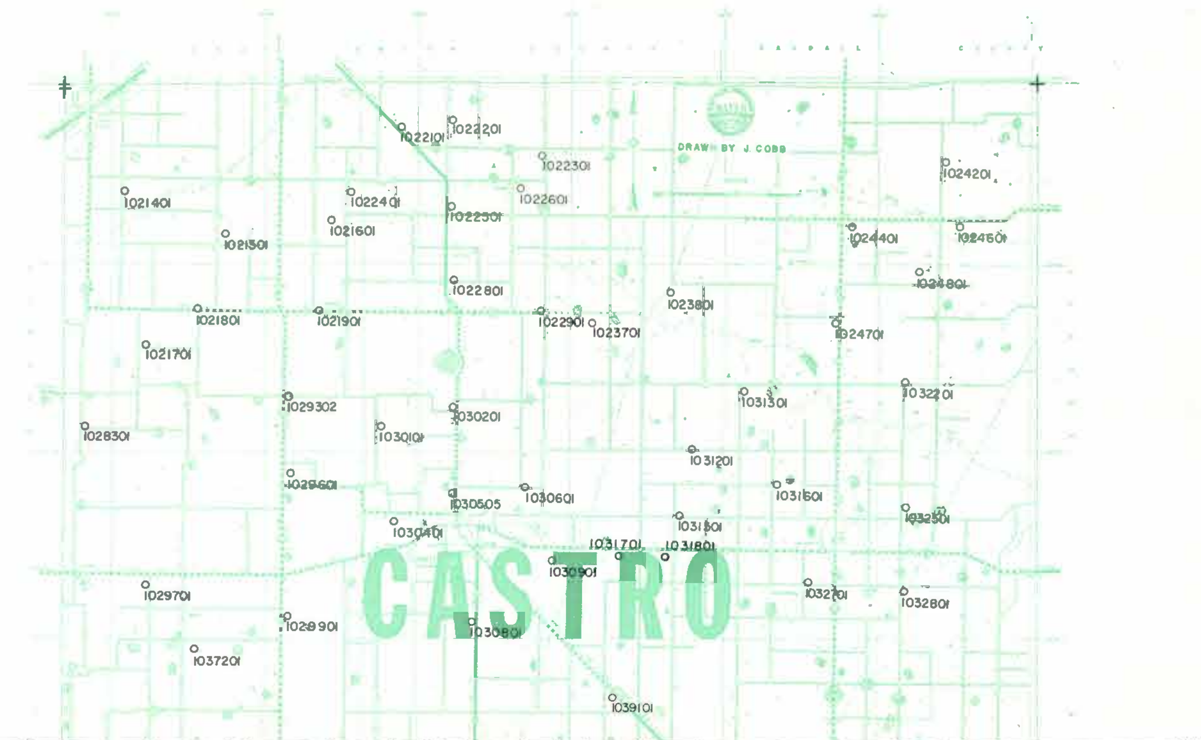


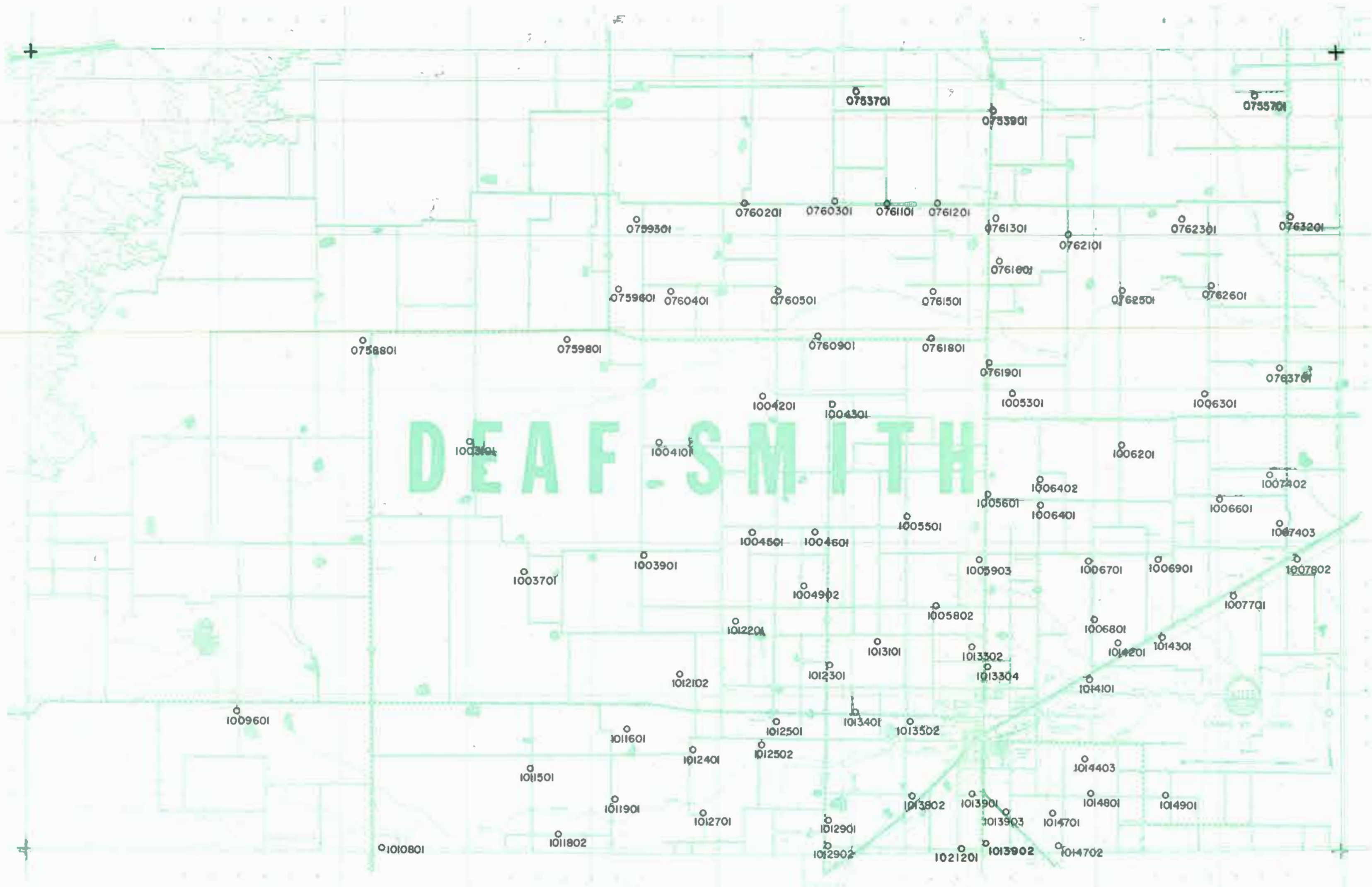
RANDALL COUNTY

Well No.	1960	1964	1965	Decline 60-65	Decline 64-65
06 49 701	....	207.02	211.88	....	4.86
06 49 902	....	197.62	198.55	....	0.93
06 50 901	....	200.78	....	....	....
06 57 202	....	178.83	180.57	....	1.74
06 57 401	150.80	160.53	....	....	....
06 57 601	145.75	149.20	154.41	8.66	5.21
06 57 802	....	129.73	132.27	....	2.54
06 58 201	....	201.52	203.49	....	1.97
06 59 101	....	197.41	196.94	....	+0.47
07 55 901	....	173.89	....	....	....
07 56 701	164.50	177.78	181.29	16.79	3.51
07 56 702	189.25	196.51	192.61	3.36	+3.90
07 56 902	....	172.26	175.09	....	2.83
07 63 301	....	....	178.82	....	....
07 63 601	120.97	126.37	129.16	8.19	2.79
07 63 902	....	115.82	121.19	....	5.37
07 64 302	139.18	141.12	153.00	13.82	11.88
07 64 402	....	101.87	102.94	....	1.07
07 64 501	....	132.87	131.40	....	+1.47
07 64 903	131.10	137.41	145.25	14.15	7.84
10 07 301	....	118.42	114.89	....	+3.53
10 07 601	....	95.29	91.77	....	+3.52
10 08 102	130.40	134.69	....	....	....
10 16 901	174.10	178.46	178.45	4.35	+0.01
11 01 601	4.20	4.94	4.54	0.34	+0.40
11 09 301	....	161.64	158.01	....	+3.63
11 09 501	....	178.64	175.69	....	+2.95
11 09 601	187.65	195.23	194.17	6.52	+1.06
11 09 801	180.30	....	179.36	+0.94	....
11 09 901	163.60	173.31	176.31	12.71	3.00
11 10 201	....	151.73	151.74	....	0.01
11 10 402	171.80	175.85	172.90	1.10	+2.95
11 10 802	....	158.09	167.55	....	9.46
11 11 101	....	130.99	131.03	....	0.04
11 11 502	....	158.21	158.67	....	0.46
11 11 701	....	152.55	155.22	....	2.67
11 11 801	....	100.69	101.81	....	1.12
11 11 901	....	104.49	106.91	....	2.42

Number Of Wells	12	32
Average Decline Per Well	7.42	1.49
Ave. Decline Per Yr Per Well	1.48	1.49

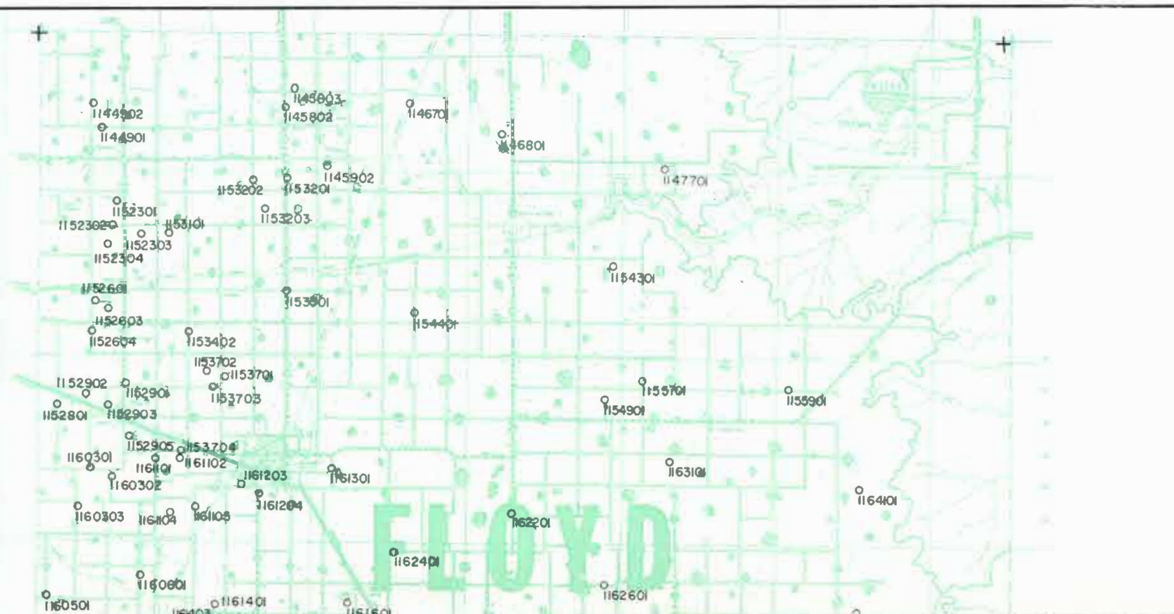


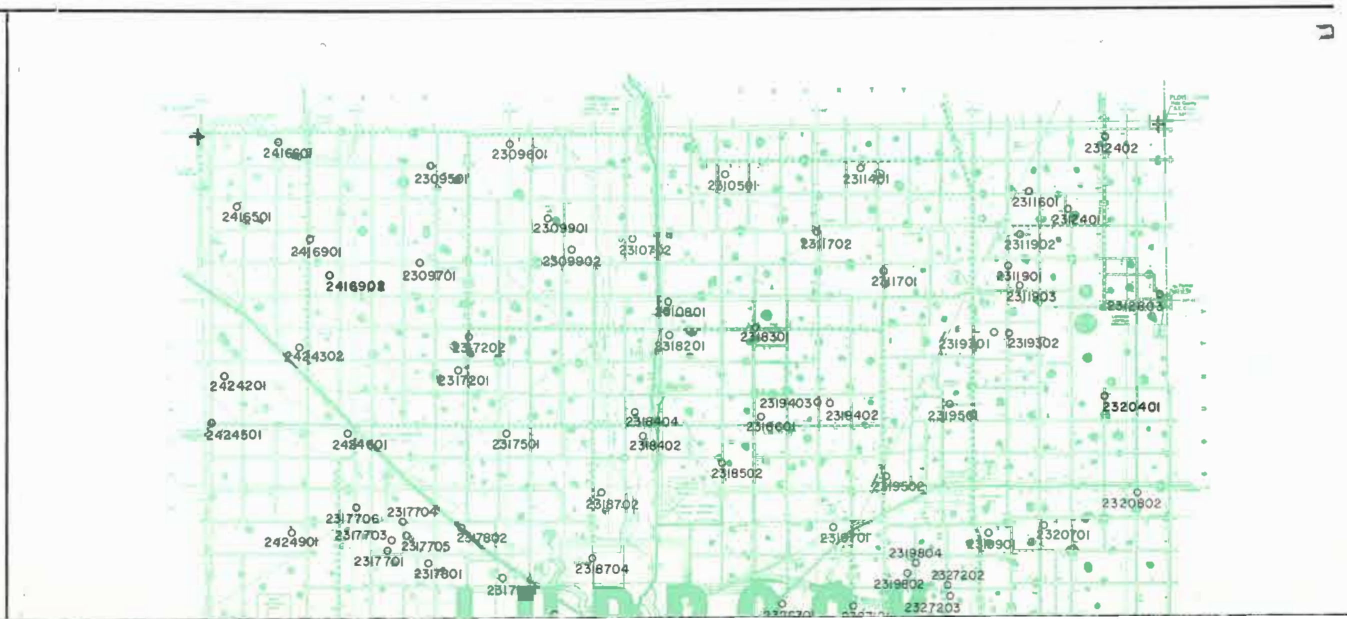




DEAF SMITH COUNTY

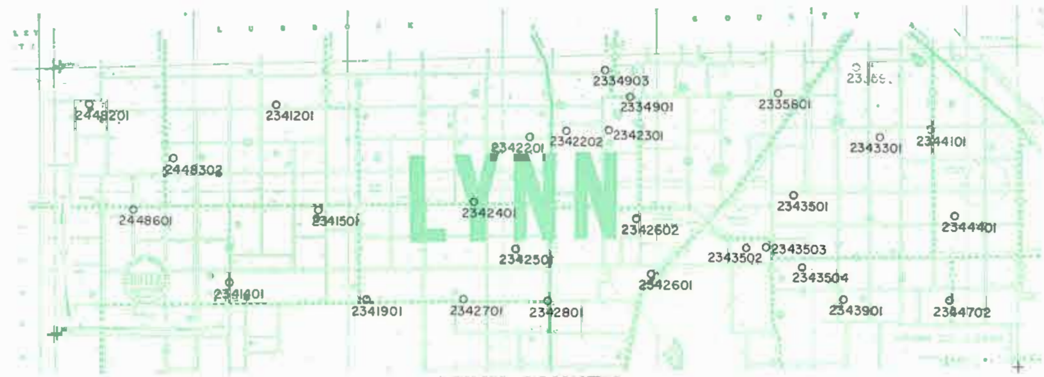
Well No.	1960	1964	1965	Decline 60-65	Decline 64-65
07 53 701	-------	215.03	-------	-------	-------
07 53 901	-------	201.12	202.75	-------	1.63
07 55 701	-------	183.14	181.89	-------	+1.25
07 58 801	246.77	246.77	246.49	+0.28	+0.28
07 59 301	-------	295.55	297.59	-------	2.04
07 59 601	-------	297.24	-------	-------	-------
07 59 801	247.24	254.45	260.42	13.18	5.97
07 60 201	-------	260.00	266.37	-------	6.37
07 60 301	-------	233.53	240.17	-------	6.64
07 60 401	-------	293.86	-------	-------	-------
07 60 501	-------	218.22	228.11	-------	9.89
07 60 901	-------	196.36	197.25	-------	0.89
07 61 101	190.25	199.84	-------	-------	-------
07 61 201	182.10	205.48	202.99	20.89	+2.49
07 61 301	-------	-------	191.79	-------	-------
07 61 501	-------	168.93	178.49	-------	9.56
07 61 601	-------	163.61	167.04	-------	3.43
07 61 801		163.87	167.45	-------	3.58
07 61 901	137.57	144.40	-------	-------	-------
07 62 101	-------	173.67	187.15	-------	8.48
07 62 301	159.93	164.63	171.70	11.77	7.07
07 62 501	-------	138.76	147.80	-------	9.04
07 62 601	-------	142.36	148.03	-------	5.67
07 63 201	134.59	155.33	161.59	27.00	6.26
07 63 701	125.55	135.18	148.89	23.34	13.71
10 03 101	-------	291.54	-------	-------	-------
10 03 701	-------	226.81	220.31	-------	+6.50
10 03 901	-------	218.37	223.28	-------	4.91
10 04 101	-------	283.27	285.15	-------	1.88
10 04 201	-------	241.28	-------	-------	-------
10 04 301	-------	235.52	239.81	-------	4.29
11 04 501	211.22	-------	230.89	19.76	-------
10 04 601	-------	199.78	207.63	-------	7.85
10 04 902	-------	159.81	165.02	-------	5.21
10 05 301	-------	138.91	148.16	-------	9.25
10 05 501	133.08	145.96	157.56	24.48	11.60
10 05 601	-------	120.76	127.69	-------	6.93
10 05 802	-------	130.53	135.62	-------	5.09
10 05 903	-------	132.52	140.45	-------	7.93
10 06 201	-------	126.32	138.71	-------	12.39
10 06 301	123.38	-------	-------	-------	-------
10 06 401	-------	132.41	141.38	-------	8.97
10 06 402	-------	135.71	-------	-------	-------
10 06 601	113.34	125.78	131.18	17.84	5.40
10 06 701	50.58	57.64	-------	-------	-------
10 06 801	65.88	73.03	-------		-------
10 06 901	98.83	109.60	114.18	15.35	4.58
10 07 402	108.16	119.07	124.89	16.73	5.82
10 07 403	92.78	103.80	111.65	18.87	7.85
10 07 701	93.04	100.84	-------	-------	-------
10 07 802	123.70	129.40	159.58	35.88	30.18
10 09 601	60.00	61.19	58.83	+1.17	+2.36
10 10 801	184.14	189.81	192.88	8.74	3.07
10 11 501	168.28	175.78	179.57	11.29	3.79
10 11 601	-------	-------	161.19	-------	-------
10 11 802	-------	170.58	175.61	-------	5.03
10 11 901	-------	180.87	-------	-------	-------
10 12 102	-------	143.96	154.78	-------	10.82
10 12 201	80.98	68.68	71.08	+9.90	2.40
10 12 301	122.85	139.75	133.48	10.63	+6.27
10 12 401	-------	153.15	163.55	-------	10.40
10 12 501	148.40	164.44	164.89	16.49	0.45
10 12 502	107.16	118.74	124.41	17.25	5.67
10 12 701	-------	125.89	130.15	-------	4.26
10 12 901	109.00	-------	121.95	12.95	-------
10 12 902	143.83	154.30	158.15	14.32	3.85
10 13 101	128.99	140.61	148.12	19.13	7.51
10 13 302	-------	108.06	121.82	-------	13.76
10 13 304	111.26	125.15	130.29	19.03	5.14
10 13 401	-------	124.30	-------	-------	-------
10 13 502	130.34	138.36	143.73	13.39	5.37
10 13 802	101.80	-------	-------	-------	-------
10 13 901	104.18	126.25	128.36	24.18	2.11
10 13 902	119.95	-------	138.38	18.43	-------
10 13 903	119.69	130.82	140.55	20.86	9.73
10 14 101	68.72	78.35	-------	-------	-------
10 14 201	69.42	-------	-------	-------	-------
10 14 301	70.86	74.89	-------	-------	-------
10 14 403	97.30	99.50	103.20	5.90	3.70
10 14 701	-------	148.08	160.20	-------	12.12
10 14 702	135.60	149.43	166.08	30.48	16.65
10 14 801	118.07	130.46	133.40	15.33	2.94
10 14 901	100.33	104.41	-------	-------	-------
10 21 201	-------	159.28	-------	-------	-------
Number of Wells				31	59
Average Decline Per Well				15.88	5.93
Average Decline Per Year Per Well				3.18	5.93





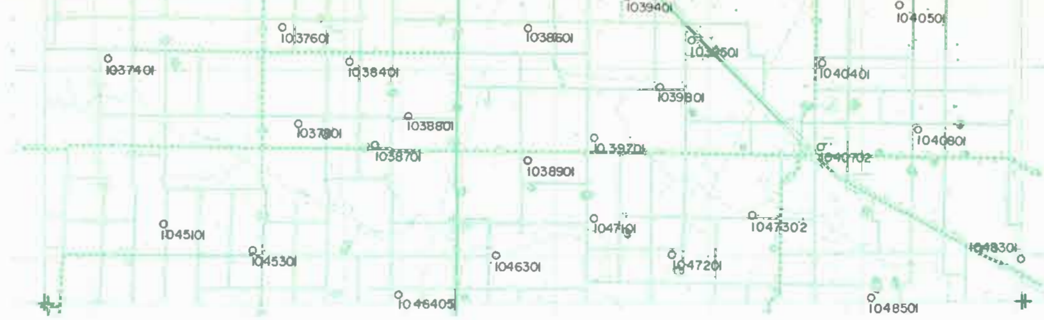
PARMER COUNTY

Well No.	1960	1964	1965	Decline 60-65	Decline 64-65
09 24 601	279.71	—	302.01	22.30	—
09 32 301	304.90	—	—	—	—
09 32 901	—	246.54	249.35	—	2.81
09 40 901	221.10	234.74	234.36	13.26	+0.38
09 40 902	195.73	205.97	209.72	13.99	3.75
09 40 903	202.90	213.25	223.29	20.39	10.04
09 48 301	—	204.95	206.08	—	1.13
10 17 301	—	191.00	188.64	—	+2.36
10 17 401	238.34	256.90	255.74	17.40	+1.16
10 17 501	225.77	240.70	244.23	18.46	3.53
10 18 501	—	—	271.20	—	—
10 18 701	203.46	216.32	220.86	17.40	4.54
10 18 901	203.60	220.16	215.65	12.05	+4.51
10 19 101	225.66	241.05	245.89	20.23	4.84
10 19 301	—	239.90	248.56	—	8.66
10 19 401	—	191.50	—	—	—
10 19 601	188.90	207.12	205.56	16.66	+1.56
10 20 401	180.00	196.36	202.15	22.15	5.79
10 20 502	142.05	153.11	159.42	17.37	6.31
10 20 801	141.32	157.10	167.75	26.43	10.65
10 25 101	—	—	304.22	—	—
10 25 301	270.35	279.87	283.61	13.26	3.74
10 25 501	—	—	164.22	—	—
10 25 701	206.90	223.56	231.93	25.03	8.37
10 26 101	284.50	299.99	—	—	—
10 26 301	261.90	275.32	280.01	18.11	4.69
10 26 701	180.60	186.30	187.66	7.06	1.36
10 26 801	—	198.05	206.80	—	8.75
10 27 101	220.60	236.59	244.46	23.86	7.87
10 27 301	245.83	263 55	267.30	21.47	3.75
10 27 401	237.40	251.83	257.44	20.04	5.61
10 27 501	—	295.37	301.55	—	6.81
10 27 901	207.05	218.80	223.13	16.08	4.33
10 28 201	—	245.82	239.52	—	+6.30
10 28 501	—	246.46	—	—	—
10 33 101	236.74	253.48	260.22	23.48	6.74
10 33 301	197.52	211.85	215.21	17.69	3.36
10 33 401	236.67	249.00	244.49	7.82	+4.51
10 33 601	236.25	248.82	253.69	17.44	4.87
10 33 801	190.99	220.20	—	—	—
10 33 802	162.66	177.66	182.13	19.47	4.47
10 33 901	160.83	175.02	179.08	18.25	4.06
10 34 301	179.30	186.20	189.48	10.18	3.28
10 34 401	229.21	244.83	248.73	19.52	3.90
10 34 801	170.27	183.77	188.49	18.22	4.72
10 34 802	195.15	206.46	211.81	16.66	5.35
10 35 304	—	181.75	186.55	—	4.80
10 35 401	200.54	—	—	—	—
10 35 501	189.84	—	—	—	—
10 35 601	168.47	177.05	182.32	13.85	5.27
10 35 701	179.99	194.51	195.13	15.14	0.62
10 35 901	192.10	214.18	215.92	23.82	1.74
10 35 902	190.31	—	—	—	—
10 36 101	167.92	177.06	178.02	10.10	0.96
10 36 601	—	164.25	169.26	—	5.01
10 36 801	152.30	165.51	167.54	15.24	2.03
10 41 201	—	—	143.21	—	—
10 41 202	119.30	130.44	133.95	14.65	3.51
10 42 101	135.35	146.43	148.24	12.89	1.81
10 42 202	—	174.23	177.05	—	2.82
10 42 501	122.14	130.20	—	—	—
10 43 201	161.78	180.30	178.98	17.20	+1.32
10 44 101	—	152.60	157.14	—	4.54
10 44 201	158.03	175.20	—	—	—
Number Of Wells				38	50
Average Decline Per Well				17.16	3.64
Ave. Decline Per Yr Per Well				3.43	3.64



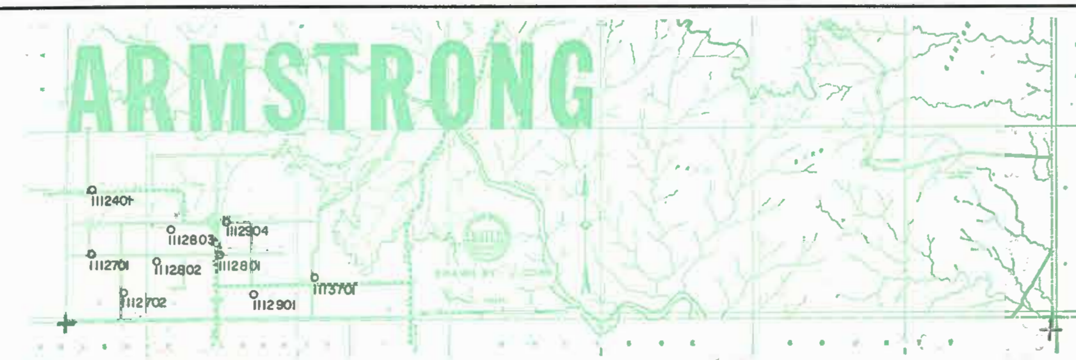
LYNN COUNTY

Well No.	1960	1964	1965	Decline 60-65	Decline 64-65
23 34 901	122.23	123.93	128.28	6.05	4.35
23 34 903	134.60	137.57	140.38	5.78	2.81
23 35 801	81.40	82.64	91.88	10.48	9.24
23 35 901	86.57	89.95	97.40	10.83	7.45
23 41 201	96.06	96.79	102.88	6.82	6.09
23 41 401	86.47	88.17	88.94	2.47	0.77
23 41 501	70.68	66.76	70.20	+0.48	3.44
23 41 901	121.86	123.08	125.67	3.81	2.59
23 42 201	125.96	127.64	—	—	—
23 42 202	119.94	120.43	122.01	2.07	1.58
23 42 301	104.30	98.08	101.32	+2.98	3.24
23 42 401	109.24	111.01	112.50	3.26	1.49
23 42 501	—	92.06	—	—	—
23 42 601	46.88	43.11	49.38	2.50	6.27
23 42 602	79.05	80.71	83.69	4.64	2.98
23 42 701	—	89.11	—	—	—
23 42 801	67.50	73.08	65.11	+2.39	+7.97
23 43 301	34.38	25.24	28.32	+6.06	3.08
23 43 501	—	70.41	76.77	—	6.36
23 43 502	75.48	74.92	76.74	1.26	1.82
23 43 503	—	84.65	84.40	—	+0.25
23 43 504	79.42	77.54	78.26	+1.16	0.72
23 43 901	65.50	65.21	65.14	+0.36	+0.07
23 44 101	64.40	58.38	69.79	5.39	11.41
23 44 401	61.53	54.38	61.35	+0.18	6.97
23 44 702	39.30	40.83	39.19	+0.11	+1.64
24 48 201	92.07	9425	98.24	6.17	3.99
24 48 302	105.20	102.51	108.55	3.35	6.04
24 48 601	87.65	86.55	89.84	2.19	3.29
Number Of Wells				24	26
Average Decline Per Well				2.64	3.31
Ave. Decline Per Yr Per Well				0.53	3.31



CASTRO COUNTY

Well No.	1960	1964	1965	Decline 60-65	Decline 64-65
10 21 401	—	119.42	121.00	—	1.58
10 21 501	—	118.68	122.62	—	3.94
10 21 601	117.28	146.06	137.80	20.52	+8.26
10 21 701	159.03	178.79	184.26	25.23	5.47
10 21 801	—	155.22	159.49	—	4.27
10 21 901	—	131.73	136.44	—	4.71
10 22 101	—	144.12	151.64	—	7.52
10 22 201	—	146.73	—	—	—
10 22 301	—	109.74	112.42	—	2.68
10 22 401	102.47	111.58	117.76	15.29	6.18
10 22 501	106.24	118.48	—	—	—
10 22 601	93.85	93.61	—	—	—
10 22 801	—	127.24	133.68	—	6.44
10 22 901	124.15	—	136.30	12.15	—
10 23 701	96.54	114.24	122.79	26.25	8.55
10 23 801	149.92	148.44	148.55	+1.37	0.11
10 24 201	—	170.04	173.68	—	3.64
10 24 401	175.59	180.16	181.17	5.58	1.01
10 24 601	—	172.80	169.50	—	+3.30
10 24 701	—	—	175.24	—	—
10 24 801	160.77	—	—	—	—
10 28 301	—	246.85	252.26	—	5.41
10 29 302	—	221.58	226.78	—	5.20
10 29 601	191.08	201.25	211.75	20.67	10.50
10 29 701	198.73	220.80	227.64	28.91	6.84
10 29 901	174.07	—	199.60	25.53	—
10 30 101	—	191.34	202.05	—	10.71
10 30 201	—	198.24	204.08	—	5.84
10 30 401	—	—	220.82	—	—
10 30 505	—	199.37	202.68	—	3.31
10 30 601	178.62	191.00	197.38	18.76	6.38
10 30 801	—	180.92	184.39	—	3.47
10 30 901	—	198.70	—	—	—
10 31 201	—	148.89	153.31	—	4.42
10 31 301	—	166.79	172.70	—	5.91
10 31 501	—	191.93	190.42	—	+1.51
10 31 601	—	139.14	142.61	—	3.47
10 31 701	198.34	—	—	—	—
10 31 801	191.96	—	—	—	—
10 32 201	—	149.97	152.32	—	2.35
10 32 501	—	129.20	129.52	—	0.32
10 32 701	175.25	185.90	192.00	16.75	6.10
10 32 801	—	176.42	—	—	—
10 37 201	150.30	—	—	—	—
10 37 401	—	135.55	139.63	—	4.08
10 37 601	113.88	124.13	120.72	6.84	+3.41
10 37 901	—	122.96	130.94	—	7.98
10 38 401	122.92	128.76	—	—	—
10 38 601	—	128.90	130.80	—	1.90
10 38 701	120.20	130.75	133.99	13.79	3.24
10 38 801	126.56	133.20	135.79	9.23	2.59
10 38 901	114.29	123.95	123.51	9.22	+0.44
10 39 101	—	161.12	167.22	—	6.10
10 39 401	—	146.42	147.05	—	0.63
10 39 501	—	141.90	145.78	—	3.88
10 39 701	—	123.83	128.42	—	4.59
10 39 801	—	138.42	136.13	—	+2.29
10 40 401	131.60	152.75	157.93	26.33	5.18
10 40 501	—	189.31	194.45	—	5.14
10 40 702	127.82	148.92	152.98	25.16	4.06
10 40 801	145.98	163.14	160.61	14.63	+2.53
10 45 101	136.97	141.98	—	—	—
10 45 301	138.24	147.12	151.49	13.25	4.37
10 46 301	50.22	60.50	63.61	13.39	3.11
10 46 405	133.25	147.02	147.27	14.02	0.25
10 47 101	—	112.24	116.05	—	3.81
10 47 201	—	145.45	152.77	—	7.32
10 47 302	—	131.26	—	—	—
10 48 501	110.97	120.64	127.89	16.92	7.25
10 48 301	106.48	129.20	134.39	27.91	5.19
Number Of Wells				24	54
Average Decline Per Well				16.87	3.61
Ave. Decline Per Yr Per Well				3.37	3.61



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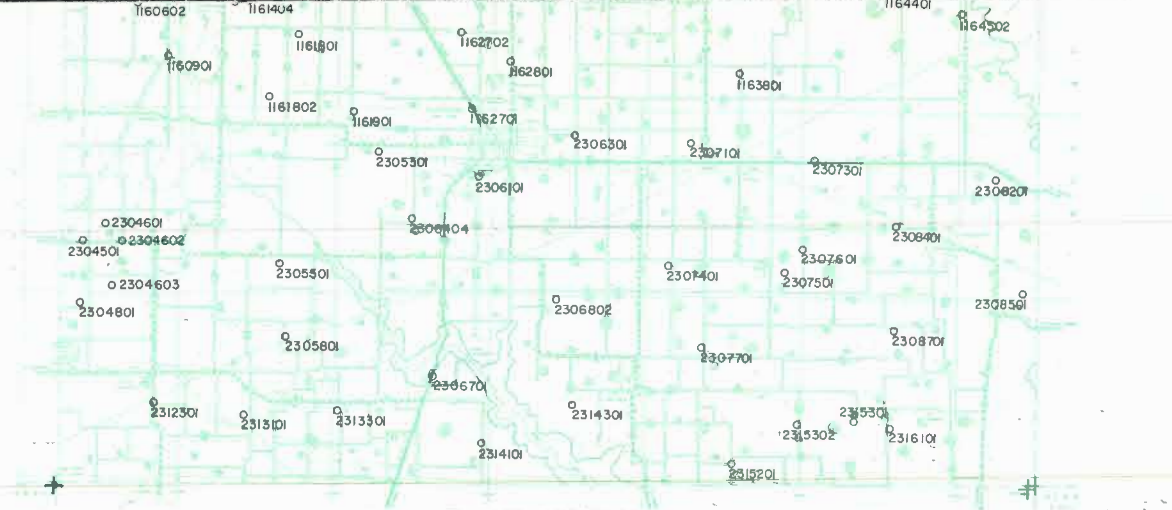
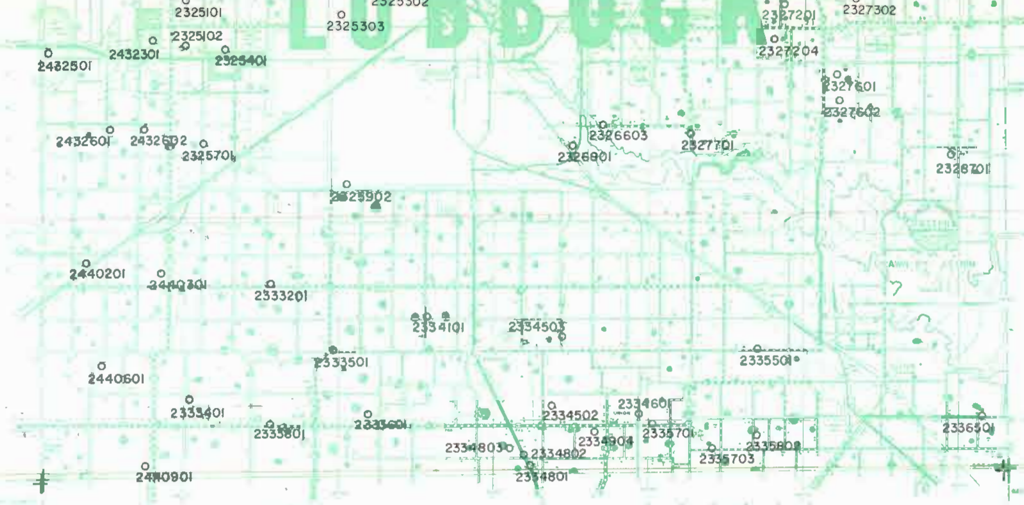
HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT

MARCH 1965

ARMSTRONG COUNTY

Well No.	1960	1964	1965	Decline 60-65	Decline 64-65
11 12 401	106.90	109.72	110.64	3.74	0.92
11 12 701	111.85	118.66	124.74	12.89	6.08
11 12 702	—	128.76	130.12	—	1.36
11 12 801	118.63	124.14	128.10	9.47	3.96
11 12 802	121.84	—	135.07	13.23	—
11 12 803	107.71	112.50	114.83	7.12	2.33
11 12 901	110.04	111.93	114.84	4.80	2.91
11 12 904	100.08	102.38	102.90	2.82	0.52
11 13 701	96.04	100.90	104.53	8.49	3.63
Number Of Wells				8	8
Average Decline Per Well				7.82	2.71
Ave. Decline Per Yr Per Well				1.56	2.71

