THE Cross SECTION

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

Volume 1 — No. 7 "THERE IS NO SUBSTITUTE FOR WATER" *January, 1955*

Washington To Hand Down Water Depletion Ruling For Tax Purposes

In the June and December issues of THE CROSS SECTION there appeared articles relative to a study being made of the possibility of obtaining an expense deduction for income tax purposes for underground water which is depleted through use for agricultural and industrial purposes. Since that time a formal request has been submitted to the Commissioner of Internal Revenue, Washington, D. C. for a ruling as to whether or not such an expense deduction may be allowed under the present law. Accompanying this request, in support of the contention that underground water in the High Plains Area of Texas is a "natural deposit" and an exhaustible resource, just as oil, gold, silver, coal, sulphur and other deposits for which depletion is allowable, was a brief in which every effort was made to perfect a "sample" case, taking facts and figures relating to specific taxpayers.

The brief submitted was developed upon the following propositions:

1. The facts relating to taxpayers and to the sources of their income reflect that the use of underground water contributes directly to the production of their income.

2. The underground water underlying taxpayer's land has a definite value which represents a part of the cost of the land.

3. Underground water in the High Plains of Texas and in the area where taxpayer's farm is located is geologically and hydrologically a "natural deposit."

4. Underground water in the High Plains area is a "natural deposit" under the laws of the State of Texas and within the meaning of the Internal Revenue Laws relating to depletion.

5. The underground water supply in the High Plains of Texas, and under taxpayer's farm, drawn upon for irrigation purposes, is being substantially and measurably depleted.

A request was made that we be afforded a conference on this matter and on January 10, 1955 such a conference was granted in the office of the Commissioner of Internal Revenue, Washington, D. C. before five high-level officials of that office. Representing the taxpayers and the Water District were Lloyd Croslin, Attorney, of the firm of Croslin and Pharr, Lubbock; Joe R. Greenhill, Attorney, of the firm of Graves, Dougherty and Greenhill, Austin; and R. L. Lawrence, Certified Public Accountant, of the firm of Hearn and Law-

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County Committeemen And Precinct Board Members Elected

Each year on the second Tuesday of January, the HPUWCD must hold an election to allow the people within the District to elect their representatives to the County Committees and to the District Board.

This year, as well as there being elected 26 new Committeemen and three District Board Members, the people within the District also voted in favor of annexing territories of Crosby, Hale and Swisher counties to the District. Parmer County voted against the annexation of Crosby territory.

The above mentioned counties, which petitioned the Board of Directors to annex their territories to the Water District, all voted not to come into the District; even though a majority of the people within the District voted in favor of the annexation.

The people of Precincts No. 1, No. 3 and No. 4 elected Mr. W. O. Fortenberry, Mr. Bill Shirley and Mr. V. E. Dodson respectively, to represent them on the five man Board of Directors. Mr. Fortenberry of Lubbock, was elected for his second 2-year term and represents Lubbock and Lynn Counties on the Board. Mr. Shirley of Lazbuddie in Parmer County is a new director elected to replace Mr. Willis Hawkins from Hart. He will represent Bailey, Castro and Parmer counties. Mr. Dodson of Hereford in Deaf Smith County, was elected to serve a second term representing Armstrong, Deaf Smith, Potter and Randall counties.

The Directors from Precincts No. 2 and No. 5, Mr. Gus Parish of Spring-Lake in Lamb County and Mr. Marvin Shurbet of Floydada in Floyd County, respectively, have not as yet served their first terms. Precinct No. 2 consists of Hockley, Lamb and Cochran counties, and Precinct No. 5 is made up of only Floyd County.

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G. W. (Doc) WILLIS UNDERGOES SURGERY

We are glad to have our District Geologist, G. W. (Doc) Willis, back on the job after a minor operation at the West Texas Hospital and a convalescing period at his home.

Mr. Willis resides at 3015 30th St., Lubbock, Texas, with his wife, Rue, and two young sons, David and Tommy.

Replenishment Of Ground Water Reservoir Practices Being Studied

By GEORGE A. WHETSTONE
Associate Prof. of Civil Engineering
Texas Technological College

The following article is the first of a series of articles by George A. Whetstone pertaining to the replenishment of ground-water reservoirs. The series will be continued in future issues of "The Cross Section."

PREFACE

Until about 100 years ago, institutions of higher learning were dedicated primarily to the study and teaching of the eternal verities, truths which were not fixed either as to time or place. The modern college or university likewise has as major purpose the study and teaching of the past and of the wisdom of mankind.

The modern college has, in addition, a further primary purpose that arises from the discovery of the value of science and from society's growing reliance upon organized knowledge as an instrument of public policy. This purpose is to foster additions to knowledge and to apply organized knowledge to the problems besetting the people of the area whom the college serves.

The Texas Technological College is committed to both purposes and works at their realization both through teaching and research.

Water, the topic of Professor Whetstone's article, is perhaps the most dramatic of the many problems facing the people of this great area and for whose solution organized knowledge needs to be utilized to an ever greater extent. We of Texas Tech are resolved to commit more and more of our energies and brains to study of the problems of West Texas. This will occur in rather direct proportions as our resources enable us to do so.

Further, it is only common sense to say that the College must stand ready to work cooperatively and jointly with every other agency concerned with these same problems. It is for this reason, among others, that the College is gratified over the close working arrangements that are developing between members of the faculty and the High Plains Underground Water Conservation District.

Dr. G. E. Giesecke,
Vice President
Texas Technological College

PART I

The policies and practices involved in the conservation of ground water may readily be separated into three distinct classes—those having to do with development, with use, and with replenishment.

In development one is concerned with the proper well spacing to minimize mutual interference, the avoidance of pollution or contamination, the selection of a pumping rate which will not draw silt into the well, and other such questions affecting the proper withdrawal of water from the underground reservoir.

In use, the concern is with the correct irrigation regime for the crop and soil type and with the minimizing of ditch losses and evaporation.

Conservation by replenishment involves the application of economical procedures for getting excess surface water to the ground-water table. In many of the world's ground-water areas this process of recharge occurs naturally; in others, like the High Plains, very little recharge occurs in years of normal precipitation. Enough is now known, however, of the behavior of water-bearing materials to permit man to make a substantial increase the amount of water reaching the underground reservoir.

We shall survey a number of examples of the artificial recharge of ground water and study the applicability of some of these to the situation existing on the High Plains.

Early Recharge Schemes—

Successful programs of artificial recharge date back many years. The earliest that has come to the writer's attention was an installation for the water supply of Chemnitz, Germany constructed in 1871-1874 and consisting of four basins isolated in some river sands by underground dams carried to bedrock. Polluted river water was filtered and then spread on the basins. When needed, it was pumped from wells.

The Denver Union Water Company of Denver, Colorado began recharge operations in 1889. In Germany, Wiesbaden and Remscheid were experimenting with artificial recharge before the turn of the century. The technical mazagines of 1903 reported on well-designed installations for the cities of Amsterdam, Holland and Got henburg, Sweden. Amsterdam recharged dangerously polluted river water onto some coastal sand dunes which were threatened with sea-water encroachment because of the excessive drawdown. Gothenburg's development was another application of sand beds as natural filters with recovery of the purified water by pumping. Plans for extension of the water supplies of London and Berlin involving artificial recharge were being discussed.

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ALLAN WHITE
Editor

BOARD OF DIRECTORS

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Precinct 3

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COUNTY COMMITTEEMEN

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H. T. Duke, Chmn. — Route 1, Happy, Texas
Bill Heisler ..... Wayside, Texas
Melton McGehee ..... Wayside, Texas
John Patterson ..... Happy, Texas
Floyd B. Adams ..... Wayside, Texas

Bailey County

Mrs. Doris Traweek, Bailey County Farm Bureau Office, Muleshoe

Troy Actkinson, Chmn. ..... Muleshoe, Texas
Robert F. Byrd ..... Route 2, Muleshoe, Texas
W. R. Carter ..... Muleshoe, Texas
W. T. Millen ..... Route 1, Muleshoe, Texas
D. V. Terrell ..... Route 1, Morton, Texas
Committeemen meet first Saturday of each month at 1:30 to 3 p. m., Farm Bureau Office.

Castro County

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Posey Cunningham, Chmn. ..... Dimmitt, Texas
H. F. Benson—Star Route 1, Hereford, Texas
Steve Brockman ..... Nazareth, Texas
T. R. Davis ..... Hart, Texas
Eugene Ivey ..... Box 157, Dimmitt, Texas

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Glenn Thompson, Chmn. ..... Morton, Texas
Max Bowers ..... Morton, Texas
Syl Greener ..... Morton, Texas
W. R. Key ..... Morton, Texas
B. R. Stovall — Star Route 2, Morton, Texas
Committeemen meet first Tuesday night of each month, Cochran County Farm Bureau Office, Basement of Court House, Morton.

Deaf Smith County

Mrs. Nadean Hulse, Deaf Smith County Farm Bureau Office, Hereford

Frank J. Bezner, Chmn. ..... Box 14 Hereford Texas
Pete Carmichael ..... Route 1, Hereford, Texas
Paul Corbett ..... Route 5, Hereford, Texas
J. N. Fish ..... Hereford, Texas
Floyd Walton ..... Route 5, Hereford, Texas

Floyd County

Mrs. Ida Puckett, 319 South Main Street, Floydada

W. Grady Walker, Chmn. — Floydada, Texas
R. C. Mitchell ..... Lockney, Texas
Robert L. Smith ..... Lockney, Texas
Sid Thomas ..... Lockney, Texas
Lee Trice ..... Rt. 1, Floydada, Texas

Hockley County

Z. O. Lincoln, 913 Houston, Levelland

H. T. Harrell, Chmn., Rt. 2, Levelland, Texas
Aubrey Cook ..... Rt. 5, Levelland, Texas
W. H. Cunningham ..... Star Rt. 4, Levelland, Texas
J. J. Hobgood ..... Rt. 2, Anton, Texas
C. E. Padgett ..... Rt. 3, Levelland, Texas
Committeemen meet first and third Fridays of each month at 1:30 p. m., 913 Houston, Levelland.

Lamb County

Loretta Hucks Chamber of Commerce Office, Littlefield

V. M. Peterman. Chmn., Rt. 1, Amherst, Texas
Oscar Allison ..... Star Rt. 1, Earth, Texas
L. Z. Anglin ..... Box 86, Earth, Texas
Eldon Franks ..... Box 36, Olton, Texas
Roy McQuatters ..... Rt. 1, Anton, Texas

Lubbock County

Mrs. Lillian Maddox, 1628-B 15th St. Lubbock

E. K. Hufstedler, Jr., Chmn., 2202 Ave. H, Lubbock, Texas
Leroy Johnson ..... Shallowater, Texas
Henry Heck ..... Box 948, Idalou, Texas
Earl Reasoner ..... Box 335, Slaton, Texas
Jackson West ..... Rt. 3, Lubbock, Texas
The next meeting of the Committeemen will be on December 13 at 7:30 p. m. in the District Office at 1628-B 15th Street. January, 1955 meetings will be held on the 3rd 17th and 31st at 7:30 p. m. in the District Office.

Lynn County

Mrs. Lillian Maddox, 1628-B 15th Street, Lubbock

E. L. Blankenship, Chmn., Rt. 2, Wilson, Tex.
A. E. Hagens ..... Rt. 1, Wilson, Texas
D. W. Hancock ..... Rt. 4, Tahoka, Texas
Wayman Smith ..... Rt. 1, Wilson, Texas
J. D. Unfred ..... Rt. 4, Tahoka, Texas
Committeemen meet the first and third Tuesdays of each month at 1 p. m. in the District Office, 1628-B 15th Street, Lubbock.

Parmer County

Raymond Euler, Parmer County Farm Bureau Office, Friona

Raymond Euler, Chmn. ..... Friona, Texas
Bruce Parr ..... Rt. 3, Friona, Texas
D. B. Ivy ..... Rt. 1, Friona, Texas
Walter Kaltwasser ..... Rt. 1, Farwell, Texas
C. V. Potts ..... Rt. 2, Friona, Texas
Committeemen meet first and third Thursday nights at 8 p. m. at the Parmer County Farm Bureau Office, Friona.

Potter County
Eldon Plunk, Route 1, Amarillo

Eldon Plunk, Chmn. ..... Rt. 1, Amarillo, Texas
T. G. Baldwin ..... Bushland, Texas
Earl Barcley ..... Bushland, Texas
W. J. Hill, Sr. ..... Box 86, Bushland, Texas
R. C. Sampson, Jr. ..... Box 86, Bushland, Texas

Randall County

Mrs. Don Olson, Route 4, Box 388, Amarillo, Texas

Marshall Rockwell, Jr., Chmn., Canyon, Texas
D. L. Allison ..... Happy, Texas
Frank Begert ..... Rt. 1, Canyon, Texas
Neil Downing ..... Rt. 4, Amarillo, Texas
Donald Olson ..... Rt. 4, Amarillo, Texas
Committeemen meet first Monday night each month, 8 p. m., County Agent's Office, Canyon, Texas.

W. O. FORTENBERRY

AN EDITORIAL

It was the thought of THE CROSS SECTION that it would be interesting to its readers to learn something about the five members that make up the Board of Directors of the HPUWCD. We will introduce them to you one at a time in Precinct order, beginning this month with Mr. W. O. Fortenberry from Lubbock.

The Chairman of the Board of Directors and its representative from Precinct No. 1, which at this time is made up of Lubbock and Lynn Counties, is Mr. W. O. Fortenberry, 1724 31st Street, Lubbock, Texas. He is a man known far and near for his business, civic, and farming activities.

Mr. Fortenberry was born in Hunt County, Texas on August 20, 1894. He was one of four sons and two daughters born to Mr. and Mrs. J. W. Fortenberry. He attended high school in Lone Oak, Texas and college at Burleson College in Greenville, Texas.

The Fortenberry family moved to Gray County in the Panhandle during the year 1916. Four years later on July 28, 1920, Miss Bonnie Hutchins of Cordell, Oklahoma became Mrs. W. O. Fortenberry.

In 1925, Mr. Fortenberry moved his family to the South Plains area and entered the cotton ginning business in Ropesville. They lived there until 1926; then moved to Pep and bought another gin. When 1930 came, he bought still another gin in New Deal (then known as Monroe) and this is where the family resided until October, 1952. At that time, Mr. Fortenberry sold out to devote all his time to farming and oil interests.

Mr. Fortenberry has always farmed on a large scale—from about 1935 until the beginning of World War II, he farmed approximately 8,000 acres of land, then he dropped off to about 3,000 acres, and presently he farms about 2,500 acres. All of his farm land is in Lubbock County.

The first irrigation well which Mr. Fortenberry drilled during 1934 is still in use east of New Deal. It is evident, by this first well drilled twenty years ago, that Mr. Fortenberry saw the great possibilities that irrigation afforded. He now has 15 wells on his farms.

Aside from being Chairman of the Water District Board, Mr. Fortenberry is also a member of the Board of Directors at the Lubbock National Bank of Lubbock; the National Bankers Life Insurance Company of Dallas; and the Southern States Life Insurance Company of Houston. During his cotton ginning days, he served as President of the National, State and Plains Ginners Associations.

Mr. and Mrs. Fortenberry have two daughters, Imogene and Betty; and two sons, Billy and Joe. Imogene, the oldest girl teaches English at the O. L. Slaton Junior High School in Lubbock. Betty is married to Ed Smith, a New Deal farmer. Mr. Smith also has farming interests at Lorenzo. Joe, the youngest son, is now in the Army and stationed at Fort Bliss (El Paso), Texas. Billy farms in the New Deal area. He served overseas during World War II with the Marine Corps. Billy attended Texas Tech where the other three Fortenberry children completed their college educations.

Mr. Fortenberry enjoys more than anything else, entertaining his grandchildren, which number three—one boy and two girls. He also enjoys driving around his farms and watching operations there.

Mr. and Mrs. Fortenberry belong to the First Baptist Church in Lubbock.

We consider the Water District very fortunate indeed to have an outstanding farmer and businessman such as Mr. W. O. Fortenberry helping to conserve our High Plains water.

"Next month, Precinct No. 2—Director, Mr. Gus Parish, Springlake, Texas."

Ground Water Reservoirs Studied—

(Continued from Page 1)

E. O. Mawson writing in THE ENGINEER, a British weekly, for October 9, 1903 laid down the following five rules for increasing recharge.

1. Retain water on the surface as long as possible.
2. Maintain vegetative covering on the watershed.
3. Reduce stream velocities. This checks erosion and also increases infiltration by increasing the wetted area and the head of water.
4. Dam the underflow of rivers.
5. Divert surface streams onto the outcrop of the water-bearing strata. Grass and fodder crops on the spreading area will keep the infiltration rate high. If these can't be maintained, provide for silt removal.

Owners of wet weather lakes may question the validity of the "as long as possible" in rule 1, since impervious deposits have sealed the bottoms of such lakes. On the other hand, the rule has been verified for spreading basins receiving proper surface treatment since it often provides a solution to the entrapped-air problem and increases the infiltration rates for clean water. Rules 2 and 3 are designed to secure silt-free water.

The drainage of ponds into drilled well has been the method of recharge tried most frequently on the High Plains. This practice also has a long history. In a government bulletin published in 1905 Robert E. Horton describes some successful applications of the method in Michigan. He refers to an earlier unsuccessful attempt, about 1880, to drain a small lake by digging the hardpan bottom and inserting a stone-filled drain.

Recharge In California—

Artificial recharge has come to be regarded as a routine phase of ground water operations in several parts of California, notably in the foothills just north of Los Angeles and in the Santa Clara Valley adjoining San Francisco Bay. Recently extensive tests of soil and water behavior have been made near Fresno with a view to storing much of the water diverted in the northern part of the state and delivered to the Upper San Joaquin Valley in the Central Valley project now nearing completion.

Several methods are employed to place the water underground. Where land is cheap or where it is necessary to use muddy water in the recharge operations it is common practice to run the water in one or more ditches with diversions to furrows much as in ordinary irrigation. However, two differences from irrigation procedure stand out. In the first place, ditch losses are encouraged since most of the water lost through seepage percolates to the water table. Secondly, the operation is kept as nearly continuous as possible to minimize the infiltration of air into the soil.

A brief digression on the variation of infiltration-rate with time might be in order here since it is a key to the selection of recharge procedures and since it is often misunderstood. Even the technical papers of only a few years ago were frequently in error on this subject.

From short-time tests such as single field irrigations or the "drying-up" of shallow ponds after heavy rains it was concluded that the rate of infiltration dropped off continuously as indicated in Fig. 1.

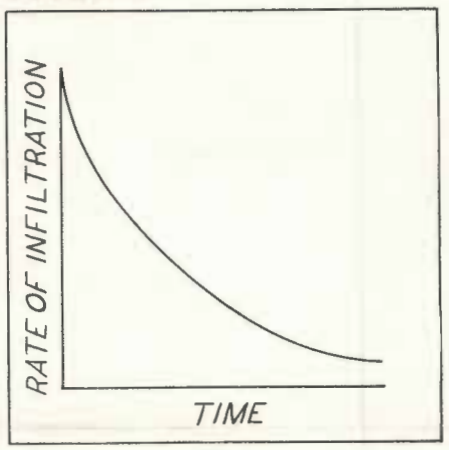

Fig. 1

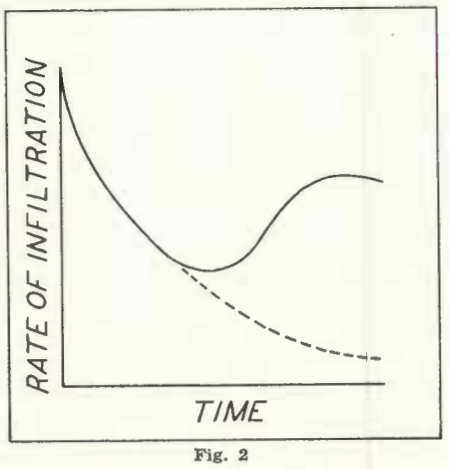

Fig. 2

Recent studies have shown that the actual behavior is represented by an "S-curve" as in Fig. 2, The rate drops at first as the soil swells closing the cracks and fissures. During this time the percolating water absorbs some of the air which had entered the soil pores during the dry period. As this air is removed, the flow of water increases to a new peak flow and then gradually tapers off as the soil pores become blocked with silt and with bacteria and their products. In studies using clear chlorinated water the higher the flow after the the first air-flushing "dip" has been maintained for months. The exact values in infiltration rates and in time depend on the soil and water conditions at a given place.

Another method of recharge used rather extensively involves the placing of low non-water-tight dams in the natural stream beds. Such dams are often made of loose rock held in place by wire netting. They slow down the natural flow of the stream, forcing it to spread over more area and thus affording more opportunity for infiltration. Occasional floods are counted on to scour the channels removing the deposited silt and leaving the stream bed more receptive to the clearer water normally associated with low flows.

A third method, frequently used where land costs are high and where each acre must thus be made to absorb the maximum amount of water, is known as the basin method. In this type of installation clear water from a reservoir or from some distant source (such as the water conveyed by the Owens Valley and Colorado River Aqueducts to Los Angeles) is spread in carefully leveled basins where its depth is maintained nearly constant at a few inches to two or three feet. Periodic harrowing keeps the basins permeable.

A fourth method, less often used but very effective in some cases, involves the flooding of pits. Often old gravel pits or surface reservoirs which failed to hold water will permit large amounts of water to pass underground.

With few exceptions the engineers writing on ground water recharge in California are hostile to recharge by wells. They regard the method as too expensive per acre-foot of recharge and as too uncertain due to sealing of the water-bearing strata silt and/or bacteria.

However, examples of successful recharge through wells do exist at a number of places. Since the problems are somewhat different in each case, we shall examine three of these.

Recharge In Brooklyn—

Brooklyn, in common with other cities, is employing an ever-increasing amount of water for air-conditioning cooling, for ice plants, and for other industrial uses. Nearly all the large users have drilled wells on their own premises to secure the water required. By 1933 the practice then followed of pumping from ground water and discharging to the city's sewers had led to a serious decline of the ground-water table under much of the western portion of Long Island. This, in turn, invited salt water encroachment from the Atlantic Ocean and various of its inlets.

To combat this threat to the aquifer the State of New York passed a law requiring new developments in the city to provide for the recharge to the underground reservoir of any industrial cooling water removed from it. In the twenty years this law has been in effect the amount of water recharged has increased continuously.

Many problems have arisen in connection with the operation. It was soon discovered that pits ending above the water table were subject to clogging by silt and by chemical incrustations. This situation could be remedied by carrying the recharge well below the water table, providing screens and even gravel envelopes, then developing the recharge well like a producing well. Such deep wells respond to cleaning by dry ice or acids whereas no very affective means exist for cleaning a dry pit. It has been reported that tests have indicated the possibility of pumping 2,000 to 3,000 gallons per minute into water-bearing formations from which only 400 to 500 gallons per minute could be obtained by normal outflow pumping.

Because of the very restricted area from which ground water is removed and to which it must be returned, several degrees warmer, after use the temperature of the water has increased to such an extent that the efficiency of the cooling operations is being seriously affected.

Recharge In Louisville—

Louisville, Kentucky is situated on the south bank of the Ohio River at a point where its flow averages 116,000 cubic feet per second. Thus quantity of water is not a serious problem. The municipal supply consists of treated river water. Since this varies in temperature between the low thirties and the high eighties in a typical year, many industries have secured their water at temperatures between 45 and 65 degrees F.. from ground water by pumping.

This led to serious depletion of ground water in the Louisville industrial area during the recent war when synthetic rubber plants and other industries requiring large cooling water supplies boosted the withdrawals far above the natural recharge.

The problem has been solved very effectively by supplying the industrial requirements and simultaneously recharging the aquifer with cold treated river water in the winter and then switching to ground water in the summer when the river water becomes too warm for efficient plant use.

*Recharge In El Paso**

The City of El Paso in conjunction with the Texas Board of Water Engineers and the United States Geological Survey made a series of studies beginning in 1947 on the feasibility of recharging its ground-water reservoirs during the winter with treated Rio Grande River water. At the time the studies were undertaken pumping from the ground-water supplies was exceeding recharge by five million gallons per day and the salt content of the water from one of the well fields was increasing. The tests could be made in the winter conveniently because of the excess unappropriated water available in the Rio Grande during that season and of the light city demand which permitted the withdrawal of one well field from service. The cost of the tests was low enough to indicate economic feasibility for a municipal supply.