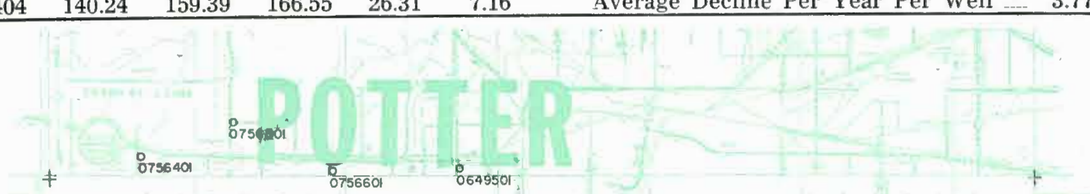




FLOYD COUNTY

Well No.	1960	1964	1965	Decline 60-65	Decline 64-65
11 44 901	98.30	109.44	115.12	16.82	5.68
11 44 902	91.80	106.73	109.63	17.83	2.90
11 45 802	124.15	133.19	147.08	22.93	13.89
11 45 803	128.60	137.42	143.08	14.48	5.66
11 45 902	139.90	158.09	152.98	13.08	+5.11
11 46 701	------	161.81	172.19	------	10.38
11 46 801	------	212.84	215.19	------	2.35
11 47 701	------	220.52	214.89	------	+5.63
11 52 301	105.88	118.48	118.48	12.60	0.00
11 52 302	110.56	125.11	------	------	------
11 52 303	135.29	151.97	157.18	21.89	5.21
11 52 304	------	138.17	145.38	------	7.21
11 52 601	132.73	143.52	147.21	14.48	3.69
11 52 603	131.50	144.89	149.15	17.65	4.26
11 52 604	115.10	------	142.05	26.95	------
11 52 801	------	137.52	140.41	------	2.89
11 52 901	144.23	154.53	156.00	11.77	1.47
11 52 902	------	149.43	150.48	------	1.05
11 52 903	140.75	149.22	152.15	11.40	2.93
11 52 905	143.63	151.83	154.80	11.17	2.97
11 53 101	125.90	148.41	149.85	23.95	1.44
11 53 201	126.65	134.33	138.97	12.32	4.64
11 53 202	120.28	136.27	136.67	16.39	0.40
11 53 203	129.65	139.36	138.98	9.33	+0.38
11 53 402	------	149.51	------	------	------
11 53 501	154.46	167.43	174.26	19.80	6.83
11 53 701	142.38	152.60	155.23	12.85	2.63
11 53 702	131.49	141.85	147.40	15.91	5.55
11 53 703	140.65	148.82	150.33	9.68	1.51
11 53 704	152.60	157.83	------	------	------
11 54 301	209.24	223.87	233.58	24.34	9.71
11 54 401	------	168.26	169.88	------	1.62
11 54 901	------	210.88	213.92	------	3.04
11 55 701	------	220.57	224.83	------	4.26
11 55 901	------	267.15	269.09	------	1.94
11 60 301	129.98	138.22	142.02	12.04	3.80
11 60 302	135.65	144.46	147.87	12.22	3.41
11 60 303	133.55	142.04	146.51	12.96	4.47
11 60 501	117.80	128.31	134.08	16.28	5.77
11 60 601	132.52	143.33	149.02	16.50	5.69
11 60 602	133.63	138.87	141.23	7.60	2.36
11 60 901	116.25	127.70	135.74	19.49	8.04
11 61 101	144.29	157.36	158.02	13.73	0.66
11 61 102	148.99	160.17	163.72	14.73	3.55
11 61 104	144.60	145.36	150.34	5.74	4.98
11 61 105	139.03	151.90	156.49	17.46	4.59
11 61 203	153.45	167.73	172.99	19.54	5.26
11 61 204	146.20	160.03	166.42	20.22	6.39
11 61 301	38.75	39.31	41.33	2.58	2.02
11 61 401	140.95	159.63	166.34	25.39	6.71
11 61 403	133.19	153.61	160.91	27.72	7.30
11 61 404	140.24	159.39	166.55	26.31	7.16
11 61 601	42.07	------	------	------	------
11 61 801	148.49	170.96	181.49	33.00	10.53
11 61 802	137.12	160.57	161.76	24.64	1.19
11 61 901	139.58	161.93	173.82	34.24	11.89
11 62 201	------	135.73	138.07	------	2.34
11 62 401	------	------	61.11	------	------
11 62 601	------	147.89	148.27	------	0.38
11 62 701	115.00	117.44	118.39	3.39	0.95
11 62 702	------	95.39	97.09	------	1.70
11 62 801	------	92.08	94.34	------	2.26
11 63 101	------	157.06	158.28	------	1.22
11 63 801	------	194.96	198.64	------	3.68
11 64 101	------	217.49	221.36	------	3.87
11 64 401	------	236.16	236.51	------	0.35
11 64 502	------	263.78	265.96	------	0.18
23 04 501	138.93	158.61	165.23	26.30	6.62
23 04 601	134.17	150.74	156.68	22.51	5.94
23 04 602	145.66	158.61	163.69	18.03	5.08
23 04 603	138.98	161.69	168.85	29.87	7.16
23 04 801	106.95	143.45	150.90	43.95	7.45
23 05 301	150.79	164.86	175.12	24.33	10.26
23 05 501	------	185.03	193.68	------	8.65
23 05 801	173.85	------	202.93	29.08	------
23 06 101	146.14	152.96	155.41	9.27	2.45
23 06 301	152.58	159.02	157.62	5.04	+1.40
23 06 404	168.93	181.91	193.21	24.28	11.30
23 06 701	178.70	------	199.40	20.70	------
23 06 802	180.15	196.40	205.16	25.01	8.76
23 07 101	------	208.99	------	------	------
23 07 301	------	222.58	224.53	------	1.95
23 07 401	------	231.71	248.43	------	16.72
23 07 501	239.36	267.88	278.00	38.64	10.12
23 07 601	237.22	259.16	266.38	29.16	7.22
23 07 701	------	195.64	196.53	------	0.89
23 08 201	------	263.61	264.01	------	0.40
23 08 401	------	263.64	270.67	------	7.03
23 08 501	------	252.57	254.42	------	1.85
23 08 701	------	264.80	270.51	------	5.71
23 12 301	133.21	154.36	167.78	34.57	13.42
23 13 101	------	163.39	171.31	------	7.92
23 13 301	------	179.02	192.27	------	13.25
23 14 101	------	198.96	222.25	------	23.29
23 14 301	------	194.73	208.89	------	14.16
23 15 201	------	246.17	------	------	------
23 15 301	270.85	266.13	270.54	+0.31	4.41
23 15 302	252.25	262.87	277.22	24.97	14.35
23 16 101	259.10	271.98	278.94	19.84	6.96

Number of Wells	61	89
Average Decline Per Well	18.83	5.05
Average Decline Per Year Per Well	3.77	5.05



POTTER COUNTY

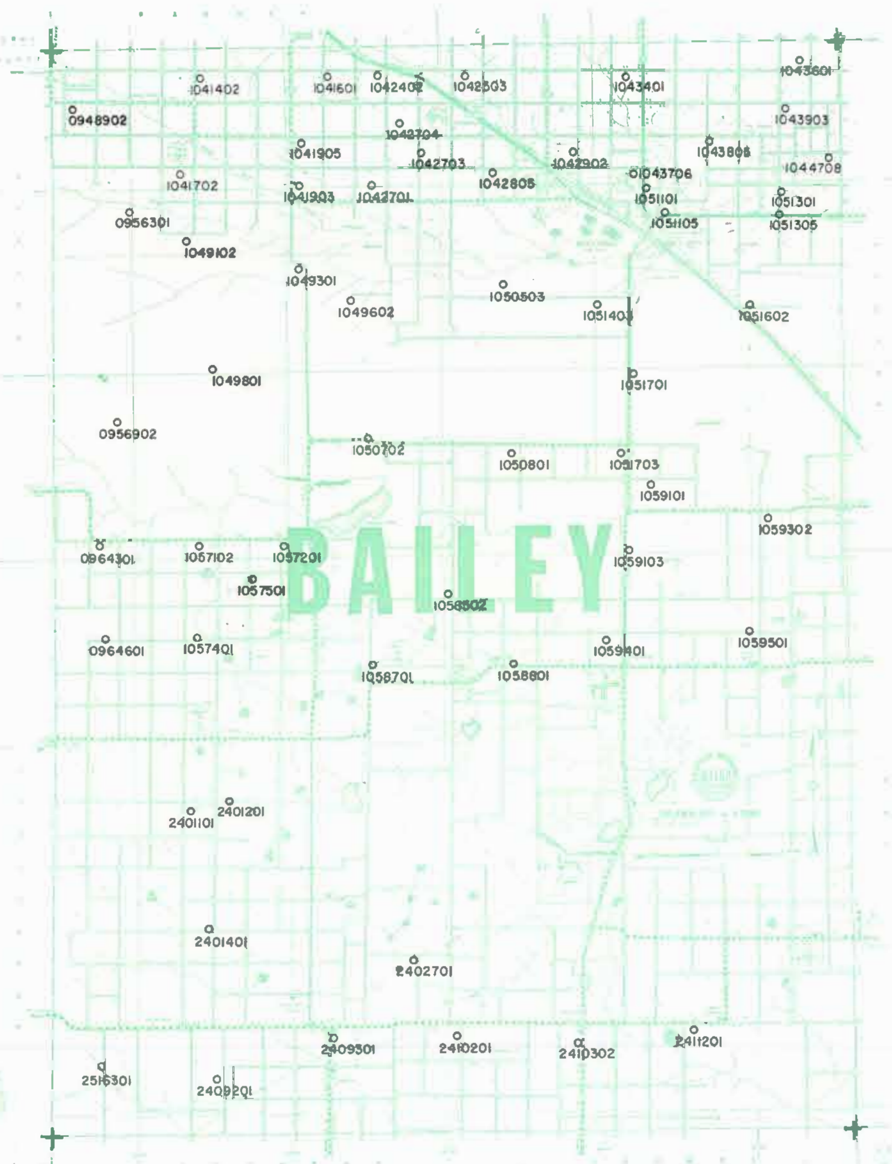
Well No.	1960	1964	1965	Decline 60-65	Decline 64-65
06 49 501	------	178.96	183.55	------	4.59
07 56 401	------	210.88	216.82	------	5.94
07 56 501	------	204.18	213.42	------	9.24
07 56 601	------	192.31	196.47	------	4.16

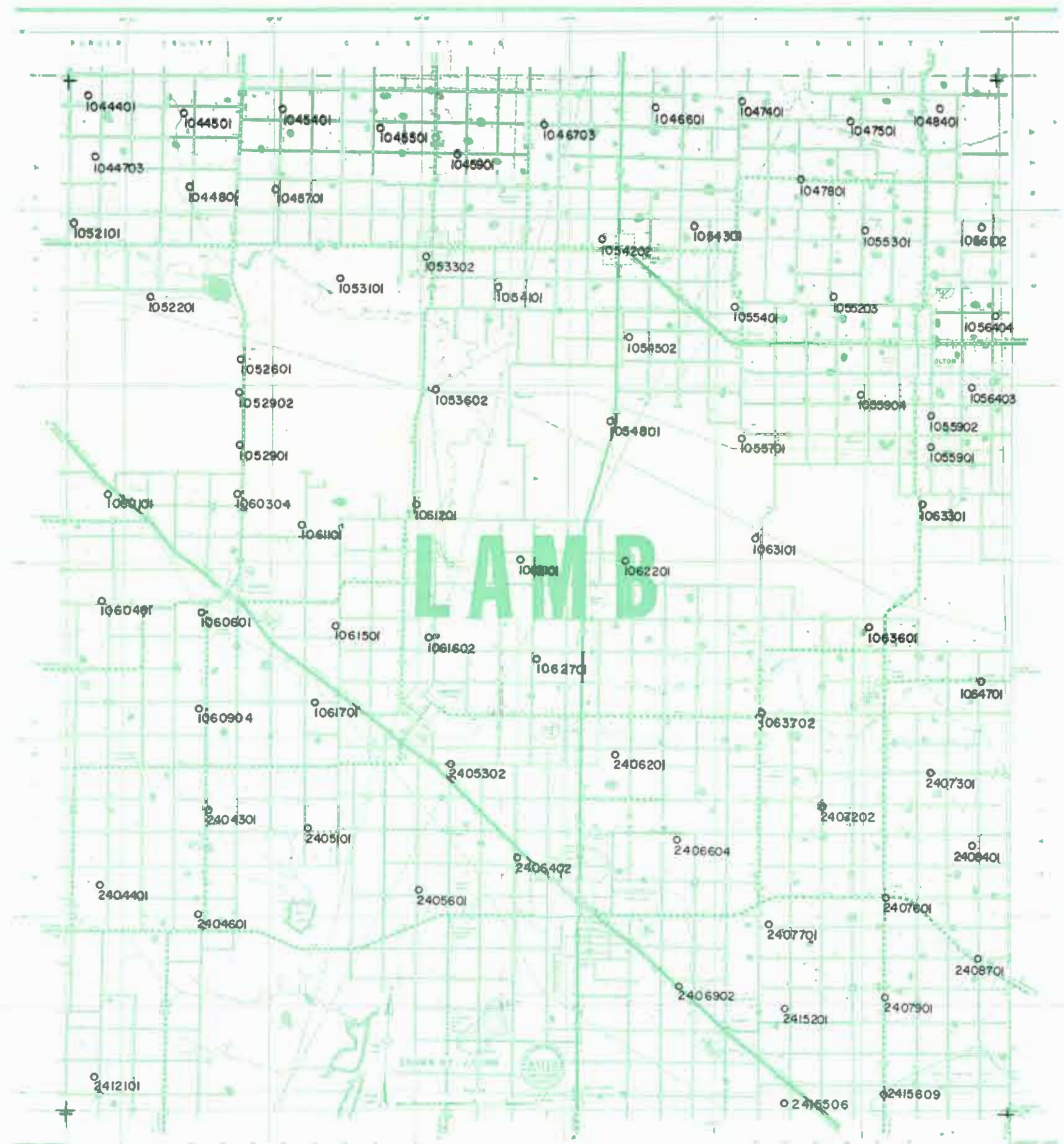
Number of Wells	0	4
Average Decline per Well		5.98
Average Decline Per Year Per Well		5.98

LUBBOCK COUNTY

Well No.	1960	1964	1965	Decline 60-65	Decline 64-65
23 09 501	140.90	147.31	151.62	10.72	4.31
23 09 601	120.69	131.81	137.85	17.16	6.04
23 09 701	------	140.77	144.28	------	3.51
23 09 901	162.77	172.17	180.43	17.66	8.26
23 09 902	------	150.01	------	------	------
23 10 501	156.56	167.03	173.19	16.63	6.16
23 10 702	------	153.81	------	------	------
23 10 801	142.71	152.74	154.74	12.03	2.00
23 11 401	149.55	159.94	168.71	19.16	8.77
23 11 601	144.40	152.51	158.35	13.95	5.84
23 11 701	143.76	157.17	162.73	18.97	5.56
23 11 702	140.87	150.98	158.03	17.16	7.05
23 11 901	124.45	136.21	------	------	------
23 11 902	143.35	147.98	151.35	8.00	3.37
23 11 903	123.77	137.72	146.73	22.96	9.01
23 12 401	147.57	156.23	166.15	18.58	9.92
23 12 402	147.88	157.57	161.29	13.41	3.72
23 12 803	134.62	146.80	153.00	18.38	6.20
23 17 201	126.03	133.07	141.24	15.21	8.17
23 17 202	------	132.25	------	------	------
23 17 501	116.05	118.11	118.61	2.56	0.50
23 17 701	95.00	99.87	106.17	11.17	6.30
23 17 703	86.65	89.07	------	------	------
23 17 704	70.35	71.70	73.26	2.91	1.56
23 17 705	78.23	82.83	86.40	8.17	3.57
23 17 706	80.30	88.02	91.34	11.04	3.32
23 17 801	75.81	77.94	------	------	------
23 17 802	56.23	57.32	54.08	+2.15	3.24
23 17 901	75.20	79.81	86.24	11.04	6.43
23 18 201	127.69	138.27	142.42	14.73	4.15
23 18 301	142.22	155.50	164.88	22.66	9.38
23 18 402	112.05	121.52	126.27	14.22	4.75
23 18 404	121.20	125.27	130.12	8.92	4.85
23 18 502	------	110.83	114.93	------	4.10
23 18 601	118.22	129.47	------	------	------
23 18 702	73.49	80.58	------	------	------
23 18 704	77.75	81.00	82.62	4.87	1.62
23 19 301	145.74	161.27	172.28	26.54	11.01
23 19 302	144.17	164.74	------	------	------
23 19 402	124.44	140.28	140.38	15.94	0.10
23 19 403	125.57	------	145.14	19.57	------
23 19 501	134.83	144.88	------	------	------
23 19 502	107.06	121.63	------	------	------
23 19 701	75.48	82.74	86.08	10.60	3.34
23 19 802	------	85.26	89.60	------	4.34
23 19 804	------	81.84	87.18	------	5.34
23 19 901	108.74	125.74	136.33	27.59	10.59
23 20 401	134.38	152.11	159.75	25.37	7.64
23 20 701	122.88	142.42	------	------	------
23 20 802	127.10	160.22	164.69	37.59	4.47
23 25 101	133.00	142.41	138.88	5.88	+3.53
23 25 102	129.94	138.26	137.79	7.85	+0.47
23 25 302	76.88	74.12	------	------	------
23 25 303	76.38	81.55	82.79	6.41	1.24
23 25 401	129.47	134.90	------	------	------
23 25 701	109.69	116.47	122.12	12.43	5.65
23 25 902	105.62	108.33	------	------	------
23 26 301	90.43	92.20	------	------	------
23 26 603	23.18	8.00	16.30	+6.88	8.30
23 26 901	52.23	50.56	------	------	------
23 27 101	93.10	93.52	93.64	0.54	0.12
23 27 201	80.45	85.03	92.52	12.07	7.49
23 27 202	74.89	78.30	------	------	------
23 27 203	76.87	80.02	83.10	6.23	3.08
23 27 204	85.88	81.42	80.64	+5.24	+0.78
23 27 302	69.66	73.14	76.52	6.86	3.38
23 27 601	76.42	81.48	81.83	5.41	0.35
23 27 602	85.70	93.82	98.41	12.71	4.59
23 27 701	------	96.93	96.38	------	+0.55
23 28 701	61.87	63.14	66.27	4.40	3.13
23 33 201	122.95	------	130.74	7.79	------
23 33 401	100.30	102.32	104.00	3.70	1.68
23 33 501	99.51	108.82	109.73	10.22	0.91
23 33 601	100.93	106.08	106.68	5.75	0.60
23 33 801	95.43	96.21	98.15	2.72	1.94
23 34 101	110.79	113.58	114.59	3.80	1.01
23 34 502	126.24	126.55	138.32	12.08	11.77
23 34 503	108.92	114.59	116.61	7.69	2.02
23 34 601	112.41	114.68	118.05	5.64	3.37
23 34 801	129.20	135.41	137.90	8.70	2.49
23 34 802	126.03	131.40	131.41	5.38	0.01
23 34 803	124.80	131.16	129.71	4.91	+1.45
23 34 904	------	126.31	122.77	+3.54	
23 35 501		88.01	90.66	2.65	
23 35 701	115.54	123.22	133.54	18.00	10.32
23 35 703	116.74	117.80	121.77	5.03	3.97
23 35 802	103.68	106.97	108.48	4.80	1.51
23 36 501	186.97	197.82	183.06	+3.91	+14.76
24 16 501	106.93	112.47	113.75	6.82	1.28
24 16 601	115.22	122.82	128.07	12.85	5.25
24 16 901	161.45	163.92	166.03	4.58	2.11
24 16 902	141.08	150.01	150.45	9.37	0.44
24 24 201	59.70	63.11	71.09	11.39	7.98
24 24 302	127.05	133.79	143.50	16.45	9.71
24 24 501	110.45	122.33	131.66	21.21	9.33
24 24 601	68.94	74.28	78.51	9.57	4.23
24 24 901	126.65	134.58	151.64	24.99	17.06
24 32 301	126.10	135.07	139.22	13.12	4.15
24 32 501	112.55	119.05	127.14	14.59	8.09
24 32 601	114.80	120.28	121.77	6.97	1.49
24 32 602	------	133.82	135.18	------	1.36
24 40 201	112.85	119.76	125.92	13.07	6.16
24 40 301	135.71	143.16	138.16	2.45	+5.00
24 40 601	110.60	118.08	120.93	10.33	2.85
24 40 901	67.04	66.62	------	------	------

Number Of Wells	80	82
Average Decline Per Well	10.64	4.02
Ave. Decline Per Yr Per Well	2.13	4.02





BAILEY COUNTY

Well No.	1960	1964	1965	Decline 60-65	Decline 64-65
09 48 902		117.15	121.90		4.75
09 56 301		62.06	64.39		2.33
09 56 902		39.64	38.97		+0.67
09 64 301		51.41	56.37		4.96
09 64 601		132.25	135.24		2.99
10 41 402	116.63	125.83	129.65	13.02	3.82
10 41 601	105.03	115.67	118.31	13.28	2.64
10 41 702	69.14	76.51	79.27	10.13	2.76
10 41 903	59.16	63.28	67.59	8.43	4.31
10 41 905	79.02	86.09	89.79	10.77	3.70
10 42 402	98.22	106.05	109.90	11.68	3.85
10 42 503	92.28	98.25	101.65	9.37	3.40
10 42 701	62.29	71.79	74.28	11.99	2.49
10 42 703	76.09	81.42	84.78	8.69	3.36
10 42 704	86.57	92.64	95.59	9.02	2.95
10 42 805	56.73	62.19	63.87	7.14	1.68
10 42 902	62.20	69.44	71.60	9.40	2.16
10 43 401	81.12	93.71	94.35	13.23	0.64
10 43 601		100.98	106.47		5.49
10 43 706	66.48	71.61	75.08	8.60	3.47
10 43 805	61.59	67.31	71.59	10.00	4.28
10 43 903		81.56	85.12		3.56
10 44 708	61.40	68.04	71.93	10.53	3.89
10 49 102			45.79		
10 49 301	25.31	26.98	28.09	2.78	1.11
10 49 602	38.18	40.37	45.84	7.66	5.47
10 49 801	73.46	74.47	74.79	1.33	0.32
10 50 503		37.68	42.87		5.19
10 50 702		82.94	84.52		1.58
10 50 801		73.52	72.74		+0.78
10 51 101	62.40	61.86	63.92	1.52	2.06
10 51 105	43.18	44.88	48.56	5.38	3.68
10 51 301		47.25	51.19		3.94
10 51 305	45.67	50.68	49.75	4.08	+0.93
10 51 403		28.67	28.66		+0.01
10 51 602	29.21	26.74	32.28	3.07	5.54
10 51 701			60.75		
10 51 703	74.05	78.36	83.48	9.43	5.12
10 57 102		77.87	77.32		+0.55
10 57 201		26.29	29.10		2.81
10 57 401		117.17	115.28		+1.89
10 57 501			35.73		
10 58 502		73.68	76.01		2.33
10 58 701		46.49	47.59		1.10
10 58 801		19.21	19.97		0.76
10 59 101	87.67	105.76	106.25	18.58	0.49
10 59 103			99.51		
10 59 302		106.31	106.66		0.35
10 59 401	101.56	106.99	109.48	7.92	2.49
10 59 501		102.39	101.74		+0.65
24 01 101	227.45	225.61	228.35	0.90	2.74
24 01 201		206.24	209.06		2.82
24 01 401		172.63			
24 02 701		59.34	59.82		0.48
24 09 201		144.04	149.66		5.62
24 09 301		89.23	89.86		0.63
24 10 201		103.19	107.40		4.21
24 10 302		90.52	87.93		+2.59
24 11 201		107.15	106.07		+1.08
25 16 301		119.32	122.33		3.01
Number of Wells				27	55
Average Decline Per Well				8.44	2.33
Average Decline Per Year Per Well				1.69	2.33

LAMB COUNTY

Well No.	1960	1964	1965	Decline 60-65	Decline 64-65
10 44 401	102.77	115.14	118.95	16.18	3.81
10 44 501		109.54	115.15		5.61
10 44 703	76.80	85.56	87.95	11.15	2.39
10 44 801	63.44	67.46	71.08	7.64	3.62
10 45 401		111.83	117.48		5.65
10 45 501		132.03	130.58		+1.45
10 45 701	69.61	75.79	78.15	8.54	2.36
10 45 901		132.22	137.77		5.55
10 46 601		149.29	154.24		4.95
10 46 703	131.72	143.45	148.45	16.73	5.00
10 47 401	115.66	125.33	129.52	13.86	4.19
10 47 501		119.68	124.78		5.10
10 47 801	138.45	150.61	154.72	16.27	4.11
10 48 401	120.98	130.15	135.72	14.74	5.57
10 52 101	58.20	60.92	65.62	7.42	4.70
10 52 201		37.03	37.69		0.66
10 52 601	26.61	29.31	30.01	3.40	0.70
10 52 901	55.80	62.06	62.62	6.82	0.56
10 52 902					
10 53 101		50.04	53,42		3.38
10 53 302	60.60	68.94	71.42	10.82	2.48
10 53 602	38.09				
10 54 101	71.43	75.18	78.81	7.38	3.63
10 54 202	105.97	114.19	118.35	12.38	4.16
10 54 301	126.25	138.41	144.07	17.82	5.66
10 54 502		87.61	90,72		3.11
10 54 801					
10 55 203		140.57	146.53		5.96
10 55 301	141.10	157.87	164.61	23.51	6.74
10 55 401		147.06	153,12		6.06
10 55 701		72.63	75,21		2.58
10 55 901	93.40	101.68	106.45	13.05	4.77
10 55 902	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10 60 601		101.66	101.32		+0.34
10 60 904		138.05	139.93		1.88
10 61 101		64.93			
10 61 201	46.17	50.89	53.89	7.72	3.00
10 61 501		106.14	112.92		6.78
10 61 602		90.18	91.19		1.01
10 61 701		106.23	110.51		4.28
10 62 101		47.75	50.02		2.27
10 62 201		92.79	96.22		3.43
10 62 701	107.07	112.93	119.38	12.31	6.40
10 63 101		64.62	78.18		13.56
10 63 301	83.23	86.61	89.78	6.55	3.17
10 63 601		101.39	103.52		2.13
10 63 702	121.25	124.28	127.96	6.71	3.68
10 64 701		105.79	110.52		4.73
24 04 301		53.94	57.48		3.54
24 04 401		164.86	179.18		14.32
24 04 601		65.16	67.86		2.70
24 05 101		37.49	39.01		1.52
24 05 302		98.64	99.87		1.23
24 05 601		89.81	94.31		4.50
24 06 201		117.79	125.15		7.36
24 06 402	81.66	84.36	85.91	4.25	1.55
24 06 604		110.01	112.98		2.97
24 06 902		85.18	92.29		7.11
24 07 202	130.70	140.98	144.18	13.48	3.20
24 07 301	114.40	118.39	122.34	7.94	3.95
24 07 601	137.10	138.04	139.12	2.02	1.08
24 07 701	120.44	127.87	130.68	10.24	2.81
24 07 901		102.63	106.87		4.24
24 08 401		137.53	145.02		7.49
24 08 701		114.98	120.18		5.20
[illegible]		[illegible]	[illegible]		[illegible]

A Thought For Everyone

Certain Brazilian shepherds once organized a party to go to California seeking gold, They took along a handful of translucent pebbles with which to play checkers on the voyage. After arriving in San Francisco, and after they had thrown most of the pebbles away, they discovered that they were diamonds. They hastened back to Brazil, only to find that the mines from which the pebbles were gathered had been sold to the government.

The majority of us have yet to learn that, "our grand business is not to see what lies dimly at a distance, but to do what lies clearly at hand." Men and women without number have sold farms and estates, and given up good positions and homes to go "somewhere else," because they were sure, if they could but change their present condition, they could succeed.

The richest gold and silver mine in Nevada was sold for forty-two dollars by the owner, to get money to pay his passage to other mines where he thought he could "strike it rich."

Thus the world has seen one man after another fail hopelslsy while in quest of success. On the other hand, by grasping opportunities where they exist, thousands have made fortunes out of trifles which others in the wild race for riches, had overlooked.

There is power and fortune lying latent everywhere about us, waiting for the eye that can see and for the mind that can utilize. We tread heedlessly upon the lids of great secrets of nature, easily discoverable to the observant eye and which would help all mankind along the upward path of civilization.

So it is with our natural resources such as water. We hold an unseen fortune in our hands. Thousands of dollars are thrown away each year through a waste of water. Doesn't this compair with the Brazilian shepherds?

Water leaders are working to conseive and develop water plans which might someday become a reality, but until our leaders seek and find this gold, "Let's be careful not to throw away or waste our diamonds."

Water Meeting Scheduled At Texas Tech April 26

The West Texas Water Institute at Texas Technological College in Lubbock has set the date af April 26th for a very informative water meeting.

Arrangements have been made for a presentation and explanation of the North American Water and Power Alliance water plan and other federal water legislation on plans that would affect West Texas.

NAWAPA is a master plan concept that proposes taking advantage of the geographical and climatogical factors of the North American continent in contrast to the single river basin plan. It would utilize the excess water of Alaska, the Northwest Territories. and the Rocky Mountain regions of Canada, and distribute it to the water-deficient areas of the Canadian Prairies, United States and Northern Mexico in sufficient quantities to assure adequate water supplies for the next one hundred years or more.

No area will have taken from it except that which is now, or in the foreseeable future, going to waste. Most of the water planned for NAWAPA now runs unused into the Pacific and Arctic Oceans. In return for its water, the supplying area could be compensated in power or some other tangible source of revenue.

The plan states that 56,000,000 acres of land could be irrigated and that thirty-three of the States in the U. S. would benefit directly from the plan.

Representatives of the company that conceived the NAWAPA plan will be present at the meeting to explain the detail and effects it would have on West Texas.

The plan, of course, is of a long range nature but it gives thought to what people of the Western States might be able to depend upon for a water supply in future years.

Gerald Thomas, Dean of Agriculture at Texas Technological College, said, "We are indeed pleased that we have been able to arrange this meeting. A future water supply for West Texas is a concern of everyone."

Several federal and state officials are planning to attend the meet. Representative Walter Rodgers and Senator Moss, two legislators vitally interested in conservation and reclamation, have made plans to attend this meeting and discuss federal legislation and proposals that will concern West Texas.

Several state officials have also indicated they plan to attend the meeting.

PLEASE CLOSE THOSE ABANDONED WELLS

THE Cross SECTION

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Editor

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Lubbock, Texas

Second Class Permit

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 11—No. 11 "THERE IS NO SUBSTITUTE FOR WATER" *April 1965*

Big Business In Lubbock Area

By Y. E. McADAMS

Irrigation is big business in the Lubbock area. When farmers irrigate their land, about one billion dollars is poured into the economy of 42 high plains counties.

They spend this money in the area for labor, pumps, pipe, sprinklers, motors, gates, valves, hoists, chains, water well casings, well drilling equipment, earth moving machinery such as motor graders, land levelers and scrapers, draglines, bulldozers and tractors. Also, gasoline, diesel oil, grease, motor oil, tires and many other machines, tools and material used to prepare the land for irrigation, to install and operate the irrigation equipment. Besides, irrigation makes it possible for farmers to grow certain crops that would not grow in the area without the water. This pumps more money into the economy of the area for manpower, material, and equipment to plant, cultivate, fertilize, harvest, haul,, and market these crops.

Farmers in the area using conservation irrigation systems efficiently apply water to their land, protect their soil from water erosion, and get the most from rainfall. In doing this, they avoid wasting water.

Wasting water is like wasting money. Because of inadequate rainfall water is of most importance to the people of the area—both urban and rural. While the potential supply of water remains constant, needs for human use multiply with growing population. Expanding industry and rising standards of living require more water per person.

Irrigation water is wasted several ways:

1. Applying water at the wrong time. This happens when the area irrigated is too big for the available water delivery rate. It takes so long to cover the area that the crop suffers from lack of moisture before it can be irrigated again. Irrigation water must be applied when crops can use it effectively or it is wasted.

2. Applying water unevenly to a field. This puts too much water on some parts of the field and not enough on other parts of the field.

3. Applying insufficient water to a field, resulting in shallow penetration and a high evaporation loss.

4. Applying too much water for the soil to soak up for storage in the crop root zone. Runoff water or "tailwater" results.

5. Putting on water so fast that the soil cannot absorb it, resulting in more tailwater loss.

If all the water put on the land soaked into the root zone, 100 percent "irrigation efficiency" would be attained. Such perfect irrigation, of course, is impossible because of evaporation, if for no other reason. But when measurements on the high plains show efficiencies as low as 15 percent this means 85 percent of the water is wasted and the cost of the water is increased in the same proportion. This is far too much loss.

But the best irrigation system does not guarantee the farmer an efficient use of water. The system must be used as planned for the crops being grown if the farmer is to realize maximum returns and economical use of his irrigation water. The system merely provides the irrigator with the tools to do a good job.

The cost of installing a conservation irrigation system will vary according to the soils, topography, and the type of system desired. and each type should be considered to best fit the local conditions and labor situation. A carefully planned and designed system can reduce water requirements as much as half when the water is used as planned for the crops being grown. Well managed systems have paid for their installation cost in as little as two years in water saved and increased efficiency.

There are two ways to irrigate—by surface flow and with sprinklers. For surface irrigation, farmers use level furrows, level borders, graded furrows and graded borders. Most of the row crops on the High Plains are irrigated by the graded furrow method or by sprinklers. A farmer must have more skill to irrigate with graded furrows than when using level furrows or sprinklers. Farmers using graded furrows must regulate the size of the water stream so the water will reach the lowest end of a furrow within a specified period of time equal to the speed of water intake by the soil. Otherwise, there will be tailwater runoff and an uneven distribution of water. The steeper the furrow-grade the harder it is to adjust the stream size. Grades down the furrows have to be planned so there will not be erosion from irrigation streams or from rainfall either. Run-off from irrigation water and rainfall will wash away soils and fertility.

With graded irrigation systems the steepest practical grade is established on the basis of an erosion loss of not more than five tons of soil per acre. Even this would be excessive loss on shallow soils. And the steeper the grade, the more rainfall runoff. This must be replaced with irrigation water.

The use of tailwater recovery systems are being studied by the High Plains Water District and the Soil Conservation Service to determine how such systems can be used to reduce the labor cost and skill needed to manage irrigation water. Sediment collecting at the recovery pump is a difficult problem. This sediment must be cut down. Therefore, a conservation irrigation system must be installed before a tailwater recovery system is installed.

Information and technical assistance are available through local Soil Conservation Districts — local offices of the Soil Conservation Service and the High Plains Water District. Cost share assistance may be obtained through the Great Plains Conservation Program, and the Agricultural Conservation Program.

So You're Going To Drill A Well

"I want to drill a well; what do I have to do?" These are familiar words in all the county offices of the High Plains Underground Water Conservation District. And if it doesn't rain, these words will likely be repeated more and more often.

The landowner or agent must file application with the High Plains Underground Water Conservation District before drilling a new well or replacing an old well. When selecting a well site, keep in mind the spacing requirements. Your site must be 400 yards, or more, from an existing irrigation well to drill an 8-inch well; 300 yards for a 6-inch; 250 yards for a 5-inch and 200 yards for a 3-inch or 4-inch well.

After selecting a location for the proposed well, distances to the nearest two non-parallel property lines—that is, north or south and east or west —must be measured. Also measure the distances from your site to the three nearest irrigation wells within a quarter-mile radius. Take these measurements, along with the legal description of your property to your local county office. Your county secretary will begin the processes necessary for drilling your well.

Without the above mentioned information, your county secretary will be unable to help you.

Many landowners ask why the measurements and information must be so exact. The answer is relatively simple. It offers the same protection to ALL of the people.

It is up to you to provide the Water District with exact information; then it is up to the Water District to do everything in its power to help you protect your investment.

RECREATION FEE ANNOUNCED BY SECRETARY OF THE INTERIOR

Secretary of the Interior Stewart L. Udall recently announced that $7 is the annual fee for the new Recreation/Conservation sticker which five million Americans are expected to buy this year as a bargain for vacations and outdoor holidays.

He has issued regulations, which are being published in the Federal Register, spelling out the sticker fee and other charges authorized by the Land and Water Conservation Fund Act of 1965. The regulations do not require any particular method of display but the stickers are intended for use on automobile bumpers. Secretary Udall pointed out that a sticker —which entitles the driver of a private noncommercial auto and all his passengers to admission to most designated Federal recreation areas for the year beginning April 1 — will mean in most cases a considerable saving in admission fees, particularly for the head of a family.

Secretary Udall added that the bargain sticker is optional, however, and single entry or weekly fees may be paid instead. All proceeds will be set aside in the Land and Water Conservation Fund. States and Federal agencies will share the revenues, subject to Congressional appropriation procedures.

In enacting the Fund Legislation, Congress did not specify the annual admission fee but limited it to a maximum of $7. Most of the areas it covers are administered by the National Park Service, Bureau of Land Management, Bureau of Sport Fisheries and Wildlife and Bureau of Reclamation, all in the Department of the Interior; the Forest Service, Department of Agriculture; Army Corps of Engineers; Tennessee Valley Authority, and the United States Section of the International Boundary and Water Commission (United States and Mexico.)

Areas where fees are charged must meet four conditions. They must (1) be administered by any of the above agencies; (2) be administered primarily for scenic, scientific, historical, cultural or recreational purposes; (3) have recreation facilities or services provided at Federal expense, and (4) be of such nature that fee collection is practical.

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BILL J WADDLE
Editor

Chemical Stimulation of Water Wells

By BRADFORD J. COTEY

EDITORS NOTE

Chemicals are certainly not a cure-all for all water wells. However, all studies made show that the additional flow obtained by chemical stimulation is always obtained at a much lower unit cost than the cost of obtaining the original flow. Many good wells have been made out of holes after all mechanical methods had failed. Many old wells have been restored to their original capacity or greater. Added capacity to wells gives a reserve for ememgencies or later expansion and prolongs the life of the well. Drilling contractors and service companies by having chemicals available are able to offer their customers a better and more complete service and have the assurance that the well is developed to its maximum capacity.

There are three main ingredients that go into making a good water well. The drilling, the pumping and the development. The first two are indispensible since an opening of some kind has to be made into the water bearing formation and some means has to be supplied for lifting the water to the surface even if it's only a bucket tied to the end of a rope.

Under drilling we can include all the various methods used: direct and reverse circulation rotary, cable tool, scow, driven points and even hand dug wells. Also, we can include running the casing, setting the screen, strainer or liner, cementing, underreaming, gravel packing and all other work done in connection with the construction of the hole.

Under pumping we can include all means of artificial lift, such as: deep well turbine, jet, rod, submersible, centrifugal and other pumps. We can also include air-lift and natural artesian flows.

The third ingredient — the development of the well is too often neglected. Many wells are drilled and a pump installed and whatever flow is obtained is accepted even though it may not be as much water as is needed or desired. Many times it is assumed that that is all the water the formation will give up. That probably is not true and the flow could be increased with proper development.

There are many mechanical methods used for developing water wells such as: Simply bailing the hole, pumping, backwashing or back lashing with the pump, surging with a surge block, explosives, jetting, surging with compressed air, fracturing and other methods used in an effort to open up the perforations and formation by force.

You will note that in all of these mechanical methods the force or pressure being applied is from the well bore out into the formation which is the same direction as the force was applied that put any plugging in place during the drilling operation.

The method being accepted more and more as the most effective way to open up the perforations and the water bearing formation to increase the flow is the use of properly designed chemical treatments.

A great many chemicals have been dumped in wells in an effort to clean up the hole. Various acids have been used, soaps, detergents similar to household cleaners, water softening chemicals, chelating agents, wetting agents, carbide and believe it or not —even Alka-Seltzer has been used.

There are several requirements that any chemical should meet if it is to be used for treating water wells. First, of course, it should be effective in dissolving, disintegrating and dispersing commercial drilling muds, clays and shales so that they can be easily bailed or pumped out. It should be capable of dissolving limestone and water deposited scales, corrosion products and organic growths. It should be relatively non-toxic and should not contaminate the water. It should, also, be safe to use on the mechanical equipment in the well. It should also be safe and easy to handle. From your standpoint, the contractor or well service company, it should be a service you can perform without any additional equipment. For big jobs there are service companies available in some areas to chemically treat water wells. However, in most cases the cost is too high to justify their use. Consequently many wells are not treated that really should be.

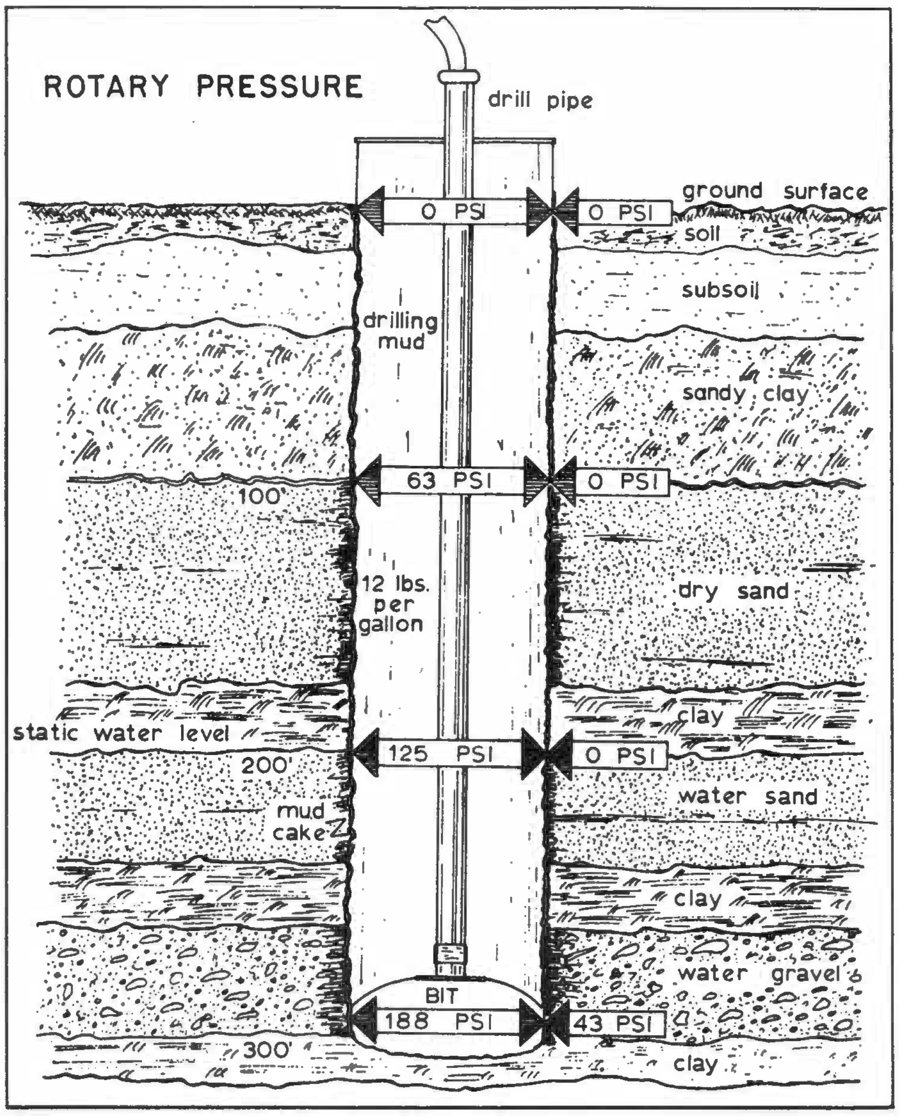
Looking at it again from the contractor's or well service company's point of view, it is now possible, with the chemicals that have been developed specifically for treating water wells, to include chemical treating along with your other services thus adding additional profit to the job and at the same time making a better well for your customer.