The investigation showed that the artesian well field used in the experiment would take treated water at the rate of six millions gallons per day indefinitely through four wells fifteen hundred feet apart. A higher rate of recharge would cause some wells in low parts of town to overflow in the winter. A non-artesian well field, at some distance from the city, was not tested but from studies of the formation it was concluded that it would take water at a much greater rate. Salt water encroachment was retarded near the recharge wells and a series of chemical analyses of the ground water pumped in the summer indicated nearly complete recapture of the injected water.

REQUEST FOR INFORMATION

Have you or your neighbors tried to drain a wet-weather lake or to dam some draw to form a stock pond? If so, the results may be of value in the study which Dr. Whetstone is now making of the feasibility of artificial recharge on the High Plains.

Projects which were considered to be failures should be reported as well as those which were effective.

Please send a description of any project with which you are familiar together with as much information about it as possible such as size of lake or pond, time to drain, difficulties with silt, and other particulars to:

Dr. Geo. A. Whetstone
Texas Tech
Lubbock, Texas

Recharge On The High Plains—

(To be written after sufficient time has elapsed to permit answers to the "Request for Information" to be received.)

*SUNDSTROM, Raymond W. and HOOD, James W. Results of Artificial Recharge of the Ground-Water Reservoir at El Paso, Texas. Texas Board of Water Enigineers Report 5206 (1952).

Washington Ruling—

(Continued from Page 1)

rence, Lubbock.

Inasmuch as this was a matter affecting numerous different individuals of this area, Congressman George Mahon, of the 19th District attended the Conference as an observer

The present status of the Request is that it is under consideration by the Internal Revenue officials. At this time it is not possible to predict whether the ruling, when issued, will be favorable or unfavorable. It has been urged that the ruling be issued at the earliest practical date, but it may or may not be published prior to the due date for filing individual income tax returns. However, the Water District will make every effort to publicize the ruling as soon as a decision is rendered.

Committeemen And Board Members—

(Continued from Page 1)

From each of the thirteen counties that comprise the Water District, there were two men elected to serve three year terms on the County Committee. These committeemen from the counties they will represent, are as follows:

Armstrong County: Mr. James Bible of Wayside and Mr. Guy Watson of Wayside replace Mr. H. T. Duke of Route 1, Happy and Mr. Melton McGehee of Wayside. The three hold-over members of the committee are Mr. Bill Heisler, Wayside; Mr. John Patterson, Happy; and Mr. Floyd B. Adams, Wayside.

Bailey County: Mr. Buck Gregory of Route 2, Muleshoe and one of three who tied in votes will replace Mr. Troy Actkinson of Muleshoe and Mr. W. T Millen of Route 1, Muleshoe. The three members of the committee who will hold-over are Mr. Robert F. Byrd, Route 2, Muleshoe; Mr. W. R. Carter, Muleshoe; and Mr. D. V. Terrell, Route 1, Morton.

Castro County: Mr. Ivor Baggwell of Route 4, Dimmitt and Mr. Sid Sheffy of Dimmitt will replace Mr. Posie Cunningham of Dimmitt and Mr. Eugene Ivey of Dimmitt. The three other members of this committee will be made up of these hold-overs: Mr. T. R. Davis, Hart; Mr. H. F. Benson, Star Route 1, Hereford; and Mr. Steve Brockman, Nazareth.

Cochran County: Mr. Hume Russell of Morton and Mr. Herbert Cadenhead of Route 1, Morton will replace Mr Glenn Thompson of Morton and Mr Sil Greener of Morton. The three men who will hold-over on this committee are Mr. W. R. Key, Morton; Mr. Max Bowers, Morton and Mr. R. B. Stovall, Star Route 2, Morton.

Deaf Smith County: Mr. Ed Dzuick, Sr. of Route 2, Hereford and Mr. Ralph Hastings of Route 4, Hereford will replace Mr. Pete Carmichael of Route 1, Hereford and Mr. Paul Corbett of Route 5, Hereford. The three hold-overs on this committee are Mr. Frank J. Bezner, Hereford; Mr. Floyd Walton, Route 5, Hereford and Mr. J. N. Fish, Hereford.

Floyd County: Mr. Tate Jones of Floydada and Mr. J. R. Belt of Lockney replace Mr. W. Grady Walker of Floydada and Mr. Sid Thomas of Lockney. The three hold-overs on this committee are Mr. R. C. Mitchell, Lockney; Mr. Robert L. Smith, Lockney; and Mr. Lee Trice, Route 1, Floydada.

Hockley County: Mr. Henry Schmidley of Route 3, Levelland and Mr. Cecil Pace of Levelland will replace Mr. H. T. Harrell of Route 2, Levelland and Mr. C. E. Padgett of Route 3, Levelland. The three hold-over members of the committee are Mr. J. J. Hobgood, Route 2, Anton; Mr. W. H. Cunningham, Star Route 4, Levelland and Mr. Aubrey Cook, Route 5, Levelland.

Lamb County: Mr. Clovis Poteet of Olton and Mr. Elmer McGill of Olton will replace Mr. Eldon Franks of Box 36, Olton and Mr. Oscar Allison of Star Route 1, Earth. The three hold-over member of this committee are Mr. V. M. Peterman, Route 1, Amherst, Mr. L. Z. Anglin, Box 86, Earth, and Mr. Roy McQuatters, Route 1, Anton.

Lubbock County: Mr. Vernice Ford of 3013 20th Street, Lubbock and Mr. Earl Weaver of Idalou will replace Mr. E. K. Hufstedler, Jr. of 2202 Avenue H. Lubbock and Mr. Jackson West of Route 3, Lubbock. The three hold-over members of this committee will be Mr. Leroy Johnson, Shollowater; Mr. Henry Heck, Box 948, Idalou and Mr. Earl Reasoner, Box 335, Slaton.

Lynn County: Mr. Roger Blakney, Route 1, Wilson and one of two men who tied in votes, will replace Mr. D. W. Hancock, Route 4, Tahoka and Mr. Wayman Smith, Route 1, Wilson. The three hold-over members of this committee will be Mr. E. L. Blankenship, Route 2, Wilson; Mr. Joe Unfred of Route 4, Tahoka and Mr. A. E. Hagens, Route 1, Wilson.

Parmer County: Mr. Matt Jesko of Route 1, Muleshoe and Mr. John Gammon of Friona will replace Mr. Bruce Parr of Route 3, Friona and Mr. Raymond Euler of Friona. The three hold-over members of the committee are Mr. Walter Kaltwasser of Route 1, Farwell; Mr. D. B. Ivey, Rt. 1, Friona and Mr. C. V. Potts, Route 2, Friona.

Potter County: Mr. Jim Line of Box 87, Bushland and Mr. E. L. Milhoan of Box 45, Bushland will replace Mr. Eldon Plunk of Route 1, Amarillo and Mr. W. J. Hill, Sr. of Box 86, Bushland. The three members of the committee who will hold-over are Mr. Earl Barclay, Bushland; Mr. R. C. Sampson, Jr., Bushland and Mr. T. G. Baldwin, Bushland.

Randall County: Mr. J. L. Weick of Route 1, Canyon and Mr. W. C. Angel of Route 2, Canyon will replace Mr. Marshall Rockwell, Jr. of Canyon and Mr. Neil Downing of Route 4, Amarillo. The three members of this committee who will hold-over are Mr. Frank Begert, Route 1, Canyon; Mr. Donald Olson, Route 4, Amarillo and Mr. D. L. Allison, Happy.

These Directors and County Committeemen have pledged their help and consideration to the water users and potential water users in our District. We are all looking forward to another successful year of cooperative effort in our common struggle to retain private ownership and control of our underground water on the local level.

LEGISLATIVE BRIEFS

Several bills are in the process of being introduced into the Legislature. The ones drawing the most attention are those of the Water Resources Committee, which have some good aspects as well as some that are being questioned.

1. Commission Act

This proposal relates to the creation of the Texas Water Commission to be composed of six members in lieu of the present 3-man Board of Water Engineers. The members to be appointed by the Governor for 6-year terms from the present statutory water divisions of the State with no two of such members to reside in the same Congressional District. It also provides for the employment of a State Water Engineer possessing certain technical qualifications who shall be the Chief Administrative Officer of the Commission.

2. Water District Registration Act

This proposal provides for the filing by all types of water districts of certain information such as the type district, date and authority of its creation, names and addresses of officers, and of the members of its governing authority.

3. Application For Permit Act

This draft proposes that permits shall be obtained from the Board of Water Engineers (Commission) for the storing, impounding, or retardation of any of the storm and flood waters of the state prior to any construction, original or expansion, or any dam or reservoir when it is sought to impound, store, or retard such waters in excess of 200 acre feet in dams or reservoirs constructed on private property when such water is used by the owner for domestic and livestock purposes.

4. Water Users Registration Act

To obtain and maintain an inventory as accurate and complete as possible, this proposal requires the filing of reports by every user, as defined in the Act, of all public waters in the State.

5. Financial Assistance Constitutional Amendment

The proposed Constitutional Amendment does the following things: it creates the Water Development Fund; it makes this fund available to aid certain political subdivisions, who desire to build water storage projects, the estimated revenue of which would not be sufficient to finance the project through private investment; the fund is supported by a 3-cent ad valorem tax, to be adjusted after five years; the Fund would be initially created by the sale of not to exceed $100,000,000.00 worth of State bonds.

6. Enabling Act To Constitutional Amendment

The proposed enabling legislation is designed to carry into effect the Constitutional Amendment recommended by the Committee. It sets up standards to guide the Texas Water Development Board in determining the tax rate of not to exceed 3c on the $100.00 valuation after the end of the initial five-year period when the full 3c will be levied.

The Texas Water Development Board can give financial assistance to certain political subdivisions by purchasing their bonds. Before the Boar can give aid in the construction of a water storage project, the Texas Water Commission must make a finding that the project is a feasible one that will pay itself out over a long term period.

State aid cannot be in excess of 1/3 of the total cost of any project nor in excess of $5,000,000 for any one project.

New Water Conservation Law Proposed

Judge M. A. Blair of Austin has written a bill for the Association of Texas Soil Conservation Districts similar to Bills proposed by the Texas Water Resources Committee.

The Blair Bill provides for a State Water Commission with six elective members where the Water Resources Bill would create a Texas Water Development Board of six appointive members. The Blair Bill provides broad authority in giving the Water Commission the power over development and use of the State Water Resources.

The Case of Pecos County Water Control and Improvement District No. 1, versus Clayton W. Williams is now before the Supreme Court. The Petitioners are holding that "percolating water" is that water below the surface but above any known water sand or water table. Before the droplets get into any known water-bearing stratum or sand, they are independent, and their movements are mysterious and occult. These droplets, they say, may be privately owned and are subject to the regulation of a district. But once the droplets get into a known sand or stratum, where the boundaries, velocity, and direction of movement are known, they are no longer "percolating waters," but they become publicly owned water;—they become "an underground stream" or "percolating water feeding a natural water course" and hence not subject to private ownership by the landowner.

Under this premise, virtually all the water under the High Plains area is publicly owned.

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

Second Class Permit

Mr. Z. O. Lincoln
913 Houston
Levelland, Texas

THE Cross SECTION

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

Volume 1 — No. 8 **"THERE IS NO SUBSTITUTE FOR WATER"** *February 1955*

Replenishment Of Ground Water Reservoir Practices Being Studied

By GEO. A. WHETSTONE

Associate Professor of Civil Engineering Texas Technological College

The following article is the second of a series of articles by George A. Whetstone pertaining to the replenishment of groundwater reservoirs. The series will be continued in future issues of "THE CROSS SECTION."

PART II

Our Future—

The Southern High Plains form a tableland. On the west they terminate abruptly in the Mescalero Ridge and the Bluffs of Llano Estacado. Along the north they are interrupted by the deeply-eroded valley of the Canadian River. On the east is the escarpment known as "the Caprock." In all cases, the cliffs cut completely through the thin layer of surface soil and through the much thicker layer of sand, caliche, and occasional clay lenses known as the Ogallala Formation. The surface exposed below the cliffs is part of the permian Red Beds or of the Cretaceous or Triassic formations.