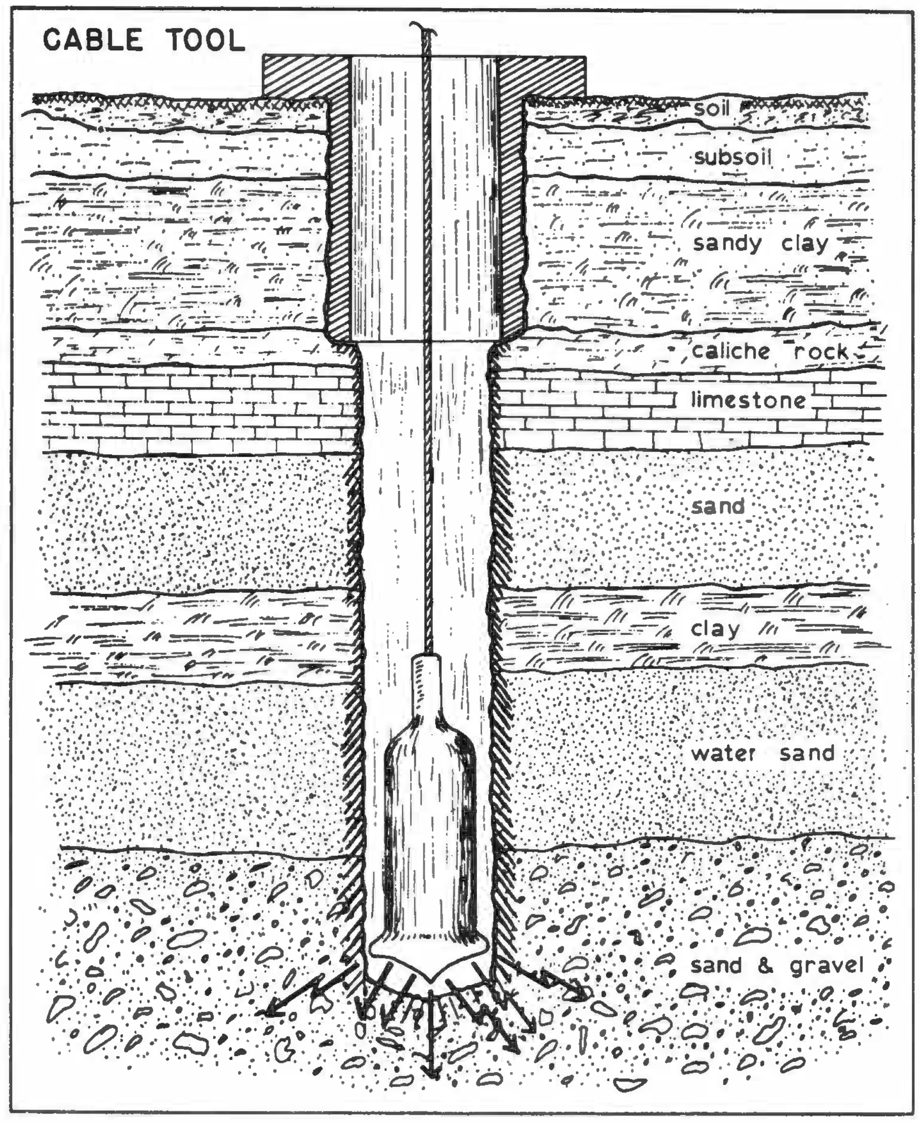
Before any chemical treatment is considered it is necessary to admit or establish the fact that some water has been plugged off and that a chemical treatment is the easiest and most effective method of removing any plugging. Some drillers are reluctant to admit the possibility that some water may be plugged off during the drilling operation. They feel it may be a reflection on their ability and some claim that if the water is there they will get it. This is not always true as borne out by the fact that many old wells made more water after treatment than they did when first completed, showing that some water had been plugged off all the time.

When you consider the pressures and methods used in drilling you can see that for all practical purposes it is almost impossible to drill a well without plugging off at least some water.

In old wells the decrease in flow may be due to a buildup of water deposited scale on the screen, casing or in the formation. Since most of the pressure and temperature change which is responsible for the deposition of the scale occurs at or near the face of the formation, most of the plugging will be concentrated there. Usually these deposits are acid soluble and can be readily removed with an acid treatment. However, in some cases these deposits may be calcium sulphate and about the only way to remove it is to pull the screen or casing and pound the scale off, or replace the casing or screen.

Some waters are very corrosive and the metal in the well will be corroded and the corrosion products which always occupy more space than the original metal will accumulate and plug the well. These are sometimes difficult to remove but usually a che-





With this chart we have tried to represent some of the things that happen when a well is drilled with the rotary method. These things will occur whether the drilling is by direct or reverse circulation. In order to drill a fluid must be circulated to remove the cuttings and hold up the hole. In almost all cases mud is used. It can be commercial drilling mud or as happens in most wells, there's enough clay in the formation to make a heavy mud as drilling progresses. As the formation is penetrated a mud or filter cake is built up on the walls of the hole. The mud cake must be strong enough to hold the pressure of the column of mud in the hole; otherwise, you will lose circulation and all the mud will go back in the formation. If the mud is too thin the mud cake will build up too far back in the formation and will be more difficult to remove. If the mud is too heavy the mud cake may get too thick and stick the bit. After the well is drilled it is necessary to remove all the mud cake if the well is to be developed to its maximum capacity. Using this illustration you will note that at the static water level of 200' the mud was put in place under 125 PSI pressure and at 300' it was 188 PSI. Now, after all the mud has been removed from the hole by bailing or pumping, the only pressure available to push the mud off the wall and out of the formation is the pressure of the water in the formation. At the static water level of 200' there is no pressure. At 300' the maximum pressure would be only about 43 PSI and this could only be if the formation had uniform vertical permeability which is rarely if ever found. There usually will be several clay or shale breaks which will reduce the total pressure. So we have the following condition — mud put in place under 125 PSI at the static water level and no water pressure to remove it, and at 300' mud put in the formation at 188 PSI and at most, only 43 PSI water pressure to push it out. Naturally, the deeper the hole and the less standing water there is, the greater the differential pressure.

With cable tool or spudder drilling, the same thing occurs but the pressure is applied in a different manner. This drawing represents roughly what happens. As the heavy tool is raised and dropped a tremendous force is developed on the face of the bit. This force acts in a direction at right angles to the face of the bit. As a result as drilling progresses, the formation around the well bore is compacted and the mud and slush in the hole is pounded back into the formation. Here again, the only pressure available to remove any plugging is the water pressure in the formation which will never anywhere near equal the pressure built up by the heavy tool string. Scow drilling, driving casing and reaming also have similar action which tends to plug off some water. The effect of this plugging is naturally a lower specific capacity. In a sand and gravel well you wind up with a mud cake on the walls and the formation compacted around the well bore. Since this is behind the casing or screen and behind the gravel pack, purely mechanical means will not be effective in removing it. In order to get maximum capacity all of the mud must be removed and the formation opened up to allow free flow of water from the formation into the well bore.

mical treatment will give the desired results.

The accumulation of nuisance organisms such as fungi, algae, molds and various bacteria is a real problem in some areas. Generally speaking, this problem is best solved by preventive treatments rather than to wait until the well is plugged. Usually these organisms can be controlled if every well is sterilized with some accepted method when the well is first completed and then treated periodically. And of prime importance is to construct the well to eliminate any surface contamination. If growths of nuisance organisms are present they can be cleaned up with suitable chemicals and then kept under control with periodic teratments.

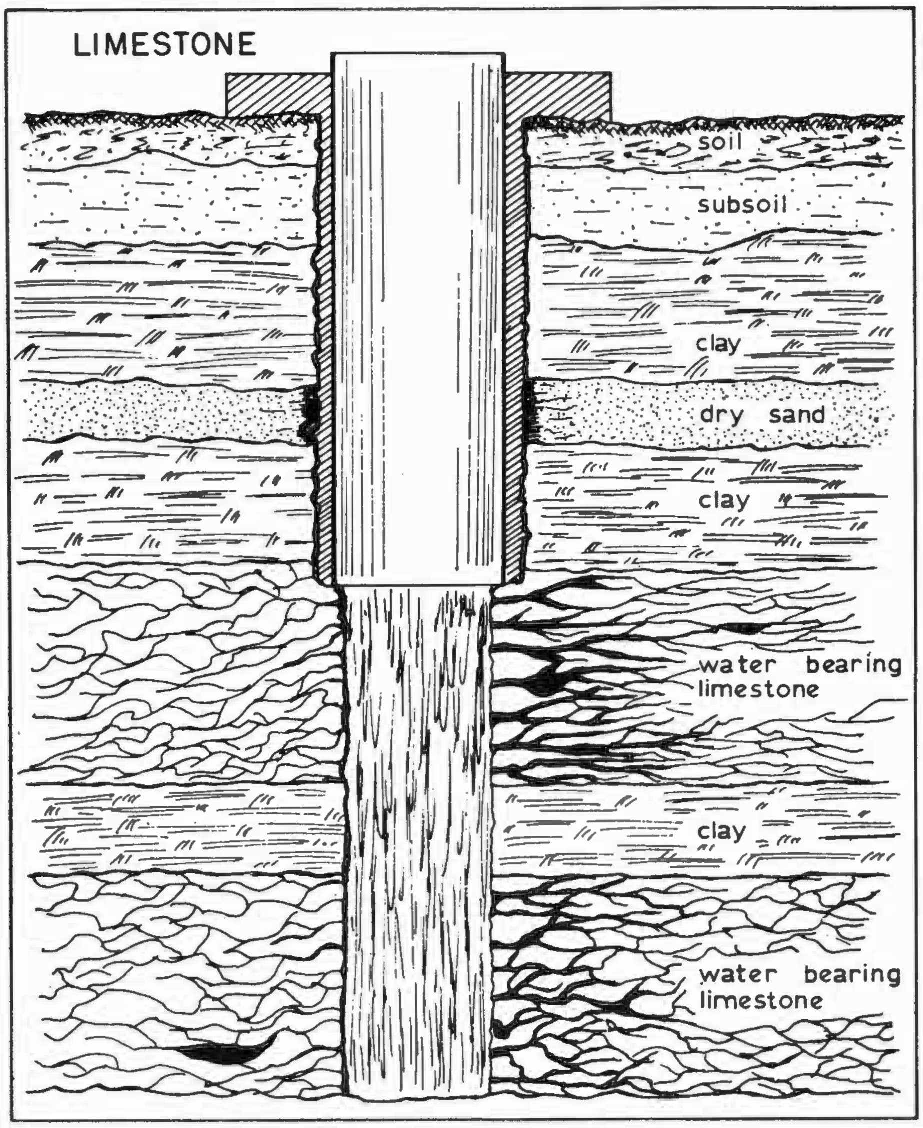
The loss of flow in many old wells is due simply to a lowering of the water table. In this case there is nothing that can be done except drill more wells or use less water.

The problem is not how or why the water is plugged off but how best to remove it all so that maximum flow can be obtained. Fortunately, much of the plugging will be removed by bailing, swabbing, surging, backwashing or pumping. Dry ice is sometimes used to agitate the water. Compressed air is also used to build up pressure and to air-lift the well in an effort to remove all plugging. As we have pointed out before, you will note that in all these methods the pressure being used is applied in the same direction as that which put the plugging in place. There is nothing that can be done to change the water pressure in the formation. Mechanical agitation in the bore hole will certainly help to loosen the mud but it is still the water from the formation that must wash it out. Since everything in the hole is completely hydrated and water wet, the water can not help in any way other than its mechanical washing action.

Chemicals are available that are effective in removing practically any type of accumulation from water wells. Instead of spending a lot of time trying to completely remove all plugging by mechanical methods a properly designed chemical treatment will make it posible to do the job better and in less time. Many times one section may be overdeveloped in order to adequately develop another section. By chemically treating along with the usual mechanical methods all sections can be developed uniformly. Most of the chemicals designed for water well treating were developed with the thought in mind that they would be used by the water well drilling contractor, pump company and water well service companies. Consequently, they are packaged in small, easy to handle containers, and usually no additional equipment is needed. Many wells equipped with deep well turbine pumps are treated with the pump in the hole. The chemical is simply poured in the well between the casing and pump column and the pump used to agitate and dissolve the chemical in the water standing in the hole. The pump is used to agitate periodically for about 24 hours and then the well pumped and developed in the usual manner.

In developing new wells or redeveloping old wells with a rig over the hole, the chemicals are added and a bailer, surge block or other tool is used for agitation. The well is then bailed or the pump set to remove the spent acid solution. The big advantage with chemicals is the fact that they can penetrate through the screen or casing perforations and back into the formation where there is little if any agitation from mechanical methods.

As pointed out earlier deep pene-



In wells producing from limestone the problem is somewhat different. Limestone is calcium carbonate which is completely soluble in acid .By dissolving part of the formation the channels leading into the well bore are enlarged, thus allowing more water to enter and the flow to increase. Some wells are producing from fissures and cracks in formations that are not soluble in any chemical and wells such as these cannot be helped with any chemical treatment. In these, shooting is the best possibility.

tration is not needed, so usually no additional water is added to the well unless the static water level is considerably above the perforations. In gravel packed wells enough water is usually added to displace the chemical solution back through the gravel wall to the formation where it can act to disintegrate and dissolve the mud and clay.

In some wells the chemical is dissolved in water and the solution added through the drill pipe or tubing. Our experience has been that it is easier and cheaper to use an excess of chemical and dissolve it in the water standing in the hole. In this way none of the chemical is lost in the open porous sections as happens when a solution is added to a well at static.

Most of the chemicals are comparatively non-toxic and are used to treat wells producing potable water. The first water produced after a treatment contains spent chemicals and should be pumped to waste. Most wells will clean up in only a few hours depending on the size and equipment being used.

PLEASE CLOSE THOSE ABANDONED WELLS ! ! !

VALUE OF WATER PUMPED
By WILLIAM F. SCHWIESOW, Asst. Professor
Agricultural Engineering Dept., Texas Tech College, Lubbock, Texas
Value of Water per acre-foot

Flow In gpm	$10.00*	$20.00	$30.00	$40.00	$50.00	$60.00**	$100.00
1	4.40	8.80	13.20	17.60	22.00	26.40	44.00
5	22.00	44.00	66.00	88.00	110.00	132.00	220.00
10	44.00	88.00	132.00	176.00	220.00	264.00	440.00
15	66.00	132.00	198.00	264.00	330.00	396.00	660.00
20	88.00	176.00	264.00	352.00	440.00	528.00	880.00
25	110.00	220.00	330.00	440.00	550.00	660.00	1100.00
30	132.00	264.00	396.00	528.00	660.00	792.00	1320.00
35	154.00	308.00	462.00	616.00	770.00	924.00	1540.00
40	176.00	352.00	578.00	704.00	880.00	1056.00	1760.00
45	198.00	396.00	594.00	792.00	990.00	1188.00	1980.00
50	220.00	440.00	660.00	880.00	1100.00	1320.00	2200.00
60	264.00	528.00	792.00	1056.00	1320.00	1584.00	2640.00
70	308.00	616.00	924.00	1232.00	1540.00	1848.00	3080.00
80	352.00	704.00	1056.00	1408.00	1760.00	2112.00	3520.00
90	396.00	792.00	1188.00	1584.00	1980.00	2376.00	3960.00
100	440.00	880.00	1320.00	1760.00	2200.00	2640.00	4400.00

* Reported average value when irrigating grain sorghum.
** Reported average value when irrigating cotton.

Example: If we assume that water is used on both cotton and grain sorghum, the value of the water per acre-foot may average $30.00. If we further assume an increased yield of 10 gallons per minute from the well, then we would follow across the table opposite the 10 g.p.m. flow increase to the column directly under the $30.00 figure. There we find the amount $132.00. This is the expected monetary return if the well is pumped 100 days. Pumping 200 days would mean an increased productive value of $264.00

Taken From THE CROSS SECTION Volume 7 No. 1 June, 1960

This last chart was prepared by a professor at Texas Technological College, in Lubbock. In our area most of the irrigation water is applied to cotton and the wells are produced an average of 100 days per year. An average value of $60.00 per acre foot which is equal to 0.18 per thousand gallons, is placed on the water when applied to cotton. This chart shows that an increase in flow of only 10 gpm is worth $264.00 per year and a 50 gpm increase is worth $1,320.00 per year.

Drilling Statistics For February & March

During the months of February and March 435 new wells were drilled within the High Plains Water District; 23 replacement wells were drilled; and 28 wells were drilled that were either dry or nonproductive for some other reason. The County Committees issued 714 new drilling permits.

Listed below by counties are permits issued and wells completed for February and March.

County	Permits Issued	New Wells Drilled	Replacement Wells	Dry Holes Drilled
Armstrong	0	0	0	0
Bailey	33	15	2	1
Castro	78	34	2	0
Cochran	14	14	0	1
Deaf Smith	112	53	1	9
Floyd	51	36	2	1
Hockley	116	81	2	4
Lamb	77	32	9	2
Lubbock	133	82	2	5
Lynn	36	41	0	5
Parmer	33	37	3	0
Potter	1	0	0	0
Randall	30	10	0	0
TOTALS	714	435	23	28

WATER IS YOUR FUTURE CONSERVE IT

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 11—No. 12 "THERE IS NO SUBSTITUTE FOR WATER" May 1965

West Texas Water Institute NAWAPA Meeting At Tech

A continental water concept was in the spotlight at a meeting of the West Texas Water Institute in the Student Union Bldg. at Texas Tech.

The concept, called the North American Water and Power Alliance (NAWAPA), was outlined by officials of the Ralph M. Parsons Co., a Los Angeles engineering firm which developed the proposal.

Approximately 470 persons attending the session also heard other speakers emphasize that current efforts to conserve present water supplies and to develop maximum water resources are falling short of the need.

Double Supplies

" Between 1960 and 1980 we will need to double our water supplies," Sen. Frank E. Moss of Utah, a member of the Senate Interior and Insular Affairs Committee, told the group.

"If the West is to achieve its share of the projected national growth, comprehensive measures must be undertaken to expand all phases of water research and utilization, he added.

"We will sooner or later find ourselves on the brink of water catastrophe in many parts of the country even though we achieve optimum development of present water supplies."

Moss described NAWAPA as "one of our greatest hopes for solving water problems." He called it "a bold new concept."

The proposal would trap wasted water of Alaska, the Yukon and British Columbia and channel it to the Canadian Plains, the Great Lakes region and the western United States and Mexico.

Moss is chairman of a Senate subcommittee on the multi-billion-dollar concept and is currently engaged in exploratory discussions throughout America and Canada on NAWAPA.

He said NAWAPA would "require a tremendous amount of preliminary study to satisfy federal, state and international political interests and to conclude the necessary agreements among the three nations involved."

Moss said NAWAPA would "provide water for the next 100 years."

Roland P. Kelly, an engineer with the Parsons firm, said NAWAPA would increase the agricultural income of West Texas by approximately $400 million annually.

He added that it would increase total income by "at least a billion dollars annually, considering direct benefits only."

Kelly said the plan is designed to supply about 5.3 million acre feet of water annually to the panhandle-Plains section, including 5 million for irrigation usage and 300,000 to be allocated to industrial and municipal usage.

The whole concept would deliver more than 50 million acre feet of water annually to California, Arizona, Nevada, New Mexico. Utah and Texas for agriculture, industry and municipal development, he explained.

"There are many problems which must be met, solved and resolved before the NAWAPA concept can become a reality," Kelly said, listing problems "of economics, engineering, legality, politics, sociology, management and operation."

"We believe these problems can be solved," he added. "We know the engineering job presents no unachievable goals.

"A feasibility study which Senator Moss' subcommittee recommends will study these areas and will recommend solutions to many of the questions which are to our minds and the minds of a number of people.

"We are making no attempt at this time to offer solutions to many of these problems, but are merely presenting a concept for utilizing water that is now flowing unused into the sea."

In opening the program, Dr. Gerald W. Thomas of Tech, Water Institute chairman, cited this region's dependence upon water "for our present and future economy."

"Neither this state nor our nation can afford to consider lightly the West Texas area in long-range water resource planning," he declared.

Vital Area

"Indeed, West Texas has a food and fiber production potential and an opportunity for continued economic development that is vital to Texas, to the United States and to the world."

Thomas asserted that "most people in the U. S.—or even in this state—don't realize that our region, West Texas, is more important than many entire states in terms of our present contribution to the national economy."

He noted that the petroleum industry generates about $2 billion annually in West Texas while farm sales in the 128 county region exceed all of the 17 western states except California and Nebraska.

"And we now believe that our cash farming income of over $1.2 billion dollars has surpassed Nebraska," said Thomas who is dean of agriculture at Texas Tech.

U. S. Rep. George Mahon, chairman of the House Appropriations Committee, pointed out that $1.6 billion was allocated for water research last year. He added that "we must think in much larger terms in the future."

"The nation has changed its thinking since new horizons were opened up by the space programs," Mahon said. "While 10 or 12 years ago we may have scoffed at the NAWAPA project, now—with unlimited horizons—it becomes a matter for serious consideration."

U. S. Rep. Walter Rogers of Pampa also spoke shortly before noon. Former Rep. Joe M. Kilgore, now chairman of the consultant panel of the Texas Water Commission, Austin, spoke at a concluding luncheon.

YOU'LL NEVER KNOW—UNTIL YOU TRY IT!

District Court Upholds Water District Rules

In a case filed in the District Court of Randall County, Texas, the court upheld the High Plains Water District and granted an injunction to close a well drilled in violation of the district's rules

With more than twenty seven thousand seperate permits now on file this is only the third time the District has been required to defend its rules in a court of law.

Texas Conservation Committee Meets

The Texas committee on Conservation Education recently held its spring meeting in Austin.

Twenty six members attended and discussion was given to the number of Conservation education workshops scheduled for this summer. Members of the committee will work with class room teachers in these work shops and give them new ideas and methods of teaching conservation education.

NR & HC Convention

The 52nd Annual Convention of the National Rivers and Harbors Congress will be held at the Mayflower Hotel, Washington D. C., on June 8-11, 1965.

Registration will begin Tuesday, June 8. Committee meetings will be held Wednesday, June 9, followed by the President's reception Wednesday evening. Thursday, June 10, will be confined to the annual excursions. The speech-making and business sessions will be on Friday, June 11, followed by the annual meeting of the Board of Directors.

Water Is Your Future, Conserve It!

THE Cross SECTION

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

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Mrs. Doris Hagens .... Secretary

Field Office, Hereford

Kenneth Seales .... Field Representative
Mrs. Mattie K. Robinson .... Secretary

Field Office, Muleshoe

David Cunningham .... Field Representative
Mrs. Billie Downing .... Secretary

COUNTY COMMITTEEMEN

Armstrong County

Cordell Mahler, 1968 .... Wayside, Texas
Foster Parker, 1967 .... Route 1, Happy
Dewitt McGehee, 1966 .... Wayside, Texas
Guy Watson, 1968 .... Wayside, Texas
Jack McGehee, 1967 .... Wayside, Texas

Bailey County

Mrs. Billie Downing
High Plains Water District
Box 594 Muleshoe

Marvin Nieman, 1968 .. Rt. 1, Box 107, Muleshoe
James P. Wedel, 1967 .... Rt. 2, Muleshoe
Homer W. Richardson, 1968 .... Box 56, Maple
W. L. Welch, 1967 .... Star Rt., Maple
J. W. Witherspoon, 1966 .... Box 261 Muleshoe
Committee meets last Friday of each month at 2:30 p.m., 217 Avenue B., Muleshoe, Texas

Castro County

E. B. Noble
City Hall, Dimmitt

Ray Riley, 1967 .... 71 W. Lee, Dimmitt
Frank Wise, 1967 .... 716 W. Grant, Dimmitt
Donald Wright, 1968 .... Box 65, Dimmitt
Lester Gladden, 1965 .... Star Rt., Hereford
Morgan Dennis, 1968 .... Star Rt. Hereford
Committee meets on the last Saturday of each month at 10:00 a.m., City Hall, Dimmitt, Texas.

Cochran County

W. M. Butler, Jr.
Western Abstract Co., Morton

D. A. Ramsey, 1967 .... Star Rt. 2, Morton
Ira Brown, 1968 .... Box 774, Morton, Texas
Willard Henry, 1966 .... Rt. 1, Morton, Texas
H. B. Barker, 1967 .... 602 E. Lincoln, Morton
E. J. French, Sr. 1968 .... Rt. 1, Morton, Texas
Committee meets on the second Wednesday of each month at 8:00 p.m., Western Abstract Co., Morton, Texas.

Deaf Smith County

Mrs. Mattie K. Robinson
High Plains Water District
317 N. Sampson, Hereford

L. E. Ballard, 1966 .... 120 Beach, Hereford
Billy Wayne Sisson,, 1968 .... Rt. 5, Hereford
J. E. McCathern, Jr., 1967 .... Rt. 5, Hereford
Billy B. Moore, 1968 .... Wildorado, Texas
Charles Packard, 1967 .... Rt. 3, Hereford
Committee meets the first Monday of each month at 7:30 p.m., High Plains Water District office, Hereford, Texas.

Floyd County

Jeanette Robinson
325 E. Houston St., Floydada

Bill Sherman, 1967 .... Route F, Lockney
J. S. Hale, Jr., 1966 .... Rt. 1, Floydada, Texas
Tate Jones, 1967 .... Rt. 4, Floydada
M. M. Julian, 1968 .... Rt. Q, Lockney Texas
M. J. McNeil, 1968 .... 833 W. Tennessee, Floydada, Texas
Committee meets on the first Tuesday of each month at 10:00 a.m., Farm Bureau Office, Floydada, Texas.

Hockley County

Mrs. Phyllis Steele
917 Austin Street, Levelland

Bryan Daniel, 1967 .... Rt. 2, Levelland
Preston L. Darby, 1968 .... Rt. 1, Ropesville
Leon Lawson, 1967 .... Rt. 3, Levelland
H. R. Phillip, 1968 .... Rt. 4 Levelland, Texas
S. H. Schoenrock, 1966 .... Rt. 2, Levelland
Committee meets first and third Fridays of each month at 1:30 p.m. 917 Austin Street, Levelland, Texas.

Lamb County

Calvin Price
620 Hall Ave. Littlefield

Willie Green, 1967 .... Box 815, Olton
Roger Haberer, 1968 .... Earth, Texas
W. B. Jones, 1966 .... Rt. 1. Anton, Texas
Troy Moss 1968 .... Rt. 1, Littlefield, Texas
Raymond Harper, 1966 .... Sudan, Texas
Committee meets on the first Monday of each month at 7:30 p.m., Rayney's Restaurant Littlefield, Texas.

Lubbock County

Mrs. Doris Hagens
1628 15th Street, Lubbock

Weldon M. Boyd, 1967 .... Rt. 1, Idalou
Bill Hardy, 1968 .... Rt. 1, Shallowater, Texas
Bill Dorman, 1967 .... 1910 Ave. E., Lubbock
Edward C. Moseley, 1966 .... Rt. 1, Slaton, Texas
W. O. Roberts, 1968 .... Rt. 4, Lubbock, Texas
Committee meets on the first and third Mondays of each month at 1:30 p.m., 1628 15th Street, Lubbock, Texas.

Lynn County

Mrs. Doris Hagens
1628 15th Street, Lubbock

Hubert Tienert, 1967 .... Wilson
Harold G. Franklin, 1968 .... Rt. 4, Tahoka
Roy Lynn Kahlich, 1966 .... Wilson, Texas
Oscar H. Lowery, 1967 .... Rt. 4, Tahoka
Reuben Sander, 1968 .... Rt. 1, Slaton, Texas
Committee meets on the third Tuesday of each month at 10:00 a.m., 1628 15th Street, Lubbock, Texas.

Parmer County

Aubrey Brock

Wilson & Brock Insurance Co., Bovina
Wendol Christian, 1966 .... RFD, Farwell, Texas
Henry Ivy, 1967 .... Rt. 1. Friona
Walter Kaltwasser, 1967 .... RFD, Farwell
Carl Rea, 1968 .... Bovina, Texas
Ralph Shelton, 1968 .... Friona, Texas
Committee meets on the first Thursday of each month at 8:00 p.m., Wilson & Brock Insurance Agency, Bovina, Texas.

Potter County

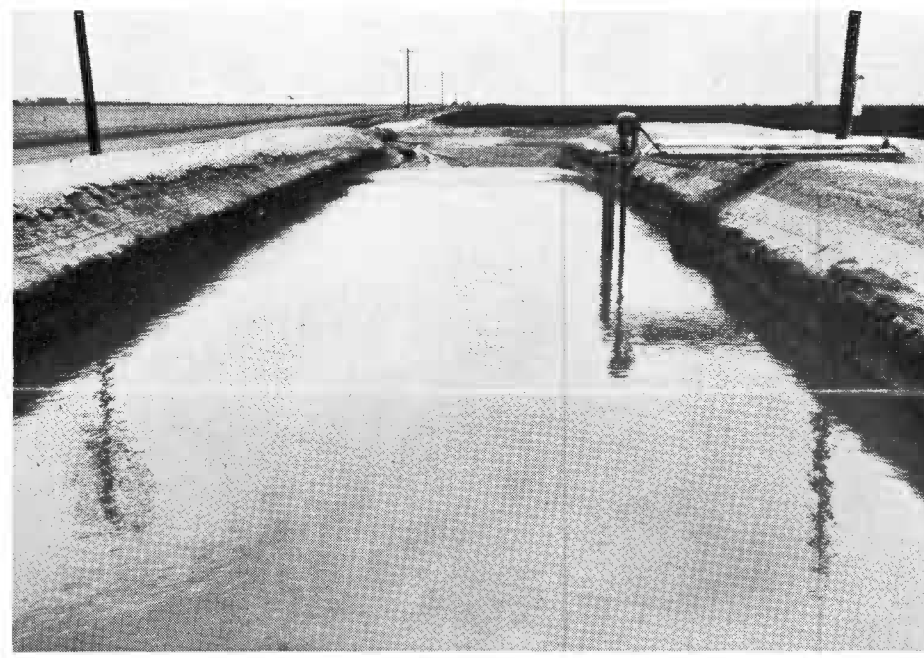
E. L. Milhoan, 1967 .... Rt. 1, Amarillo
W. J. Hill, Jr., 1966 .... Bushland, Texas
L. C. Moore, 1968 .... Bushland, Texas
Jim Line, 1968 .... Bushland, Texas
Eldon Plunk, 1967 .... Rt. 1, Amarillo

Randall County

Mrs. Louise Knox

Randall County Farm Bureau Office, Canyon
R. B. Gist, Jr., 1968 .... Rt. 3 Box 43 Canyon
Paul Dudenhoeffer, 1966 .... Rt. 2, Canyon, Texas
Carl Hartman, Jr. 1968 .... Rt. 1, Canyon
Lewis A. Tucek, 1967 .... Rt. 1, Canyon
Ed Wieck, 1967 .... Rt. 1, Canyon
Committee meets on the first Monday of each month at 8:00 p.m., 1710 5th Ave., Canyon, Texas

Many High Plains farmers use every conceivable idea to save water. A modified road ditch shown above does a wonderful job of catching tail water.



Hundreds of new tail water pits were constructed this spring and many acre-feet of water have been salvaged from pre-plant and planting irrigation.

DRILLING STATISTICS FOR APRIL

During the month of April 232 new wells were drilled within the High Plains Water District; 8 replacement wells were drilled; and 10 wells were drilled that were either dry or nonproductive for some other reason. The County Committies issued 265 new drilling permits.

Listed below by counties are permits issued and wells completed for April.

County	New Wells Drilled	Permits Issued	Replacement Wells Drilled	Dry Holes Drilled
Armstrong	0	0	0	0
Bailey	26	20	2	1
Castro	21	37	1	0
Cochran	0	5	0	0
Deaf Smith	22	29	1	1
Floyd	16	24	1	0
Hockley	28	38	0	1
Lamb	31	40	2	2
Lubbock	52	48	1	4
Lynn	9	10	0	0
Parmer	21	7	0	1
Potter	0	0	0	0
Randall	6	7	0	0
Total	232	265	8	10

PLEASE CLOSE THOSE ABANDONED WELLS

FLUORIDES IN HIGH PLAINS WATER DISCUSSED BY AMERICAN CHEMICAL SOC.

Some do, and some don't.

That is, some consumers extoll the values of fluorides in South Plains water supplies, and others shy from the very mention.

Whatever preconceived opinions may be, a new element has been introduced—a startling one.

As result, there are observers who wonder if the high fluoride content South Plains water one day in the foreseeable future may be sold at a premium—not only as a tooth decay preventative but for conditioning of astronauts in their months-long space adventures.

Indications are that chemists may be on the threshold of new conceptions, discoveries and understanding of fluoride properties and effects, if one is to give credence to reports (involving the Lubbock area) given this month before the American Chemical Society.

Fluorides in water supplies, a situation well known in most South Plains communities, came in for national publicity and a "new twist" in recent reports to the chemical society in Detroit.

Lubbock was singled out in examples of bone structures of specimens from four cities in the nation in reports by two chemists before the convention.

Bone structures and related fluoride content water were reported for Lubbock, New York City, Grand Rapids, Mich., and Colorado Springs, Colo.

The chemists followed through by offering that mineral crystals in bones increase in size with the amount of fluorides in their drinking water.

Implication of this theory ranges all the way from aid in treatment of diseases associated with aging to safeguarding the health of astronauts on long space voyages.

Reactions among dentists, chemists and bone specialists in Lubbock have been varied. Some expressed caution in coming to immediate conclusions. Others had suspected such developments for some time.

One Lubbock observer said, "The American Chemical Society is most conservative in my opinion, and news coming from that source must be credited."

Since 1961, first at the National Institute of Dental Health and now at the Hospital for Special Surgery in New York, Dr. Aaron S. Posner and Dr. Edward D. Eanes have been measuring bone crystal sizes with a method called low-angle X-Ray scattering.

Their samples of human bones came from deceased persons, and they also have fed laboratory animals with regulated amounts of fluorides in course of their testing.

As basis for conclusions, the chemists used bone specimens from New York City people, whose drinking water is not fluoridated. To the mineral crystals of these bones, they compared samples from the three other cities, including Lubbock where they said they found four parts of fluorides per million concentrations in the water.

Grand Rapids tested one part per million, and Colorado Springs, two parts.

Periodic Tests

Dr. David M. Cowgill, city-county health doctor has told the news media that periodic tests by the State Health Department reveal about 1.5 parts per million of fluorides content usually found in the city water supply.

Both Dr. Cowgill and other city authorities point out, however, that the public water supply test varies in Lubbock. Water from nearby wells shows up to about four parts per million fluoride content, while the city wells in the sandhill area near Muleshoe show much less. Consequently, the measurement varies with ratio of water pumped into the mains from the different well areas.

Locations near Post have been found to contain possibly highest fluoride content in the area, up to seven parts per million concentration.

Most fluoride study in the South Plains area has heretofore been considered in relation to tooth decay, mottling and structure.

Advent of the relationship to bone crystals opens up an entirely separate field and awakens possibility of reappraisal of benefits and drawbacks of fluorides.

Hereford, about 100 miles northwest of Lubbock, long has capitalized on its claim of "A Town without a Toothache," based on a Hereford dentist's study of cavity-free teeth by longtime residents there, the condition attributed to fluorides. Hereford water has been marketed for at least two decades on a national scale by firms publicising it as a dental aid.

That area has about 1.5 to 2 parts per million ratio in the fluoride water content.

Which Is Better

A Lubbock dentist commenting on effects on the teeth, said:

"Who is to say about benefits of fluorides for teeth? Is it better to risk cavities or mottled teeth? Extremes in lack or supply of the fluorides seem to result in a choice of the two ills."

John Hickerson, director of public works for the City of Lubbock. said that in any comparison between water of widely-separated towns. "It seems that more information needs to be available on the other chemical components, in addition to fluorides present in the water."

In their claim for bone structure aid by fluorides. the New York chemists explain:

Bones have two major structural components—an array of tiny calcium phosphate crystals and a column of connective tissue in which the crystals are suspended. This tissue, called collagen, gives the bones their particular shapes.

The mineral crystals participate in the chemical activity in living bones, and the extent of their participation is dependent on, among other things, the combined surface area of the crystals. As the crystals get larger, their combined surface area gets correspondingly smaller, and it was in this decrease of crystal surface area that the chemists reported on relating to the four cities.

They claimed those bone samples from Grand Rapids had five per cent less surface area of mineral crystals than those from New York; those from Colorado Springs, 15 per cent less; and in the Lubbock samples, where fluoride content of water was highest. the reduction was 30 per cent below the New York level.

Dr. Posner said it appeared that the fluorides consumed with drinking water became a part of the mineral structure of the bones and gave them added stability in terms of chemical activity.

He went on to submit that in bone disease characterized by a progressive loss of calcium, fluoride therapy might help curtail such calcium loss.

Dr. Joe Dennis, head of the chemistry department at Texas Tech, said:

"I know that experiments along this line have been going on for a number of years, and the reported results were not unsuspected. There are even some test results indicating mottled teeth may be stronger than those less affected by flourides."

There are reports, repeated but unofficial, from both the Russian— and American-manned space flights, that prolonged weightlessness might cause astronauts to discharge calcium with body wastes.

The possibility is then evident that if this theory is substantiated, it might be useful in preparation for longer space flights to put astronauts on a fluoride- fortified diet for several years before their flights.

This, the New York chemists suggested, probably would produce a change in the size of their bone mineral crystals that could be useful in slowing down such calcium losses.

Not Understood

Dr. Posner touched on the tooth relationship of fluorides and pointed out that the mechanism of tooth decay is not sufficiently understood, in his opinion, to permit placing the blame of decay on this particular relationship. Decay might involve other processes, also he said.

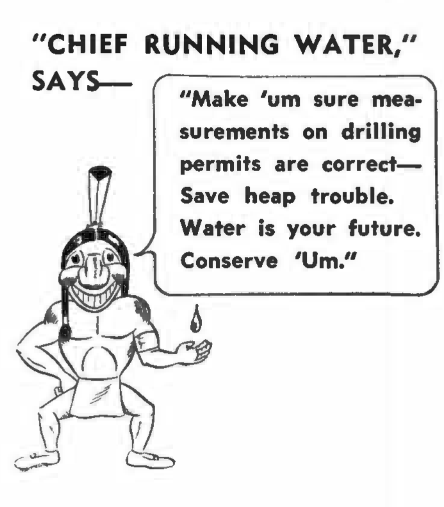
But, he admitted, "test results have provided at least a partial explanation for the biological stablization of teeth by fluoridation of drinking water."

Whatever the answer, whatever the results—they are bound to become known as interested toothpaste manufacturers, soft water merchandisers, chemists. bone specialists, dentists, government agencies and city officials of the nation press their quest for the truth.

And as the truth becomes proven, will Lubbock and its residents be the benefactors?

The possibilities are most intriguing.