Since the underground reservoir of the area is almost completely in the Ogallala, whereas the little water contained in the Red Beds is so highly mineralized as to be unfit for use, it follows that the area is not supplied by underflow from the Rocky Mountains or elsewhere, but must depend upon precipitation falling on the surface of the Plains.

Oversimplifying the very complex situation which confronts us when we attempt to get definite numerical values for these phenomena, we can say that of a given amount of precipitation some evaporates from the surfaces of leaves, and other objects without even reaching the ground. More evaporates from moist earth, puddles, lakes, and streams.

Part of the water which is not evaporated at the surface enters the ground. Very little of this percolates to the water table. Most of the infiltrating water remains in the root zone until it is used by plants or until it is evaporate by dry air circulating through the upper few inches of soil. Water in small quantities will not drain through soil by gravity alone.

For a clarification of this statement, imagine an experiment in which we take a long glass tube filled with well-packed sand, and closed at the bottom with a fine-meshed screen. If an inch of water be poured in at the top, it will wet about three inches of

(Continued on Page 3)

REPRESENTATIVE SAUL APPOINTED

Representative LeRoy Saul of Kress has been appointed to the Texas Water Resources Committee. This is a very important committee studying the water resources of the State of Texas, compiling information and it has recommended legislation to utilize and conserve the waters of the State.

Representative Saul has been greatly interested in the ground water problems of the High Plains area. He has spent many hours in group meetings, not only in his District, but throughout the High Plains area in studying the problems of water and soil conservation. Saul has been a very active member in the House of Representatives and has helped a great deal on the passage of several bills affecting water.

Drought Conditions Alarming

It is plain to see that a lot of people on the High Plains are getting worried about not being able to produce a farm crop any more from dry land.

One evidence of this fact is the tremendous number of irrigation well permits issued by the High Plains Underground Water Conservation District during the months of December and January. During these two months 1,544 permits were issued from the thirteen counties that participate in the High Plains Water District. The distribution by county follows

COUNTY	DEC.	JAN.
Armstrong	4	4
Bailey	59	46
Castro	70	73
Cochran	33	48
Deaf Smith	38	43
Floyd	93	82
Hockley	86	114
Lamb	90	112
Lubbock	77	137
Lynn	44	60
Parmer	98	97
Potter	0	0
Randall	13	23

We are all thankful for the water that is contained under our High Plains surface and its ability to see us through years that would have meant financial and economic disaster without the irrigation it affords. We should pledge ourselves anew to the unified task of using our water in a manner to produce the greatest economic return possible.

Oklahoma's Ground Water Law Reviewed

By W. L. BROADHURST

The Oklahoma Statutes of 1951, Title 82, Section 1001-1019, contain an ACT known as the "Oklahoma Ground Water law".

For the purpose of this article, we will quote parts of the Act and discuss those parts as they might affect the water users.

The Act defines certain terms, among which are:

"The term 'Board' shall mean the Oklahoma Planning and Resources Board."

"'Critical ground water area' shall mean any ground water basin as herein defined, or any designated subdivision thereof, not having sufficient ground water to provide a reasonably safe supply for domestic, municipal, industrial, irrigation, recreational and other beneficial uses in the basin at the then current rate of withdrawal."

"The Board shall make or cause to be made surveys of the ground water of the various basins of the State, using such facts and data as may be available and shall determine the area and the safe annual yield measured by the average annual recharge of such basin."

"These sections imply that if annual pumping is more that the average recharge the safe yield is being exceeded, and that the area may be designated a critical ground water area.

"In cases where an applicant desires to extract large quantities of water from a basin and before issuing a permit the Board is authorized to determine and order a proper spacing of wells which in its judgement is necessary to an orderly withdrawal of water in relation to the average annual recharge of the whole basin."

"No permit shall be issued by the Board for the extraction of water from a basin if the findings of the Board indicate that such use would result in depletion above the average annual ratio of recharge."

In turn-row language that provision might have the same meaning as the following example . . . Suppose you bought a farm which had a large granary filled with wheat. Suppose then, the Legislature should pass a law which would permit you to sell or feed the grain but specified that for each load you take out you shall put a load in. What value could you receive from the large quantity of grain in storage?

Some 20 years ago (1934-1937) studies of recharge and water-level measurements in the old irrigation districts near Lockney, Muleshoe and Hereford showed that pumping in those areas was causing a lowering of the water table and that locally the pumping exceeded natural recharge. Under the Oklahoma Law no more permits could have been issued in those areas.

We know that ground water is being withdrawn from storage in the High Plains. We also know the supply will not last forever at the present rate of pumping. For that reason the High Plains Underground Water Conservation District urges the wise development and use of water, both natural rainfall and underground water and we likewise urge the elimination of all waste of water.

The Oklahoma Law provides for court action to determine the safe annual yield and annual recharge of a ground water basin, the priority of existing claims of all persons to appropriate the water of such basin, and the amount of each claim. It provides further that in any ground water basin in which the withdrawal of ground water exceeds the annual yield as determined by the court under the provisions of this Act, the Board shall have the power to require persons to cease excessive withdrawals in reverse order of their priority of rights.

Again had that been the law of our land, not only could no more wells have been drilled in the old irrigation areas, but those who drilled their wells in the late thirties would have been required to cease operations.

We will admit that the Texas Ground Water Law is not perfect. However, we do agree with one section which states: "The ownership and rights of the owner of the land, his lessees and assigns, in the underground water are hereby recognized and nothing in this Section 3C shall be construed as depriving or divesting such owner, his assigns or lessees, of such ownership and rights, subject, however, to the rules and regulations promulgated persuant to the Section 3C."

Meeting Held In Dimmitt

County Committeemen from the thirteen counties that make up the HPUWCD came together for their first meeting of this year in Dimmitt, Castro County, at the school cafeteria on the 27th of January.

After a dinner served by the Dimmitt American Legion Auxilliary, Mr. Sam Aldridge and Mr. A. P. Duggan, District lawyers from Farwell and Littlefield respectively were called on to read and explain the final drafting of our bill to be introduced at this session of the Legislature, designed to strengthen the ground water laws of Texas.

After all questions were discussed the meeting was adjourned.

THE Cross SECTION

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Telephone PO2-8088

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ALLAN WHITE
Editor

BOARD OF DIRECTORS

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W. O. Fortenberry, President—1123 Lubbock National Bank Building, Lubbock, Texas

Precinct 2

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Precinct 3

W. M. Sherley ..... Lazbuddie, Texas

Precinct 4

V. E. Dodson ..... Hereford, Texas

Precinct 5

Marvin Shurbet, Secretary ..... Route One
Petersburg, Texas

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G. W. Willis ..... District Geologist
Allan White ..... Office Manager
Mrs. M. McVay ..... Secretary-Bookkeeper
Mrs. Lillian Maddox ..... General Office
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Ted Evans ..... General Office

COUNTY COMMITTEEMEN

Armstrong County

John Patterson, Happy

John Patterson ..... Happy, Texas
James Bible, Chairman ..... Wayside, Texas
Floyd B. Adams ..... Wayside, Texas
Guy Watson ..... Wayside, Texas
Bill Heisler ..... Wayside, Texas

Bailey County

Mrs. Doris Traweek, Bailey County Farm Bureau Office, Muleshoe

Buck Gregory ..... Route 2, Muleshoe, Texas
Bill Garrett ..... Route 2, Muleshoe, Texas
W. R. Carter ..... Muleshoe, Texas
Robert F. Byrd ..... Route 2, Muleshoe, Texas
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Steve Brockman ..... Nazareth, Texas

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J. B. Knox, Western Abstract Co., Morton

Max Bowers, Chairman ..... Morton, Texas
Hume Russell ..... Morton, Texas
Herbert Cadenhead ..... Route 1, Morton, Texas
W. R. Key ..... Morton, Texas
R. B. Stovall ..... Star Route 2, Morton, Texas
Committeemen meet first Tuesday night of each month, Cochran County Farm Bureau Office, Basement of Court House, Morton.

Deaf Smith County

Elna Bishop and Kay Jowell, Deaf Smith County Farm Bureau Office, Hereford

Frank J. Bezner, Chmn, Box 14, Hereford, Tex
Ed Dzuick, Sr. ..... Route 2, Hereford, Texas
Ralph Hastings ..... Route 4, Hereford, Texas
Floyd Walton ..... Route 5, Hereford, Texas
J. N. Fish ..... Hereford, Texas
Committeemen meet the first Monday of each month in the Farm Bureau Office, Hereford, 7:30 p. m.

Floyd County

Mrs. Ida Puckett, 319 South Main Street, Floydada

Tate Jones ..... Floydada, Texas
J. R. Belt ..... Lockney, Texas
R. C. Mitchell ..... Lockney, Texas
Robert L. Smith ..... Lockney, Texas
Lee Trice ..... Route 1, Floydada, Texas

Hockley County

Z. O. Lincoln, 913 Houston, Levelland

Henry Schmidley ..... Route 3, Levelland, Texas
Cecil Pace ..... Levelland, Texas
J. J. Hobgood ..... Route 2, Anton, Texas
W. H. Cunningham Star Rt. 4, Levelland, Texas
Aubrey Cook ..... Route 5, Levelland, Texas
Committeemen meet first and third Fridays of each month at 1:30 p. m. 913 Houston, Levelland.

Lamb County

Jess Everett, Chamber of Commerce Office, Littlefield

V. M. Peterman, Chmn, Route 1 Amherst, Texas
Elmer McGill ..... Olton, Texas
Roy McQuatters ..... Route 1, Anton, Texas
L. Z. Anglin ..... Box 86, Earth, Texas
Bill Nix ..... Sudan, Texas

Lubbock County

Mrs. Lillian Maddox, 1628-B 15th Street, Lubbock

Earl Weaver ..... Idalou, Texas
Earl Reasoner ..... Box 335, Slaton, Texas
Leroy Johnson ..... Shallowater, Texas
Henry Heck ..... Box 948, Idalou, Texas
Vernice Ford ..... 3013 20th St., Lubbock, Texas
The next meeting of the Committeemen will be on February 28 at 2:00 p. m. in the District Office at 1628-B 15th Street. March meetings will be held on the 14th and 28th at 2:00 p. m. in the District Office.

Lynn County

Mrs. Lillian Maddox, 1628-B 15th Street Lubbock

Roger Blakney ..... Route 1, Wilson, Texas
E. L. Blankenship ..... Route 2, Wilson, Texas
Joe D. Unfred ..... Route 4, Tahoka, Texas
A. E. Hagens ..... Route 1, Wilson, Texas
H. D. Dean ..... Route 6, Lubbock, Texas
Committeemen meet the first and third Tuesdays of each month at 10:00 a. m. in the District Office, 1628-B 15th Street, Lubbock.

Parmer County

Aubrey Brock, Bovina

John Gammon, Chmn. ..... Friona, Texas
Walter Kaltwasser ..... Rt. 1, Farwell, Texas
D. B. Ivy ..... Rt. 1, Friona, Texas
C. V. Potts ..... Rt. 2, Friona, Texas
Matt Jesko ..... Rt. 1, Muleshoe, Texas
Committeemen meet first and third Thursday nights at 8:00 p. m. in Bovina.

Potter County

Jim Line, Box 87, Bushland

R. C. Sampson, Jr. ..... Box 86, Bushland, Texas
Earl Barclay ..... Bushland, Texas
Jim Line ..... Box 87, Bushland, Texas
E. L. Milhoan ..... Box 45, Bushland, Texas
T. G. Baldwin ..... Bushland, Texas

Randall County

Mrs. Don Olson, Rt. 4, Box 388, Amarillo

J. L. Weick ..... Rt. 1, Canyon, Texas
Frank Begert ..... Rt. 1, Canyon, Texas
Donald Olson ..... Rt. 4, Amarillo, Texas
D. L. Allison ..... Happy, Texas
W. C. Angel ..... Rt. 2, Canyon, Texas
Committeemen meet first Monday night each month at 8:00 p. m., County Agent's Office, Canyon, Texas.

MARVIN SHURBET

AN EDITORIAL

This is the second article in a series that is designed to introduce the members of the High Plains Underground Water Conservation District's Board of Directors to THE CROSS SECTION'S readers. This month we have Mr. Marvin Shurbet, Director of Precinct No. 5.

At this time Precinct No. 5 is composed of Floyd County only and its representative to the Board of Directors is Mr. Marvin Shurbet of Route 1, Petersburg, Texas. Mr. Shurbet is a farmer, stockman, and businessman.

The parents of our Director, Mr. and Mrs. Oscar Shubert, were living six miles south of Lockney in Floyd County, Texas, at the time of his birth, May 7, 1909. They also had one daughter and two other sons.

Mr .Shurbet began his education in Lockney and upon being graduated from Lockney High School, attended Texas Technological College in Lubbock, Texas. He later began farming with the Stringer Estate at Barwise, twelve miles west of Floydada, Texas. Just about this time, Miss Mildred Welborn, who was a bank cashier in Floydada, came into Mr. Shurbet's life. They were married in 1939.

In 1943, the Shurbets moved to their present home seventeen miles southwest of Floydada. The Shurbet family now numbers five; Mr. and Mrs. Shurbet, Mack—age 16, Mike—age 14, and Judy—age 8. All three children attend school in Petersburg, Texas. The two boys have been outstanding with their 4-H and FFA stock projects in Fat Stock Shows throughout the Southwest.

Mr. Shurbet has always managed to be active in his area. He not only serves as Secretary of the Water District Board, but he is also President of the Hale County Fair Association; a member of the Floyd County Stock Show Board; and Adult Leader for the Petersburg 4-H Club. He has served for ten years on the Petersburg School Board; is a member of the Hale County Stock Show Board; and is on the Legislative Committee of the Floyd County Farm Bureau.

For fifteen years Mr. Shurbet owned and operated his own airplane for enjoyment, and played polo for ten years with the City of Plainview Polo Team. During World War II he served with the Civil Air Patrol. For the past several years, he has been in the stock feeding business and he estimated that within the last twenty years he has fed out over 100,000 head of sheep alone. His calves and hogs are some of the best in Texas. At the present time Mr. Shurbet is farming two sections of irrigated land and one and one-fourth sections of dry land. This land is located in four counties: Floyd, Potter, Randall and Hale.

Irrigation has played a big part in Mr. Shurbet's life. His father bought one of the first seven irrigation pumps in the county. These pumps were purchased in California and shipped to Floyd County. The first water meeting ever held in the county was attended by Mr. Shurbet. This meeting was twenty-five years ago and he hasn't missed a meeting since. It is plain to see that he has had an interest in the preservation of our water and the problems connected with it for many years.

In the Spring of 1954, Mr. Shurbet bought an interest in the Allmon Gin Company, which is located near his home. The gin has in conjunction with it a blacksmith shop and a grain storage warehouse.

The Shurbets are active in all types of church work in the Main Street Church of Christ in Petersburg. In the summer the family has a great deal of fun in their yard. Mr. Shurbet takes tremendous pride in the barbecue he turns out, and also in the fact that he has lived his entire life in Floyd County.

We consider Mr. Marvin Shurbet a great asset to the Water District Board and to the people of Floyd County who are so ably represented by him.

"Next month, Precinct No. 2—Director, Mr. Gus Parish, Springlake, Texas."

CONSERVATION CONVERSATION

House Bill No. 404 of the High Plains Water District follows below in its entirety. This bill was presented to the Legislature early this month.

Section 1. Subsection A (5) of Subsection 3c of Section 1 of H. B. 162, Acts 51st Legislature, 1949, Chapter 306, p. 559, is hereby amended so as to hereafter read as follows:

"(5) 'Subdivision of an underground water reservoir' is that reasonably definable part of an underground water reservoir within which the underground water supply will not be unreasonably affected by withdrawals of water from any other part of such reservoir, based upon known geological and hydrological conditions and relationships and upon foreseeable economic development at the time of the designated or alteration of such subdivision. When the Board of Water Engineers has ascertained the boundaries of a subdivision pursuant to this Act, its findings on the location of such boundaries, the questions of 'Reasonableness' and 'Affect' in the foregoing definition, and all other questions essential to the existence of a subdivision, shall be conclusive and final unless a suit is instituted, pursuant to paragraph F hereof, within 30 days from the date on which the order of such Board is entered."

Section 2. Subsection A(6) of subsection 3c of Section 1 of H. B. 162, Acts 51st Legislature, Regular Session, 1949, Ch. 306, p. 559, is hereby amended by adding the following section:

"(e) Wilfully causing, suffering, or permitting underground water produced for irrigation or agricultural purposes to escape into any river, creek, or other natural watercourse, depression, or lake, reservoir, drain, or into any sewer, street, highway, road, road ditch, or upon the land of any other person than the owner of such well, or upon public land."

Section 3. Subsection 3c-A(9) of Section 1, H. B. 162, Acts 51st Legislature, Regular Session 1949, Ch. 306, p. 559, also known as Section A(9) of Article 7880-3c, V. A. C. S., is hereby amended to read as follows:

"(9) 'Grazing land' shall mean land in tracts of not less than six hundred and forty (640) acres used exclusively for grazing purposes on which water is being produced for domestic and stock raising purposes only. Grazing land as defined above within the boundaries of an underground Water Conservation District may, upon petition to the directors of the district, be excluded therefrom and shall not be liable for the bonded indebtedness of such District: provided that such land shall be excluded only so long as such conditions continue to exist. If, after exclusion, underground water is produced therefrom for irrigation, municipal, or industrial purposes, or in an amount in excess of 100,000 gallons per day from any well, such excluded land shall promptly be brought back within the district and shall thereafter be subject to taxation and bonded indebtedness as any other land within the district, and shall thereafter be subject to the rules and regulations of the District. The lands may be brought back within the district on petition of the landowner or the owner of the water rights thereunder, or by the directors of the district on their own motion, or upon petition of any landowner in the district. The owner of the land shall be entitled to a reasonable notice and hearing to determine whether his land should be brought back within the district. The issue at such hearing before the directors of the district shall be whether or not water has been or is being produced for irrigation, municipal, or industrial purposes, or is an amount in excess of 100,000 gallons per day from any well thereon. If the directors find, upon substantial evidence, that water is being so produced, they shall enter an order in their minutes so finding; and the land shall thereafter be a part of the district for all purposes. If the owner of the land desires to appeal from the finding of the directors, he may do so pursuant to Section F hereof. As a condition to such exclusion, it shall be specified and understood that while such land is excluded, no well capable of producing 100,000 gallons of water per day shall be drilled within 400 yards of any other such well or within 200 yards of any land within the district. Production from any such well drilled in violation of the above condition may be enjoined by the district; or, upon the land being taken back into the district, the district may regulate the production therefrom so as to protect the rights of other landowners.

Section 4, Subsection B(3) of subsection 3c of Section 1 of H. B. 162, Acts 51st Legislature, Regular Session 1949, Chapter 306, p. 559, also known as Sec. B(3) of Art. 7880-3C, V. A. C. S., is hereby amended so as to hereafter read as follows:

"(3) to require permits for the drilling, equipping or completion of water wells or the substantial alteration of the size of the wells or the pumps used therein, or all or any of such acts, and to issue permits subject to the rules and regulations promulgated by the District pursuant to subparagraph (4) next below, and subject to such terms and provisions with reference to the drilling, equipping, completion or alteration thereof as may be necessary to preserve and conserve the underground water, to prevent waste, to minimize as far as practicable the draw down of the water table or the reduction of artesian pressure, or to lessen interference between wells. No person, firm, or corporation shall hereafter begin to drill or drill a well or substantially alter the size of a well or pump used therein, within the boundaries of a district organized hereunder which well could reasonably be expected to produce in excess of 100,000 gallons per day from the underground water reservoir or subdivision thereof without first having applied to the Underground Water Conservation District for and had issued a permit to do so, unless the drilling and operation of the well is otherwise exempt herein."

Section 5, Section 1, Subsection 3c B(4) of H. B. 162, Acts 51st Legislature, 1949, Ch. 306, p. 559, is hereby amended to hereafter read as follows:

"(4) Either (a) to provide for the spacing of wells to be drilled for the production of water from the underground water reservoir or subdivision thereof; or, (b) to regulate the production of wells producing underground water from such source, unless such wells are otherwise exempt herein, or both (a) and (b), so as to minimize as far as practicable the draw down of the water table or the reduction of artesian pressure; or to prevent waste. Provided further, however, that the owner of any tract of land, his heirs, assigns, and lessees who have no well capable of producing in excess of 100,000 gallons per day on said tract, shall not be denied either a permit to drill a well on his land or the privilege to produce underground water from his land subject to the rules and regulations of the District."

Section 6. Section 1, Subsection 3c, B, of H. B. 162, Acts 51st Legislature, 1949, Ch. 306, p. 559, is hereby amended by adding thereto a new paragraph at the end thereof which shall read

(Continued on Page 4)

Ground Water Reservoirs Studied—

(Continued from Page 1)

the sand by filling the spaces between the sand grains. If the tube be set aside for some time the water will evaporate, but will not flow out the bottom. In fact, with care, the tube can be filled until the water has penetrated to within a quarter-inch of the bottom without a drop ever being lost by downward percolation.

In addition to evaporation and infiltration, surface runoff to streams and lakes accounts for some of the precipitation. It is this water that is of particular interest in recharge operations.

Such arroyos as Yellowhouse Canyon, Tule Canyon, and Palo Duro Creek are usually dry, often going a year or more without significant surface flow. When they do flow, they seldom do so on their entire length. It is not uncommon for a thunderstorm near the Texas-New Mexico state line to start a roaring cascade down some gulch, and yet not have a drop reach the edge of the Caprock. Virtually all of the water will have percolated through the stream bed—Some of it reaching the water table. Occasionally dams have been constructed to intercept and pond these flash flows to be doubly sure that this water didn't run to waste. These have often resulted in the reservoir's sealing its bottom with silt and then slowly evaporating. An important exception to this behavior is seen in Amarillo's City Lake on Palo Duro Creek near Canyon.

The same difficulty has been experienced with the wet-weather lakes of the region. While they make some natural contribution to the ground water, much of their shrinkage is due to evaporation.

How can we divert more of the water now lost to evaporation and to surface flow off the High Plains to the ground water reservoir? On the basis of experiences elsewhere on the recharge problem, it would seem that several procedures are worth trying.

1. The use of so-called "sausage" dams in the arroyos consisting of a roll of wire netting about three feet in diameter with a rock fill has been found effective. These cause the flow to spread out over the entire canyon bottom, thus increasing the infiltration area; they hold pond enough to provide a head of water which will penetrate through the sand to the water table; and they receive an occasional flushing from the storm flows which top the dams and carry the silt on downstream.

2. Especially where it is necessary to recharge with siltladen water, various types of surface treatment—leveling, introduction of organic matter such as cotton burrs, and planting—have increased infiltration rates materially.

3.Study should be given to the collection and return to the ground of clean process water. Many cities, Brooklyn and Louisville in particular, have solved problems of salt-water intrusion and of summer water shortages by recharging water used for air-conditioning and ice plant cooling. While their problems and reasons for water conservation differ from ours, their solution might prove effective on the Plains. The diversion of process water to storm sewers for concentrated recharge instead of to recharge wells drilled and maintained by each individual establishment using cooling water might prove to be the best procedure.

4. The High Plains Underground Water Conservation District is making a series of tests on recharge wells under the supervision of their Chief Hydrologist, Mr. W. L. Broadhurst. Various methods of overcoming the silt problem are being tested in this program.

Wells have many advantages. When placed at the edge of wet-weather lakes, they are effective in reclaiming the lake bottom for crops or pasture. This consideration has led a number of individuals to experiment with recharge wells at various places on the Plains. The same well may be used for recharge and for pumping, with the pumping being of fundamental importance in the prevention of accumulated clogging. Water placed in storage through a well is available when wanted, subject to the consideration that water in the aquifer is in slow motion — usually well under a mile per year. On the other hand, water introduced through surface spreading or by means of pits not penetrating to the water table may be suspended like the water poured into the sand in the experiment mentioned earlier. With intermittant wetting of the recharge area, problems of entrapped air arise; these are avoided when wells penetrating to the water table are used.

5. A large proportion of what little natural recharge occurs on the Plains, occurs in the sand hills. Studies directed toward improving their infiltration efficiently deserve our attention.

6. Recharge pits are subject to siltsealing. Yet the impervious layer retarding percolation is often but a fraction of an inch thick. Here again, cultivation and surface treatment might be found to be economically justifiable.