Will Superman of the future be known as "The Fluoride Man?"



Governor Appoints Men To Texas Water Development Board

Governor Connally, April 22, announced the appointment of Mills Cox of Gay Hill (Washington County), Groner A. Pitts of Brownwood, and Robert B. Gilmore of Dallas to the Texas Water Development Board.

Cox was designated as chairman of the Board. He and Pitts succeeded C. Y. Milis of Mission and James D. Sartwelle of Houston for terms to expire December 30, 1969. Gilmore succeeds Marvin Nichols of Fort Worth who resigned for a term to expire December 30, 1965.

Cox, a native of Dublin, Texas, is an attorney and a retired president of Transwestern Pipeline Company. He is presently a consultant on matters pertaining to natural gas.

A law graduate of Baylor University, he attended Yale University Graduate School of Business Economics. From 1921 to 1942, he was engaged in the oil business with the Mills Bennett interests in Houston, serving as vice president of the Mills Bennett Production Company, president of Liberty Pipeline Company, and vice president of Carter Drilling Company. During World War II, he served four years in the Army Air Corps, including two years on the ferry route transferring lend-lease aircraft to Russia. He was discharged as a Lieutenant Colonel.

Cox joined Texas Eastern Transmission Corporation in 1948, later serving as vice president. He became president of Transwestern Pipeline Company in 1958.

Pitts, vice president of Davis- Morris Funeral Home in Brownwood, is president of Eastlawn Memorial Park and President of Brownwood College of Business. A native of Crystal City, he graduated from high school at Cleburne, and received his BBA degree from Howard Payne College. In World War II, he served with the 12th Air Force in the European Theater, and is presently a Captain in the 36th Infantry Division of the Texas National Guard.

Pitts is a trustee of Howard Payne College, past president of the Brownwood Chamber of Commerce and the Brownwood Lions Club, director of the West Texas Funeral Directors Association, and regional director of Texas Golden Gloves. In 1955 he was voted the Outstanding Citizen of Brownwood.

Gilmore, a petroleum engineering graduate of the University of Tulsa, is president and director of DeGolyer and MacNaughton of Dallas. He is a past president of Society of Petroleum Engineers of A.I.M.E., a director of Engineers joint Council, a Fellow of American Association for the Advancement of Science, and is a past president of Engineers Club of Dallas. He is a former president of the Board of Education, Dallas Independent School District, and is president of Southwestern Engineering Foundation.

Gilmore, a native of Tulsa, has been with the DeGolyer and MacNaughton firm since 1941.

Directors Adopt Rule Concerning Triassic Wells

The continued decline of the water table in the Ogallala Formation of the Southern High Plains of Texas has promoted an increased interest in exploring for and developing water from the sands in the Triassic Formations. (Normally referred to as the "Red Beds".)

Exploratory holes and/or production wells drilled into the deeper Triassic sands, when not properly constructed, create a passage from which water from the Ogallala Formation can recharge into the lower sands, resulting in even greater declines of the water table, possibly drying up the Ogallala sands in the vicinity of the well. Other problems are that the water from the Triassic Formations are sometimes under Artesian pressures and in some cases this pressure will push the water up into the Ogallala Formation. In some areas this water is high in salts, polluting the fresh waters of the Ogallala.

These pollution and conservation problems have resulted in the necessity for the Board of Directors of the High Plains Underground Water Conservation District to pass a rule to prevent and arrest this waste.
The rule reads as follows:

"Rule 16 (A) PLUGGING TRIASSIC WELLS. Any water well or test hole drilled through the Ogallala into the underlying Triassic or Red Bed formation shall be so completed as to eliminate any movement of Ogallala water into the underlying Triassic Formation.

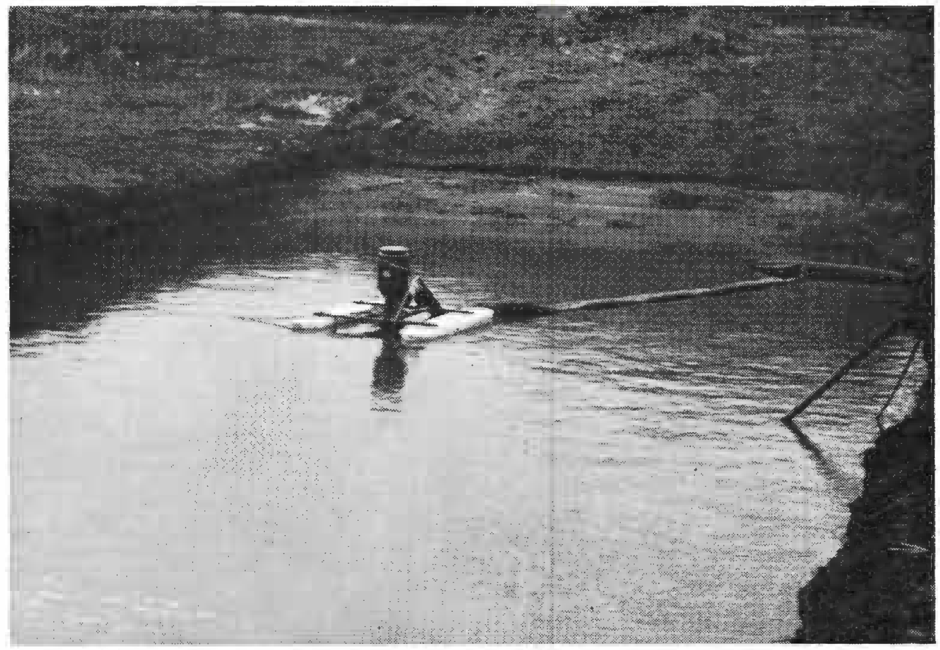
I. If it is proposed to produce the Triassic water, then casing must be set through the Ogallala and into the Triassic a minimum of 10 feet and cemented to the surface,

II. If it is proposed to abandon the Triassic portion of the well, then the following procedure will be observed:

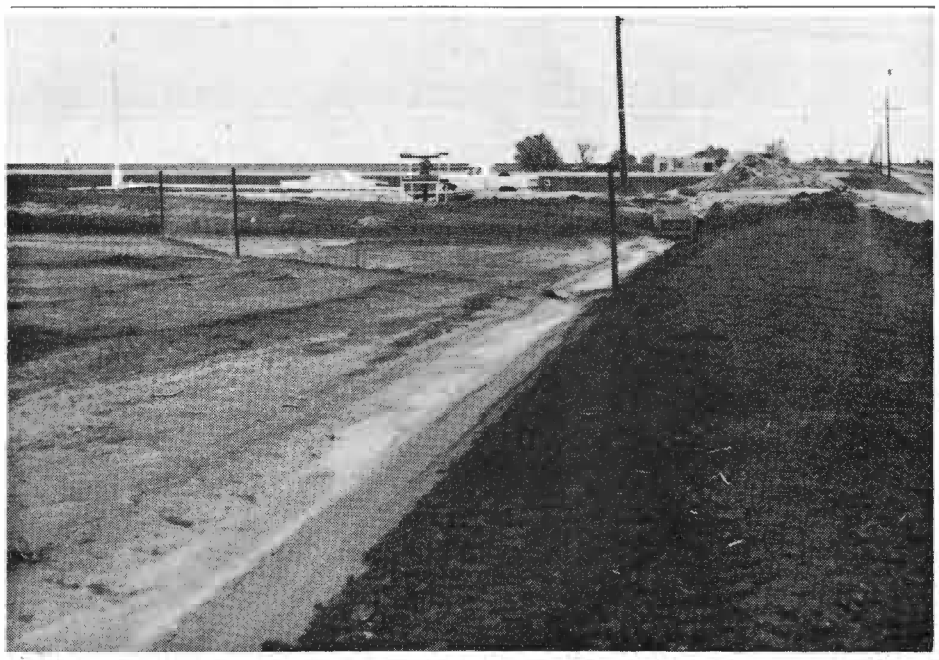
1. If no casing is placed in the well below the top of the Triassic, the hole will be filled with dirt, rock, mud or similar material to a level no less than 50 feet below the base of the ogallala and sufficient cement added to fill the hole to the base of the Ogallala.

2. If casing has been set through the Triassic with perforations below the Ogallala, all such perforations shall be closed with cement and a cement plug at least 10 feet in height placed in the casing below the base of the Ogallala, and above the highest perforation in the Triassic.

3. If blank casing (no perforations) has been set into the Triassic, then either (a) cement shall be pumped below the shoe of such casing in sufficient volume to fill the annulus between the casing and the wall of the hole up to the base of the Ogallala, or (b) the casing shall be removed from the well and the Triassic formation plugged in accordance with pp. II (1) above."



Extensive use of tail water pits in the High Plains Water District has brought about many new pumping installations. Illustrated is a new pump that floats on pontoons and rises or descends with the level of the water in the pit.



Stalks and foreign matter can cause problems. Fences like the one above catch debris before it enters the recirculation system.

Evaporation Losses Vary From Playa Lakes

Studies reveal that playa lakes lose an average of approximately .3 of an inch of water per day per surface acre to evaporation from April through September. The actual amount lost to evaporation is influenced by several variables, with wind velocity, temperature and humidity being the most influential.

Based on the estimated loss, a lake with one hundred surface acres would lose some 566 gallons per minute around the clock for the six month period mentioned above.

Surface Acres of Lake	Gallons Lost per Minute to Evaporation
5	28
10	56
15	84
20	112
25	140
30	168
40	224
50	283
75	423
100	566

Playa lake researchers estimate that farmers can modify their own lakes by using their own machinery for approximately six to eight cents per cubic yard of dirt moved. Using seven cents as an average it would cost $112.91 to move enough soil to hold an acre foot of water.

Contract dirt moving costs range from eighteen to twenty cents per cubic yard. It would cost approximately $300.00 per acre foot of storage area to modify a playa lake by using a commercial dirt contractor.

With a shortage of water available, the cost would be minor if the practice provided additional water for irrigation.

Engineer On National Advisory Committee

John J. Vandertulip, Chief Engineer of the Texas Water Commission, has been named to the National Advisory Committee on water data for public use.

The 15-member committee will advise the Department of the Interior on policies and procedures concerning water data acquisition and the non-federal needs for data. This includes the broad range of information needed for all purposes on the amounts and quality of stream flows and underground water and the sediment loads of streams.

Chairman Joe D. Carter stated that the Texas Water Commission was pleased with the recognition accorded Vandertulip by his selection to the advisory committee.

High Plains Underground Water
Conservation District No. 1
1628 Fifteenth Street
Lubbock, Texas

Second Class Permit

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 12—No. 1 "THERE IS NO SUBSTITUTE FOR WATER" June 1965

Water Depletion Claim Upheld By High Court

On June 7, 1965, three judges of the United States Court of Appeals for the Fifth Circuit unanimously affirmed the United States District Court's judgment allowing a tax deduction for the depletion of groundwater in the case of United States v Marvin Shurbet et ux. Undoubtedly, the basic lesson to be learned from the Shurbet decision is that groundwater is the irrigated land owner's most precious asset which must be carefully conserved. The Circuit Court's decision further paves the way for all irrigated land owners on the Southern High Plains to qualify for and calculate their tax deduction with a minimum of trouble and expense.

The Fifth Circuit at the outset of its written opinion places the case in its proper perspective by emphasizing that the case is a test case for the irrigation farmers in the Southern High Plains of Texas. The Court next ordered the publication of the detailed findings of fact found by the trial court. From this it can be assumed with confidence that no other individual irrigated land owner on the Southern High Plains will be faced with the prospect of a costly trial to prove the basic geological and hydrological facts necessary to substantiate a cost depletion deduction for his groundwater. This is because the trial court's findings of facts not only covered Marvin Shurbet's individual farm and the groundwater thereunder, but also the entire Southern High Plains and the Ogallala groundwater reservoir within it.

The court also accepted without question the formula devised to measure the amount of the tax deduction to which the irrigated land owner is entitled. A simple example of the formula can be demonstrated by assuming and concluding as follows:

If farmer Jones paid $300 an acre for irrigated land and similar dryland is selling for $100 per acre, then $200 per acre is the cost of the water under the land; if there was 100 feet of water under the land at the time of purchase, then Jones paid $2 per foot for water. If the water table declined 3 feet during the taxable year, then Jones's cost depletion deduction is $6 per acre ($2 per foot cost x 3 feet of decline).

From the foregoing it follows that the individual irrigated land owner on the Southern High Plains need only ascertain:

First, the annual decline of the water table under his land.

Second, the thickness of the water bearing sands under his farm at the time of purchase.

Third, his cost basis in the water.

The first point should not present any difficulty. This is because the High Plains Underground Water Conservation District in cooperation with the Texas Water Commission annually measures hundreds of observation wells throughout the Southern High Plains and publishes the results of such measurements. It is hoped that the Water District will be able to work out some type of an agreement with the Internal Revenue Service so that the government need not be concerned with the accuracy of the individual taxpayers' measurements of decline. Conversely, the taxpayer will be relieved of the problem and expense of providing proof of decline.

A type of agreement that could be worked out between the Water District and the Internal Revenue Service might be to take the average annual decline for a whole county or a portion of a county and permit each irrigated land owner within the designated area to use that figure. In the absence of such an agreement, the problem of each farmer measuring the decline in his individual wells is minimal.

Likewise, the second point dealing with thickness of the water bearing sands under an individual farm at the time of purchase should not present much of a problem. Here again, it is entirely possible that the Water District and the Internal Revenue Service can reach an agreement to use the highly accurate contour maps prepared by the Water District down through the years. Such maps show the average saturated thickness of the water bearing sands in the Water District. In any event, the land owner might have independent proof of the thickness of the water bearing sands at the time of purchase, such as drillers logs.

The third point pertaining to proof of cost basis requires the taxpayer to prove the purchase price of the land and allocate part of the purchase price to the groundwater. Such allocation, as in farmer Jones's case above, can be found simply by showing the difference between the price of comparable dry land and the price actually paid for the irrigated land. Of course, in individual cases, allowances may have to be made for substantial improvements or other items that might influence price such as oil and gas or other mineral leases.

In the absence of a general agreement as to dry land values down through the years, each individual land owner might have to produce his own proof, as to the value of comparable dry land at the date of purchase.

Also, each irrigated land owner must compute his cost basis in each individual farm. For example, if farmer Jones purchased 320 acres of irrigated land in 1938 and the adjoining 320 acres in 1965, due to the price spreads during that period of time, the cost bases in the two tracts of land would be different. Likewise, if Jones had inherited lands or received irrigated lands as a gift, the bases of such lands would have to be computed separately.

Fortunately, the basis problem arises only in the first year the deduction is taken. Subsequent years are necessarily calculated on the same cost basis. Therefore, it is most important that the cost basis be accurately and realistically calculated for the first year the deduction is taken. Otherwise, there is the probability that the Internal Revenue Service will not accept such cost basis and this would adversely affect the allowance of at least part of the deduction.

Having ascertained the facts enumerated above, the irrigated land owner must next determine when he should first take the deduction. Technically, a taxpayer could take the deduction at anytime and even file refund claims for past years not barred by the statute of limitations. However, as a practical matter the Internal Revenue Service probably will disallow all claims for deduction and refunds until the Shurbet case is finally settled.

Whether the Shurbet case is appealed to the Supreme Court is a decision which rests with the government. If the case is appealed, a final decision by the Supreme Court would probably not be reached before returns are due for the taxable year 1965. Ninety days is ordinarily allowed for appeal. If the case is not appealed, then the irrigated land owners on the Southern High Plains of Texas will be able to claim their deductions and refunds for the taxable year 1965 and for past years not barred by the statute of limitations.

TERM OF OFFICE FOR DIRECTORS OF WATER DISTRICT MAY BE CHANGED

The 59th Legislature passed House Joint Resolution 21 by Rep. Clayton of Springlake proposing an amendment to Article XVI of the Texas Constitution providing for six-year terms of office for directors of conservation and reclamation districts, water districts, etc. It provides that Article XVI of the Constitution be amended by adding a new section to read as follows:

"Sec. 30c. (a) The terms of office of persons serving on the governing body of a political subdivision of the State created to further the purposes of Section 52, Article II, or Section 59, Article XVI, of this Constitution, shall never exceed six years.

"(b) Statutory provisions enacted before the first Tuesday after the first Monday in November, 1966, relating to terms of office of governing bodies of political subdivisions created to further the purposes of Section 52, Article III, or Section 59, Article XVI, are validated, so long as the provisions do not provide for a term of office which exceeds six years."

This proposed constitutional amendment will be submitted to a vote of the people at the General Election in November 1966.

This amendment if passed will allow water districts to hold elections every two years rather than annually. This would allow a great saving of money spent in holding water district elections.

Water Is Your Future, Conserve It!

THE Cross SECTION

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

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BILL J WADDLE
Editor

BOARD OF DIRECTORS

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(BAILEY, CASTRO and PARMER COUNTIES)
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(ARMSTRONG, DEAF SMITH, POTTER and RANDALL COUNTIES)
Andrew Kershen .... Rt. 4 Hereford Texas

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Tom McFarland .... District Manager
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David Cunningham .... Field Representative
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Dana Wacasey .... Bookkeeper
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Jayne Cobb .... Draftsman
Mrs. Doris Hagens .... Secretary

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Kenneth Seales .... Field Representative
Mrs. Mattie K. Robinson .... Secretary

Field Office, Muleshoe
David Cunningham .... Field Representative
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COUNTY COMMITTEEMEN

Armstrong County
Cordell Mahler, 1968 .... Wayside, Texas
Foster Parker, 1967 .... Route 1, Happy
Dewitt McGehee, 1966 .... Wayside, Texas
Guy Watson, 1968 .... Wayside, Texas
Jack McGehee, 1967 .... Wayside, Texas

Bailey County
Mrs. Billie Downing
High Plains Water District
Box 594 Muleshoe
Marvin Nieman, 1968 ... Rt. 1, Box 107, Muleshoe
James P. Wedel, 1967 .... Rt. 2, Muleshoe
Homer W. Richardson, 1968 .... Box 56, Maple
W. L. Welch, 1967 .... Star Rt., Maple
J. W. Witherspoon, 1966 .... Box 261 Muleshoe
Committee meets last Friday of each month at 2:30 p.m., 217 Avenue B., Muleshoe, Texas

Castro County
E. B. Noble
City Hall, Dimmitt
Ray Riley, 1967 .... 71 W. Lee, Dimmitt
Frank Wise, 1967 .... 716 W. Grant, Dimmitt
Donald Wright, 1968 .... Box 65, Dimmitt
Lester Dowell, 1966 .... Rt. 1, Dimmitt
Morgan Dennis, 1968 .... Star Rt. Hereford
Committee meets on the last Saturday of each month at 10:00 a.m., City Hall, Dimmitt, Texas.

Cochran County
W. M. Butler, Jr.
Western Abstract Co., Morton
D. A. Ramsey, 1967 .... Star Rt. 2, Morton
Ira Brown, 1968 .... Box 774, Morton, Texas
Willard Henry, 1966 .... Rt. 1, Morton, Texas
H. B. Barker, 1967 .... 602 E. Lincoln, Morton
E. J. French, Sr. 1968 .... Rt. 1, Morton, Texas
Committee meets on the second Wednesday of each month at 8:00 p.m., Western Abstract Co., Morton, Texas.

Deaf Smith County
Mrs. Mattie K. Robinson
High Plains Water District
317 N. Sampson, Hereford
L. E. Ballard, 1966 .... 120 Beach, Hereford
Billy Wayne Sisson,, 1968 .... Rt. 5, Hereford
J. E. McCathern, Jr., 1967 .... Rt. 5, Hereford
Billy B. Moore, 1968 .... Wildorado, Texas
Charles Packard. 1967 .... Rt. 3, Hereford
Committee meets the first Monday of each month at 7:30 p.m., High Plains Water District office, Hereford, Texas.

Floyd County
Jeanette Robinson
325 E. Houston St., Floydada
Bill Sherman, 1967 .... Route F, Lockney
J. S. Hale, Jr., 1966 .... Rt. 1, Floydada, Texas
Tate Jones, 1967 .... Rt. 4, Floydada
M. M. Julian, 1968 .... Rt. Q, Lockney Texas
M. J. McNeil, 1968 .... 833 W. Tennessee, Floydada, Texas
Committee meets on the first Tuesday of each month at 10:00 a.m., Farm Bureau Office, Floydada, Texas.

Hockley County
Mrs. Phyllis Steele
917 Austin Street, Levelland
Bryan Daniel, 1967 .... Rt. 2, Levelland
Preston L. Darby, 1968 .... Rt. 1, Ropesville
Leon Lawson, 1967 .... Rt. 3, Levelland
H. R. Phillip, 1968 .... Rt. 4 Levelland, Texas
S. H. Schoenrock, 1966 .... Rt. 2, Levelland
Committee meets first and third Fridays of each month at 1:30 p.m. 917 Austin Street, Levelland, Texas.

Lamb County
Calvin Price
620 Hall Ave. Littlefield
Willie Green, 1967 .... Box 815, Olton
Roger Haberer, 1968 .... Earth, Texas
W. B. Jones, 1966 .... Rt. 1. Anton, Texas
Troy Moss 1968 .... Rt. 1, Littlefield, Texas
Raymond Harper, 1968 .... Sudan, Texas
Committee meets on the first Monday of each month at 7:30 p.m., Rayney's Restaurant Littlefield, Texas.

Lubbock County
Mrs. Doris Hagens
1628 15th Street, Lubbock
Weldon M. Boyd, 1967 .... Rt. 1, Idalou
Bill Hardy, 1968 .... Rt. 1, Shallowater, Texas
Bill Dorman, 1967 .... 1910 Ave. E., Lubbock
Edward C. Moseley, 1966 .... Rt. 1, Slaton, Texas
W. O. Roberts, 1968 .... Rt. 4, Lubbock, Texas
Committee meets on the first and third Mondays of each month at 1:30 p.m., 1628 15th Street, Lubbock, Texas.

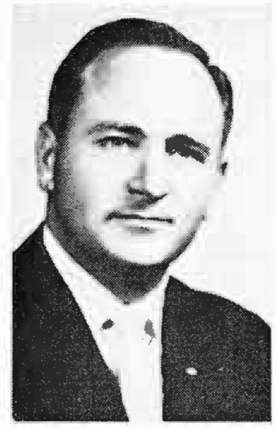
Lynn County
Mrs. Doris Hagens
1628 15th Street, Lubbock
Hubert Tienert, 1967 .... Wilson
Harold G. Franklin, 1968 .... Rt. 4, Tahoka
Roy Lynn Kahlich, 1966 .... Wilson, Texas
Oscar H. Lowery, 1967 .... Rt. 4, Tahoka
Reuben Sander, 1968 .... Rt. 1, Slaton, Texas
Committee meets on the third Tuesday of each month at 10:00 a.m., 1628 15th Street, Lubbock, Texas.

Parmer County
Aubrey Brock
Wilson & Brock Insurance Co., Bovina
Wendol Christian, 1966 .... RFD, Farwell, Texas
Henry Ivy, 1967 .... Rt. 1. Friona
Walter Kaltwasser, 1967 .... RFD, Farwell
Carl Rea, 1968 .... Bovina, Texas
Ralph Shelton, 1968 .... Friona, Texas
Committee meets on the first Thursday of each month at 8:00 p.m., Wilson & Brock Insurance Agency, Bovina, Texas.

Potter County
E. L. Milhoan, 1967 .... Rt. 1, Amarillo
W. J. Hill, Jr., 1966 .... Bushland, Texas
L. C. Moore, 1968 .... Bushland, Texas
Jim Line, 1968 .... Bushland, Texas
Eldon Plunk, 1967 .... Rt. 1, Amarillo

Randall County
Mrs. Louise Knox
Randall County Farm Bureau Office, Canyon
R. B. Gist, Jr., 1968 .... Rt. 3 Box 43 Canyon
Paul Dudenhoeffer. 1966 .... Rt. 2, Canyon, Texas
Carl Hartman, Jr. 1968 .... Rt. 1, Canyon
Lewis A. Tucek, 1967 .... Rt. 1, Canyon
Ed Wieck, 1967 .... Rt. 1, Canyon
Committee meets on the first Monday of each month at 8:00 p.m., 1710 5th Ave., Canyon, Texas

A JOB WELL DONE


Bill Clayton


Ralph Wayne


Bill J. Parsley

During the 59th session of the legislature three men serving in the House of Representatives were very active in water legislation.

Officials of the High Plains Water District were kept informed on water legislation by the untiring efforts of these men:

Bill Clayton of Springlake, who represents Bailey, Castro, Deaf Smith, Lamb, and Parmer Counties, served as a member of the house committee on Conservation and Reclamation and sponsored or co-sponsored the following water legislation:

H.J.R. 21 — Terms of office of Directors of Conservation and Reclamation Districts.

H. B. 77 — Regulation of the business of drilling water wells.

H. B. 231 — Extending the benefits of the Texas Water Development Board to underground water.

H. B. 232 — 233 — Changing the name of Soil Conservation Districts and election of State Soil and Water Conservation Board of Directors. and general laws of State Soil and Water Conservation Districts.

H. C. R. 153 — Declaring legislative intent as to various sections of the State in appointing members of Texas Water Rights Commission.

Clayton also has served as Chairman of a study committee on water and Soil Conservation and Development. This committee recommended twelve bills to the 59th session and passed eight.

S. J. R. 19, S. B. 144, 145 and 146 previously discussed in the Cross Section.

Ralph Wayne of Plainview, who represents Hale, Swisher, Floyd and Briscoe Counties also served as a member of the Conservation and Reclamation Committee in the House. He sponsored or co-sponsored the following legislation:

H. B. 622 — Creating the Mackenzie Municipal Water Authority.

H. B. 231 — previously discussed.

H. B. 11 — Raising load limits on cotton trailers, very important to cotton growers on the High Plains of Texas and in the High Plains Water District.

Wayne worked also on the Governor's water bills and was chosen by his fellow legislators as one of the most outstanding first year men in the House of Representatives.

Bill J. Parsley of Lubbock, who represents Lubbock County was the House sponsor of S. B. 144, S. B. 145, S. B. 146 and H. J. R. 19. These bills were all designed to implement the Governor's State Wide Water Plan.

The Water District would like to congratulate these representatives for a job well done.

DRILLING STATISTICS FOR MAY

During the month of May 358 new wells were drilled within the High Plains Water District; 31 replacement wells were drilled; and 18 wells were drilled that were either dry or nonproductive for some other reason. The County Committies issued 214 new drilling permits.

Listed below by counties are permits issued and wells completed for May

County	Permits Issued	New Wells Drilled	Replacement Wells Drilled	Dry Holes Drilled
Armstrong	0	0	0	0
Bailey	17	11	3	0
Castro	30	24	7	2
Cochran	12	10	0	0
Deaf Smith	19	25	0	0
Floyd	20	40	2	1
Hockley	27	40	1	2
Lamb	18	28	7	1
Lubbock	24	85	5	3
Lynn	3	25	0	4
Parmer	33	52	6	4
Potter	0	0	0	0
Randall	11	18	0	1
Total	214	358	31	18

PLEASE CLOSE THOSE ABANDONED WELLS

Water Legislation Of The 59th Session

On May 31, 1965 the 59th Texas Legislature was adjourned. With the adjournment of the 59th session, several records were established.

A record number of bills was introduced, 1,906 to be exact, and a record number passed — 789.

There were 232 bills introduced relating to the development, conservation, distribution and use of water. Of this number, 107 were finally passed,including 46 creating new water districts, most of which comprise only small urban areas. One underground water district was created. Four navigation districts were created in East Texas.

All bills to implement Governor John Connally's water program were enacted by the 59th session, except bills creating the Texas Water Resources Research Institute at Texas A&M University and the Water Rights Adjudication Act.

The Water Rights Adjudication Act, H. B. 887 was introduced late in the session. It was reported favorably, as amended, by the House Committee on Conservation and Reclamation but it was too late for floor action with all the other bills on the calendar. However, it advanced farther than any other similar bill over the past several years.

The Governor's other water bills, S. J. R. 19, S. B. 144, S. B. 145, S. B. 146 were enacted.

Senate Joint Resolution 19 proposes an amendment to Section 49 D, Art. III of the Texas Constitution, authorizing the use of the Texas Water Development Fund in the acquisition and development of storage facilities and in any system of works properly appurtenant thereto, and the issuance of an additional $200,000,000 in bonds by the Texas Water Development Board upon a two thirds vote of the elected members of each house.

S. J. R. 19, as finally passed, contains the following proviso sponsored by the East Texas Legislators:

"Provided, however, the Texas Water Development Fund, or any other State fund provided for water development, transmission, transfer, or filtration shall not be used to finance any project which contemplates or results in the removal from the basin of origin of any surface water necessary to supply the reasonably foreseeable future water requirements for the next ensuing fifty-year period within the river basin or origin, except on a temporary, interim, basis."

Many West Texans were unhappy with the proviso because they felt it would be impossible to divert water from East Texas to West Texas if ever needed in future years. Many expressed concern that under this set up it would be difficult to sell bonds to finance transmission lines and systems for West Texas under the proviso.

The planning division of the Texas Water Commission is presently developing a long-range Statewide plan to take care of all sections of the state over the next fifty years. Legislators say that, "all the proviso does is write into the State Constitution a requirement that is already being carried out, that is, a long range water plan for all Texas. — East West, North, and South."

S. J. R. 19 will be submitted to a vote of the people at the General Election in November, 1966.

S. B. 144 authorizes the Texas Water Development Board to issue the second $100 million of the $200 million Water Development Fund voted by Constitutional Amendment in 1957. It is anticipated that all of the first $100 million will be loaned to local governments or committed to the purchase of storage space in reservoirs during the coming biennium.

S. B. 145 reconstituted the Texas Water Commission as the Texas Water Rights Commission and freed it of all responsibilities except the protection of the public interest and private rights in water development.

The Texas Water Rights Commission under the terms of S. B. 145 and 146, as enacted, is directed to:

1. Hold a public hearing on the State Water Plan prepared by the Water Development Board to make sure the plan is publicized and that it includes adequate consideration for water rights;
2. Grant permits to individuals, local governments and the Water Development Board for project construction, water storage or use, and inter-basin transfers of water;
3. Conduct feasibility hearings on proposed federal projects, with the assistance of the staff of the Water Development Board and advise the Governor as to their effect;
4. Designate local sponsors for either State or Federal projects after public hearings;
5. Cancel water permits which have not been put to beneficial use over a ten year period; and
6. Create certain types of water districts.

The Commission is thus responsible for holding hearings on major State and Federal water plans, granting permits for project construction and water storage or use, cancelling unused permits, designating local sponsors of projects and creating water districts.

S. B. 146 amends the Texas Water Development Board Act of 1957 and transfers to the Board all of the water resources planning functions formally vested in the Texas Water Commission.

The bill as passed, directs the board to:

1. Make a comprehensive State Water Plan;
2. Act as the State cooperator in water development planning with the Federal Bureau of Reclamation and the Corps of Engineers;
3. Act as the State sponsor of Federal projects where no suitable local agency (or agencies) can undertake the task;
4. Make loans to local governments for approved water projects consistent with over-all planning objectives;
5. Negotiate with the Federal Government for the inclusion of water storage space in Federal projects;
6. Purchase storage space in local or federal reservoirs to insure optimum development of the damsites; and
7. Construct reservoirs and (subject to vote approval of the Constitutional Amendment submitted in S. J. R. 19) other facilities such as canals, pipelines, pumping stations, and filtration plants which might be required to move water from the reservoirs to cities, districts or other wholesale customers.

The Texas Water Development Board is thus charged with making a State Water Plan and implementing it through negotiations with federal agencies, loans to local governments, investment in local and federal projects and actual construction of projects where necessary.

H. B. 887, the water rights adjudication act proposed an administrative procedure for the adjudication of water rights conflicts to prevent costly court contests and delays.

As previously stated, the bill was reported out of Committee but there was not enough time in the session for action by the full house.

Water lawyers feel that until an administrative procedure is provided to set out the tangle of water rights claims, it will not be possible to make any major water plan which protects legitimate water rights.

Other bills passed having a regional effect include:

H. B. 77 by Clayton — to aid in prevention of pollution of the State's underground water by regulating the business conduct of persons drilling water wells and creating the Texas Water Well Drillers Board.

H. B. 231 Clayton, Wayne and Murry — Extending the benefits of the Texas Water Development Board program to the development of underground waters.

H. B. 622 by Wayne — Creating the Mackenzie Municipal Water Authority comprising the terrfitory contained within the boundaries of the City of Tulia, Swisher County, the City of Silverton in Briscoe County, and the cities of Lockney and Floydada in Floyd County as the boundaries of each city existed on February 1, 1965.

H. B. 232 — Clayton and Murry — Changing the name of Soil Conservation Districts to "Soil and Water Conservation Districts" and State Soil Conservation Board to "State Soil and Water Conservation Board."

Water legislation was a key factor during the 59th session and looks as if it will probably be a major item during the 60th session. People are all getting interested in establishing local districts for local control and if this be the case more districts will be formed in the future.

THE CROSS SECTION
1628 - 15th Street
Lubbock, Texas
Dear Sirs:

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WATER POLLUTION CONTROL ACT

The State Water Pollution Control Act of 1961, Art. 7621d, Vernon's Civil Statutes of Texas, was amended by the 59th Legislature to clarify the duties, responsibilities and authority of designated personal representatives of members of the Water Pollution Control Board; to provide for Board membership, and to clarify the responsibilities of the Railroad Commission as a member of the Board.

H. B. 785 by Rep. Mutcher of Brenham increases the membership of the Board from six to seven members by adding the Chairman of the Railroad Commission as a member. The Board will now consist of three members appointed by the Governor with the advice and consent of the Senate, one representing agriculture and soil conservation interest; one, the manufacturing industry; and one, the general public interests, and the following four State officers: the Executive Director of the Texas Water Development Board, the State Commissioner of Health, the Executive Director of the Texas Parks and Wildlife Department, and the Chairman of the Railroad Commission.

Each ex officio member of the Board is authorized to delegate to a personal representative from his office the authority and duty to represent him on the Board, but by such delegation a member shall not be relieved of responsibility for the acts and decisions of his representative.

The Texas Water Development Board, the Texas Parks and Wildlife Department, the Texas State Department of Health, and the Railroad Commission of Texas are charged with the following specific duties in addition to any other duties imposed on such agencies elsewhere in the Act:

"(1) It shall be the duty of the Texas Water Development Board to investigate and ascertain those situations in which the underground waters of the State are being polluted or are threatened with pollution, and it shall report all findings to the Board together with its recommendations in regard thereto.

"(2) It shall be the duty of the Texas Parks and Wildlife Department and the employees thereof duly authorized by such Department to enforce the provisions of this Act insofar as any violation hereof occurs which affects aquatic life, birds and animals.

"(3) The Texas State Department of Health shall continue to perform the research, training, planning and other functions presently being conducted by it in matters concerning pollution in cooperation with, or as a State agency contributing its services to, the Board.

"(4) The Railroad Commission of Texas shall be solely responsible for the control and disposition of waste and the abatement and prevention of pollution, resulting from activities associated with the exploration, development or production of oil and gas. Said Commission may issue permits for the discharge of waste resulting from such activities."

H. B. 785 provides that: "After consultation with the Board, the State Commissioner of Health shall designate an employee of the Texas State Department of Health in the Water Pollution Control Division to serve as Executive Director of the Board.

Colorado Farm Group Studies High Plains Water Management As Guests Of High Plains District

A 30-member agricultural group from Burlington, Colo., took an inventory of water management practices in Deaf Smith and Parmer counties as guests of the High Plains Underground Water Conservation District.

The group inspected irrigation tailwater return systems, lakepump installations used to salvage rainfall runoff, a silt management experiment, land levelling to conserve water and other projects aimed at prolonging the life of the underground water supply.

Thirteen farms which are cooperating with the Water District were visited. The Colorado group, which arrived in Amarillo Monday afternoon, spent Tuesday night in Clovis and will return home today.

Have Water Problem

Don Reddell engineer with the Water District, explains that the group from eastern Colorado has a problem of a declining water table similar to that on the High Plains.

The Burlington area has somewhat more natural recharge, although it depends on precipitation to replenish the underground supply. Withdrawals of water exceed the rate of recharge.

Irrigation in the Burlington area is in its infancy. Farmers there pump from the Ogallala formation, the same kind of water-bearing formation that is underneath the High Plains.

Similarities between the two regions prompted the Burlington group to make arrangements through the Water District to inspect water management projects on the High Plains. The tour was made Tuesday, June 15th on a chartered bus.

Lake Pump Setup

The first stop was at the Stewart Brothers farm at Dawn where the visitors saw a lake pump installation that was put into use in 1958. The brothers have more than $15,000 invested in the lake pump, pipeline and dirt work.

"We could not have stayed in the farming and livestock business without our lake water," one of the brothers said. Part of the salvaged water is transported through two miles of pipeline to another of the brothers' farms which has an inadequate water supply.

A recharge well was inspected on the Robert Viegel farm about 10 miles north of Hereford. It is used to put runoff water back into the underground formation. The well also is used as a production well. It will "take" about one-third more water than it will produce.

The visitors saw a lake pump installation on the Steve Clements farm about 10 miles northwest of Hereford which has been used to salvage more than 1,800 acre feet of water since 1959.

Cost of the Clements installation was less than $1,250. The installation will produce between 900 and 1,250 gallons of water per minute at a pumping cost of about 45 cents an hour.

A new concept in sprinkler irrigation systems was seen on the Bruce Burney farm about nine miles northwest of Hereford. It features a main line and lateral lines and can be used to water eight acres every 24 hours while applying five inches of water per acre.

Friona Farm Viewed

Burney last year watered 105 acres of wheat, 71.3 acres of Midland Bermuda grass and 66 acres of cool grasses with the system. He has been running 193 cows on the Bermuda grass. Cost of operating the sprinkler system, including labor and fuel, is $16.70 per day.

The group viewed a tailwater return system on the Dave Thompson farm about eight miles southwest of Friona which was used to recover 33.7 acre feet of water over about a six week period starting last March 15. A tailwater gravity flow system also was inspected on the Gabe Anderson farm near Bovina.

J. B. Taylor, who farms 1 1/2 miles southeast of Friona, told of salvaging 91.1 acre feet of water during the year ending last April with a tailwater return system that cost $3,800. The system salvaged 151 acre feet of water the preceding year.

Water District officials reported that 24 per cent of the total water pumped by three wells in 1964 was salvaged by Taylor's tailwater return system. Meters were installed on the wells to determine the percentage of water salvaged from 290 acres contributing to the system.

Other Projects Visited

The 151 acre feet of water salvaged by the Taylor system in 1963-64, if valued at $40 peracre foot, would be worth $6,040, Water District officials pointed out.

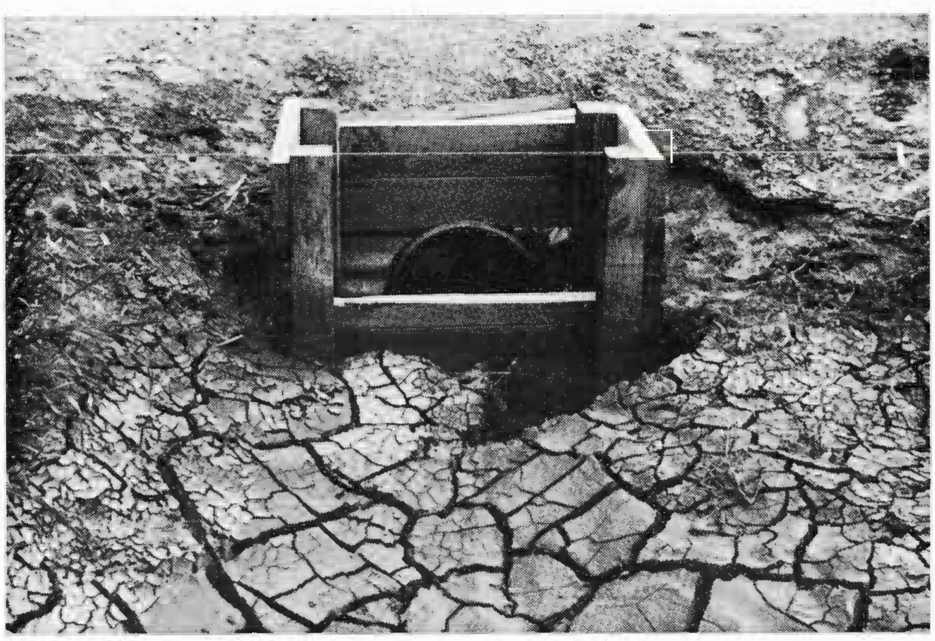
A silt management experiment was inspected on the Dwain Menefee farm about 3 1/2 miles south of Friona. Water is recirculated through pipes on the bottom of Menefee's tailwater pit with the objective of keeping the silt suspended until it can be pumped out. This is to reduce silting in the water storage area.

Other tailwater return systems or lake pump installations were seen on the farms of Spencer Hough, Gilbert Wenner and James Mabry in the Hub community.

A land levelling project to control irrigation tailwater and soil erosion was inspected on the Kenneth Cass farm in the Hub community. Cass has levelled a strip of land 300 feet wide across the entire length of the 160-acre farm.

Cost of the levelling was about $2,250. A tailwater return system, officials said, would have cost about $2,500.

Group of Colorado farmers on tour of tailwater installations of the High Plains Water District.



This odd looking structure is simple but effective. The wooden box surrounds the intake pipe of a tailwater pit. By adding sections to the front of the box, water is dammed up and allows the silt to settle out of the water before it enters the pit.

High Plains Underground Water
Conservation District No. 1
1628 Fifteenth Street
Lubbock, Texas

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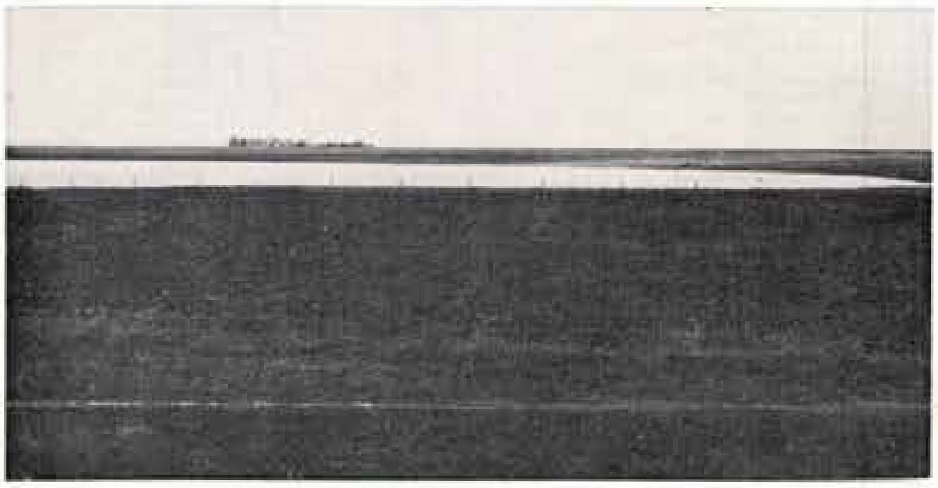
THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 12—No. 2 "THERE IS NO SUBSTITUTE FOR WATER" July 1965

PLAYA LAKE

Cheap Irrigation Water



One of the many playa lakes located on the high plains of Texas.

Farmers on the High Plains of Texas are constantly facing a shortage of water for irrigation. A constant decline of the water table in the Ogallala Formation has caused many farmers to turn to another available supply of water suitable for irrigation. By utilizing all available water the decline of the water table can be slowed and farmers can look ahead to many more years of high production from irrigated crops.

Playa lakes, thousands of them across the High Plains, collect approximately a million and a half acre-feet of water in years of average rainfall. Some of this water soaks back into the ground, but thousands and thousands of acre-feet of it are lost through evaporation and does not do anybody any good, unless some enterprising farmer happens to think that this is water that the good Lord has put on his land as a "fringe benefit" to help him with his crop production and ultimately help pay off the mortgage on his land.

J. B. Sneed, Jr., of Friona, Texas, is one of these farmers. Mr. Sneed made a small investment in available water and reaped returns far in excess of his expectations. Unfortunately, Mr. Sneed didn't have a lake on his farm, but he kept looking longingly at one across the fence on his neighbor's land.

Like some other farmers, Mr. Sneed's neighbor did not want to waste the time rigging up a pump, so Mr. Sneed made a contract with the neighbor to let him pump the lake. Sneed paid the neighbor $600.00 and paid a thousand dollars, each for two pumps. The High Plains Water District loaned him one of the District's flow meters and helped him install it in a line leading from one of the pumps. Records were to be kept in order that the District, as well as Sneed, might know the rate of pumping and how much water was salvaged from the lake. In April, 1964 he began pumping. By the end of the first week, Mr. Sneed told an employee of the Water District his lake pumps were delivering twice as much water as all three of the irrigation wells on his land would produce pumping together. The meter was whirling merrily along at a thousand gallons per minute. The lake was pumped continuously from April until the latter part of September, when the irrigation season ended. The facts were there — not only in beautiful crops, but the pump with the meter on it had delivered over one hundred and thirty acre-feet of water to fields of sugar beets, grain sorghum, carrots and alfalfa.

When asked what an acre-foot of water was worth to him on crops like these; "About forty dollars an acre-foot", Mr. Sneed answered. The rest is a matter of simple mathematics. For a twenty-six hundred dollar investment Mr. Sneed produced over ten thousand, four hundred dollars worth of free water. Free to the extent that it was water that would have all been lost while his irrigation wells were drawing from storage several hundred feet below. "Next year, I'm ready for 'em, when the rains come. I'll keep my wells, but just for insurance", Sneed said.

To insure an adequate supply of water for future years Sneed recently purchased the tract of land on which the lake is located. With foresight like this Sneed is sure to be in the farming business for years to come.

A Job For Everyone

Water Conservation in Texas should be a full time job for everyone — farmers, ranchers, businessmen, housewives, lawyers, everyone.

Many people view water conservation in a light manner and feel unless they are involved directly with water and soil conservation work, they really have no responsibilities. This is very untrue.

Recent legislation passed by the 59th session was a great step in the orderly development and distribution of the state's water resources. It is now up to the citizens of this state to take an active part and help implement the work this legislation will require of each individual of this state.

Unfortunately, many people view water conservation very lightly. A good comparison to some individuals' views would be that of a baseball game. Many people plan water conservation on a "three inning basis" and think they can get the job done when it takes the full "nine innings" to accomplish the feat.

The citizens of Texas have a nine inning water conservation game before us and it is going to take a strong team with each player doing his part to win. If we go only three innings in our water conservation programs, we will lose the entire game.

Let's set our goals for the future and everyone join in the game of water conservation. If everyone will play to win, Texas will have the finest water conservation plan in the nation.

Water Is Your Future, Conserve It!

Water For The Future

Organization of a "Water for the Future Committee" was completed in a special meeting of the recently-appointed group at Lubbock.

G. H. Nelson, Lubbock attorney, was elected chairman of the five-man group appointed in June by Dr. Gerald Thomas Texas Tech. chairman of the West Texas Water Institute.

Purpose of the committee is to obtain for the entire West Texas area any surplus surface waters made available in the future, to attend related water meetings throughout the nation, and to safeguard West Texas' water rights in state and national legislation.

Shurbet Named

Marvin Shurbet, Petersburg farmer, was named executive vice chairman of the committee; and A. C. Verner, Lubbock banker, was elected treasurer. Other members include J. W. Buchanan, Dumas, and Loyan Walker, West Texas Chamber of Commerce official at Abilene.

Nelson emphasized the importance of the committee functions, observing that "we anticipate the long-range water needs, domestic and agriculturally, for West Texas if we are to continue to grow and prosper as in the past."

A budget for actual operational expenses of the committee is being prepared for presentation within a few days. Solicitations from interested business and individuals throughout West Texas will be made after submission of the budget, Nelson said,

Meeting Slated

A representative from the group will attend a meeting in early August at Oregon State University, Corvalis, Ore., when 11 western universities are sponsoring the Second Western Interstate Water Conference. Water resource needs in the West will be discussed, together with development of effective interstate and regional water planning.

Other meetings, to be attended by the Lubbock committee representatives, will be held in California, New York and possibly Washington, D. C., later this year.

The "Water for the Future" committee will keep abreast of all developments in the various regional water programs, Nelson said, including that of the North American Water and Power Alliance for bringing water from Canada and Alaska, and other proposals for utilization of water from the Missouri River or East Texas.

THE Cross SECTION

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BILL J WADDLE
Editor

Parallel Terraces

Milton Kirksey, Vice-Chairman of the Lubbock County Soil Conservation District, living near Wolfforth, Texas, states that his land is ready to hold a rain when it comes.

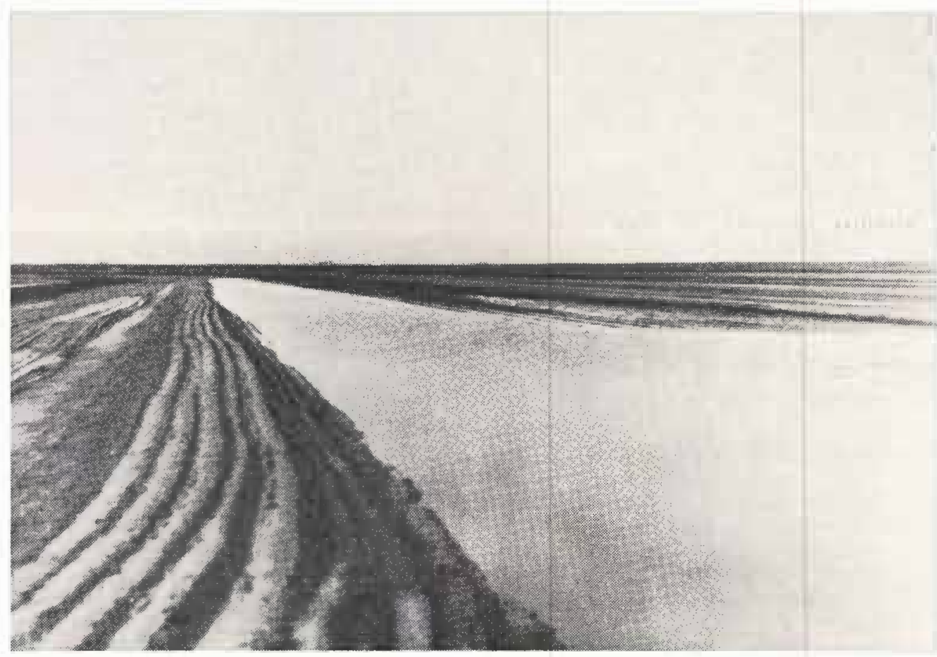
Mr. Kirksey, owns and operates a half-section of irrigated land on which he has completed construction of 20,361 linear feet of parallel terraces. He was assisted by technicians of the Soil Conservation Service in the design, layout and supervision of construction of this system. One hundred acres of sloping cultivated land around a playa lake will be protected by the parallel terraces against water erosion and will hold the rain where it falls. After a 3 inch rain in June, there was no runoff from this field.

The almost 4 miles of terraces built by Kirksey do not have a point row in the entire system. The terraces are spaced to accomodate either 4 or 6 row equipment. He stated that when the listing was done for this years crop, all the rows fit perfectly. There were no wide or narrow places between the terraces to become weed traps and make farming with large equipment difficult.

Kirksey is one of the pioneers in this area in building parallel terraces. His terraced land on this farm will be sprinkler irrigated and farmed just the same as his other irrigated land.

There is also a good conservation cropping system being carried out on this farm. A rotation system of cotton and fertilized grain and forage sorghum, as well as heavy applications of cotton burs, make this an excellent farming operation to conserve all the natural rainfall. Kirksey recognizes water as the most valuable asset on his farm and is making every effort to hold what water falls on the land where it falls and also to make maximum efficient use of his irrigation water.

The Great Plains Conservation Program assisted Mr. Kirksey in building the parallel terraces by paying about 70 per cent of the cost of construction. This program is designed to assist farmers and ranchers financially and technically in carrying out a complete soil, water and plant conservation program. This program can be carried out over a long period of time and federal cost-share ranging from 50 percent to 80 percent of the cost may be earned by installing the needed conservation measures.



Water behind a level parallel terrace. Picture was made following the first rain after the completion of the terrace. S. C. S. Photo

DRILLING STATISTICS FOR JUNE

During the month of June 163 new wells were drilled within the High Plains Water District; 21 replacement wells were drilled; and 12 wells were drilled that were either dry or nonproductive for some other reason. The County Committees issued 121 new drilling permits.

Listed below by counties are permits issued and wells completed for June.

County	Permits Issued	New Wells Drilled	Replacement Wells Drilled	Dry Holes Drilled
Armstrong	0	0	0	0
Bailey	8	8	4	1
Castro	14	15	3	2
Cochran	9	10	0	1
Deaf Smith	18	21	1	1
Floyd	16	8	0	0
Hockley	10	13	2	3
Lamb	9	18	6	0
Lubbock	13	33	1	3
Lynn	2	10	0	0
Parmer	18	18	4	0
Potter	0	0	0	0
Randall	4	9	0	1
Total	121	163	21	12

Water and Grain Sorghum

Irrigated grain sorghum was grown on 2,042,174 acres in the Texas High Plains in 1964. This was approximately 40 percent of the irrigated cropped acreage in this area. Most of the irrigation water was pumped from the Ogallala formation which underlies much of the Southern High Plains of Texas.

Experiments concerning limited irrigation of grain sorghum have been conducted in recent years at experiment stations in Lubbock and Amarillo, Texas. These experiments have revealed several factors concerning the irrigation of grain sorghum.

As one might assume, the water requirement of grain sorghum is not a fixed value. In hot, dry years transpiration by the plant is higher than in cool, relative humid seasons. Low relative humidities, high temperatures and wind movement also increase evaporation from the soil surface, adding further to the consumptive use.

Water used by the grain sorghum plant begins with germination but is comparatively low for the first two or three weeks of development, averaging from 0.05 to 0.10 inch per day. Irrigation is usually not necessary during this time even through periods of drought, except for sandy soils with low water holding capacities. Daily water use through July, August and early September averages about 0.25 inch.

Rainfall and irrigation water are equally valuable for crop production. An additional acre-inch of rainfall utilized is an acre-inch of irrigation water saved. In most years rainfall provides half the water requirements of grain sorghum. The final measure of efficient water use by the crop is in the pounds of grain obtained per acre-inch of water. The highest possible yield per acre irrespective of water use, is not necessarily the most profitable. Researchers reveal that the greatest return per acre-inch of water has been obtained by providing adequate amounts of water for vigorous crop growth throughout the season to plants adequately supplied with the necessary nutrients.

Preplant irrigations are usually necessary to provide adequate soil moisture before grain sorghum is planted. These irrigations should be made to provide field capacity storage to a depth of about 4 feet if the soil profile is that deep. 4 to 6 inches of irrigation water should be adequate to bring the soil to field capacity on the Pullman silty clay loam soil and mixed land which are prevalent in the Lubbock — Amarillo area. The Pullman silty clay loam has little available water in the profile.

Weather records at the Lubbock and Amarillo stations show that preplanting irrigations are necessary two years out of three to bring the soil to field capacity.

Rainfall usually provides half the water requirements of grain sorghum, but it is too undependable to eliminate the need for planning each irrigation in one's water management program. Irrigation may be delayed a few days and the necessary volume of application decreased following an effective and timely rain at any time during most growing seasons. Rains are seldom adequate to provide for consumptive use for a two week period during the irrigation season and thus completely eliminate an irrigation. Farmers with playa lakes that are equipped are usually able to capture considerable amounts of rainwater and in many instances can irrigate two or three times from the lake, depending on the acreage to be covered.

If playa lakes are not available for a farmer's use, efforts should be made to control run-off so that large rains during the growing season can be utilized more effectively.

A theory has existed that if sorghum is put in stress for water a deeper root system is produced. Another similar idea has been that "it doesn't hurt sorghum to wait for water." Both are without basis. At no time in a five year study made at Lubbock and Amarillo was there any evidence that sorghum plants in stress for moisture produced better or deeper root systems. More water may have remained in the soil profile or plots receiving additional irrigation, but the use of sub soil moisture was as great or greater by plants maintained with constantly adequate supplies of available moisture. Plants once in severe stress for moisture never produced as much grain as plants not in stress even though rainfall and later irrigation provided enough moisture to grow a plant of normal size. An adequate and continuous supply of available soil moisture must be maintained to produce maximum yields. The plants need a certain quantity of water at the proper time for maximum yields. However 2 inches of water prior to stress will yield much more than the 5th or 6th irrigation as far as return per acre inch.

The first irrigation should be planned about three weeks after planting if rainfall has not replenished an appreciable portion of the two to three inches of water used by the sorghum crop and lost by evaporation. At this stage of growth some available moisture should be maintained in the surface foot of soil. On the Pullman soils the readily available moisture in the 0 to 24 inch depth should be maintained above 50 percent of storage capacity. After this time, irrigation is usually required at 10 to 14 day intervals until after blooming whenever rainfall is inadequate to maintain 25 to 50 percent available water in the 0 to 24 inch depth of soil.

Sandy soils or shallow soils require more frequent applications. Extremely high temperatures may require more frequent irrigations.

In late July, August and September, the crop extracts water from depths below three feet.

In most seasons two irrigations after planting are adequate and if a farmer is short on water, this is about all the irrigation water he will have available for the crop.

Applications of 3.5 to 4.0 inches are usually adequate for the growing crop on clay or loam soils, with 2.0 to 2.5 inches per application on extremely sandy soil. More frequent irrigation is required on a sandy soil.

An irrigation should be started early enough so that the last plants irrigated will not have suffered for moisture. This often makes it desirable to increase the amount of water applied at the first irrigation. A two inch irrigation may be adequate to replenish the soil moisture deficit when such an irrigation is started. An increased depth of application should be provided on each successive day to provide for the added consumptive use. If ten days are required to irrigate the crop acreage, an application of 4 inches or more may be required to replenish the soil moisture deficit on those portions of the field irrigated near the tenth day.

The depth of application for irrigation varies greatly with different types of soil. A soil must store water as well as supply nutrients for optimum grain sorghum production. Studies show that in most years sorghum plants extract water from depths of five to six feet. A soil storing two inches of water per foot of depth stores twice as much water in the same depth as a soil storing only one inch per foot of depth, and requires less frequent irrigations during dry periods.

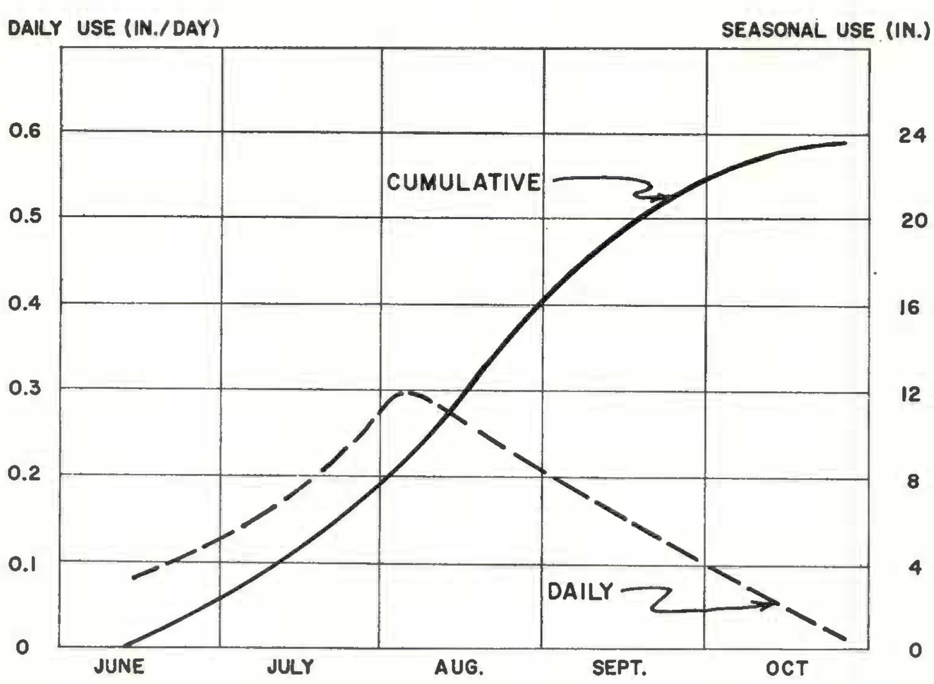
The main requirement of an irrigation for a grain sorghum crop is to deliver the amount of water needed to the root zone of each plant. This requires good distribution. It is desirable to apply little more water than the root zones require and to lose as little as possible by runoff. This involves application efficiency. No other single factor has lowered the overall yields of grain sorghum fields on the Texas High Plains more than poor distribution of irrigation water.

Using graded furrows and border strips with underground concrete pipe and portable aluminum gated pipe eliminates ditch water losses.

The graded border strips conduct water uniformly over the soil surface throughout the field.

Efficient water management can be accomplished in grain sorghum production by using only the amount of water required for the plant, too much is as destructive as too little, use short runs, eliminate the use of open ditches as much as possible and use land leveling practices to get even distribution of water throughout the field.

Experiments in various parts of the High Plains reveal that the proper timing of limited irrigations results in the most efficient use of irrigation water in the production of grain sorghum.



Water use by irrigated grain sorghum in the southern Great Plains area. Stage of development: emergence, mid-June; rapid elongation, late July; late booting, early August; flowering, mid-August; grain development, late August to early September; complete maturity, October.

Typical grain sorghum crop being produced with a limited water supply.

Reduction of the "Duty" of Water

High Plains farmers have searched many years for ways to produce crops on less water. This may be just around the corner for High Plains farmers due to research presently being conducted.

Laboratory, greenhouse, and field experiments currently underway by Dr. Arthur F. Gohlke, Assistant Director and Senior Soil Scientist for the High Plains Research Foundation at Halfway, Texas, may disclose the possibility of securing the same yield from cotton on 1/4 to 1/2 of the irrigation water now used. A hormone has been found which produces cotton plants with shorter, thicker stems and thicker, darker — green leaves than untreated plants. This change in the plant inhibits the transpiration of water through the leaves of the plant without reducing the ability of the plant to produce from one to two bales of cotton per acre. Dryland cotton yields similar to irrigated cotton yields may be obtained through the use of this hormone. On irrigated land, the reduction of up to 50 percent of the irrigation water requirements might not be too far in the future.

The Agricultural Research Service, U. S. Department of Agriculture, has conducted experiments at six locations in the Great Plains to determine the potential benefit from reducing evaporation by covering the soil surface with a plastic film. At Bushland, Texas, west of Amarillo, bare soil produced 2,560 pounds of grain sorghum per acre on 10.5 inches of water, and covered soil produced 2,420 pounds of grain sorghum per acre on 7.6 inches of water. This is an increase of 33-1/3 percent in water use efficiency. At Big Spring, Texas, bare soil produced 2,870 pounds of grain sorghum per acre on 7.6 inches of water while the covered soil produced 2,710 pounds of grain sorghum per acre on 2.5 inches of water; an increase in water use efficiency of 186 percent. It is apparent that evaporation control can save appreciable quantities of water and improve water use efficiency.

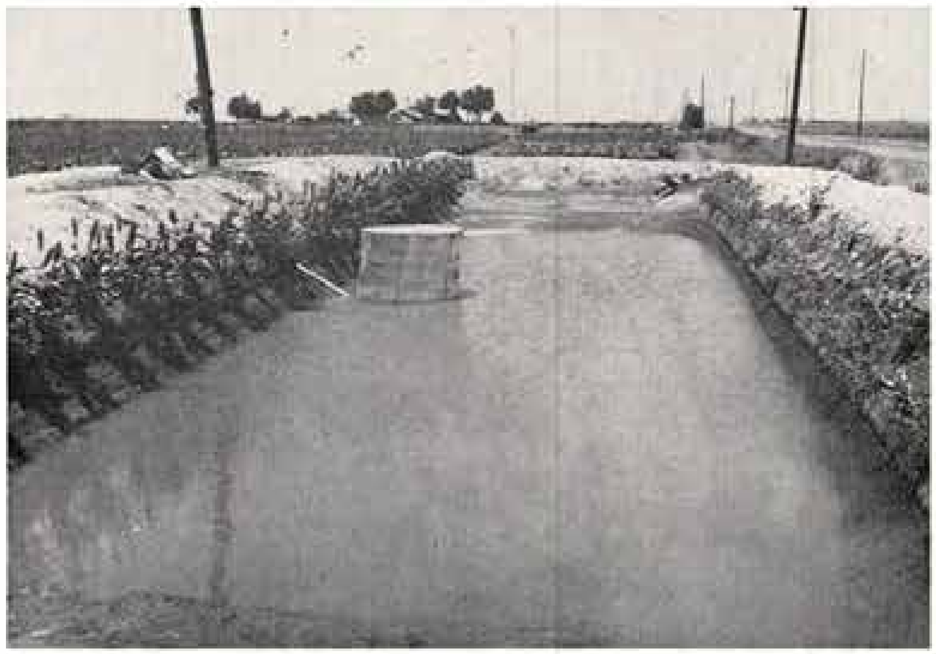
The chief problem facing the irrigation farmer on the High Plains of Texas is one of maximum conservation. The High Plains farmer loses three to four inches of water as evaporation for each 12 inches of irrigation water applied. With this in mind, it seems appropriate to deliver irrigation water directly to the root zone without simultaneously wetting the soil surface, from which a considerable portion of the moisture is lost to evaporation. Perforated plastic pipe buried 16 inches deep, is being used in subirrigation tests at the Texas Agricultural Experiment Station in Lubbock, Texas. In the 1963 test, comparable cotton yields were produced on 42 percent less irrigation water by the subirrigation technique when compared with furrow irrigation. An average of 714 pounds of lint per acre was produced by 8 inches of water delivered by subirrigation, whereas 684 pounds of lint per acre was produced by 14 inches of water with furrow irrigation. The subirrigation technique offers great promise as a more efficient method of applying irrigation water, yet requires additional research to be perfected.

Many people in the High Plains have felt that sprinkler systems are not a great saver of water. Very little research on sprinkler irrigation has been done on the High Plains, a considerable amount has been done in Arizona which indicates that sprinkler irrigation can be a saver of water. Lemon trees, planted experimentally in 1958 on the Yuma Mesa, have required one-half as much water under sprinkler irrigation as under flood irrigation. During 1961 a total of 4.8 acre-feet per acre was applied to the sprinkled trees while the flood irrigated trees required 9.5 acre-feet per acre to maintain similar moisture conditions. Recent tree measurements showed 10 percent greater girth for the four year old trees on the sprinkler irrigated plots, and first yields were 4 to 10 percent higher for sprinkler irrigation.

The Agricultural Engineering Department of the University of Arizona has been studying performance characteristics of sprinkler irrigation systems since 1950. These studies have evaluated water application efficiencies and the factors affecting water losses, crop yields and water requirements over a wide range of crops, climatic conditions and sprinkler system operations. One variety of (A-44) cotton produced 2,942 pounds of seed cotton per acre on 3.15 feet of water under sprinkler irrigation, as compared to 2,941 pounds of seed cotton per acre on 4.09 feet of water under furrow irrigation. This is a 23 percent reduction in water use by the sprinkler system over furrow irrigation. Similar results were obtained on other crops. Irrigation water can generally be saved by the installation of a properly designed sprinkler system,especially on the lighter soils.

The above mentioned research projects are only a few of the projects presently being conducted by irrigation engineers and plant scientists which will help to reduce the water requirements of agriculture in the future. In view of the results from some of this research, it seems that a reduction of the "duty" of water in the High Plains of from 25 to 30 per cent is on the conservative side. A combination of the hormone and subirrigation could result in a water saving of from 50 to 70 percent.

Irrigation studies generally assume that adequate irrigation for optimum yields is desirable in that the problem is: "How to most efficiently use an adequate water supply? However, most High Plains farmers find that they do not have large enough well yields to produce optimum yields on all of their land. The question which becomes pertinent under these conditions is: "How can limited water supplies be used most efficiently in crop production to supplement rainfall?" With this last question in mind, researchers in the High Plains are conducting their research with water, not land as the limited resource.



Delton Jack of Lockney uses this return system to capture 98 percent of his irrigation runoff. This system is in its second year of operation.

F H A APPROVES WATER LOANS

The Farmers Home Administration in Washington, D. C. announced June 22, approval of 11 new community water system loans in Texas during April and May.

The following Texas water supply corporations and the number of families benefiting received loans:

Desert Water Supply Corporation, Collin County, $30,000, 28 families; New Summerfield, Cherokee County, $33,000, 18 families; North Shore, Denton County, $61,800, 51 families; Butler, Freestone County, $74,000, 60 families; Telico, Ellis County, $20,000, 110 families.

Sturdivant, Palo Pinto County, $122,000, 100 families; Whitt, Parker County, $28,000, 28 families; Goodsprings, Rusk County, $158,000, 114 families; Carroll, Smith County, $50,500, 44 families; Cunningham, Lamar County, $72,000, 65 families; High Point, Kaufman County, $240,000, 189 families.

The loan funds will be spent to buy sites, drill wells, erect storage tanks, buy pumps, lay pipelines and pay for legal and engineering services. The principal beneficiaries will be rural homes.

PLEASE CLOSE THOSE ABANDONED WELLS

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HIGH PLAINS OF TEXAS . . .

WATER RESOURCES OF PLAYA LAKES

By DONALD L. REDDELL

Introduction

The High Plains of Texas occupies an area of about 35,000 square miles in northwest Texas, extending from the Texas-Oklahoma state line southward about 300 miles and from the New Mexico-Texas state line eastward an average distance of about 120 miles.

The Ogallala formation, a ground water reservoir of Tertiary age, extends over large parts of the Texas High Plains. Approximately 55,000 irrigation wells have been drilled into this ground water reservoir, and water is being removed at the rate of five to eight million acre-feet per year to irrigate five million acres of land. Depth to water measurements show that since large-scale pumping was started in the early 1930's, the water table has declined significantly in large portions of the Texas High Plains. The decline of the water table indicates that water is being withdrawn from the Ogallala formation at a much greater rate than it is being replenished; therefore, ground water is being mined.

The length of time that any particular area of the High Plains will produce water in sufficient quantities for large-scale irrigation is dependent chiefly upon the thickness of the water-bearing material underlying the area. As the water table is lowered by the pumping of water ,and the saturated thickness is reduced, the yields of the wells will decline and the pumping lifts will increase. The local people recognize that the ground water reserves are being depleted and methods of supplementing the water supply, such as importation of water, weather modification and desalinization, are being considered.

A more practical method for meeting the water-depletion problem is the improvement of water conservation practices which, at best, will only serve to extend the life of the area's water supply. Considering the economic value of water, the extension of the water supply for even a few years is worthy of a concerted effort.

The Texas High Plains has a remarkably flat surface with minor features of relief such as sand dunes, small streams, valleys and playa lakes. The slope of the plains surface is generally about 8 to 10 feet per mile in a southeastern direction.

The climate of the High Plains is semi-arid. The average annual precipitation is about 20 inches, with about 70 per cent of the annual precipitation occurring during the growing season, April to September. The mean annual temperature is about 60 degrees F. and the average evaporation rate is about 80 inches per year.

Shallow undrained depressions or playas are characteristic of the plains surface throughout the High Plains. Most surface runoff water in the High Plains collects in these numerous natural depressions forming wet weather lakes. Playas contain water only when filled by surface runoff, and are normally dry many months of the year. Runoff water impounded in playas is the main surface water supply available for irrigation. The water which collects in playa lakes has been overshadowed in use by the vast ground water reserves of the High Plains. However, as ground water use decreases, playa lake water and its potential use should not be overlooked.

Amount Of Playa Water Available

To determine the average annual volume of runoff water impounded in playas, a water yield study for the High Plains was conducted. This study used methods developed by the Soil Conservation Service for small agricultural watersheds and outlined in their "NATIONAL ENGINEERING HANDBOOK".

The hydrologic properties of a soil or group of soils are an essential factor in the analysis of a watershed. Four major soil groups are recognized for the classification of watershed soils: (1) Soils having high infiltration rates, (2) soils having moderate infiltration rates, (3) soils having slow infiltration rates and (4) soils having very slow infiltration rates.

Another important hydrologic property is the soil cover. Essentially, cover is any material (usually vegetative) covering the soil and providing protection from the impact of rainfall. A combination of a specific soil group and a specific soil cover is referred to as a *soil-cover* complex, and a measure of this complex can be used as a watershed parameter in estimating runoff.

Generalized soil maps of each county in the High Plains were obtained from the Soil Conservation Service. The soils on these maps were placed in one of the four soil classifications described above, and the percentage of the county area in each classification was calculated.

By using the 1959 Census of Agriculture, the percentage of the county land area with various types of soil cover was determined. The types of soil cover used were row crops, small grains, legumes, hay, or rotation meadow; fallow land, native range, woodlands, and farmsteads, roads waste land, etc.

Daily rainfall data from 1940-1964 for Amarillo, 1940-1964 for Lubbock and 1944-1964 for Midland were used in the runoff computations. The number of daily occurrences of rainfall in 0.25-inch increments (0.26 to 0.50; 0.51 to 0.75; 0.76 to 1.00; etc.) were tabulated for each of the three stations during the period of record. The daily rainfall was also tabulated according to antecedent moisture conditions.

Although the rainfall at Amarillo, Lubbock and Midland reflects point rainfall, it was assumed that the same number of occurrences in each rainfall interval would occur over the area immediately surrounding each rainfall station. In other words, if Lubbock had 10 daily occurrences in the 1.51 to 1.75-inch increment during the period 1940-1964, then all of Lubbock County, Crosby County, Hale County, etc. received 10 daily occurrences in the 1.51 to 1.75-inch increment.

Using the data from the soils maps, the 1959 Census of Agriculture, the rainfall data and the Soil Conservation Service's "NATIONAL ENGINEERING HANDBOOK", an average annual runoff rate for each county was calculated. These runoff rates ranged from a low of 0.14 inches per year in Andrews and Gaines Counties to a high of 3.03 inches per year in Parmer and Castro Counties. The area of each county contributing runoff to playa lakes was determined, and this area multiplied by the average runoff for the county gives the average annual volume of water which collects in playa lakes for each county.

From this water yield study, 20.17 million acres of High Plains land contributes an average of 3.00 million acre-feet of water to playa lakes each year. The bottoms of the playa lakes consist of a thick clay and colloidal material that is relatively impermeable. Consequently, the playas hold water for months and approximately 90 per cent or 2.70 million acre-feet of water is lost annually through evaporation. About 10 per cent or 300,000 acre-feet of water is lost to percolation each year and eventually contributes to the natural recharge of the Ogallala aquifer.

Lake Pumps

Some method of salvaging the 2.70 million acre-feet of playa water presently lost to evaporation needs to be developed. One method of using this water is to install a pump at the lake and pump water onto the adjoining cropland. This method is receiving wide acceptance by High Plains farmers, and a recent survey of pump company sales indicates that approximately 2,000 lake pumps are presently being used in the High Plains.

The lake pump has one serious disadvantage. When rainfall occurs to put significant volumes of runoff water in the playas, the cropland is wet and not in need of irrigation water. Therefore, excessive evaporation losses will occur before the farmer is ready to pump from the lake. However, by utilizing lake pumps in all of the lakes, it should be possible to use 25 per cent of the available playa

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water or 750,000 acre-feet annually.

Lake Modification

Another method of using playa water consists of constructing a reservoir in the playa to concentrate the water into a much smaller, deeper area, thereby reducing evaporation losses. These reservoirs are built by excavating dirt from the lake bottom and spreading the dirt onto the adjacent lake area. A long, narrow, deep pit is thus constructed which will hold a significant quantity of water. A lake pump is then installed in the reservoir for reclaiming the accumulated water.

By modifying the bottom of the playa lakes, evaporation losses are reduced because of the reduction in lake surface area. Therefore, the farmer is given a longer period of time in which to pump water onto the cropland. By using a reservoir and lake pumps in all of the lakes, it is believed that at least 50 percent of the available playa water or 1.50 million acre-feet could be used annually.

Artificial Recharge

Artificial recharge is another method of salvaging the playa water, and has been proposed by many agencies. The chief problem with this method is the silt and clay particles held in suspension by the playa water. These particles when recharged into a sand and gravel aquifer cause plugging problems around the well bore, and must be removed either prior to recharge or by redeveloping the well. Redevelopment of recharge wells has not proven successful, and an economical method of removing the particles prior to recharge has not been developed.

If research should develop recharge into an economical method, then it appears to offer the best solution for using playa water. A recharge project could begin operation immediately after a rain, and reduce evaporation losses to a minimum. By utilizing a recharge well in every playa, approximately 75 percent or 2.25 million acre-feet of water could be salvaged annually.

Public Health

For six or seven months of each year, playa lakes contain no water, but in the spring and summer of each year, normal rainfall will inundate the lakes, and some water usually remains until September or October. The depth of water in the lakes is shallow, and dense vegetative growth frequently covers the lake. The shallow, tepid waters of the playas are ideal breeding areas for mosquitos, and during the summer season are a source of prolific mosquito production. *Culex Tarsalis* a species of mosquito generally considered to be the primary vector of human encephalitis, is a predominant species in playa lakes and sewage-irrigated pastures.

Western and St. Louis encephalitis virus have, on numerous occasions been isolated by the laboratories of the Texas State Department of Health from Culex Tarsalis collected in Lubbock County, Texas. That the encephalitis virus is well seeded in this area is proven by a history of endemicity extending back beyond 1950.

By utilizing the water resources of the playa lakes to their fullest potential, the major habitat of the mosquito in the Texas High Plains will be destroyed. Thus, a major benefit to public health will have been achieved.

Recreation

The people of the High Plains of Texas are much like millions of people all over the nation; they are recreation starved. Thousands of High Plains people drive hundreds of miles to fish and hunt in New Mexico, Colorado, Oklahoma and distant points in Texas. There are only a few perennial streams or lakes on the High Plains of Texas.

The playa lake is virtually the only source of surface water, and because of its intermittant nature, is a poor habitat for fish. However, by modifying the playa lake and constructing a deep reservoir, the playa loses the intermittant nature and provides water year around. Two lakes in Lubbock County which were modified and not pumped have had water in them the past two years. Large mouth bass, channel catfish and bluegill sunfish have been stocked in these lakes, and are growing fast enough to present some fine angling for fishermen next summer. The water in these playas could conceivably be worth more to grow fish than for irrigation purposes.

Summary And Conclusion

As the ground water reserves of the Texas High Plains continue to be "mined", the High Plains farmer will use larger and larger amounts of playa water. An average of approximately 3.00 million acre-feet of runoff water collects in playa lakes on the Texas High Plains each year. About 90 per cent or 2.70 million acre-feet of this water is lost to evaporation each year.

Using lake pumps in all of the playa lakes, about 750,000 acre-feet of the available playa water could be used annually. By constructing a reservoir in each playa lake and utilizing a lake pump, at least 1.5 million acre-feet of the playa water could be used annually. However, if research should develop artificial recharge into an economical method, at least 2.25 million acre-feet of playa water could be used annually .

In addition to water conservation, the development of playa lake water resources could eliminate a major habitat of the mosquito in the Texas High Plains and directly benefit public health. The playa lake could also be a source of recreation to hundreds of fishermen and hunters in the High Plains.

The quantity of water which collects in the thousands of playa lakes of the Texas High Plains is not large by comparison with ground water reserves. However, if all of this water, which is now largely lost to evaporation, were put to beneficial use, it would help extend the life of the ground-water reservoir. Conservation of the present ground-water supply in conjunction with the use of water from playa lakes are the best and only feasible means of extending the life of the ground-water reservoir in the Texas High Plains.

Delineation Order Released By Texas Water Commission

The Texas Water Commission recently released a delineation order for Subdivision Four, High Plains Area, Ogallala, South of the Canadian River.