In summary, there are several promising methods of artificial recharge applicable to the High Plains. Further studies, here and elsewhere, will improve their physical and economic efficiency.

Request For Information—

Have you or your neighbor tried to drain a wet-weather lake or to dam some draw to form a stock pond? If so, the results may be of value in the study which Dr. Whetstone is now making of the feasibility of artificial recharge on the High Plains.

Projects which were considered to be failures should be reported as well as those which were effective.

Please send a description of any project with which you are familiar together with as much information about it as possible such as size of lake or pond, time to drain, difficulties with silt, and other particulars to:

Dr. Geo. A. Whetstone
Texas Tech
Lubbock, Texas

Recharge on the High Plains—

(To be written after sufficient time has elapsed to permit answers to the "Request for Information" to be received.)

The Problem of Water Resources

By L. K. SILLCOX
Reprinted from July 1, 1954 edition, Journal American Water Works Association.

Excerpts from an address presented on April 22, 1954 at the New York Section Meeting, Watertown, N. Y., by L. K. Sillcox, Pres., American Society of Mechanical Engrs. and Vice-Chairman of the Board, New York Airbrake Co., New York.

PART II

Agricultural Base—

The relationship between agriculture and a highly industrialized society such as that of the United States is frequently overlooked. At first thought, for instance, an automobile plant seems an operation quite remote from that of a farm. Statistics should generally be given with the same reluctance as they are apt to be read, but those which follow bear so vividly on the industry-farm relationship that we may well devote a moment to their consideration. It has been computed that to produce a ton of steel requires 65,000 gallons of water and to turn out a million automobiles requires the various resources listed in Table 2. These figures become even more impressive when it is pointed out that we must multiply them six or seven times in order to turn out the number of new cars required per year on the continent.

Agricultural resources required to produce 1,000,000 automobiles:

TABLE 2

Item	*Quantity*	*Resources Used*	*Purpose*
Water	15 bil. gal.		Mfg. process only
Soybean oil	2,000,000 lb.	10,000 acres	enamel
Mohair	350,000 lb.	87,500 goats	upholstery fabric
Lard	1,000,000 lb.	20,000 hogs	lubrication
Leather	1,500,000 sq. ft.	30,000 cattle	glue, upholstery
Wool	3,200,000 lb.	800,000 sheep	upholstery, gaskets
Molasses	2.5 mil. gal.	12,500 a. cane	Antifreeze, sol
Linseed Oil	2,400,000 lb.	17,500 a. flax	paint glyc
Corn Co.	500,000 bu.	11,280 a. corn	rubber sub. alch.
Cotton	89,000,000 lb.	558,000 a. cot.	brakes & gears

In all that we do, we are forced to count on the great asset of our agricultural base, namely, our forests and soils and water resources. These "renewable" resources provide approximately one-half of our entire national economy, measured in goods consumed, or in their transport, processing, financing, and marketing. We are apt to think of ourselves as a mechanized society wherein metals and minerals play a predominant role, but the industrial complex will gradually weaken unless we not only maintain but substantially improve our agricultural practices. Although the overall picture of our forests indicates that replacement growth shows promise of catching up with annual drain, the fact still remains that we are using up saw timber at a rate 40 percent greater than its annual growth.

We have destroyed one-fifth of the original area of our crop lands and are continuing to injure a considerable portion of the rest by improper agricultural methods. We are beginning to feel the pinch of water shortages in various parts of the continent. All in all, we are not as yet conserving these vital resources sufficiently to insure the welfare of coming generations.

American population growth is largely a result of the remarkable advances in sanitation and medical care that have occurred concurrently with economic expansion and the development of transportation. The wholly unexpected change in our population expectancy has actually resulted, however, from three unforeseen circumstances: (1) somewhat larger immigration than foreseen; (2) a continuing decline in the death rate; and (3) the predominating factor of a sharp and sustained upsurge in the birth rate. It is sufficient to take a now generally accepted opinion that our population will reach a figure of at least 190,000,000 by the year 1975, 30,000,000 more people than we have today. This prospect poses a host of problems, such as the physical functioning of ever larger cities, the increased costs of various forms of social welfare, and the added load upon our educational system, which, in many respects, is incapable of meeting present demands. The essential question . . . the one first to consider . . . will still remain: can our farm lands produce sufficient food for this substantial increase in our numbers? The food producing capacity of our country is so great that it is illogical to anticipate a food crisis, at least within the period of which we are now thinking. Further, the diet standard of the American people as a whole is relatively so high that moderate downward adjustments could be made without physical ill effect.

At present crop lands, plus land devoted to livestock used for food supplies, aggregates 464,000,000 acres. The latest computations prepared by the United States Department of Agriculture, submitted in testimony before Congress in 1952, indicate that the amount of land that will be needed to provide food at present diet levels for our anticipated population in the year 1975, including provision for our present export surplus, adds up to the formidable figure of 577,000,000 acres . . . 113,000,000 more than is now in use. The day is still to come when we are sufficiently alert to the fact that the protection of our agricultural base is the first need of our physical future. (To Be Continued)

LEGISLATIVE BRIEFS

Committee Hearings have been held both in the Senate and the House on the Legislation proposed by the Texas Water Resources Committee and the State Soil Conservation Service. Both bills were referred to subcommittees for further study and consideration before action will be taken.

Both bills include several good sections on the matter of water uses and conservation.

One objection that has been heard considerably throughout the High Plains area to both bills is the three cent ad valorem tax to be used to create a fund for the construction and maintenance of dams throughout the State.

Representative Harold Parish of Taft passed a bill through the Committee and on to the House Calandar this week. The Parish bill is also a bill pertaining to surface water and would create a two hundred million dollar fund for the conservation and utilization of both surface and ground water resources. The Parish bill calls for a two cent ad valorem tax to be collected throughout the State.

Another bill introduced by Senator Strause of Halletsville calls for the licensing and bonding of all water well drillers throughout the State. This bill also provides for the State Board of Water Engineers to approve and grant permits in any area not included in an underground water conservation district created by House Bill 162 of the 51st Legislature. In issuing such permits, the State Board of Water Engineers may provide for the spacing of wells and the catching of samples of material encountered in drilling such wells. The bill provides for the payment of a $25.00 annual fee by the well drillers in return for a certificate of registration which would allow them to drill anywhere in the State of Texas.

The conditions of such a certificate would be based upon a performance bond in the amount of $5,000 with corporate surety theron duly licensed to do business in the State of Texas. The failure to comply with such regulations would create a misdemeanor on the part of the driller, upon being found guilty would call for a fine not less than $25.00 or more than $200.00.

CONSERVATION CONVERSATION

(Continued from Pafe 3)

as follows:

"The drilling of any well for which a permit from the District is required and for which no permit has been obtained, or the operation of any well at a higher rate of production than the rate approved for such well, is hereby declared to be illegal, wasteful per se, and nuisance. Any person having an estate in land adjacent to or any part of which lies within one-half mile of such well may, with or without the joinder of the District, bring suit in court of competent jurisdiction to restrain or enjoin such illegal drilling or operation or both. He may also sue for and recover any damages which he may have suffered by reason of such illegal operation and such further relief as he may be entitled to in law or in equity. In any suit for damages, the existence of such well or the operation thereof in violation of the rules of the district, or both, shall be taken by the courts, to constitute prima facie evidence of illegal or illegitimate drainage. Such suit may be brought in any county where (a) the illegal well is located, or (b) the affected land of the plaintiff, or any part thereof, is located. The cause of action and rights here created or recognized shall constitute a cumulative or additional remedy and shall not be considered to exclude, impair, or abridge any other rights, remedies, or causes of action which are or may be available to any individual or to the District. Such suits shall be advanced for trial and be determined as expeditiously as possible, and no postponement thereof or continuance, including a first motion therefor, shall be granted except for reasons deemed imperative by the court."

Section 7. Subsection D (4a) of Section 3c enacted in Section 1 of H. B. 162, Acts 51st Legislature, Regular Session 1949, Ch. 306, p. 559, also known as Article 7880-3C, V. A. C. S., is hereby amended to hereafter read as follows:

"(a) the requirement of a permit for the drilling or producing of a well drilled to supply water for the drilling of any one or more wells mentioned in (3) next preceding, so long as such well and the production therefrom is being used for such purposes and not thereafter. When the well has ceased to be so used, it may thereafter be used as an ordinary water well if it meets the spacing and other rules of the district; and if used, such well shall thereafter be subject to the rules and regulations of the district."

Section 8, the saving clause of this bill and Section 9, the emergency clause have been deleted from this writing.

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

Second Class Permit

Mr. Z. O. Lincoln
913 Houston
Levelland, Texas

THE Cross SECTION

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

Vol. 1 — No. 9 "THERE IS NO SUBSTITUTE FOR WATER" *March 1955*

COUNTY COMMITTEE SECRETARIES HAVE ALL DAY SESSION

County Secretaries from all but four counties in our HPUWCD, met at the Caprock Hotel in Lubbock the 16th of this month to discuss problems that are arising in the various county offices within our district.

Those attending were Miss Kay Jowell, Mr. Ed Dziuk and Mr. Frank Bezner of Deaf Smith County; Mrs. Doris Traweek of Bailey County; Mrs. Lillian Maddox of Lubbock and Lynn Counties; Mr. Z. O. Lincoln of Hockley County; Mr. Eugene Ivey of Castro County; Mr. Jess Everett of Lamb County; Mrs. Donald Olson of Randall County and Mrs. Ida Puckett of Floyd County. Mr. J. B. Knox of Cochran County, Mr. Aubrey Brock of Parmer County, Mr. Jim Line of Potter County and Mr. John Patterson of Armstrong County were unable to be present at this meeting.

Mr. Wilson Buchanan of Dumas, Texas and manager of the new North Plains Ground Water Conservation District, north of the Canadian River, also set in on this meeting in order to get the benefit of these county secretaries' experience in dealing with well permits.

Tom McFarland, W. L. Broadhurst and Allan White of the District office discussed with the secretaries several new forms to be used and administrative changes to be made in the handling of drilling permits. A question and answer session was held to give everyone an opportunity to air different situations that are arising

(Continued on Page 3)

Pictured above are County Secretaries who met in Caprock Hotel to discuss problems of issuing water well drilling permits. From left around table are: Ed Dziuk, Deaf Smith; Mrs. Doris Traweek, Bailey; Frank Bezner, Deaf Smith; W. L. Broadhurst, Lubbock; Mrs. Lillian Maddox, Lubbock; Mrs. Mayme MvVay, Lubbock; Z. O. Lincoln, Hockley; Mr. and Mrs. Allan White, Lubbock; Eugene Ivey, Castro; Jess Everett, Lamb; Mrs. Don Olson, Randall; Mrs. Ida Puckett, Floyd; and Miss Kay Jowell, Deaf Smith.

McFarland Released From Hospital

Tom McFarland, manager of our HPUWCD, has been released by the Methodist Hospital in Lubbock after having quite a bout with what the doctors decided must have been a kidney stone, even though no stone was found.

We are glad Tom is feeling better and is back on the job, and we know that his many friends will be happy to get this news.

Tom, with his wife, Gwen, and children, Cindy, 4, and Jim, 8, reside at 2417 25th Street, Lubbock.

The Problem Of Water Resources

By L. K. SILLCOX
Reprinted from July 1954 edition Journal American Water Works Association.

Excerpts from an address presented on April 22, 1954 at the New York Section Meeting, Watertown, N.Y., by L. K. Sillcox, Pres., American Society of Mechanical Engrs. and Vice-Chairman of the Board, New York Airbrake Co., New York.

PART III

Water Resources Conservation and Development

The necessary change in our outlook on the country's food supply will finally do away with the fantasy that "America can feed the world." Let us never forget, however, that the problem of water will always dominate the entire natural-resource picture.

The water development recommendations included in President Eisenhower's 1954 "state of the Union" message are seen as presenting a potential program second in size only to highway construction. A problem which is coming in for more attention than ever before is the effect of industrial wastes on some of our important rivers. Americans are fortunately devoting an increasing amount of thought and action to problems connected with stream pollution. In days gone by, when the economy was largely agricultural, industry was given every encouragement possible by communities to locate or expand, even though they faced rising stream pollution loads. The states, as well as the nation, stood idly by while free air and free water were exploited. Particularly in the East, "once in and waste" was accepted practice in using large quantities of water for processing, cooling, or cleaning out industrial debris. Many rivers are still used as "open sewers," and mines are allowed to contaminate large volumes of water which would otherwise be available for domestic use.

How costly this lack of foresight can be has been the subject of much discussion at symposiums during a recent annual meeting of the American Ass'n. for the Advancement of Science, held at Boston, Mass. Several speakers stressed the need for gathering facts before giving the green light to any far-reaching schemes for water use, whether public or industrial. Some idea of the costs involved were given by Francis A. Pitkin, chairman of the Interstate Commission on the Deleware River Basin. Discussing

(Continued on Page 4)

WILSON BUCHANAN

New Water District In Operation

On March 14, 1955 the new North Plains Ground Water Conservation District No. 2, North of the Canadian River began issuing drilling permits and the task of prolonging the economic life of the underground water in the area as designated. This is the fourth locally controlled conservation district in the history of our State—our own High Plains Water District being the third.

All, or parts, of six counties are participating in this new district: Hansford, Hartley, Hutchinson, Moore,Ochiltree and Sherman.

Mr. Wilson Buchanan, pictured above, former resident of Spearman and Chamber of Commerce manager there has moved to Dumas to take over as the District's manager. His office is in the Sneed Hotel at Dumas.

Mr. Gaston Wells, of Dumas is the President of the Board of Directors; Mr. Harlan A. Hawk, of Perryton is Vice-President; Mr. R. V. Converse, of Spearman is Secretary; Mr. Luther Browder of Sunray and Mr. Robert Thompson of Hartley round out the five man Board of Directors.

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THE Cross SECTION

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ALLAN WHITE
Editor

GUS PARISH

AN EDITORIAL

This is the third article in a series designed to introduce the members of our Board of Directors to our readers. This month we present to you Mr. Gus Parish of Springlake, Lamb County, Texas, Director from Precinct No. 2.

Mr. Gus Parish of Springlake, Lamb County, Texas represents Lamb, Hockley and Cochran Counties on the HPUWCD Board of Directors. He is now serving his second year as a member and has represented his people of Precinct No. 2 very ably.

Mr. Parish was born April 1, 1900 in Llano County, Texas. His parents were Mr. and Mrs. Jessie A. Parish. His father was a stockman.

Our director attended school in Llano until he was sixteen years of age and his family moved from Llano to Valley View, Texas in Cook County. There he began working as a mechanic for the Nichols Motor Company and stayed until deciding to move to West Texas. Before leaving Cook County, the Miss Emma Belle Carter became Mr. Parish's bride—December 19, 1923. She had been attending college at C. I. A. (now Texas State College for Women) in Denton, Texas.

When arriving in West Texas Mr. Parish established a garage 1 1/2 miles north of the present site of Springlake, Texas and also joined with his father and three brothers in farming some lands in that vicinity. In 1927 the garage was moved to Earth, Texas and in 1928 was sold to allow Mr. Parish to build a hardware and farm implement store in Earth.

Through the years the Parishs have had four girls: Mary Miller, Margaret, Charlene and Carlyon; and four boys: Gus, Jr., Kenneth Bain, Charles, and Douglas.

In 1944 Gus, Jr. was killed serving with the First Marine Division on the Island of Peleliu in the Palau South Pacific group. He was only 18 years old at the time. Mr. Parish had intended to turn the business over to him when the war ended, but in 1945 sold out and devoted all his time to farming.

Kenneth Bain, 25, is married and has one son and is farming in the Springlake-Earth area. Charles, 19, is single and farms. Douglas, 17, is a Junior in the Springlake High School and he too farms. He also participates in FFA and 4-H Club work. The girls are married except for Carlyon Joyce, 16, who is a sophomore in high school. Mary Miller Burkett has one son and her husband is a building contractor in Earth. Margaret Riddle has two sons and is married to a pharmacist. They life in Winfield, Kansas. Charlene McFatter has a daughter and her husband farms in the Springlake-Earth area. Charlene and Charles are twins.

Mr. Parish has no business interests other than farming and all except approximately 500 acres of his lands are rented to his children. He has twelve irrigation wells, with the first being drilled back during the winter of 1936, 1 1/2 miles north of Springlake.

Besides serving on the HPUWCD Board of Directors, Mr. Parish was chairman of the old Water Users Association, and helped to organize the Farm Bureau in Lamb County north of the sand hills. He is a former member of Springlake School Board and has served on the Lamb County Fair Board. He also was a member of the Earth Cemetary Association.

The Parishs are members of the First Baptist Church of Springlake and in fact they donated the lot where the church building stands. Mrs. Parish teaches in the Primary I Sunday School department and Mr. Parish is President of the Adult Sunday School department.

The people of Precinct No. 2 have a man representing them on our Board who is honest, upright and an outstanding citizen. They are fortunate to have such a man helping to administer our locally controlled water district.

"Next month, Precinct No. 3—Director, Mr. W. M. Sherley, Lazbuddie, Tex."

CONSERVATION CONVERSATION

There has been a considerable amount of confusion in all the counties within our district, as to what a person needs in the way of information in order to obtain a permit to drill a water well. Then too, with changes that are necessary from time to time in our forms and requirements, we know that it is hard to keep abreast of the procedure involved. Consequently, we have prepared a form that points out the things necessary for the person making application to take along when he goes to his county office to obtain a drilling permit.

We are running a copy of this form below in order that our readers will have the information handy when, and if, they get ready to drill a water well.

Information Needed For Water Well Permits

(1) Owner and legal description of the land.

(2) Measured yards from well site to two (2) nearest property lines, quarter section lines, or labor lines.

(3) Measured yards from well site to the three (3) nearest wells that are within 440 yards or a quarter of a mile. (This shall include applications for wells as shown by County Committee records.)

Procedure To Obtain Permit

Owner or his agent shall submit above information to the secretary of the county water committee who will assist in filling out the application.

Spacing for a well site must meet the published rules and regulations for size of well desired before application can be approved by three of the five county committeemen. (Date and place of committee meetings may be obtained from the county secretary.)

4-inch well must be 200 yards from nearest existing well.

5-inch well must be 250 yards from nearest existing well.

6-inch well must be 300 yards from nearest existing well.

8-inch well must be 400 yards from nearest existing well.

After an application has been approved, the owner or his agent will be given a copy of the permit (which is his authority to drill within ten (10) yards of the location specified and not elsewhere) and also the log and registration forms.

As soon as the well is ready for production, the completed log and registration forms must be returned to the county secretary. Copies of all forms will then be furnished to the owner for his file.

Upon return of completed log and registration forms, or cancellation of the permit, the deposit which was made to the county secretary will be refunded to the applicant.

We hope that the above information will help all applicants who desire well permits. If there are questions that you think of that are still not clear, your County Secretary or one of your County Committeemen will be glad to go into the matter as thoroughly as is needed.

—o—

In the Texas State Ground Water Laws there is an item that has been somewhat confusing to a number of our people, it reads as follows:

(4) "Nothing in this Section 3-c shall authorize or permit: (b) the requiring of a permit for the drilling or producing of a well drilled, completed and equipped so that it will not produce in excess of one hundred thousand (100,000) gallons of underground water per day."

Now, we interpret the preceding to mean that a person who is going to drill a well that will be equipped to produce no more than 69.4 gallons of water per minute does not need a drilling permit to do so. These small capacity wells are used primarily for livestock and domestic purposes and do not come under jurisdiction of our HPUWCD.

—o—

It has come to our attention that Part C of Rule 4, regarding the spacing of new wells, is not thoroughly understood by many applicants. This part deals specifically with the use of a pump of different rate in gallons per minute from the pumps in general use. The rule states:

"If the pump which is to be used by the applicant is of a different size or type, or is to be operated at a different rate in gallons per minute from the pumps in general use . . . such fact shall be made known in the application; and in such case, the actual rate at which the well is to be pumped shall be the determining factor in the spacing for such well instead of the size of the pump . . ."

This makes it possible for a person to use equipment that he already owns. In a case where a person has on hand an old pump and wants to use it in a new well, but cannot move far enough from an existing well to meet the minimum spacing requirement to qualify for a permit to use as large a pump as he has, he may make this fact known in his application. He will be granted permission to use his old pump, if he consents to produce no more than the maximum amount of water allowed for the size permit he is applying for.

This is important to a person with an old pump of larger column size than he really needs to pump his well. Let us take an example where a person has an 8-inch column pump that was originally designed to produce a 1,000 gallons a minute at the normal rate of speed. This person would like to use the pump in a new well that will produce only 500 gallons a minute. If the bowl assembly is exchanged for one that will offer high efficiency while pumping only 500 gallons a minute, then the 8-inch column may serve better than, or as well as, a smaller size. Normally there will be less friction loss in the larger pipe than there will be in a smaller size when pumping a given amount of water.

These old pumps of large capacity, and there is getting to be an abundance of them particularly in parts of our district, do not necessarily have to be discarded or sold for a fraction of their worth. They can be used with efficiency even though the water available from the wells decreases in quantity.

—o—

If you should have an abandoned well on your farm that has not been closed in some satisfactory method, we urge you to do so without delay. Children have a way of finding things like open wells, and accidents can and do happen . . . CLOSE THOSE OLD WELLS, PLEASE!

LEGISLATIVE BRIEFS

The first two bills pertaining to water legislation of the 54th session of the Texas Legislature went to the Governor's desk this week for signature. One of the two bills affected ground-water districts in that it provides that our Water District in Texas shall file within 60 days after it's organization or creation:

A certified copy of the order creating the District. If the boundaries of any district have been or are hereafter altered by inclusion or exclusion of land the District shall file such notice within 60 days.

Such Disrticts shall file a list of names and addresses of all officers and members of the Board of Directors or other governing bodies.

The Board shall be notified of changes in membership giving the length of the term of office of each director together with the date that each term of office shall expire.

Failure on the part of any district to fully comply with the provisions of this Act shall subject the district to a civil penalty of Fifty Dollars ($50) and a further civil penalty of Two Dollars ($2) per day for each day of failure to comply with such provisions after the effective date of this Act; and the State may recover such a penalty by suit therefor, provided, however, the maximum penalty shall not exceed the sum of Three Hundred Dollars ($300).

Quite a controversy has arisen among the members of both the House and the Senate on the passage of the Water Resources bills. There has been a struggle among the members of both the Senate and the House to include certain parts of the Soil Conservation bill with that of the Water Resources Committee bill. In some cases the arbitration has been to the detriment of both bills.

A lot of opposition has arisen against the three cent (3c) on the One Hundred Dollar ($100) valuation ad valorem tax for the financing of dams. The opposition has been particularly strong from the High Plains areas. Feelings have been expressed that "very little benefit could be derived from the use of the water impounded in such reservoirs, since only one such site exists in the High Plains."

Senator Hardeman made a plea for a broader attitude toward the bills than mere consideration of local situations. He urged it as a major attack on the State's water problem and not as a means of individual benefit. A struggle has arisen among proponents of an elected board versus an appointed board for the administration of the State program. Many people feel that the present State Board of Water Engineers should be abolished and replaced with a Water Commission composed of 6 members with an executive secretary. Very little support has been gathered on abolishing the Board of Water Engineers.

Senate Bill No. 130 which provided for the licensing of water well drillers has been sent to a Senate Subcommittee for future study. Not only did the bill provide for licensing of well drillers but it gave certain powers to the State Board of Water Engineers in issuing permits for the drilling of water wells in areas not located within the bounds of organized water districts.

The provision for the licensing of drillers seemed to be well accepted on the first hearing however, considerable opposition was voiced against the issuing of permits for water wells by the State Board of Water Engineers.

Several hundred farmers from the North Plains appeared in Austin this week in support of a bill to allow them to take all or part of their 1/8 royalty in natural gas to be used for the pumping of irrigation wells within their area.

An Act providing that no water district, created pursuant to the Constitution of Texas, shall hereby be created by a Commissioners Court without the approval of the Board of Water Engineers.

New Water District—

(Continued from Page 1)

A meeting of the new County Committeemen was held the 10th of this month to acquaint them with the new rules adopted by the Board of Directors. Mr. Allan White and Mr. "Doc" Willis from our District office, attended that meeting for the purpose of pointing out problems that would arise and methods of handling the administrative procedure of their district. This meeting was well attended and all present seemed to have benefitted from it.