Counties in this area are Gaines, Yoakum, Andrews and portions of Lynn, Terry and Cochran.

Interested citizens in the above counties are initiating steps to form an underground water district. The proposed name of the district is the

IRRIGATION PROCESS USING SEWAGE EFFLUENT

BY J. FRANK GRAY

Frank Gray is managing partner of farms handling sewage effluent of Lubbock, Texas. He is a member of the State Soil Conservation Board.

Design and management of an irrigation system for municipal sewage effluent or re-claimed water is basically about the same as any other good, efficient irrigation system using water from other sources.

Perhaps we should first discuss a good irrigation system and then add any additional features necessary for handling sewage effluent.

First, there must be an adequate supply of water that is free enough of minerals to be suitable for irrigation. If the municipal domestic water supply would be suitable for irrigation, then its sewage effluent would also be suitable unless industrial or chemical wastes are allowed to be dumped into sewage lines. But a good irrigation system must have an adequate supply of water whether it comes from underground wells, canals, lakes, running streams, or municipal sewage treatment plant.

Second, a good irrigation system requires a great deal of engineering and planning in order to obtain maximum efficiency out of pumps and power units. Also, much planning and good engineering are required in preparation of the land to be irrigated.

Good irrigation is best accomplished by irrigating on the level with the length of runs depending upon the permeability of the soil. The best length of runs probably should be from 600 to 1,000 feet, again depending upon the permeability of the soil.

When the terrain is not naturally level, different methods of mechanically leveling may be used. One method is field leveling where the entire field is leveled. Another is bench leveling where small terraces, or borders, are constructed perferably parallel and even in width and leveled from side to side and from end to end. Generally these benches are from 16 to 24 40-inch rows in width. Still another method is using parallel terraces and leveling between them. The main objective of all methods is to water on the level in order to get an even distribution and penetration and to prevent erosion.

The best water conveying system, of course, is the underground pipe system which prevents erosion, seepage, and evaporation, and permits cultivation over the lines. Of course temporary or portable lines may also be used. The next best conveyor system is the lined ditches which prevents erosion and seepage, but does not prevent evaporation and does not allow cultivation across the ditches. A third system uses plain, open ditches. If they are used, by all means they should be as level as possible in order to slow down erosion, but seepage and evaporation will still be taking place.

One needs to manage his operation in such a way that he can maintain his conveyor system properly at all times. He should always maintain his terraces and borders and keep the terrain of the field level.

One needs to carry out a cropping system that will maintain a good organic matter content in the soil. This may be done by rotation programs, by growing organic crops, by using high residue crops properly, and by applying barnyard manure and cotton burrs. Many other methods not mentioned may be used profitably.

The management also needs to use varieties best adapted to the particular operation, to fertilize according to needs, to control insects, to use cultural practices best suited, and to irrigate at the right time with proper amounts of water. The use of these practices will help obtain the maximum net return per acre-inch of water applied.

These general items discussed so far are necessary for successful irrigation farming, but they are most important where sewage effluent is to be used, and particularly where the operator has to take the entire flow at all times as is done at Lubbock.

In its beginning the operation at Lubbock, even though it is considered highly successful, was not a new nor unique idea.

Uses of sewage effluent for rrigation dates back into the 18th Century according to some authorities on sewage and sewage disposals. According to some of these authorities, the practice of irrigation with sewage has been discontinued in some instances; however, such irrigation is still being used in some places, especially on small-scale operations.

Level Irrigation

The practices of using sewage effluent for irrigation is best adapted to arid and semi-arid climates and to soils adapted to irrigation. The soils most desirable are those of sandy clay loams, highly permeable with a level terrain. In this practice level irrigation is extremely important.

Soil and climate are of prime importance in considering an operation of this kind, especially if the effluent has to be used every day. Other factors to be considered are the amount of effluent and the number of acres on which it must be used. If large amounts of effluent are available, then crops that are high users of water will have to be planted; for example, forage, such as feed crops and pastures. When plenty of land is available, the operation may be diversified with any and all crops adapted to the locality. Diversified farming is a good practice under any system of irrigation. But if sewage is to be used daily, then diversified farming is essential in that the farmer will have a place to go with the effluent at all seasons of the year.

With good soil management practices, which include level farming, increase of organic matter or humus in the soil by the use of high residue crops, conserving crop residues, rotating crops, and using other scinetific practices, irrigation with sewage effluent can be highly successful.

Because of the rapid growth of our population and the multiplying increase of our water problems, more consideration and encouragement should be given to the use of our waste or reclaimed water.

There are many advantages in the use of sewage effluent for irrigation. Some of these have been listed.

1. A regular supply of water, especially if a person is using all the water from a municipality.

2. Some fertility is added to the soil, depending on the type of waste water and the degree of treatment given the raw sewage. Most of the benefit is from the addition of nitrogen. However, some phosphorus is added, especially with the increasing use of new detergents.

3. With towns located on small streams, we are not polluting the water and killing fish and marine life when the sewage effluent is used for irrigation. At the same time the amount of usable domestic water which might be reclaimed from such sewage disposal into small streams would be insignificant without expensive treatment.

Reclaiming Water

The problem of reclaiming the water from sewage effluent for domestic use is not so big where towns and cities are located on large streams or bodies of water, but it is a real problem where such cities and towns are not located on large bodies of water where adequate dilution of the discharged effluent can be accomplished.

There are also disadvantages in the use of reclaimed water for irrigation purposes.

1. With the continuous supply, the consumer must use the water at all times during all kinds of weather, usually seven days of every week.

2. Odors of the effluent are sometimes objectionable.

3. It is more difficult to secure help to handle effluent because of the odors and because of their fear of disease.

4.Small seedling plants are killed by the effluent when submerged for more than six to eight hours.

Holding tanks or reservoirs large enough to hold the flow for several days and probably several weeks will help greatly in overcoming the first two if these disadvantages.

For a successful sewage effluent irrigation project there must be a cooperative and understanding attitude between the municipal government and the operator of the project. The operator has to be protected with a long-term contract if he is to be out the large investments necssary to handle properly the effluent. At the same time the municipal government wants assurance it is being handled properly.

Another important item in developing a sewage effluent operation is a geological survey. This should be made to determine whether or not the water table might be raised to a danger point it a large amount of effluent is to be used.

Experiences At Lubbock

Briefly the experiences at Lubbock in handling the effluent since 1937 are outlined in the paragraphs to follow:

Sewage irrigation was started at Lubbock in the early 30's. The late Dr. Fred Standefer started using the effluent soon after the practice was adopted by the city. I began with Dr. Standefer in 1937 as part-time manager of the farm and in 1939 a partnership was formed which still exists with Mrs. Standefer.

The sewage treatment plant is located on Double Mountain Fork of the Brazos River. The farm is located on both sides of the river or canyon breaks. Buffalo Springs or Lakes is located down the canyon approximately five miles. Since this is the only body of water of any size near Lubbock, it is a recreation center and the sewage effluent is not permitted to enter this waterway.

Of the approximate 2,000 acres irrigated with sewage effluent, the City of Lubbock owns part, we own part, and some acreage is leased from adjoining farms.

Our climate is semi-arid with an annual rainfall of only 18 or 20 inches, but we are able to grow a large number of crops under irrigation. These crops consist mainly of the following:

Small grains, such as wheat (largest acreage), barley, oats, and rye.

Row crops of cotton, many variteies of grain sorghums for grain or seed production, and also dry and silage feeds.

Hay and pasture crops for livestock, including alfalfa, sudan or millet for temporary grazing, and improved or irrigated grasses, such as rye, brome, orchard, fescues, switch, love panic, bermudas, and many others.

In 1937 we were using approximately 1 to 1 1/2 million gallons daily of effluent on approximately 200 acres; our crops were only alfalfa and small grains. In 1938 additional land was put under irrigation, totaling approximately 450 acres. We began with some row crops, cotton and grain sorghums, using this cropping system until about 1943. Then, as the effluent increased to approximately 3 million gallons daily, we dropped cotton from our row crops. With only about 450 acres under cultivation with irrigation and the flow increasing from approximately 2 million gallons daily in 1941 to approximately 4 million gallons daily in 1947, our crops were feed, pasture and livestock. This type of farming will utilize more water than will row crop farming.

More Acreage

In the fall of 1947 we bought 640 acres of land of which about 585 were in cultivation and by the 1949 crop year we were able to go back to some cotton farming. We added more to our acreage in 1952 and in 1953.

With the rapid growth of Lubbock the sewage flow has increased steadily and the flow for 1963 will average approximately 12 to 12 1/2 million gallons daily. With 2,000 plus acres now under irrigation we are able to diversify our crops and grow any that are adapted to the area.

Our storage tanks will hold approximately 60 to 70 hours sewage flow and therefore we have to keep some place ready for water. This requires diversified farming which is a good practice on any farm. However, our storage is very inadequate. It would be much better to have storage space for at least 30 days if possible. We are using several playa lakes for storage during bad weather. Then, as needed, we pump this water back into our pipe system and onto our land.

The lease arrangement with the city is for a 20-year period consisting of an annual cash lease per acre of land owned by the city, and we are required to take the effluent from the holding tanks at all times. The preparation of land, construction of ditches, pipe lines, and the like are all done by us at no cost to the city. One must emphasize the importance of a long-term contract and the importance of cooperation between city government and farm operator.

We have cooperated with the Soil Conservation District and Soil Conservation Service since 1944 and have had their help in bench leveling more than 1,300 acres of land and in the construction of 16 to 17 miles of un-

(Continued On Page 4)

South Plains Underground Water District No. 4.

Petitions are now being distributed for signatures within the area. When the petitions are completed, they will be presented to the Texas Water Commission for a hearing on the proposed district.

FERTILIZERS MAY FEED ALGAE WHICH PLUG IRRIGATION WELLS

Nitrates and phosphates could be to algae and bacteria what hamburgers are to people, according to a ground water geologist studying pollution of irrigation wells on the North Plains.

"Algae and bacteria have to have nitrates and phosphates to live, and the logical source for them is fertilizers," he said. "We put tremendous amounts of fertilizer into the plains, and on the surface it looks as if we're feeding these organisms the kind of hamburger they like."

A polluted well could mean a plugged well, and a plugged well means less flow, and less flow means running the well longer, and running the well longer means higher production costs.

For three years, Dr. William D. Miller, 34, associate professor in the geoscience department at Texas Tech in Lubbock, has been studying the biological plugging of irrigation wells, first on the South Plains and now on the North Plains.

"There are a considerable number of polluted wells on the Plains," he said, "and many times the farmer isn't even aware of it. All he knows is that the well isn't producing as it should."

There are three causes for an irrigation well decreasing in flow — lowering of the water table, mechanical malfunction and plugging, either by sand or bacteria.

"The first two are not corrected easily, and both can be expensive. Biological plugging, and that's my area of study, can be corrected without pulling the well."

Dr. Miller added that the organisms grow on the casing and in the formation and that when a well is pulled half the problem remains in the hole.

"The real plugging occurs in the perforations in the casing, and the farmer should sterilize the bore hole to kill the organisms causing the stoppage."

A 10 per cent decrease in irrigation water production is costly.

Dr. Miller gave the following example:

"Let's say you have a well that yields 600 gallons per minute, covering 2.64 acre-feet per day. Based on a generally accepted average water value of $40 per acre-foot and a 100-day pumping season, the daily value of your water would be $105.60 or $10,560 for the full 100 days.

"With a 10 per cent decrease in production, just 60 gallons per minute, you'd lose .264 acre-feet per day. The daily dollar loss would be $10.56, or $1,056 for the 100 days."

There are ways a farmer can tell if his well is polluted:

* If there has been a SUDDEN decrease in production over a short period of time.
* If the water has a slight the-ordinary color — milky or reddish-brown.
* If the water has a slight rotten-egg odor
* If it has a sulphur taste.
* Slime around the outlet pipe.
* "And suspension in the water," Dr. Miller said. "That means that if things that are supposed to sink don't, the well is probably polluted.

There are other ways, but it would take someone such as Dr. Miller to spot them.

"I'm looking for wells to sample," he said "The more I look at, the better the study will be and the more beneficial the results will be for plains farmers in treatment of the wells."

Dr. Miller will examine wells free of charge ,and can be contacted through the Plains Water Treatment Co. of Amarillo.

"Chemical treatment, if it's biological pollution, is cheaper and better than pulling a well," Dr. Miller said. "Chemical treatment will get rid of the farmer's plugging problem, but not necessarily all the bacteria or algae in the hole. In drilling new wells or in pulling old ones, it would be best to sterilize them entirely. This would prevent most of the problems."

Dr. Miller predicted that within two to three years all drilling companies would be sterilizing wells as a matter of course. They don't all sterilize them now.

"Any time a well is pulled and growth is noted on the column pipe, the well hole should be sterilized." he said. "If a farmer is going to spend $3 a foot to drill a well, an extra $150 to $200 to sterilize it isn't too much to save himself some problems later on."

He added, however, that "money spent on sterilizing a well during installation is lost if preventive methods for controlling infiltration around the well are not carried out."

Wells not sealed at the surface allow soil organisms to enter and pollute the well.

There are still some questions about well pollution that have to be answered. For example, where does the pollution occur? That is, what is the geographic distribution of well pollution? Why and how does pollution take place? When does the well become polluted—when it's drilled or after it has been completed?

"I want to sample oil and water lubricated pumps," Dr. Miller said. "Oil is a food and energy source for bacteria. The oil industry has had pollution problems for years, and I need to know if these particular type bacteria are in water wells. Some algae feed on oil, others on fertilizer and others on carbon dioxide from the air."

He added that there's a food chain going on that can be broken, and once the chain is broken, the bacteria will die of starvation.

"That's what the study is about," Dr. Miller said.

Railroad Commission Office To Open

The Railroad Commission, citing a need for more efficient administration of oil and gas conservation laws, created a new commission District 8-A in West Texas.

The 21-county district becomes effective Sept. 1. The counties presently part of District 8, are Bailey, Lamb, Hale, Floyd, Motley, Cottle, Cochran, Hockley, Lubbock, Crosby, Dickens, King, Yoakum, Terry, Lynn, Garza, Kent, Gaines, Dawson, Borden and Scurry.

The director for the district will be stationed at Lubbock. The commission directed that records pertaining to fields in the 21 counties be moved from the District 8 office to 8A headquarters.

"The commission is of the opinion and finds that the administration of the oil and gas conservation statutes in the area of West Texas can be made more efficient" by establishing the new district, the agency said.

Sewage—

(Continued From Page 3)

derground concrete pipes as well as other advice on crops and conservation practices. We also are using information from other agricultural sources, such as the colleges, extension service, and research stations.

We think that to farm as level as possible, to keep the water where we put it, and to keep a high organic content in the soil is very essential to any irrigation farm operation but it is most important where sewage effluent is used. We use legumes, crop residues, weeds, barn yard manure, cotton burrs, etc., to keep our organic matter at a high level.

From the economic standpoint the use of sewage effluent for irrigation can be profitable. Under our climatic and soil conditions at Lubbock we can expect approximately 800 to 1,000 pounds of grain sorghums, ten to twelve bushels of wheat, or 150 to 225 pounds of lint cotton per acre without the use of irrigation water. Under good management the expected yields of these crops under irrigation would be 4,000 to 5,000 pounds of grain sorghum, 30 to 40 bushels of wheat, and 600 to 800 pounds of lint cotton. Usually the quality of the irrigated crops is higher than that of land not irrigated. It should be noted that the costs per acre for production of these crops are considerably higher under irrigation.

Other important factors could be mentioned in connection with agricultural uses of sewage effluent, but we want to repeat ond to stress that we should all promote and encourage the use of our reclaimed water to the best advantage to our country as a whole. In the semi-arid climates especially, the use of reclaimed water for agriculture is very important.

Please Close Those Abandoned Wells!!!

This table shows the dollar value of a 10 percent increase or decrease in irrigation water production. These figures are based on a generally accepted average water value of $40 per acre-foot and a 100-day pumping season.

Original Yield		Value ($40/AF)		Increase or Decrease Yield—10%		Dollar Gain or Loss	
GPM	A/Fday	Per day	100days	GPM	A/Fday	Per day	100days
300	1.32	52.80	5,280	30	.132	5.28	528
400	1.76	70.40	7,040	40	.176	7.04	704
500	2.20	88.00	8,800	50	.220	8.80	880
600	2.64	105.60	10,560	60	.264	10.56	1.056
800	3.52	140.80	14,080	80	.352	14.08	1,408

Second Class Permit

High Plains Underground Water
Conservation District No. 1
1628 Fifteenth Street
Lubbock, Texas

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 12—No. 4 "THERE IS NO SUBSTITUTE FOR WATER" September 1965

FIELD DAY HELD IN LUBBOCK

The South Plains Research and Extension Center at Lubbock held its annual field day and open house September 28.

Water, a prime resource of this area was given special emphasis.

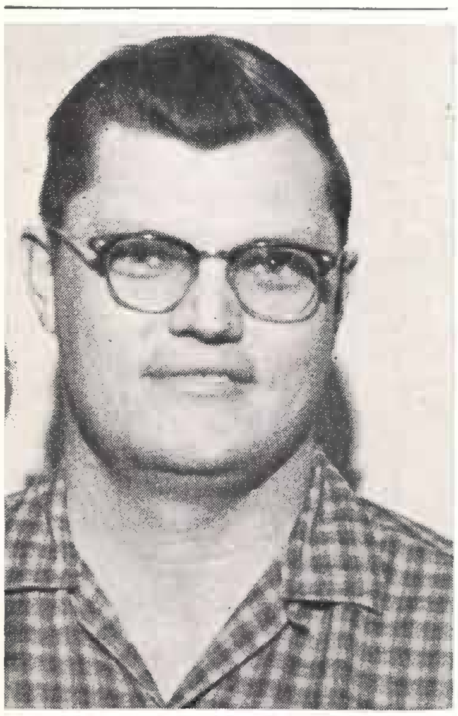
Visitors were informed on water saving advantages of various land farming practices.

Center scientists have observed phenomenal water savings and yield increases where gently sloping land has been formed into perfectly level land.

Agronomist Shelby Newman discussed how limited irrigation water could be stretched to give maximum yields and prolong limited underground supplies.

Newman stated that, "research on cotton root development indicates heavy preplant irrigations waste both money and water." Careful management has been shown to be equally important as water quantity. The last few inches of an eight-inch preplant irrigation contribute only a 15 pound incerase in lint yield per acre inch of irrigation water. Yet, with the right practices and prudent management, research here at the center shows it is quite practical to expect a total yield of 75 pounds of lint for each acre inch of irrigation water.

Flow meters, run off recording devices, and sub irrigation studies were also viewed by several hundred visitors.



DON REDDELL

Water Conservation Meet Held In Houston

The twenty first annual meeting of the Texas Water Conservation Association was held in Houston, September 26 and 27.

Several interesting topics were discussed by various speakers.

Charles G. Bueltman, Technical Director, The Soap and Detergent Association, discussed "The Responsibility of Industry in Maintaining Water Quality".

"Urbanization and Water Supply" was the test of a presentation by Henry J. Graeser, National Director, American Water Works Association.

State Senator Culp Krueger discussed "Pollution Has Become Our Number One Problem". Krueger is chairman of the Pollution Control Study Committee.

Several other topics of interest to water conservationists were discussed.

The association representatives of ground water, irrigation, industrial, navigation and river authorities also had meetings.

The convention met in the Continental Houston Hotel.

ENGINEER RESIGNS POSITION WITH WATER DISTRICT

Don Reddell, Agricultural Engineer for the High Plains Underground Water District since 1960 has resigned his position to return to school for advanced studies in hydrology.

←

Projects of the district which Reddell was associated with were artificial recharge, tailwater return systems, water quality analysis, and playa lake modification. Reddell also did key work in collecting and assembling data and materials used in the Marvin Shurbet tax case.

Don and his family will move to Fort Collins, Colorado where he will do research work while working on his advanced degree.

The directors and staff of the district wish Don great success in his new venture and hope some day to have him back in Texas and again a member of the High Plains Underground Water District staff.

PLEASE CLOSE THOSE ABANDONED WELLS ! ! !

Test Hole Drilling Usually Desirable

The drilling of a test hole is usually desirable before starting to drill a large capacity well. The purpose of test drilling is to explore the subsurface material to determine whether or not conditions are favorable for obtaining a satisfactory well, and in the event conditions are favorable, how the well should be constructed to give the most water with the least drawdown and the longest economic life.

One would not think of buying a farm without first determining how much of the land could be cultivated, whether or not the land is flat or rolling, what improvements there are, and whether or not the title is clear. Test drilling for water is just as sensible. Wouldn't it be more practical to have some idea of what you are spending your money for before you go to the expense of drilling and constructing a large capacity well? We think it would.

A test hole should be logged accurately to show the depth to each stratum and its thickness. A representative sample of each stratum should be collected in order to determine the nature and the size of the particles. The test hole should be drilled completely through all the strata to the underlying bedrock in order to determine the depth to which a well should be drilled. After the test hole has been drilled, the depth from the surface to the water table should be measured to determine the total thickness of the water-bearing strata. If the quality of the water is questionable, a sample of water for chemical analysis may be obtained from the test hole.

A careful study of the above information would enable one to make a reasonable estimate of the rate at which water may be pumped from the water-bearing strata and to design the well, pump and power unit to match the water-bearing characteristics of the formation.

It is recommended that samples should be collected and saved for future reference. One good method for collecting of samples is the cutting of tops from quart oil cans, perforating the bottom of the cans which will allow the excess water to escape. The cans can be marked for future reference with identification for future reference as to the depth taken. Also, we recommend the landowner to make a generalized map of the farm and spot the test holes as drilled as near as possible for his future references.

WATER STATUTE WILL HAVE DAY IN COURT

A new statute, introduced by State Representative Bill Heatly of Paducah and passed by the fifty ninth session of the legislation will soon be tested in the federal courts. The statute prohibits the transporting of underground water from Texas to other states.

The city of Altus, Oklahoma, recently filed suit in a federal court to rule unconstitutional the new Texas law. Altus, which is just a few miles north of the state line of Texas entered into a contract in 1963 with Mr. and Mrs. C. F. Mock of Wilbarger County, Texas for underground water rights on land owned by the Mocks. The water supply is fourteen miles from Altus but is located in Texas.

The city has recently passed a two million dollar bond issue to develop the underground water supply.

Altus, population of 23,500, has been getting water from the U. S. Bureau of Reclamation under an agreement allowing 4,800-acre feet annually. The water is also utilized by Altus Air Force Base. The city had been unable to negotiate a contract for additional water with the bureau and had entered into a contract with the Mocks.

The suit names Texas Attorney General Waggoner Carr as defendant and asks that the law be thrown out. Altus contends it is in violation of the constitutional provisions of interstate commerce.

The suit asks that it be heard before a three judge federal court. Besides the bond issue, the suit said Altus residents have obligated $300,000 for roads, equipment and development in connection with the water routing and authorize a one million dollar pipe line.

Other states have similar laws pertaining to transporting of ground water outside the state. Oklahoma has such a law itself.

A few years ago Oklahoma law makers declared all waters in the state were public waters and owned by no individual. New Mexico and Kansas also have similar situations. Underground water in Texas is owned by the individual who owns the surface rights and can be purchased or sold as private property.

This case will be very interesting to observe. Can Oklahoma prohibit the transporting of public waters from within its bounds to another state and can Texas prohibit the transporting of underground water, which is private property, to another state.

THE Cross SECTION

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BILL J WADDLE
Editor

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J. W. Witherspoon, 1966 .... Box 261 Muleshoe
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Castro County
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City Hall, Dimmitt

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Frank Wise, 1967 .... 716 W. Grant, Dimmitt
Donald Wright, 1968 .... Box 65, Dimmitt
Morgan Dennis, 1968 .... Star Rt. Hereford
Committee meets on the last Saturday of each month at 10:00 a.m., City Hall, Dimmitt, Texas.

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Western Abstract Co., Morton

D. A. Ramsey, 1967 .... Star Rt. 2, Morton
Ira Brown, 1968 .... Box 774, Morton, Texas
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H. B. Barker, 1967 .... 602 E. Lincoln, Morton
E. J French, Sr. 1968 .... Rt. 3 Levelland, Texas
Committee meets on the second Wednesday of each month at 8:00 p.m., Western Abstract Co., Morton, Texas.

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High Plains Water District
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Billy Wayne Sisson,, 1968 .... Rt. 5, Hereford
J. E. McCathern, Jr., 1967 .... Rt. 5, Hereford
Billy B. Moore, 1968 .... Wildorado, Texas
Charles Packard. 1967 .... Rt. 3, Hereford
Committee meets the first Monday of each month at 7:30 p.m., High Plains Water District office, Hereford, Texas.

Floyd County
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325 E. Houston St., Floydada

Bill Sherman, 1967 .... Route F, Lockney
J. S. Hale, Jr., 1966 .... Rt. 1, Floydada, Texas
Tate Jones, 1967 .... Rt. 4, Floydada
M. M. Julian, 1968 .... Rt. Q, Lockney Texas
M. J. McNeill, 1968 .... 833 W. Tennessee, Floydada, Texas
Committee meets on the first Tuesday of each month at 10:00 a.m., Farm Bureau Office, Floydada, Texas.

Hockley County
Mrs. Phyllis Stecle
917 Austin Street, Levelland

Bryan Daniel, 1967 .... Rt. 2, Levelland
Preston L. Darby, 1968 .... Rt. 1, Ropesville
Leon Lawson, 1967 .... Rt. 3, Levelland
H. R. Phillip, 1968 .... Rt. 4 Levelland, Texas
S. H. Schoenrock, 1966 .... Rt. 2, Levelland
Committee meets first and third Fridays of each month at 1:30 p.m. 917 Austin Street, Levelland, Texas.

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620 Hall Ave. Littlefield

Willie Green, 1967 .... Box 815, Olton
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W. B. Jones, 1966 .... Rt. 1. Anton, Texas
Troy Moss 1968 .... Rt. 1, Littlefield, Texas
Raymond Harper, 1966 .... Sudan, Texas
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1628 15th Street, Lubbock

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Bill Hardy, 1968 .... Rt. 1, Shallowater, Texas
Bill Dorman, 1967 .... 1910 Ave. E., Lubbock
Edward C Moseley, 1966 .... Rt. 2 Slaton, Texas
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Committee meets on the first and third Mondays of each month at 1:30 p.m., 1628 15th Street, Lubbock, Texas.

Lynn County
Mrs. Doris Hagens
1628 15th Street, Lubbock

Hubert Teinert, 1967 .... Wilson Texas
Harold G. Franklin, 1968 .... Rt. 4, Tahoka
Roy Lynn Kahlich, 1966 .... Wilson, Texas
Oscar H. Lowrey, 1967 .... Rt. 4, Tahoka
Reuben Sander, 1968 .... Rt. 1, Slaton, Texas
Committee meets on the third Tuesday of each month at 10:00 a.m., 1628 15th Street, Lubbock, Texas.

Parmer County
Aubrey Brock
Wilson & Brock Insurance Co., Bovina

Wendol Christian, 1966 .... RFD, Farwell, Texas
Henry Ivy, 1967 .... Rt. 1. Friona
Walter Kaltwasser, 1967 .... RFD, Farwell
Carl Rea, 1968 .... Bovina, Texas
Ralph Shelton, 1968 .... Friona, Texas
Committee meets on the first Thursday of each month at 8:00 p.m., Wilson & Brock Insurance Agency, Bovina, Texas.

Potter County

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W. J. Hill, Jr., 1966 .... Bushland, Texas
L. C. Moore, 1968 .... Bushland, Texas
Jim Line, 1968 .... Bushland, Texas
Eldon Plunk, 1967 .... Rt. 1, Amarillo

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Randall County Farm Bureau Office, Canyon

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Paul Dudenhoeffer. 1966 .... Rt. 2, Canyon, Texas
Carl Hartman, Jr. 1968 .... Rt. 1, Canyon
Lewis A. Tucek, 1967 .... Rt. 1, Canyon
Ed Wieck, 1967 .... Rt. 1, Canyon
Committee meets on the first Monday of each month at 8:00 p.m., 1710 5th Ave., Canyon, Texas

Power To Pump vs. Size of Column Pipe

Thousands of water wells in the High Plains that were drilled during the 15-year period from 1935 to 1950 were equipped with deep-well turbine type pumps that lifted the water to land surface through 8-inch column pipes. Fortunately, nearly all those wells originally delivered a full pipe of water, 800 to 1,000 gallons a minute; but unfortunately, some of them now deliver only half-a-pipe, 400 to 500 gallons a minute.

Many operators believe that the power required to lift 500 gallons a minute 200 feet through an 8-inch pipe is more than the power required to lift the same quantity the same height through a 6-inch pipe, merely because of the larger column of water. As a result of that belief, some operators have sold their 8-inch column pipe for a fraction of its cost and installed more expensive 6-inch pipe. As a matter of fact, the power required to lift 500 gallons a minute 200 feet through an 8-inch pipe is less than the power required to lift 500 gallons a minute 200 feet through a 6-inch pipe, because in the smaller pipe the water moves at a greater velocity and consequently the friction is greater.

Now don't misunderstand this statement. We didn't say you could operate an 8-inch well cheaper than you can operate a 6-inch. Quite often you can pump 500 gallons a minute with a 6-inch pump cheaper than you can pump the same quantity with an 8-inch pump. But one principal factor involved with respect to cost is the efficiency of the pump-bowl assembly. A set of bowls designed to lift 1000 gallons a minute 200 feet at maximum efficiency will lift 500 gallons a minute 200 feet at a much lower efficiency and consequently at greater cost per gallon. The proper pump-bowl assembly is the problem instead of the size of the column pipe. The point to be made is this: If you have a pump with an 8-inch column pipe but your well delivers only half a pipe, the practical thing to do is keep the 8-inch column but install a set of bowls designed to pump the quantity of water available to your well. You will not reduce the cost of pumping your water merely by reducing the size of your column pipe—you may actually increase the cost.

In order to illustrate the point above, a model was constructed. The model consisted of a table on which was mounted a piece of 10-inch pipe and a piece of 5-inch pipe, a series of fruit jars to measure the quantity of water pumped in a given time, together with a small airconditioning pump which lifts the water from a container through a small pipe to a tee and then into the 10-inch and 5-inch pipes. The water enters the 10-inch pipe and the 5-inch pipe at the same level near the bottoms, is raised 2 feet in each pipe, and overflows the same level into the jars.

This model with the single pumping unit lifts 1 gallon 2 feet in 1 minute through a 10-inch pipe, while at the same time it lifts 1 gallon 2 feet in 1 minute through a 5-inch pipe. It proves that the power required to pump any quantity of water in any time to any height through a large diameter pipe is never greater than the power required to pump the same quantity in the same time to the same height through a pipe of smaller diameter.

The purpose of the model and this article is to advise the pump owners and operators that they cannot reduce the cost of pumping water merely by reducing the size of the column pipe. Costs may be reduced considerably by reequipping the unit with a bowl assembly designed to operate efficiently at the optimum yield and pumping level for each individual well.

PURE WATER

Our drinking water is being polluted faster than it is being purified, warns the Journal of the AMA in an editorial. It says, "Only a slight favorable balance is needed, but the balance has not yet been achieved. Even rain water is no longer pure, for "rains carry down the industrial dusts, and smokes, and steams; they now are made radioactive in traces; they also carry pesticides. All of these substances eventually get into man's system."

WHEN YOU MOVE—
Please notify the High Plains Underground Water Conservation District, Lubbock, Texas on Post Office Form 22S obtainable from your local postmaster, giving old as well as new address, to insure no interruption in the delivery of "The Cross Section."

Drilling Statistics For July and August

During the months of July & August 315 new wells were drilled within the High Plains Water District; 32 replacement wells were drilled; and 14 wells were drilled that were either dry or non-productive for some other reason. The County Committees issued 261 new drilling permits.

Listed below by counties are permits issued and wells completed for the months of July & August:

County	Permits Issued	New Wells Drilled	Replacement Wells Drilled	Dry Holes
Armstrong	3	2	0	0
Bailey	17	12	4	0
Castro	28	39	2	0
Cochran	3	0	0	1
Deaf Smith	34	43	4	0
Floyd	45	44	2	1
Hockley	14	38	0	1
Lamb	21	41	7	1
Lubbock	59	50	7	5
Lynn	6	11	1	0
Parmer	22	23	5	2
Potter	1	0	0	0
Randall	8	12	0	3
TOTALS	261	315	32	14

It's Only Twenty-Five Percent Moisture

By BILL J. WADDLE

If you had access to a huge volume of "free" irrigation water right in your front door, what would you do? Fantastic as it sounds it is true. In fact the water at times actually got in the house.

This water condition and a 257 acre farm suffering from a deficient supply of irrigation water has prompted a south plains farmer to install one of the most unique "water stretcher" installations this writer has ever observed.

Clarence Byrd of Kress, Texas, is the farmer who has experienced the above conditions. Byrd farms about four miles south of Kress on State highway 87. The land in this area is flat and drainage in front of his farm residence has been a problem when heavy rains have occurred. Rain water must drain to the south and due to the flatness of the land, several times, The Byrd family experienced water in their house.

The flooded house was remedied by a unique driveway and a three foot concrete block fence around the house. This eliminated the high water situation in the house but did not solve the shortage of irrigation water.

When asked why he installed a water recirculation system Byrd said, "I laid awake at night thinking about all that rain water wasting when it did rain and about the irrigation water passing my place in the ditch when it was dry and my neighbors were pumping their wells. I could also see my cotton and milo crop across the highway suffering from lack of water, that's when I decided to do something."

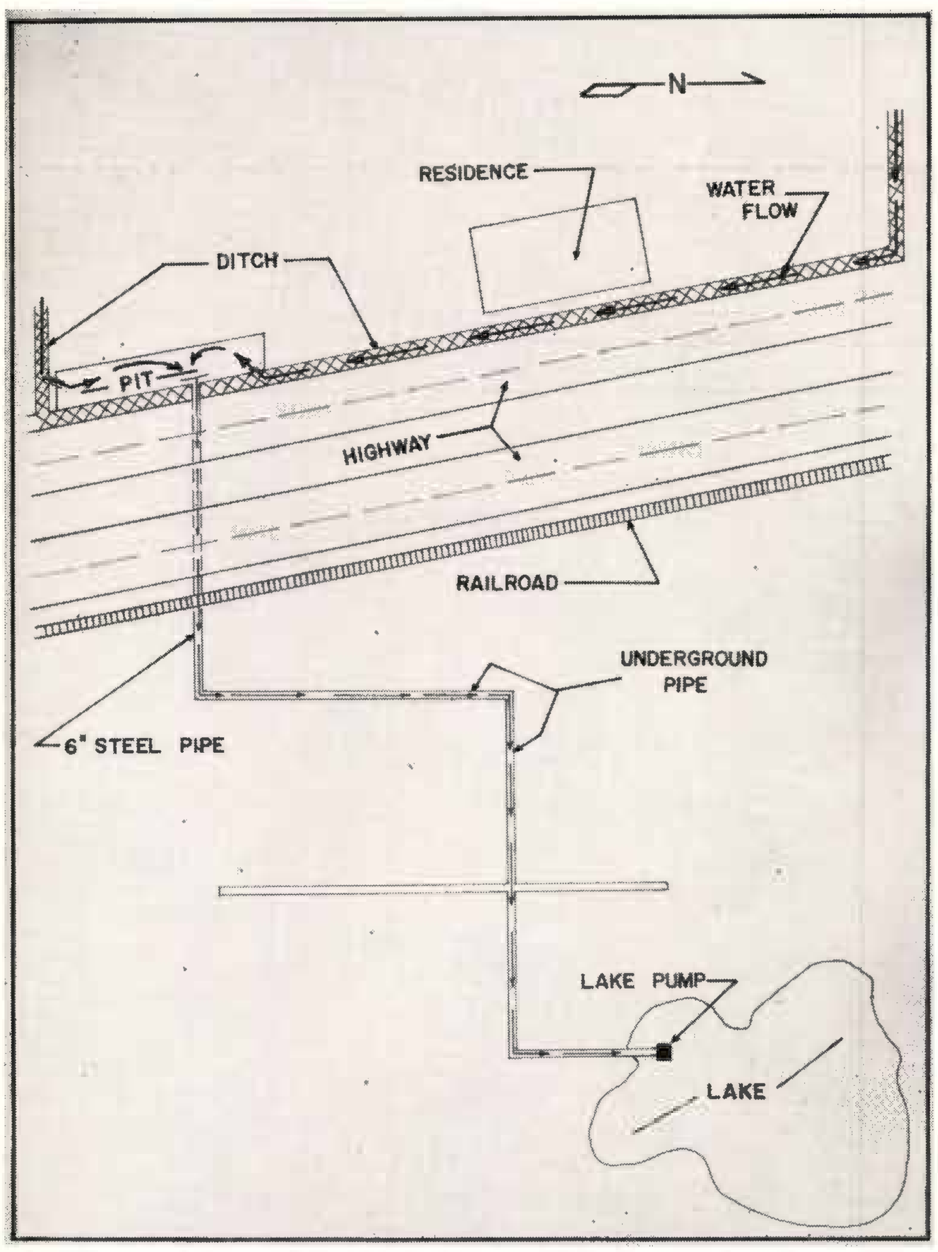
Do something he did, he installed a tailwater pit to catch tailwater as well as rainwater.

Byrd lives on the west side of Highway 87 owning a 327 acre block of land. He rents a 257 acre block on the west side of the highway which has three small wells equipped with submergible pumps. The wells are three inch in capacity and aren't adequate during the irrigation season.

The tailwater pit was installed on the east side of the highway on the land owned by Byrd. A hole was then bored under the highway which is four land, and a railroad, to pipe water from the pit to the 257 acre water deficient area.

The pit was constructed to hold three acre feet or about one million gallons of water. The hole under the highway and railroad was lined with a twelve inch steel casing and a six inch water line was installed to carry the tailwater from the pit to the underground pipeline on the 257 acre rented farm.

Clarence Byrd standing in his cotton that was watered three times using tailwater and lake water exclusively.



Sketch shows the workings of Byrd's "water stretcher" operation. Follow water flow arrows into the pit and through distribution lines. Lake is equipped with a lake pump and picks water up from the lake and puts it in concrete pipe line. Very little rainwater escapes that comes by the house.

The pit was equipped with a seven and one half horsepower single phase electric motor. The pump installed has a capacity of 1000 gpm but Byrd stated, "we raised the impellers on the pump and I figure the pump is delivering about 700 gallons per minute to my underground line."

Accurate cost records were kept on the installation. The pit cost $493.00, the pump cost $1,260., and the ditching work under the highway and railroad cost approximately $2,268. This figure include the casing and water line installed to transport the water from the pit under the highway and railroad.

The 257 acre rented farm actually has 207 acres in cultivation and has a 50 acre lake.

In a period of heavy rainfall Byrd catches rainwater in his pit from the ditch along the road. The rainwater is pumped from the pit through the underground lines to the 50 acre lake and stored for later use. The lake has been modified to enable it to be pumped completely dry with a lake pump which is installed on the lake.

Tailwater is collected in the pit from thirteen wells. None of the contributing wells are smaller than six inch. Byrd himself has two eight inch and one ten inch well contributing to the pit. The remainder of the tailwater comes from Byrd's neighbors' wells.

The land irrigated with the tailwater and rainwater is producing 66 acres of grain sorghum and 61 acres of cotton. Both crops this year have been watered three times exclusively with tailwater and the rainwater that was transported from the pit to the lake.

In 1964, 61 acres of cotton watered with the three small wells produced 57 bales. Byrd said, "If the weather and other conditions are favorable from now until harvest time, I feel I have an excellent chance to make one hundred bales on the 61 acres of cotton." The cotton is planted on the skip row plan with four rows in and four rows out.

The grain sorghum crop, if excellent conditions prevail, should yield four to six thousand pounds per acre.

Byrd stated, "Before I installed my system we used the three wells to water all the crops grown on the 207 acres. We could water ten rows at a time by combining the three wells. With my pit we watered forty rows at a time and at no time did the cotton or sorghum plants suffer for water. My pit is equal to a good eight inch well."

Another amazing feature of the system is the distance that water travels. Tailwater travels about three and one half miles from the fartherest well to the pit. If it is transported to the lake for storage it travels about four miles.

This pit probably cost a little more than the average system would because of the work of transporting the water underneath the highway and railroad.

Byrd said that, "If I can get one half a bale increase in my cotton crop this year on this farm I'll pay for my system. From then on it will all be free. It is my aim and goal to use this water so extensively that when I get through with it, there will only be twenty five per cent moisture in it."

Although Clarence Byrd does not live within the High Plains Underground Water District, he is using conservation methods pioneered by the district and we feel quite sure others in his area will soon do the same. A little thought and planning on water conservation can mean great returns in the future. Now is the time to start planning for next year. How about it?

What Small Leaks Mean---

Under the Average Water Pressure

Size of Hole

- A leak this size will waste 62,000 Gallons in One Year.
- A leak this size will waste 354,000 Gallons in One Year.
- A leak this size will waste 1,314,000 Gallons in One Year.

Interference Between Wells

Before any well had been drilled in the High Plains, the underground water was in a state of balance; the average annual recharge from precipitation was equal to the annual discharge through seeps and springs, by evaporation, and by transpiration through native plants. When the first well was drilled and allowed to stand idle for a time the water stood at a definite level in the well. That position of the water in the idle well is known as the "static water level" and generally expressed in feet below the land surface. In other words, static water level means water at rest or in equilibrium.

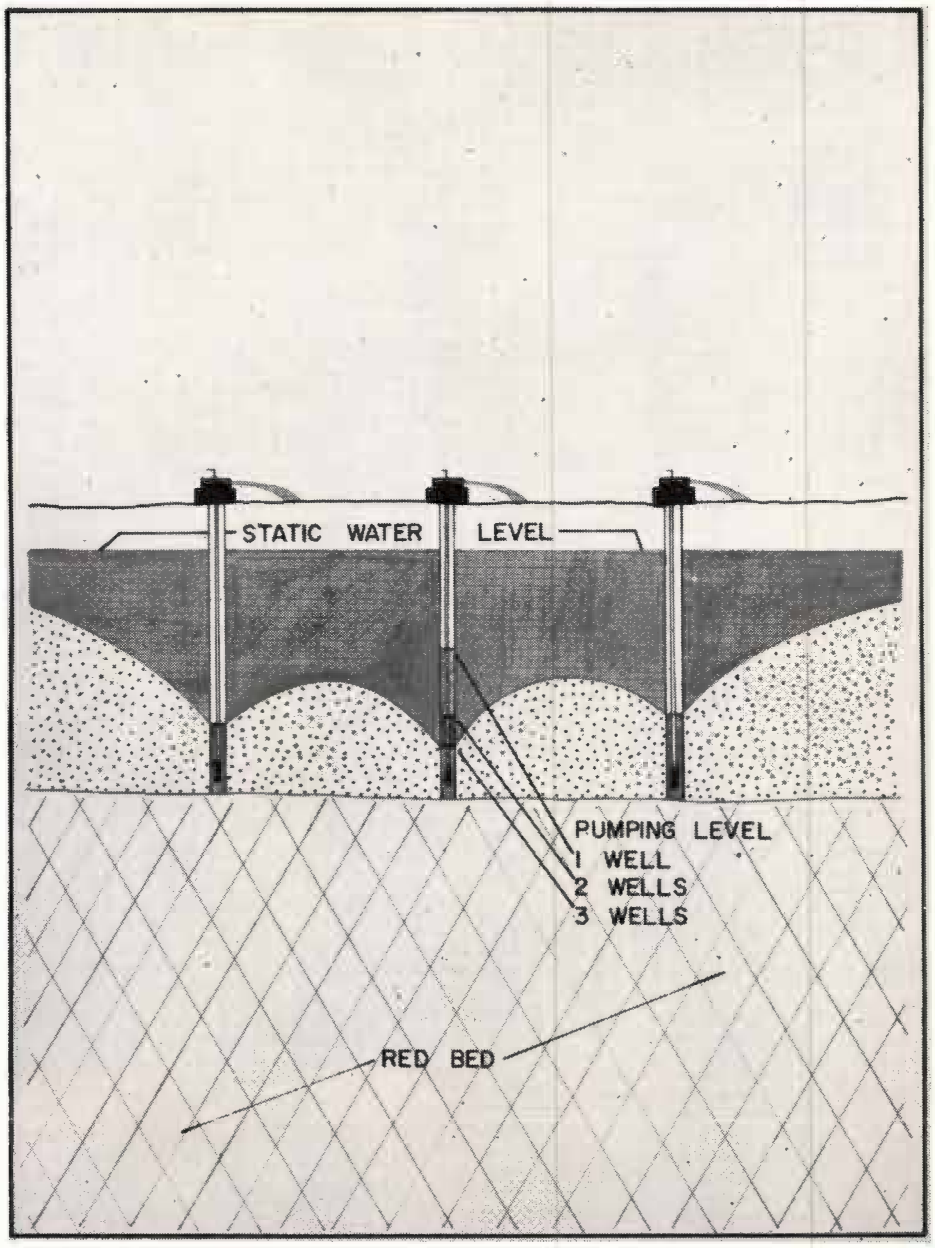
When a pump, of any capacity, is placed in a well and starts withdrawing water from the well, the water level in the well is drawn down. The "drawdown", which is defined as the amount of lowering of the water level while the pump is in operation, varies, within limits, in direct proportion to the rate of withdrawl and inversely as the ability of the formation to transmit water. For example, in some places here on the Plains, the withdrawal of 10 gallons of water a minute from a well will cause a drawdown of one foot whereas the withdrawal of 1,000 gallons a minute will cause a drawdown of 100 feet. In a locality where the water-bearing material is thick and consists of coarse-grained sand and will readily transmit the water, a well will yield 1,500 gallons a minute with a drawdown of only 30 feet; but in another locality where the water-bearing sand is fine grained, very tight, or thin the withdrawal of 100 gallons a minute may cause a drawdown of 100 feet.

The maximum drawdown caused by pumping a well occurs in the well itself, and the amount of drawdown in surrounding area is progressively less at greater distances away from the pumped well. Therefore, when a relatively large quantity of water is pumped from a well, the water level is drawn down, not only in the well itself but also in the area surrounding the well. Again, as will be inferred from the above concept, the amount of lowering of the water level in the area surrounding a well, and consequently in surrounding wells, varies directly in relation to the rate of withdrawal. It was with this precept in mind that the Texas Legislature enacted the Underground Water Conservation Bill in 1949 which contains the following statement.

B. "Such Districts shall and are hereby authorized to exercise any one or more of the following powers and functions: (4) to provide for the spacing of wells producing from the underground water reservoir or subdivision thereof and to regulate the production therefrom so as to minimize as far as practicable the drawdown of the water table***."

In order to comply with the law and at the same time fulfill some of the obligations placed on them by the voters of the High Plains Underground Water Conservation District, the Directors of the District formulated a rule for the spacing of water wells to be drilled within the District which are capable of producing more than 100,000 gallons a day. Although the spacing rule does not adequately cover every conceivable well in the District, it appears to be a sound and sensible rule, based on present geologic, hydrologic, and economic relationships.

Numerous tests have been made in the High Plains by the Ground Water Branch of the United States Geological Survey in cooperation with the Texas Water Commission to determine the interference between large capacity wells while the pumps are in operation. In some localities where the water is not confined by a relatively impervious overlying bed, days or even weeks of continuous pumping have been required before the drawdown caused by the producing well could be physically measured at a distance of a few hundred yards. In other local areas where the water is confined beneath a relatively impervious lense of clay, artesian conditions exist, and the effect of pumping a well can be measured in a nearby well within a few minutes. Regardless of whether the water occurs under water-table conditions or under artesian conditions, ground water in a sand such as the Ogallala formation on the Plains obeys the laws of fluid mechanics. A well that produces from a relatively tight sand which contains unconfined water will have a large drawdown per unit of yield, and as a result of several weeks of continuous operation, a large percentage of the water will be withdrawn from storage relatively close to the well and the drawdown may be negligible 1,000 feet from the well. On the other hand, a well that produces from a clean, coarse sand will have a smaller drawdown per unit of yield, but a larger percentage of the water pumped will have moved toward the well from a greater distance and the drawdown in surrounding wells will be more noticeable. During irrigation season when all wells are being pumped the areas of influence of many wells overlap and in general the closer the wells the greater the mass interference between wells.



Above sketch shows effects of wells on pumping level. Note difference in one well and three wells.

The practice of spacing wells throughout the District is primarily to reduce the interference between wells so as to minimize as far as practicable the drawdown of the water table while the pumps are in operation. It is recognized that in a few locations the interference during any one season may not be excessive with the present distribution of wells. But as time goes on, as the wells become more concentrated ,and as the water table declines, the interference between wells will become more acute. As a matter of fact, in many localities where the wells are closely spaced, the life of large scale irrigation will be determined not by complete unwatering of the sands but by interference between wells to such an extent that withdrawals will be no longer economically feasible.

High Plains Underground Water
Conservation District No. 1
1628 Fifteenth Street
Lubbock, Texas

Second Class Permit

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 12—No. 5 "THERE IS NO SUBSTITUTE FOR WATER" October 1965

Water Well Construction

Several methods of well construction have been used in the Southern High Plains. Probably the method most frequently used is to drill a hole to a depth that is considered sufficient to obtain the yield of water that is desired, case the hole with steel casing that is about two inches smaller in diameter than the wall of the drilled hole, and perforate the casing from the water table to the bottom of the hole with torchcut slots ranging from about one-fourth inch to one inch in width and from about eight inches to twelve inches in length. It is a common belief that it is necessary to have such large openings in the casing in order to allow water to enter, but they also allow large amounts of the unconsolidated material from the formation to enter along with the water.

When the well is developed, an attempt is made to remove a large quantity of sand in order to form a cavity or cavities in the strata adjacent to the well. These cavities may form and remain open for several years; however, in many places the strata overlying these cavities collapse. When this happens the perforations may be clogged, the casing may be crushed, the pump bowls may be covered with sand, or the entire well may be a total loss.

This method of construction is the least expensive in initial cost, and in many instances it has been a satisfactory method in the High Plains. However, there is a large amount of risk involved, and the average useful life of wells constructed in this manner may be less than 10 years, one should not be unduly critized for perhaps there is sufficient justification for using this method of construction in the development of an irrigated area.

Irrigation has now become extensive over a large part of the High Plains. More than 50,000 irrigation, industrial, and municipal wells have been drilled in the High Plains in Texas south of the Canadian River. Records of the U. S. Geological Survey, the Texas Water Commission and the High Plains Underground Water Conservation District show that static water levels in observation wells declined appreciably during the past several years.

The rate at which a well may be pumped efficiently will decrease when an appreciable percentage of the strata that contributes to the well is unwatered. The usual method of well construction, while it may have been satisfactory in the past, may not be entirely satisfactory now that our underground reservoir has become extensively developed. Many wells that would yield a full pipe of water when they were first completed have declined appreciably in yield. Some wells that formerly yielded relatively sand-free water have started pumping sand and have even become failures because of caving. Why have these things happened?

When large capacity wells were first constructed in the High Plains, the underground reservoir was more or less in balance. The natural recharge to the reservoir was about equal to the natural discharge. Relatively shallow wells, many of them less than 100 feet in depth, would yield a full pipe of water. Water levels declined, however, and now the thickness of the water-bearing strata that contributes to these wells is considerably less. If the pumps are lowered and more bowls are added to compensate for lower pumping levels, water is withdrawn from the remaining saturated strata at a faster rate. The increase in the velocity of the water as it is withdrawn from the strata causes the loosening of sand and weakens the walls of the cavities until they collapse. Sometimes these wells may be redeveloped, and their usefulness extended for a time. Quite often, however, the well becomes a failure.

Many individuals who have made studies of the economy of the High Plains and the development of the underground reservoir feel that it is time to give more consideration to EFFICIENCY in the construction and the operation of our water wells. If a well is constructed and developed properly and equipped with the proper pump, it should have a useful life of about 25 or 30 years.

The method of constructing any large capacity water well should be determined after a careful analysis of the data obtained from TEST DRILLING. Test holes may be either large or small in diameter. It is important to obtain accurate logs of the holes and representative samples of the different water-bearing strata. These will indicate the best site for the location of a well with reference to the best water bearing starta.

If the water-bearing strata are consolidated, (rocks such as limestone, sandstone, or conglomerate) and the water in these strata is in crevices or solution cavities, it may not be necessary to case a well below the top of such strata. If these strata are interbedded with unconsolidated sand and gravel or clay, it is desirable to extend the casing to the bottom of the well. The perforations in the casing may be torch-cut slots opposite the good water-bearing strata. The casing should, however, be left blank opposite beds of clay and sandy clay.

If the good water-bearing strata are unconsolidated sand and gravel, the samples of these strata should be studied to determine what size perforations should be made in the casing. A bed of sand and gravel may contain enough coarse-grained material to form a natural gravel pack around the casing if the perforations are small enough to prevent the gravel particles from entering the well. A bed of unconsolidated fine-grained sand may not contain enough coarse-grained material to enable one to use casing with torch-cut slots. It is possible to use special screens in fine-grained sand.

These screens range in price from about $20 to $50 a foot, and it is necessary to obtain a truly representative sample of the sand in order to determine the proper size of screen opening to use. A gravel pack may be used to prevent the pumping of sand instead of using well screen. This method of construction has been carefully worked out over a period of many years. It is an effective method of preventing sand from entering a well if it is done properly.

WATER FOR TEXAS

The tenth annual conference, "Water for Texas" at Texas A & M University is directed toward water planning problems.

The conference program will include papers by leading water authorities in Texas and the nation. The three half-day sessions are on the general topics "Effective Planning Requirements", "Aspects of Water Planning" and "Agencies and Water Plans".

The conference has been held annually at the University since 1955.

The tenth conference theme, "Creative Thinking and Practical Planning" is directed to the important planning phase of water resources management—perhaps the most vital phase for State development.

Over one dozen authorities on water will be heard at the conference.

PLEASE CLOSE THOSE ABANDONED WELLS ! ! !

GRAVEL PACKED WATER WELLS

A gravel-packed well is one that is constructed with an envelope of gravel between the outside of the casing and the wall of the hole.

The reasons for gravel-packing a well are to increase the permeability of the material next to the casing, to develop the maximum yield of the well, and to prevent the continuous infiltration of fine-grained sand into the well. It is often advantageous to gravel-pack wells in strata that consist of fine-grained unconsolidated sand.

The principal water-bearing formation in the High Palins is the Ogallala formation. This formation is composed of clay, silt, sand and gravel that were deposited in discontinuous layers by streams carrying rock particles eroded from the Rocky Mountains. The coarse-grained materials, in general, are present in the lower part of the formation; however, the particles of rock material differ greatly in size and the strata differ greatly in thickness from place to place.

Unconsolidated sand that is saturated with water will enter a well and be pumped out with the water when casing is used that is perforated with wide torch-cut slots. The removal of large quantities of sand from the area adjacent to a well leaves a void space filled with water. The material overlying these voids or cavities often caves and causes the casing to collapse, the slots to become clogged, the pump bowls to become sand locked, or even the total loss of the entire well and pumping equipment.

A well that yields sand along with the water is never desirable, therefore, a method of well construction that will prevent the pumping of sand and allow the production of large quantities of water would benefit many well owners who are tired of the expense of pump repair, the frequent replacement of wells and the other inconveniences of "sand pumpers". The gravel-packed well is a satisfactory method of construction in an area where the water-bearing strata consist almost entirely of fine-grained, unconsolidated sand.

The practice of gravel-packing a water well is nothing new, and it is not a hit or miss proposition if it is done properly. It is a process that requires a scientific approach to the problem and should be carried out in nine logical steps.

1. Test holes should be drilled. An accurate driller's log should be kept and representative samples of the water-bearing strata should be collect-

(Continued on Page 4)

THE Cross SECTION

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BILL J WADDLE
Editor

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Preston L. Darby, 1968 .... Rt. 1, Ropesville
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Wilson & Brock Insurance Co., Bovina

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Henry Ivy, 1967 .... Rt. 1. Friona
Walter Kaltwasser, 1967 .... RFD, Farwell
Carl Rea, 1968 .... Bovina, Texas
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Lewis A. Tucek, 1967 .... Rt. 1, Canyon
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Committee meets on the first Monday of each month at 8:00 p.m., 1710 5th Ave., Canyon, Texas

WATER QUALITY

The next time your reconstituted orange juice or instant tea has that "blah" taste, the fault could be with the water and not the product.

A 12-member tasting panel at Texas A&M University recently smacked their way through a like number of orange juice and tea samples made from several types of common drinking water. The tasters didn't use the word blah, but they had words almost as uncomplimentary for most of the samples.

The test was conducted by Dr. A. V. Moore, professor in the Dairy Science Department and a man much experienced in the subtle art of taste-testing foods.

It's the professor's contention that "potable water isn't always," and he believes that water resource people and the public should concern themselves as much with water quality as quantity.

"The chemical composition of natural, potable water may change considerably the flavor of reconstituted orange juice or instant ice tea," Moore said.

All the samples of orange juice and tea were compared against the same drinks made from distilled (mineral-free) water. The latter were rated good but definitely flat.

Panel members rated the natural water samples as "better than" or "poorer than" those from the distilled water. They also added specific flavor criticisms on each. Standard tasting practices were followed to avoid bias as much as possible.

Moore said off-flavors were general' ly recognized even though not always tagged as the same defect. For example, bitterness came through to all the tasters, but they didn't always call it bitter. Mustiness was sometimes called foreign, earthly, aromatic or alkaline.

The natural waters came from three private wells and eight municipal wells from different areas in the state.

Moore learned that waters with high alkalinity (mostly bicarbonate) tended to cut tartness of orange juice, which some panel members failed to recognize. This accented other flavors and led to faulty identification.

One municipal water made orange juice better than that made from distilled water, the professor said. Although it was relatively high in total alkalinity at 200 parts per million, it contained 31 parts of sodium chloride, which may have had a balancing effect.

Iced tea was tasted both with and without sugar. In some cases, the sugar masked bitterness found in the non-sweetened drink. In other instances, the sweetness apparently heightened bitterness to those tasters especially sensitive to that trait.

"If, however, the unsweetened tea had an outstanding bitter, medicinal or foreign flavor, it was detected in the sweetened sample, too," Moore said. "One natural water from a private well made sweetened and unsweetened tea that was superior to that made from distilled water."

Then the professor came up with a Heloise style hint: Excessive alkalinity can be reduced by adding lemon juice to the water before using it in reconstituted beverages.

Summing up, he said consumer criticism of reconstituted orange juice and instant tea might be attributed to the water, even when the water is satisfactory for drinking straight.

"Unscientifically speaking, low quality water can give drinks a kind of a—well, a blah taste," Moore said.

Water Is Your Future, Conserve It!

Please Close Those Abandoned Wells!!!

DRILLING STATISTICS FOR SEPTEMBER

During the month of September 154 wells were drilled within the High Plains Water District; 30 replacement wells were drilled; and 9 wells were drilled that were either dry or non-productive for some other reason. The County Committees issued 84 new drilling permits

Listed below by counties are permits issued and wells completed for the month of Septmber:

County	Permits Issued	New Wells Drilled	Replacement Wells Drilled	Dry Holes
Armstrong	0	1	0	0
Bailey	17	16	5	0
Castro	3	29	3	3
Cochran	4	2	0	0
Deaf Smith	9	23	1	0
Floyd	10	15	1	0
Hockley	10	8	1	2
Lamb	6	13	3	1
Lubbock	14	33	4	3
Lynn	1	1	0	0
Parmer	6	12	2	0
Potter	0	0	0	0
Randall	4	1	0	0
TOTALS	84	154	30	9

POLLUTION IN THE OIL PATCH

Several years ago oil was discovered on the High Plains of Texas. This was a great discovery and has been of great value to all West Texans. Many people have accumulated great wealth from this mineral.

Years later the development of underground water for irrigation was initiated on the High Plains of Texas. An abundant supply of water was available and people dug irrigation wells to use in agricultural production. In many instances oil wells and irrigation wells were located on the same piece of land relatively close to one another.

Years have past and the farmer raised his excellent crops by the use of irrigation and the oil people produced an abundant supply of oil. The two industries seemed to work together in fine order.

Then it happened! Water being pumped from the Ogallala formation in some areas where oil was being produced began to show signs of high salt content.

Unfortunately in connection with the production of oil, large quantities of salt water are also produced and brought from the Permian rocks (the area where much of the oil in West Texas is found). Much of this oil field brine is highly concentrated, containing more than 25 per cent dissolved solids. This problem of brine and the disposal of it could and has been the cause of pollution in many instances. Although never proven in court, many thousands of dollars in damages have been paid over alleged oil field brine pollution.

During the more than thirty years from the time oil was discovered in West Texas until September 1957, nothing officially was done to prevent the use of surface pits for the disposal of oil field brine. The accepted practice of all operators, after an oil well came in, was to set up a tank battery and separator, separate the oil from the salt water, pump the oil into the tanks and drain the salt water into open earthen pits from which it was supposed to evaporate.

Investigations have shown conclusively that a large portion of the salt water that was placed in open earthen pits did not evaporate. As the salt water sinks into the ground and additional water is added to the pit, the first water is driven down both by gravity and hydrostatic head. As the salt water moves downward most of the salt remains in solution and because of greater density the salt water will continue on to the bottom of the permeable material at which point it will start moving laterally in the direction of the hydraulic gradient. Generally speaking, a greater concentration of brine will be found east and southeast from the pits, because in general the hydraulic gradient in the Plains region is southeastward parallel to the slope of the land surface. However, when a well is pumped, a drawdown in the water table causes an increase in the hydraulic gradient and as a result the rate of movement of water increases accordingly. Because drawdown occurs in all directions from a pumped well, the gradient may be reversed and, therefore, a well within reasonable distance in any direction from a salt water pit may eventually show pollution.

As previously mentioned, from the time oil was discovered in West Texas until 1957, nothing was officially done to prevent the use of surface pits for disposal of brine.

On September 6, 1957 the High Plains Underground Water Conservation District promulgated a rule which outlawed the use of unlined earthen pits for the disposal of salt water. The rule pertained only to operations within the District.

Most oil operators adhered to the rule and many pits were closed.

The state legislature saw a need to control pollution and created the Texas Water Pollution Control Board. The board set out to eliminate water pollution of all types. This worked fine until a law suit was filed.

Superior Oil Co. filed suit against the Water Pollution Control Board seeking relief from the board's rules on the disposing of oil field waste and brines. The court ruled in favor of Superior and the Texas Railroad Commission was given the authority of controlling oil field waste and brines.

During the 59th session of the Texas Legislature, H. B. 785 was passed. This bill amended the State Water Pollution Control Board Act of 1961, to clarify the duties, responsibilities, and authority of designated representatives of board members.

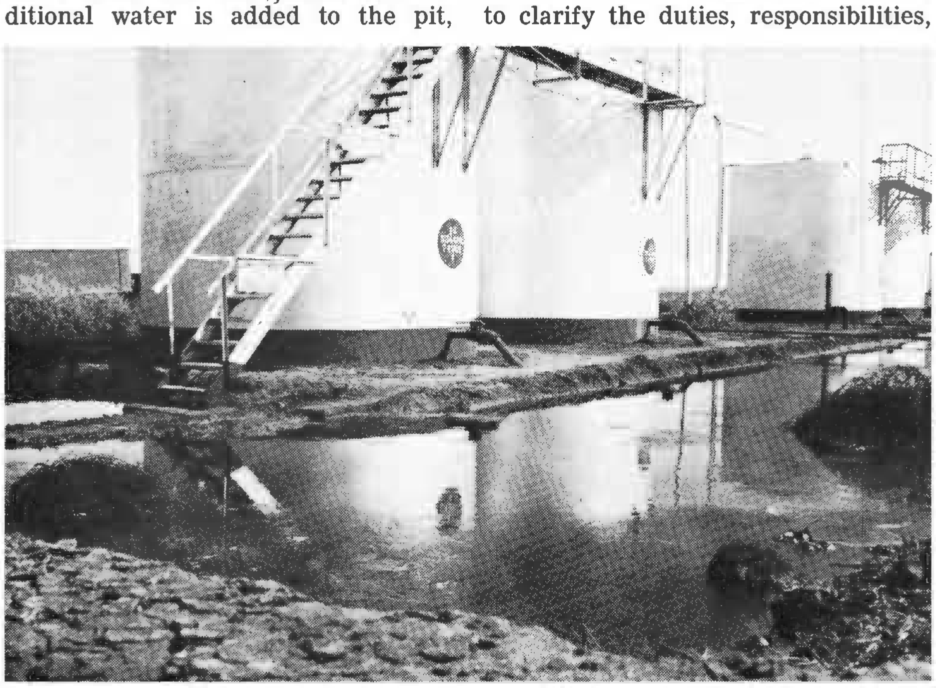
The new legislation states, "The Railroad Commission of Texas shall be solely responsible for the control and disposition of waste and the abatement and prevention of pollution, resulting from activities associated with the exploration, development or production of oil or gas. Said Commission may issue permits for the discharge of waste resulting from such activities."

Many law makers said, "this is just what we need, now everyone knows for sure who is responsible for the control of oil field pollution."

Since the court case previously mentioned and the above legislation was passed, the commission has issued no pit orders for several Texas counties. Several more are sure to follow.

No pit orders are fine but with lack of enforcement they soon fall by the wayside. Many residents of West Texas are very eager for the Railroad Commission to enforce the law and give them relief from oil field pollution.

Salt water disposal pit operating on a lease in Hockley County, Texas



With waste and pollution such as this, what does this young man have to look forward to in his future? Salt water and a depleted supply of oil?

RETURN SYSTEMS

Collection and re-distribution of tailwater has increased rapidly this year on the High Plains of Texas. Several systems have been installed in counties that are not in the Water District, as well as some in New Mexico.

The district has kept records on nine installations in 1965. The nine systems as of July 19th had salvaged 319.56 acre-feet of water or an average of 35 acre-feet per unit.

The amount of water salvaged, valued at $40 per acre-foot, has almost paid for the cost of an average tailwater return system.

Now is the time to start planning for next year. Consult your field representative or the district office in Lubbock for detailed information on construction of tailwater return systems.

Gravel Packed—

(Continued from Page 1)

ed. The best location for a well may be selected from the data obtained from test drilling.

2. Select the proper size gravel to control the formation sand. The proper size of gravel should be determined from a screen analysis of the samples obtained from test drilling.

3. Determine the size of the openings in the screen or in the casing from the size of the gravel selected. The openings should be small enough to prevent the gravel from entering the well.

4. Drill the well completely through all of the water-bearing strata. The well should be as nearly straight and plumb as possible. The diameter of the well should be large enough to allow approximateiy six inches of annular space between the casing and the wall of the well.

5. Gage the well to determine whether or not it is straight and plumb. If the well is too crooked, it would be impossible to place a uniform envelope of gravel around the casing, and it may be impossible to install a pump at the desired setting.

6. Install the casing in the center of the well. Spacers or casing centralizers should be attached to the casing to insure proper centering.

7. Place the gravel in the annular space between the casing and the wall of the well. This should be done in such a manner that the entire interval to be gravel-packed will receive a uniform envelope of gravel. It is a good idea to bail the well while the gravel is being placed around the casing. The bailing removes a large part of the fine-grained material from the gravel-pack and facilitates the proper arrangement of the gravel.

8. Develop the well thoroughly by the use of a swab and bailer or a surge block and bailer and then by pumping and backwashing with a test pump.

9. Test the well when it is thoroughly developed in order to determine the necessary data to select the proper size pump to be installed in the well.

The most common method of placing gravel in a well in the High Plains is to shovel the gravel into the annular space between the casing and the wall of the well. This method may be satisfactory if the wall of the well is firm and will not cave. Quite often, however, the particles of gravel in falling from the surface will dislodge clay and unconsolidated sand from the wall of the well and cause a bridge to form.

A good method to use, in order to insure a uniform gravel envelope, is to lower a 2 1/2 or 3 inch pipe to the bottom of the well between the casing and the wall and to feed the gravel mixed with water through this pipe. The pipe can be raised as the annular space is filled. This method prevents bridging and makes a cleaner gravel envelope.

Several methods of gravel-packing wells have been developed. It is our desire to determine which methods are more suitable for use in the High Plains, and we will make additional data available from time to time when we find that it is practical and economically feasible.

One of the several educational booths on water viewed by thousands at the South Plains Fair.

IRRIGATION INVENTORY

Irrigation increased significantly in Texas from 1958 to 1964 both in the amount of land irrigated and the amount of water used. So states the second published irrigation inventory taken in the State and released today in Austin by Water Commission Chairman Joe D. Carter.

"Inventory of Texas Irrigation, 1958 and 1964," Bulletin 6515, by Paul T. Gillett and I. G. Janca, Water Commission Hydrologists, is based on cooperative studies conducted by the Soil Conservation Service of the U. S. Department of Agriculture, the State Soil Conservation Board, and the Water Commission.

The amount of irrigated land increased in the 6-year period by about 15 percent, an average annual gain of nearly 2 1/2 percent. Nearly 60 percent of this gain occurred in the High Plains—in the upper parts of the Canadian, Colorado, Brazos, and Red River Basins. The Rio Grande and the Nueces River Basins also showed acreage gains.

The amount of water used increased nearly one-third, the report states, from over 9.6 million acre-feet—or 1.43 acre-feet per irrigated acre—in 1958, to 12.5 million acre-feet—or 1.62 acre feet per irrigated acre—in 1964.

In most parts of Texas, 1958 was an abnormally wet year, while 1964 was exceptionally dry. Most of the gain in pre-acre use of irrigation water in 1964 was probably due to less abundant natural rainfall.

Until the 1940's the report explains, Texas irrigation barely reached a million acres. After the war, irrigation farming boomed, and by 1958, 6.7 million acres of land were irrigated. In the 1964 crop year, more than 7.7 million acres were irrigated, a million more than was covered in the Commission's first published inventory in 1958.

Ground water continues as the major water source for irrigation, the publication points out. Slightly over four-fifths of all irrigation, both in 1958 and 1964, was accomplished with ground water. In fact, ground water furnished all the increase in total water use since 1958, while surface-water use showed a slight decrease.

For example, 81 percent of the irrigation in 1958 was with ground water, rising to 83 percent in 1964. In contrast, 19 percent of the irrigation was with surface water in 1958, dropping to 17 percent in 1964.

Stressing the widespread use of ground water for irrigation, the report lists areas other than the High Plains that rely heavily on that source: Trans-Pecos and El Paso-Hudspeth areas, the Winter Garden area, the counties below the Balcones Escarpment south and west of San Antonio, many of the rice-belt counties along the Gulf Coast, and the Childress-Hardeman and Haskell-Knox County areas of north-central Texas.

Reporting on crops over the 6-year period, the Water Commission bulletin states that cotton and grain sorghum, with approximately 2 1/2 million acres each, continue to be the State's major irrigated crops. Irrigated wheat, totaling over 0.7 million acres in 1958 and nearly 0.9 million acres in 1964, is the third largest irrigated crop acreage in Texas.

The inventories disclosed an additional 25 million acres of good farming lands, suitable for irrigation, if and when needed by the Nation's fastgrowing appetite for more and more food and fiber. Texas is fortunate in having this large reserve of lands on which irrigation farming, often the most efficient type of operation, can continue its major role in producing large amounts of these future needs. One part of the current undertaking of the Texas Water Commission, in development of a statewide water plan, is to locate sources of and plan developments for water to serve the future irrigation needs of the State.

Maps and inventory data in the report were developed primarily from field observation but also from personal knowledge of the areas; records from the Soil Conservation Service, irrigation districts, or other groups; published reports; and data from other reliable sources, the publication explains.

The new 1964 report, Water Commission Bulletin 6515, points out many other highlights, trends, and comparsions of the 6-year period.

A copy of Bulletin 6515 may be obtained while the supply lasts without charge from the Texas Water Commisison, P. O. Box 12311, Austin, Texas 78711.

High Plains Underground Water
Conservation District No. 1
1628 Fifteenth Street
Lubbock, Texas 79401

Second Class Permit

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 12—No. 6 "THERE IS NO SUBSTITUTE FOR WATER" Novmber 1965

Stewardship of Soil and Water

By REV. L. C. WADDLE

To be given something is to enter into responsibility.

Each of us is the recipient of various "givens," demanding response from us, and simultaneously affording us resources with which to be "response-able."

Life is one of these givens.

No one of us can claim to have created himseif. Each of us was given life through the process of birth. Thereby each of us entered into a strongely mixed existence of dependence and independence. Allen O. Miller comments on this strangely mixed given we call life in the following manner.

REV. L. C. WADDLE

"There are two very significant characteristics about the birth of a child. One of these is symbolized by the umbilical cord, the other by the navel, umbilcal scar after the cord is cut. The umbilical cord symbolizes our creatureliness, our utter dependence upon parents for our procreation. On the other hand, the cutting of the umbilical cord symbolizes our being put here in a world in which, sooner or later, we will have to stand on our own feet and become individual, separate persons. These are the two basic aspects of our human life as we know it: one, our *creatureliness* and *dependence;* the other, our *freedom* and *creativity.* One represents our need for security; the other our capacity for responsibility."

Life was completely given to us. Like it or not, we have it, and we have to do something with it. As surely as there was no choice in being given life, just so surely are we accountable for its use. Some may choose to use it responsibly. Others may choose to use it irresponsibly. No person can choose to be neutral; even suicide is a choice. The choice a person makes is shaped by many factors, but a most influential factor is found in the person's concept of what this gift of life really is. If his concept of life is largely shaped by materialistic views, he may very well use the gift of life with little regard for himself or others. If, on the other hand, he conceives life as a gift from God, and thus to be lived as unto God, he can more likely use his life with some degree of responsible regard for himself and others.

The biblical affirmation about man's life is that it is given, that it is given by God's own creativity, and that it is shaped in the image of God himself. If this biblical affirmation is seriously accepted as one's concept of life, responsibility for the use of this given life must be seen in terms of God's will. Mere man perspective will not suffice as a basis for determining one's use of life. It is impossible, with this concept of life, to think in terms of a supposed neutrality, that is, to think life may be lived without regard for God's will or man's better will. But of the two, the higher will of God must be the governing factor in one's stewardship of self. You have life. You have it as God's gift. You have it in the image of God. There is the upward tug of human dignity and worth that find their being in the facts that God not only gives life but loves it to the point of giving himself to recreate it in its original image, and you can do no other than to try to be its best possible steward.

But just as the given life ushers us into responsibility for its use as unto God, and simultaneously makes us "response-able," so does it cut us loose with freedom for response on our animalistic level. We can and do choose which response we make to the given life, whether we shall live as unto God, or only as unto self. The first response we have to consider responsible. The latter response we have to consider irresponsible. And its fruitage need not be spelled out here, for disease, ignorance, dissipated bodies, wasted intellect, broken human relationships, exploitation of others for selfish purposes, these are altogether obvious.

Let it be repeated, to be given something is to enter into responsibility. The given makes response inevitable, because it makes response possible. The measure of our response writes a tale of responsibility or irresponsibility, of worthy or unworthy stewardship, of wholesome, abundant living, or living sickened unto death.

Just as surely as life is a given, confronting us with a demand for responsible stewardship of the given, so are those parts of the physical world which we call soil and water. Who of us but the incurably foolish would claim to have created them? They were here when we came onto the human, earthly scene. The Genesis writer says the soil was the stuff of which we human beings were formed, therefore it preceded us in God's order of creation. He further affirms that we were the late-comers as far as water was concerned, and that we human creatures were given the charge of having dominion over these aspects of God's total creation. But He in no way indicates that we can think of them as "our" creations or special possissions. On the contrary, having been ushered into a living relationship with them, we have to choose to use them wisely or foolishly. This also we have to choose; there is no neutrality for us. And the initial affirmation holds, that to be given anything is to find oneself simultaneously privileged by the gift and responsible for its use.

An additional word about the word of the Genesis writer—"And the Lord God formed man of the dust of the ground, and breathed into his nostrils the breath of life; and man became a living soul." (Genesis 2:7).

Eugene Smathers, long-time pastor of the Presbyterian church in Big Lick, Tennessee and a recognized leader in rural life concerns, has written: "Man is formed from the soil, from it his body draws all its elements, and when he dies his body is slowly reincorporated into the soil."

Granted the truth of the affirmation by the Genesis writer, and the validity of this statement by Mr. Smathers as an interpretation of at least a part of the meaning of the biblical idea, it seems not in error to suggest that man's use or misuse of the soil is tantamount to his use or misuse of himself. This is not said facetiously. It is not meant to sound morbid, like suggesting that we should be careful where we walk, for the soil we step on might be one of our ancestors. Rather is it to appeal to us to conceive the soil of the earth with highest regard. It is to insist that we see it as an essential part of God's total creation, just as surely as human life is. It is to urge that we see our stewardship of the soil inextricably bound up within the stewardship of our very own lives. The soil is one of God's givens, just as life is, and we have the

(Continued on Page 2)

Judge Otha Dent Reappointed To Third Term

JUDGE OTHA DENT

Judge Otha Dent has been recently appointed to a third term as a member of the Texas Water Rights Commission by Governor Connally. The Commission was formerly the Texas Water Commission but was renamed by the recent session of the legislature.

Dent was first appointed to the Board of Water Engineers in 1953 by Governor Allen Shivers, then was reappointed in 1959 by Governor Price Daniel. His new term runs until February 1, 1971.

Judge Dent is a former Lamb County judge and president of the Texas County Judges and Commissioners Association in 1950-51.

Dent's keen interest in the State's water problems and his plain spoken manner has contributed to solutions of many Texas water problems. He has labored hard in his capacity with the State and was well deserving of his reappointment.

THE Cross SECTION

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BILL J WADDLE
Editor

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City Hall, Dimmitt

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Frank Wise, 1967 .... 716 W. Grant, Dimmitt
Donald Wright, 1968 .... Box 65, Dimmitt
Morgan Dennis, 1968 .... Star Rt. Hereford
Committee meets on the last Saturday of each month at 10:00 a.m., City Hall, Dimmitt, Texas.

Cochran County
W. M. Butler, Jr.
Western Abstract Co., Morton

D. A. Ramsey, 1967 .... Star Rt. 2, Morton
Ira Brown, 1968 .... Box 774, Morton, Texas
Willard Henry, 1966 .... Rt. 1, Morton, Texas
H. B. Barker, 1967 .... 602 E. Lincoln, Morton
E. J French, Sr. 1968 .. Rt. 3 Levelland, Texas
Committee meets on the second Wednesday of each month at 8:00 p.m., Western Abstract Co., Morton, Texas.

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High Plains Water District
317 N. Sampson, Hereford

L. E. Ballard, 1966 .... 120 Beach, Hereford
Billy Wayne Sisson,, 1968 .... Rt. 5, Hereford
J. E. McCathern, Jr., 1967 .... Rt. 5, Hereford
Billy B. Moore, 1968 .... Wildorado, Texas
Charles Packard. 1967 .... Rt. 3, Hereford
Committee meets the first Monday of each month at 7:30 p.m., High Plains Water District office, Hereford, Texas.

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325 E. Houston St., Floydada

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J. S. Hale, Jr., 1966 .... Rt. 1, Floydada, Texas
Tate Jones, 1967 .... Rt. 4, Floydada
M. M. Julian, 1968 .... Rt. Q, Lockney Texas
M. J. McNeill, 1968 .... 833 W. Tennessee, Floydada, Texas
Committee meets on the first Tuesday of each month at 10:00 a.m., Farm Bureau Office, Floydada. Texas.

Hockley County
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917 Austin Street, Levelland

Bryan Daniel, 1967 .... Rt. 2, Levelland
Preston L. Darby, 1968 .... Rt. 1, Ropesville
Leon Lawson, 1967 .... Rt. 3, Levelland
H. R. Phillip, 1968 .... Rt. 4 Levelland, Texas
S. H. Sehoenrock, 1966 .... Rt. 2, Levelland
Committee meets first and third Fridays of each month at 1:30 p.m. 917 Austin Street, Levelland, Texas.

Lamb County
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620 Hall Ave. Littlefield

Willie Green, 1967 .... Box 815, Olton
Roger Haberer, 1968 .... Earth, Texas
W. B. Jones, 1966 .... Rt. 1. Anton, Texas
Troy Moss 1968 .... Rt. 1, Littlefield, Texas
Raymond Harper, 1966 .... Sudan, Texas
Committee meets on the first Monday of each month at 7:30 p.m., Rayney's Restaurant Littlefield, Texas.

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Bill Hardy, 1968 .... Rt. 1, Shallowater, Texas
Bill Dorman, 1967 .... 1910 Ave. E., Lubbock
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W. O. Roberts, 1968 .... Rt. 4, Lubbock, Texas
Committee meets on the first and third Mondays of each month at 1:30 p.m., 1628 15th Street, Lubbock, Texas.

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1628 15th Street, Lubbock

Hubert Teinert, 1967 .... Wilson Texas
Harold G. Franklin, 1968 .... Rt. 4, Tahoka
Roy Lynn Kahlich, 1966 .... Wilson, Texas
Oscar H. Lowrey, 1967 .... Rt. 4, Tahoka
Reuben Sander, 1968 .... Rt. 1, Slaton, Texas
Committee meets on the third Tuesday of each month at 10:00 a.m., 1628 15th Street, Lubbock, Texas.

Parmer County
Aubrey Brock

Wilson & Brock Insurance Co., Bovina
Wendol Christian, 1966 .... RFD, Farwell, Texas
Henry Ivy, 1967 .... Rt. 1. Friona
Walter Kaltwasser, 1967 .... RFD, Farwell
Carl Rea, 1968 .... Bovina, Texas
Ralph Shelton, 1968 .... Friona, Texas
Committee meets on the first Thursday of each month at 8:00 p.m., Wilson & Brock Insurance Agency, Bovina, Texas.

Potter County
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W. J. Hill, Jr., 1966 .... Bushland, Texas
L. C. Moore, 1968 .... Bushland, Texas
Jim Line, 1968 .... Bushland, Texas
Eldon Plunk, 1967 .... Rt. 1, Amarillo

Randall County
Mrs. Louise Knox

Randall County Farm Bureau Office, Canyon
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Paul Dudenhoeffer. 1966 .. Rt. 2, Canyon, Texas
Carl Hartman, Jr. 1968 .... Rt. 1, Canyon
Lewis A. Tucek, 1967 .... Rt. 1, Canyon
Ed Wieck, 1967 .... Rt. 1, Canyon
Committee meets on the first Monday of each month at 8:00 p.m., 1710 5th Ave., Canyon, Texas

same charge to use it as unto God as we have with respect to the gift of life. In the words of Eugene Smathers, "Man has a moral responsibility to the soil, and failure to accept this responsibility brings judgment."

"Moral responsibility . . . judgment." Some persons express the view that these words belong only in the area of theological jargon. In the words of others, they are "spiritual" words, without import for the physical, work-a-day world of the tiller of the soil or the producer of beef cattle. Some would refer to this as the "secular" world and propose to separate it from the so-called "spiritual" side of life. We err in this, this idea that one side of life is spiritual and the other secular, and in the idea that they can be separately lived. All of life is God's creation and no worthy part of it is exclusively spiritual or secular. We err in this general area of thought in part because many of us who profess to be Christian have too often ignored the earthy words in which Jesus clothed profound truth and in which he defined life on God's terms. His words were of sheep and barren fig trees and a sower who sowed seed on rocky soil, or a beaten path, or soil infested with thorns, or soil rich and productive. And his redemptive truth was not merely couched in these earthy terms. His redemptive truth dealt with the abundant life for man, as man lives out his life within the framework of these earthy, physical relations—relations with soil and water and air and plant life. He spoke even of the kingdom of God as having come among us in Himself and as being involved in man's total relationship to the total of life.

Eugene Smathers comments:

"In other words, man's relationship to the soil is a part of the structure of reality, and he finds abundance of life to the degree in which he lives in harmony with that structure, and brings judgment upon himself when he tries to 'run against the grain.' The good life for a man or a people is conditioned by the degree to which the obligation to be 'custodian of the organic powers and of the earth's flowering heritage' is accepted. On the other hand, something happens to a man or a people who exploits the soil for selfish and immediate gain."

Now, if the moral implications of good soil stewardship escape us, we at least can get our teeth into the matter of economics, even if we are not economists, as this writer is not. Anyone with average intelligence can perceive the economic ruin resulting from poor soil stewardship. Historians point out that the story of risen and fallen cultures and nations often includes a tale of soil wastage. But where soil and water conservation are concerned the reading of history is as current as today's eroded hillside or dry, dusty pasture. Or the tale of economic disaster resulting from poor stewardship of soil and water is clearly observable in hungry people, badly bloated indebtedness and general poverty. Man's survival is the ultimate issue. And this says that good soil and water stewardship is not simply a nice thing for all of us to do; rather it is an absolute necessity. Save and live, or waste and die. That's about the jist of it.

Dr. Ide P. Trotter, Director of Texas Agricultural Extension Service, addressed the first Annual Rural Church Conference meeting at College Station in September 1946, using the subject "Soils And Souls." He said:

"The soil is, in my thinking, God's means of supporting all life on earth. There is no other means whereby life can be maintained other than through some direct or indirect use of the soil He has given us. He has placed in us a trust, that we use the soil efficiently and permanently. We are not only charged by God to use the soil effectively, but should we misuse it in any unnecessary manner, we are responsible to God. I can very readily say that we are mocking God if we misuse the soil."

So we come full circle again, in Dr. Trotter's words, not only to the fact that good stewardship of the soil is basic to man's survival, but to the higher demand of man's "responseability" to God's given. Being recipients of the given, we are thereby ushered into the demand of worthy response and made able to respond worthily.

It seems superfluous even to mention the stewardship of water to readers of *The Cross Section.* Certainly you know much better than this writer the absolute necessity for adequate water, if your fields and pastures are to produce desired and needed fruitage. Economic security is at stake, with all its ramifications for physical health, educational and intellectual achievements, improved flocks and herds, more nutritious foods, community development and inter-personal relations. Ultimately, again, life itself is at stake.

These primarily materialistic factors provide motive enough for conserving water and using it wisely. But this writer has to insist that there is a higher motivation. It again is found in the fact that water, like life and soil, is God's given. It is His creation, not our own. It was here when we came into being. It is of the stuff of the life given us. The demand upon upon us is that we use this creation of God as unto God, because it is God's creation and we are God's creatures, with ability to respond to him and to His created world with intellngence and creativity. To misuse this given of God is not merely to misuse water, it is to deface the image in which God created us and to defile our humanity. We are not really human when we exercise sloppy stewardship of any of God's givens—life — soil — water. We are sub-human. And this means that the hurt we incur through poor stewardship of these givens is not confined to infertile soil and depleted water. The hurt is more poignantly spelled out in terms of broken humanity. This is the essence of sin, for the defacing of humanity is the defacing of God's image in ourselves, and sin against humanity is sin against God, as all sin ultimately is.

WATER DEVELOPMENT BOARD VISITS HIGH PLAINS

Members of the Texas Water Development Board recently visited the High Plains area of Texas. They were accompanied by staff members of the organization in their tour.

Two private airplanes were used to fly the members and members of their staff over this vast area so they could get a first hand view of the terrain.

The group toured the South Plains Research and Extension Center in Lubbock, High Plains Research Foundation at Halfway and flew all over the Southern and Northern Plains of Texas. It was certainly a pleasure to have this group visit our area and we hope they will return soon.

The Land Loan Picture On The Texas Plains

Many people are vitally interested in the future of the High Plains of Texas. Some are residents of the plains, others are nonresidents.. One common question that comes to everyone's mind is what about land values and land loans.

All of the major land financing agencies are actively soliciting long term farm mortgage loans on the North and South Plains of Texas. These agencies have been long established and use a careful and conservative approach to their investment portfolio. Their objective must be to make well secured loans at an interest rate that will yield income to their stockholders.

It is the moral and financial obligation of lenders to make safe loans. These lenders make careful and thorough investigations before making land loans in any area. The files of the High Plains Underground Water Conservation District are used by many investment people to establish the amount of water beneath a portion of land in the Southern High Plains that is being considered for a long term loan. They also check the average rate of decline of the water table and assure themselves that all existing irrigation wells are correctly spaced. Through our files they have established three facts. How much water is beneath the land, the expected drawdown, and the validity of the irrigation wells. These facts give excellent projections to the type of loan an agency might place on a piece of property.

Irrigated farming on the High Plains is relatively new compared to other areas of the United States. With some exceptions the major lenders started considering loans on irrigated farms in the late 40's and early 50's. Many were making land loans prior to that time, but they were lending on a dry land production basis. Even though the land might have been irrigated it was simply a question in the lenders conservative method of approach as to whether the capital investment required for irrigation equipment and the cost of pumping water was economically feasible.

By the mid 50's practically all agencies were giving added value to irrigated land. The amount of water estimated to be available for future pumping naturally effected the loan value, but the estimated availability of adequate water for a full loan term period is not a prerequisite for making a loan.

Irrigation on the plains is generally considered to be supplemental rather than primary since past experiences have shown that a large portion of the area can show substantial agricultural income return under dry land conditions. All lenders are congnizant of the fact that the ground water under any particular piece of land might be depleted before the loan reaches maturity. They are not unduly concerned because they know that an efficient operator can service the remaining portion of his debt with dryland production.

Without exception, every investor lending nationwide on agricultural lands will confirm the fact that they have fewer delinquencies on the Plains of Texas than any other region of the United States. Pay record history is excellent with many farm loans being paid in full long before the maturity date. Foreclosures since World War II are practically nonexistent. These statements apply to the entire Plains area, whether the security be an irrigated farm or dry land farm.

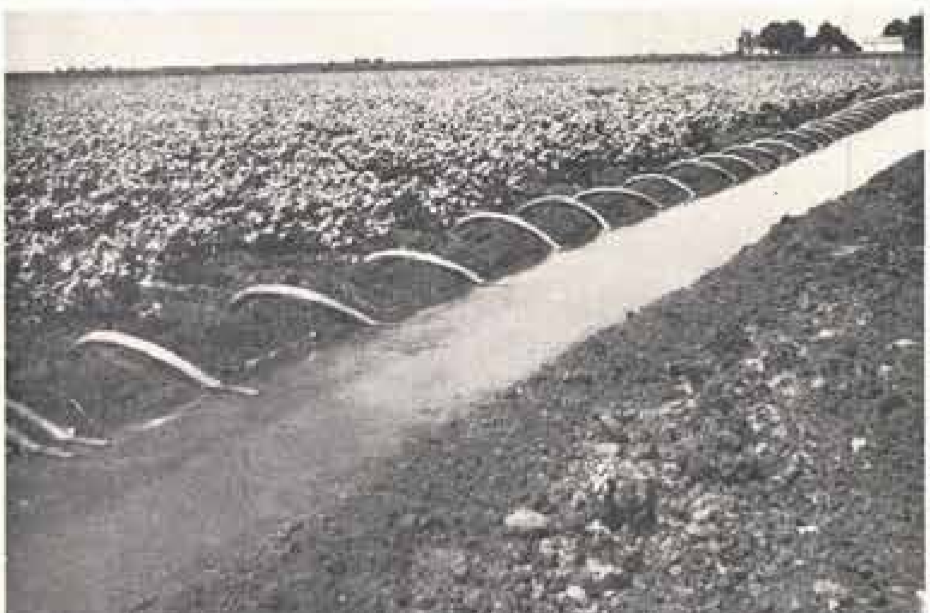
Plains farmers are among the most progressive in the country. They are quick to try improved practices and technological advancements in crop production and water use. Some examples are milo maize yields with very little additional water requirements, areas where well yields have drastically declined, cotton yields per acre have continued to increase, irrigated wheat yields have doubled or tripled in the past ten years, and the accelerated use of playa lakes has put an increased value on land that has a lake of this type.

In 1954 it was the common opinion that a well that produced less than 500 gpm was not worth the capital expense to equip the well. Today numerous farms produce excellent crop yields with wells pumping 100 gallons per minute. Many farmers combine several small wells to produce a sizeable pipe of water. Studies have shown that the capital investment in a series of small wells might not be as high as it is for one large well. Neither will maintenance costs be as high.

What about the future? Lending agencies presently have approximately $300,000,000 invested in long term agricultural land loans in the 42 county area of the High Plains of Texas. Future changes in agricultural, economic conditions and hydrology in the area will influence the policies of lenders. One agricultural scientist of the High Plains recently stated that, "due to research the water requirements of crops grown in this area will be cut 50 per cent in the next five years". These factors, some lending agencies say, "indicate no need for any major overall lending policy changes."

The amount per acre being loaned on land in the High Plains has steadily increased and should continue. Most investors are confident that the soundness of the agricultural economy of the area will progress as it has in the past.

So if you have let the declining water table convince you the High Plains area of Texas is dying on the vine, better take a closer look, most people don't share that conclusion.



Long term farm loans have made possible intensive irrigation development on the High Plains of Texas.

First Place Educational Booth at the 1965 Tri-State Fair. The booth was constructed by the Vega FFA Chapter, Frank Kennedy, Advisor.

ARE YOU LUCKY

Are you one of the lucky ones fortunate enough to have a playa lake on your farm? If you are, you are indeed fortunate.

You say, "now that I have a lake why am I so fortunate?"

It is estimated that 1.4 million acre feet of rainfall becomes runoff. If this water were used to irrigate dryland acreage, it could raise the economy of the High Plains some $84,000,000 annually if used on cotton; $56,000,000 if used on grain sorghum; and $35,000,000 if used on wheat.

The average amount of water collected in a playa lake on the High Plains is approximately 45 acre feet. If you have such a lake you could estimate your gross return from the use of this water at $80 per acre for grain sorghum, $120 per acre for cotton and $37.50 per acre for wheat.

A few years ago a playa lake was considered a real detriment to a farm and very little value was placed on playa lake land. Today they are usually considered more valuable than the actual farm land because of their potential of producing cheap irrigation water.

If you are lucky and have a lake, are you making it work for you?

Put some thought and the pencil to the idea and you'll probably see there is some real money to be made by using your playa lake.

Water Is Your Future, Conserve It!

DRILLING STATISTICS FOR OCTOBER

County	Permits Issued	New Wells Drilled	Replacement Wells Drilled	Dry Holes
Armstrong	0	0	0	0
Bailey	2	3	0	0
Castro	10	11	1	1
Cochran	2	1	0	0
Deaf Smith	16	16	1	1
Floyd	7	11	1	0
Hockley	7	4	1	2
Lamb	5	7	1	0
Lubbock	22	11	3	1
Lynn	2	3	0	0
Parmer	7	15	2	0
Potter	0	1	0	0
Randall	1	13	1	1
TOTALS	81	96	11	6

Revenue Ruling Released By Treasury Department

On November 19, 1965, the Internal Revenue Service published Revenue Ruling 65-296 which states:

"The Internal Revenue Service will follow the decision of the United States Court of Appeals for the Fifth Circuit in *United States v. Marvin Shurbet et ux,* 347 Fed. (2d) 103 (1965), in the disposition of cases involving taxpayers in the Southern High Plains of Texas and New Mexico who extract ground water from the Ogallala formation beneath their land for irrigation purposes.

"In that case, the court held that the taxpayers are entitled to a cost depletion deduction for the exhaustion of their capital investment in the ground water extracted and disposed of by them in their business of irrigation farming. The court specifically stated, however, that its decision was not meant to furnish a precedent for the allowance of cost depletion except under the peculiar conditions of the Southern High Plains.

"Accordingly, cost depletion will be allowed to taxpayers in the Southern High Plains under facts similar to those in the *Shurbet case.* However, taxpayers claiming cost depletion on underground water will be required to prove both their depletion basis (especially where the water deposit was acquired with the purchase of the land for a single price) and the amount of exhaustion of the water deposit beneath their land during the taxable year."

MARVIN SHURBET

The Internal Revenue Service is now studying the problems involved in administering the allowance for water depletion. It is hoped that guidelines will be published by the Internal Revenue Service in the near future so that the farmer's burden of establishing his annual deduction and the administration of such deduction will be minimal.

It's never too late to install a tailwater return system.

TRIASSIC WATER WELLS AND TEST HOLES

In March 1965, the District adopted a rule for preventing the waste of Ogallala water through leakage and improperly constructed Triassic water wells and test holes. This rule known as Rule 16A is as follows:

"Rule 16 (A) PLUGGING TRIASEIC WELLS. Any water well or test hole drilled through the Ogallala into the underlying Triassic or Red Bed formation shall be so completed as to eliminate any movement of Ogallala water into the underlying Triassic formation.

"I. If it is proposed to produce the Triassic water, then casing must be set through the Ogallala and into the Triassic a minimum of 10 feet and cemented to the surface. (between the casing and well bore)

"II. If it is proposed to abandon the Triassic portion of the well, then the following procedure will be observed:

"1. If no casing is placed in the well below the top of the Triassic, the hole will be filled with dirt, rock, mud or similar material to a level no less than 50 feet below the base of the Ogallala, and sufficient cement added to fill the hole to the base of the Ogallala.

"2. If casing has been set through the Triassic with perforations below the Ogallala, all such perforations shall be closed with cement and a cement plug at least 10 feet in height placed in the casing below the base of the Ogallala, and above the highest perforation in the Triassic.

"3. If blank casing (no perforations) has been set into the Triassic, then either (a) cement shall be pumped below the shoe of such casing in sufficient volume to fill the annulus between the casing and the wall of the hole up to the base of the Ogallala, or (b) the casing shall be removed from the well and the Triassic formation plugged in accordance with pp.II (1) above."

A brief explanation of the facts which led up to the adoption of this rule might be helpful to the farmers in the District in planning their further development of available water.

Within the boundaries of the Water District, the Ogallala rests upon either Cretaceous beds or the Triassic Red Beds. The Triassic formation, ranging in thickness from a few hundred feet to more than 800 feet consists of inter-bedded red clays and red to gray sandstones which are more or less consolidated. From a regional standpoint, the Triassic occurs in a saucer like depression thickening in all directions toward the center of the Permian Basin. In the marginal areas of deposition or where subsequent erosion has cut deeply into the Triassic formation the sands contain water of useful quality, and locally where the sands are particularly well developed or structural movement has caused joints and fissures to occur large well yields have been found. The occurence of fresh water under these conditions is a result of a long period of ground water movement and discharge at relatively shallow depths.

However, in the interior areas, where the Triassic sands occur at considerable depth below the land surface the movement of water has been very slow and as a result the water is more mineralized. In the deeper parts of the Triassic basin the water is unsuitable for domestic or agricultural purposes.

Water level measurements in Triassic wells show that the static water level is at a lower elevation than the Ogallala water levels, and generally lower than the base of the Ogallala. This means that a water well or a test hole drilled through productive Ogallala sands into a Triassic sand will allow the Ogallala to drain directly into the underlying Triassic reservoir. Unless the Ogallala is thoroughly isolated from the deeper reservoirs, this induced drainage of the Ogallala will continue uninterrupted as long as water remains in the Ogallala.

Since most efforts at developing Triassic water have in the past and will continue to be concentrated in areas of marginal supply of Ogallala water it becomes increasingly important to protect this potential loss of water. Therefore, the District has adopted the above rule to insure the prevention of waste of the Ogallala water into the underlying Triassic.

It is not the intent of this rule to prevent any landowner from developing to the fullest extent the Triassic water under his land. It is, however, the opinion of the Board of Directors of the District that any landowner desiring to develop and produce Triassic water on his land should do so independently of whatever reserves of Ogallala water are available to him. The District recognizes that this may require both an Ogallala well and a Triassic well on the same tract of land, but it is our opinion that this is preferable to a situation where the Ogallala is allowed to drain into the Triassic on a continued uninterrupted bassis.

PLEASE CLOSE THOSE ABANDONED WELLS ! ! !

High Plains Underground Water
Conservation District No. 1
1628 Fifteenth Street
Lubbock, Texas 79401

Second Class Permit

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 12—No. 7 | "THERE IS NO SUBSTITUTE FOR WATER" | December 1965

Merry Christmas

Happy New Year

Board of Directors

County Committeemen

Office Personnel

THE Cross SECTION

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

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BILL J WADDLE
Editor

LET'S TAKE A LOOK AT 1965

This edition of the Cross Section closes the door on 1965. During the past year many things have happened in the High Plains Underground Water District, in the State of Texas, and all over the United States. This writer was very interested in all occurrences that dealt with water and water conservation—underground water particularly.

Just how valuable is underground water to the world? A recent professional publication carried an article stating that "Ninety-seven percent of the earth's fresh water is underground. Less than two percent is surface water." This is quite a surprise to people, to discover how important and precious our groundwater is to so many.

Let's go back through this year and look at what happened concerning water in 1965.

January was election time for the district and we saw two new district directors elected to the board, and twenty-six new county committeemen take office. A Parmer County farmer found that a $500.00 investment in water conservation paid great returns in crop production. The State Legislature convened and started their work on a complete re-organization of the Texas Water Commission and drafted water legislation such as has never before been done.

Texas Tech entered into a research program with the Texas Water Commission to further develop the State's water resources.

February brought the annual West Texas Water Institute into focus and featured speakers on water supply, legislation, economics, and many other interesting topics dealing with water. Attendance at the institute hit an all time high.

Ed Reed was employed as Hydrologist for the Water District. Legislators' desks began to "sag" from the weight created by the large number of "water bills" being introduced.

March featured the publication of the annual decline maps for the counties in the High Plains Water District. The observation wells revealed a 3.99 foot average decline for the District. Water people began to discuss the NAWAPA plan as a possible source of importing water to the arid regions of the Southwest. Farmers began extensive irrigation, and "tailwater" return systems were being utilized to full advantage. Many new systems were installed.

April and the West Texas Water Institute brought representatives of the Parsons Company to Lubbock to discuss the North American Water and Power Alliance. This conflab was attended by several hundred interested water people as well as several national and state legislators. The Secretary of Interior announced the new $7.00 fee for a Recreation/Conservation sticker that would admit people to most designated recreation areas. Chemical stimulation of irrigation wells was discussed by the Cross Section. By this time, the water legislation was getting hot and heavy. Senate Bill 144,145, and 146 which dealt with the re-organization of the Texas Water Commission had been introduced and had been "hacked" on in committee by representatives from all parts of the State.

May brought warm sunny weather to the area and cotton and grain sorghum seed went into the ground all over the High Plains of Texas. The sun was not the only source of heat for many Texans. Time was growing short in the legislative session and the major water bills had not been passed Senate Bills 145 and 146 had caused quite a few heated arguments in establishing the Texas Water Rights Commission and shifting the duties of the Texas Water Commission to the Texas Water Development Board. Items involved in the bills were the appointment of the members of the Water Rights Commission and the transfer of surplus water from its basin of origin to some other area. After many heated hours at the discussion table, both houses finally ironed out their differences and passed the bills in the last days of the session. Senator Parkhouse and Representative Parsley worked many long hours on getting the bills through both houses.

The District Court in Randall County upheld the rules of the High Plains Water District by closing an irrigation well drilled in violation of the District's rules.

Directors of the Water District adopted a rule concerning the drilling of Triassic Wells.

June was a big, eventful month for thousands of landowners on the Southern High Plains of Texas. On June 7, the United States Court of Appeals for the Fifth Circuit unanimously affirmed a tax deduction for the depletion of groundwater in the case of United States v. Marvin Shurbet, et ux. This decision paved the way for all landowners to take a tax deduction on their underground water

(Continued on page 4)

DRILLING STATISTICS FOR NOVEMBER

County	Permits Issued	New Wells Drilled	Replacement Wells Drilled	Dry Holes
Armstrong	0	0	0	0
Bailey	1	0	0	0
Castro	5	2	0	0
Cochran	5	2	0	0
Deaf Smith	2	5	0	0
Floyd	15	7	2	0
Hockley	28	6	0	2
Lamb	3	6	2	0
Lubbock	32	15	2	1
Lynn	5	2	0	0
Parmer	22	6	0	1
Potter	1	0	0	0
Randall	6	9	0	2
Total	125	60	6	6

Water District Election January 11

The High Plains Water District's annual election will be held on the second Tuesday in January 1966—January 11 is the date voters will go to the polls to decide on three issues.

At the end of this year three of the five men who serve as members of the Board of Directors will conclude their present terms of office. These three are: Russell Bean of Lubbock, who represents Lubbock and Lynn Counties; Bean is presently serving as Chairman of the Board; Weldon Newsom of Morton who represents Cochran, Hockley and Lamb Counties; and Chester Mitchell of Lockney representing Floyd County.

The ballot will also include the nominees to fill one vacancy for each five man County Committee in the District. Each county has a "County Committee" that approves well drilling permits and makes recommendations on various matters to the District Board. One member of the present "County Committees" in the thirteen counties of the District term expires at the end of this year.

The third proposition to be considered is the annexation of certain eligible lands in Cochran County.

In April of 1965 the Texas Water Commission issued an order, after thorough investigations, redefining the boundaries of Subdivision One, High Plains Area, Ogallala Formation, South of the Canadian River. This order included certain lands in Cochran County and made them eligible to become a part of a water district. Landowners in the areas affected have petitioned the Board of Directors of the High Plains Underground Water Conservation District to become a part of the District.

Residents living within the areas applying for admission to the District will vote either to join the District or remain separated from it. To vote on this proposal one must be a qualified voter and must live in the area affected. A person who owns property in the areas under consideration but does not reside in the area is not eligible to vote on this proposal.

All qualified voters living within the District are eligible to vote for the District Directors, County Committeemen and to accept or reject the areas in Cochran County who de sire to become a part of the District.

A qualified voter is one who has a valid poll tax and owns property within the District. This property can be a house and lot, farm, business property or land of any type. You do not have to be a farmer or own an irrigation well. School teachers, bankers, mechanics, grocers, or anyone who owns property that is taxed by the Water District is eligible to vote.

Nominations of qualified persons for District Directors and County Committeemen are made by the respective County Committees or they are made by petition signed by any twenty-five qualified voters in the area involved.

Voters must cast their ballots in their home counties; however, they may vote at any one of the voting places in that county.

Nominees for Directors' and Committeemen's places are as follows:

POLLING PLACES

ARMSTRONG COUNTY

1. School House in Wayside

BAILEY COUNTY

1. Enoch's Gin, Enochs
2. Community House, Muleshoe

CASTRO COUNTY

1. Brockman Hardware Co., Nazareth
2. County Court House, Dimmitt
3. Easter Community Center, Easter
4. American Legion Hall, Hart

COCHRAN COUNTY

1. County Activities Bldg, Morton
2. Star Route Co-Op Gin, 5 miles west of Morton
3. Alamo Gin, 8 miles east of Morton
4. Whiteface Co-Op Gin, Whiteface

DEAF SMITH COUNTY

1. County Court House, Hereford,

FLOYD COUNTY

1. County Court House, Floydada
2. City Hall, Lockney

HOCKLEY COUNTY

1. City Hall, Anton
2. Farm Center Gin, Ropesville
3. County Court House, Levelland
4. Whitharral Lions Club Bldg., Whitharral
5. City Hall, Sundown

LAMB COUNTY

1. City Hall Olton
2. City Hall, Sudan
3. Community Bldg., Earth
4. County Court House, Littlefield
5. Farmers Co-Op Gin, Spade

LUBBOCK COUNTY

1. Community Club House, Shallowater
2. City Hall, Wolfforth
3. Old County Court House, Lubbock
4. City Hall, Idalou
5. Community Club House, Slaton

LYNN COUNTY

1. Community Center, New Home
2. City Judge's Office, Wilson State Bank, Wilson

PARMER COUNTY

1. City Hall, Friona
2. Wilson & Brock Insurance Agency, Bovina
3. County Court House, Farwell
4. School House, Lazbuddie

POTTER COUNTY

1. School House, Bushland

RANDALL COUNTY

1. Consumer's Fuel Assoc. Elevator, Ralph Switch
2. V. F. W. Hall, 1 mile north of Canyon
3. Columbus Club Hall, Umbarger

NOMINEES
FOR DISTRICT DIRECTOR
(One to be elected for each precinct)

PRECINCT ONE (1) Lubbock and Lynn Counties

1. Russell Bean, 2806 21st, Lubbock, Texas
2. ____________

PRECINCT TWO (2) Cochran, Hockley and Lamb Counties

1. Weldon Newsom, Rt. 2, Morton, Texas
2. ____________

PRECINCT FIVE (5) Floyd County

1. Chester Mitchell, Lockney, Texas
2. Ernest Lee Thomas, Route 1, Floydada, Texas
3. ____________

NOMINEES
FOR COUNTY COMMITTEEMEN
(One to be elected for each County)

ARMSTRONG COUNTY
(One to be elected — Commissioner's Precinct No. 3)

1. George Denny, Rt. 1, Happy
2. John Patterson, Rt. 1, Happy

BAILEY COUNTY
(One to be elected Committeeman-at-Large)

1. Gene Caldwell, Rt. 1, Box 122, Muleshoe
2. Ernest Lamm, Rt. 2, Muleshoe
3. Melvin Hale, Box 76, Maple
4. J. W. Witherspoon, Box 261, Muleshoe

CASTRO COUNTY
(One to be elected — Commissioner's Precinct No. 1)

1. Calvin Petty, Box 605, Dimmitt

COCHRAN COUNTY
(One to be elected — Commissioner's Precinct No. 4)

1. Willard Henry, Rt. 1, Morton
2. Kenneth G. Walls, Star Rt., Morton

DEAF SMITH COUNTY
(One to be elected — Commissioner's Precinct No. 2)

1. W. H. Gentry, 400 Sunset, Hereford
2. Charles Hoover, 301 Sunset, Hereford

FLOYD COUNTY
(One to be elected — Committeeman -at-Large)

1. J. S. Hale, Jr., Rt. 1, Floydada
2. E. J. Foster, Lockney
3. Kenneth Bean, Floydada
4. Orland Howard, Dougherty

HOCKLEY COUNTY
(One to be elected — Commissioner's Precinct No. 4)

1. S. H. Schoenrock, Rt. 2, Levelland

LAMB COUNTY
(One to be elected — Commissioner's Precinct No. 3)

1. W. B. Jones, Rt. 1, Anton
2. Leon Leonard, Rt. 1, Anton

LUBBOCK COUNTY
(One to be elected — Commissioner's Precinct No. 2)

1. Edward C. Moseley, Rt. 2, Slaton
2. Joe Schramm, Rt. 1, Slaton

LYNN COUNTY
(One to be elected — Committeeman -at-Large)

1. Roy Lynn Kahlich, Box 36, Wilson
2. Don Smith, Rt. 1, Wilson

PARMER COUNTY
(One to be elected — Commissioner's Precinct No. 3)

1. Wendol Christian, R. F. D., Farwell
2. Webb Gober, R. F. D., Farwell

POTTER COUNTY
(One to be elected — Commissioner's Precinct No. 4)

1. W. J. Hill, Jr., Bushland

RANDALL COUNTY
(One to be elected — Committeeman -at-Large)

1. Paul Dudenhoeffer, Rt. 2, Canyon
2. Ralph Ruthart, Rt. 1, Canyon

FOR Addition of certain eligible lands in Cochran County south and west of Whiteface, Texas to the High Plains Underground Water Conservation District No. 1 and the assumption of their proportionate part of outstanding debts and taxes.

AGAINST Addition of certain eligible lands in Cochran County south and west of Whiteface, Texas to the High Plains Underground Water Conservation District No. 1 and the assumption of their proportionate part of outstanding debts and taxes.

* * * * *

FOR Addition of certain eligible lands in Cochran County north and west of Morton, Texas to the High Plains Underground Water Conservation District No. 1 and the assumption of their proportionate part of outstanding debts and taxes.

AGAINST Addition of certain eligible lands in Cochran County north and west of Morton, Texas to the High Plains Underground Waer Conservation District No. 1 and the assumption of their proportionate part of outstanding debts and taxes.

Absentee Balloting

Absentee balloting for the annual election of the High Plains Underground Water Conservation District will be held December 22 through January 7th. With two exceptions, absentee balloting will be conducted by the secretaries of the county water district offices.

Potter County residents may cast their ballots at the County Clerk's Office. Armstrong County residents may cast their absentee ballots with John Patterson of Wayside.

Eligible voters of the Water District are urged to vote absentee if they are going to be absent from the county on January 11.

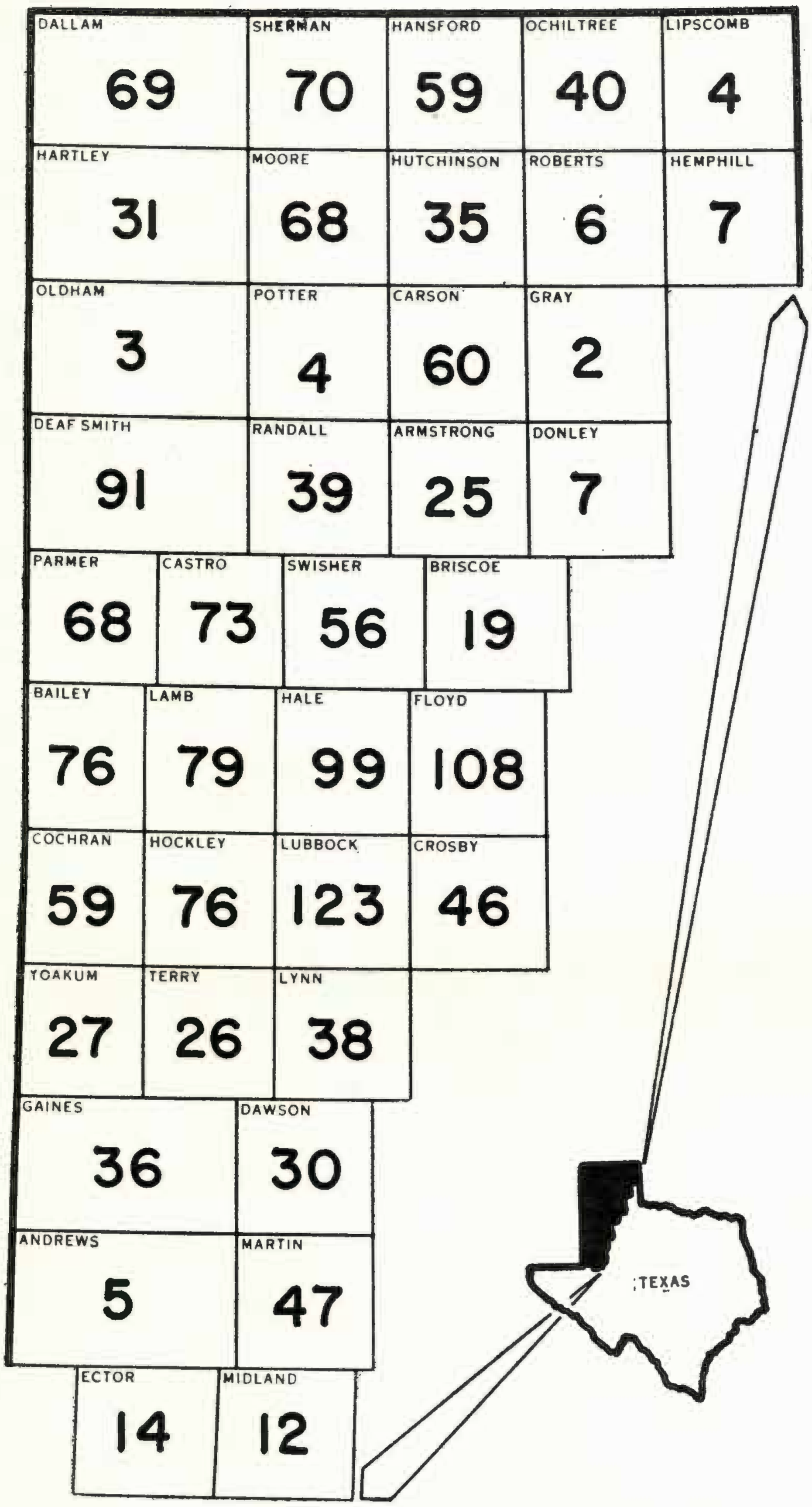
Proposals on the ballot will be three district directors positions, thirteen county committeemen, and the acceptance or rejection of certain elibible lands in Cochran County.

Be sure to vote, either absentee or on January 11.

WELL MEASURING TIME NEAR

January is very significant to all Water District personnel. The annual water level measurements of more than 800 observationwells in the High Plains Underground Water District will be made. The district's observation wells are a portion of over 1700 wells to be measured in a 39 county area by the Texas Water Commission,

(Continued on page 4)



Well Measuring –

(Continued from page 3)

North Plains Water District, and the High Plains Underground Water District.

Observation wells are very important to the Water District as well as to the landowner. In the Shurbet Tax Case, data assembled from detailed records kept on observation wells was used to prove the annual decline in the water table under Shurbet's land. It would seem evident, now that the Treasury Department has declined to appeal the decision of the courts, that the observation well program will be the general basis for computing the decline of the water table under a landowner's land.

A good thorough back log of data is available on every well and gives a good clear picture of what is happening to the ground water reservoir in a certain area.

Observation wells in the Southern High Plains, South of the Canadian River will be the wells that will figure heavily on the amount of decline shown by taxpayers in this area.

Water levels in the observation wells register the stages of the water reservoir. The readings show the extent to which water supplies are depleted by drouth, by heavy pumping for irrigation, industrial uses and public water works, and also to the extent to which they are replenished by rainfall and snow.

Observation wells are measured in January of each year because of the desirability to get a "fair" picture of the water table. By waiting until January to measure the well, it has had time to recover from the summer pumping. If the wells were measured in September, the reading would not give a true picture because of the pumping stress placed on it during irrigation serson.

The Water District is proud of its fine system of observation wells and it appears they will be of great value to all landowners of the Southern High Plains who will be taking advantage of the water depletion ruling.

So farmers, if you see someone around one of your wells during the next month, don't be hasty to think of vandals, it will probably be a member of the staff measuring an observation well.

The results of the observation well measurements will be printed later in a future edition of the Cross Section.

Counties and the number of observation wells on the High Plains

A Look At 65 –

(Continued from page 2)

being used for irrigation. The State Water Pollution Control Act was entered into the law books after some changes were made by the 59th Session of the Legislature.

A group of thirty farmers from Colorado visited the High Plains Water District for a two day tour of the area.

In July, the Water For The Future Committee was organized to study the possibility of importing water from other areas to West Texas. Grain sorghum water requirements were studied and the reduction of "duty" of water was studied. The District was doing extensive studies for the State Wide Water Plan.

August saw opening of a District office of the Texas Railroad Commission to better serve the West Texas and High Plains area.

September arrived with a bang! The City of Altus, Oklahoma filed suit in a federal court to have a statute passed by the 59th Session of the Legislature declared unconstitutional. The statute prohibits the transporting of underground water from Texas to other states.

The Texas Water Conservation Association held a very successful annual meeting in Houston. The Lubbock Experiment Station held "open house" for all area farmers. The Cross Section reported on an area farmer who put excessive rain water to use by piping it under a highway.

October and November saw more work being done on the tax deduction for underground water and the reappointment of Otha Dent to the Texas Water Rights Commission. It also featured a lesson in stewardship in the Cross Section.

Well here it is December, and this water conservation business is still going. It is hoped it will get stronger and stronger, and more people will become aware of the responsibilities they have in conservation.

Next year, 1966, will no doubt, present many new problems, but people being what they are, it is hoped a solution to all water problems will be found. Until that time, have a very MERRY CHRISTMAS.

WHEN YOU MOVE—

Please notify the High Plains Underground Water Conservation District, Lubbock, Texas on Post Office Form 22S obtainable from your local postmaster, giving old as well as new address, to insure no interruption in the delivery of "The Cross Section."

PLEASE CLOSE THOSE ABANDONED WELLS ! ! !

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