Mr. Robert Lemon, attorney from Perryton, has been responsible for most of the legal advice and legal work done since the organizing of the district began.

The creation of this new district tends to strengthen our contention that the locally controlled conservation district is the best way in which to meet and to solve this problem of protecting and conserving the ground water of our state. We believe that we are proving that we can take our own problems and with our own people work out a program of conservation that will be agreeable with the majority of our people.

Our position is definitely being strengthened by citizens in other ground-water reservoirs creating conservation districts—making us stronger in numbers and in political sentiment.

We want to wish the new North Plains Ground Water Conservation District good luck in their operation, and it is our desire to continue our close relationship with them.

County Secretaries—

(Continued from Page 1)

in their counties.

Lunch was served the group and the business meeting was then reconvened.

We are trying, with meetings such as this, to maintain an operation with as little paper work and red-tape as is possible and still have the information that is needed. We welcome any constructive suggestions from our people, and by calling our county workers together from time to time we can better get the thinking of those who are obtaining drilling permits.

The meeting was adjourned when all secretaries had discussed their particular problems and possible solutions were suggested by others who had met and solved similar problems.

Water Resources—

(Continued from Page 1)

"Correction of a Fluviatile Delinquent, the Schuylkill River," he said that recent rehabilitation measures to remove silt and culm (coal debris) dumped in the river by coal mine operators over a period of 130 years have cost Pennsylvania $35,000,000, while the federal government has spent $10,000,000. Mine operators, to stay in business under new laws, have had to invest $6,000,000 to keep their silt and culm out of the Schuylkill. To clean up all the nation's rivers in 10 years would cost somewhere between $9 and $12 billion, according to one authoritative source (2).

Despite the provocative title of Pitkin's paper, there was no doubt that most of the symposium participants realized it is not America's rivers that are delinquent, but Americans themselves. The responsibility for restoring the Schuylkill to some semblance of its original cleanliness has been accepted by state and industry, but those concerned with water supply matters would be derelict in their duty if they did not strive on a nationwide scale to prevent a continuance of such problems. Not only is dredging expensive and water treatment complicated as well as costly (where water is needed for municipal or industrial uses), but there are intangibles such as lowered property values, health hazards, added flood dangers loss of recreation facilities, and destruction of aesthetic values also to be considered.

An important recommendation in President Eisenhower's message was that the nation take steps to insure an adequate supply of water. In this connection, it is estimated that, apart from the $9 - $12 billion which would be required to make the country's streams reasonably free of polution, an additional $12 - $15 billion is necessary for expansion and conservation. It is gratifying to observe that industrialists are among the first to recognize this urgency. Charles M. White, president of Republic Steel Corp., emphasized it in a recent article (3) and quoted an announcement of General Motors Corp. as stating that "Water is our most important raw material."

The nation's average 30 in. of rainfall annually is much more than adequate for our needs, but unfortunately, too much of it (8 in.) is lost through wasteful runoff. Therefore, a major portion of our water problem lies in the field of conservation. From the standpoint of self-interest, as well as of national interest, industry should do everything it can to relieve the water crisis promptly.

Why the water shortages? Demands have exceeded existing sources of supply, particularly in growing communities and those with new industries. Treatment, storage, and distribution systems were not planned ahead and are now inadequate. In about one-third of the instances, drought has been a factor. In the majority, the shortages were due to lack of foresight and development; the big need, however, is conservation and metering is a must.

The sea has been suggested as a possible source of fresh water. Although the desalting of ocean water has been made possible for the sailor by several clever gadgets using chemicals or sunshine, a large-scale solution to this problem is as elusive as it has ever been. Recently the Conservation Foundation published a book (4) that reviews the physics and economics of two-score methods of desalting the ocean. The group picked as a goal the design of a plant that would produce 1 bgd, or about the amount New York City uses. Of all the methods considered, from distillation to biological growth techniques to electrical devices, the researchers found only one — the ion-selective membrane—which could produce this quantity at a price of no more than 30 cents per 1,000 gal. The group pointed out that large users of water now pay about 0.5 cents per 1,000 gal. and that any price greater than 6 cents puts manufactured water out of reach of farmers. (New York City's water costs 20 cents per 1,000 gal. delivered.) To arrive at the 30-cent figure, the scientists made many assumptions which they readily admit are probably too modest. For example, the cost of power was put at 0.5 cents per kilowatt-hour. Power—even atomic power—at such a price will probably not be available in arid regions. Furthermore, 1,000 ppm dissolved solids was allowed. (The US Dept. of Agriculture calls this grade permissible; New Work's water contains less than 50 ppm.) With distillation methods, using conventional fuels, the cost is 70 cents per 1,000 gal. and distillation is second best to the selective membrane device. The authors dismiss solar energy for water purification entirely. They calculate that, even with the maximum efficiency thus far obtained with any known device, 300 sq. miles of apparatus would be needed to supply 1 bgd, at a cost of $8 billion.

The membrane method suggested by the group utilizes a series of plastic sheets. These act as sieves either to the positively charged sodium particles or the negatively charged chloride particles, but not to both at once. The sheets are arranged in alternate layers, with a negatively electrified plate at one end and a positive plate at the other. As the particles are attracted to the plates of opposite electric charge, they move through one sieve but not through the other. They become trapped between the sieves and can be pumped away, leaving fresh water behind.

The US Dept. of the Interior is encouraged over prospects for developing a process for economical conversion of saline into fresh water. It is spending $400,000 a year on research in its $2,000,000 program.

Although industrial uses, as a rule, are not highly consumptive, there is now a trend toward reducing the amount of water for such purposes, particularly by industries located in the semi-arid states of the West and Southwest. A new steam-electric plant at Amherst, Texas, uses just over 1 gal. of water per kilowatt-hour, as compared with the 80 gal. used by conventional older plants. This trend is due to grow and is an intelligent step which enlightened leadership must take.

A scientific research program, conducted by meterologists and cloud physicists and aimed at determining how much the fertilization of dry regions throughout the nation can be advanced by stimulation of rainfall was recently announced. The study of clouds as a possible untapped water resource will be made jointly in the arid Southwest by the University of Chicago and the University of Arizona. To facilitate the program, a new Institute of Atmospheric Physics has been formed at Tucson, Ariz. The expenses of the institute will be defrayed partly from state funds and partly from private sources, including chiefly the Sloan Foundation.

The scientists engaged in this work have been occupied in research on clouds and thunderstorms for several years and are carrving out fundamental laboratory studies and field measurements in cooperation with the Air Force. Knowing from balloon measurements the temperatures at the various levels in which the clouds lie, the meteorologist can determine whether subfreezing conditions play a part in the formation of the rain or the snow that melts into rain as it falls. Present rain-making techniques normally require subfreezing temperatures in the upper parts of the clouds. A special radar set to scan the clouds will be installed on one of the mountain peaks above the valley floor around Tucson. Cameras will photograph the echoes received on the radarscope from clouds that are forming rain. It is planned that the new institute will study other problems of the atmosphere, such as the possibility of the use of the energy in the bright sunshine of Arizona, but clouds and rain possibilities will be the main interest at first.

Artificial nucleation may have other useful potentialities, such as increasing snowpack in mountainous areas, deterring and weakening rainstorms (thereby reducing soil erosion), inhibiting hail, breaking up hurricanes, and aiding aircraft operation.

These activities give hope of solving the problem of providing an adequate water supply—a vital part of the larger problem of conserving and developing the natural resources upon which the well-being of the nation depends.

Acknowledgement

This paper is partially based on information contained in published reports from federal government sources (2, 5), some of which was summarized in a recent article by Bello (1). Osborn's writings on natural-resources problems (6) have also proved of great assistance.

References

1. Bello, Francis. How are We fixed for Water? *Fortune,* p. 120 (Mar. 1954).

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3. White, C. M. Will Water Shortages Flash the Stop Sign on Industry? *Cleveland* (Jan. 1954).

4. Ellis, C. B., Et. Al. *Fresh Water From the Ocean.* Ronald Press Co., New York (1954).

5. MacKichan, K. A. Estimated Use of Water in the United—1950. USGS Circ., No. 115 (1951).

6. Osborn, Fairfield. *The Limits of the Earth.* Little, Brown & Co., Boston, Mass. (1953)

STATISTICS FOR FEBRUARY

During the month of February, 391 completed wells were registered with the District office and 521 new permits were issued by the County Committees. These new permits issued follow by county:

County	*Completed Wells*	*Permits Issued*
Armstrong	1	0
Bailey	14	35
Castro	44	27
Cochran	12	31
Deaf Smith	25	24
Floyd	17	36
Hockley	58	79
Lamb	57	55
Lubbock	54	89
Lynn	49	44
Parmer	50	96
Potter	0	0
Randall	10	5

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

Second Class Permit

Mr. Z. O. Lincoln
913 Houston
Levelland, Texas

THE Cross SECTION

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

Vol. 1 — No. 10 "THERE IS NO SUBSTITUTE FOR WATER" *April 1955*

GEOLOGISTS ATTEND IRRIGATION TRAINING SCHOOL

The Extension Service of Texas A. & M. College in cooperation with The U. S. Department of Agriculture held an irrigation training school for County Agents at West Texas State College in Canyon April 11 - 15, 1955. The program of the school included information on irrigation research, groundwater in the High Plains and surrounding areas, recharge, hydraulics, hydrology, pumps, fuels, power units, concrete pipe, soils, quality of water, irrigation practices, and the application of irrigation water.

W. L. Broadhurst and G. W. Willis of the High Plains Underground Water Conservation District No. 1 attended lectures the first two days of the school to obtain information on research in irrigation, recharge, and hydrology. The Water District is interested in obtaining such information for possible application to the High Plains area.

THE STATISTICS FOR MARCH

During the month of March, 548 completed wells were registered with the District office and 592 permits were issued by the County Committees. These new permits issued and completed wells follow by county:

County	*Completed Wells*	*Permits Issued*
Armstrong	2	2
Bailey	18	34
Castro	37	53
Cochran	7	32
Deaf Smith	38	35
Floyd	57	65
Hockley	61	71
Lamb	67	103
Lubbock	103	81
Lynn	46	25
Parmer	92	65
Potter	0	0
Randall	20	26

Paper To Begin 'Letters To The Editor' Column

THE CROSS SECTION will begin a "Letters to the Editor" column next month, in an effort to answer questions pertaining to the water district. This column will be run each month thereafter, and we trust that letters will come to us from all who have questions. We will try to answer any question that comes into us.

TOM McFARLAND

McFarland To Receive Annual Award

Tom McFarland, manager of our HPUWCD, has been selected by the Fort Worth Press to receive their annual award for the person contributing the most to water conservation during the past year.

Mr. McFarland has been invited to a dinner in the Texas Hotel, Fort Worth, on April 30th where a plaque will be presented him for his outstanding contribution to the conservation of water.

We offer our sincere congratulations for this well deserved award and honor.

We have been advised by the Fort Worth Press that their choice for this award was made only after carefully weighing all achievements and contributions of individuals around our State of Texas. This fact makes the choice even more meaningful than it would be otherwise.

We, of the High Plains area, know that Tom McFarland is deserving of this honor, but when people from other parts of this big state of ours recognize his efforts and accomplishments then we begin to know how really valuable he is to us and our Water District.

Please Close Those Abandoned Wells!!!

WATER LAW CONFERENCE TO BE HELD IN AUSTIN

The 1955 Water Law Institute of the University of Texas has been scheduled for June 17th and 18th. We notice that some time has been given on the following program to the discussion of ground-water laws in the Western states and ground - water rights in Texas.

As has been the custom of the University Law School in presenting a very interesting program each year, it appears that the program for the 1955 Institute will be equally as interesting and informative.

WATER LAW CONFERENCE
School of Law, University of Texas
June 17-18, 1955

Friday Morning, June 17:
Welcome and Introduction of General Chairman Page Keeton.
Chairman: R. Richard Roberts
9:00 - 9:45—Survey of the Work of the 54th Texas Legislature in the Field of Water Resources.
9:00 - 10:30—Panel Discussion.
10:30 - 10:45—Recess.
10:45 - 11:15—Rights in Diffused Surface Water.
11:15 - 12 Noon—A Reappraisal of Motl V. Boyd.
12 - 1:30 P. M.—Lunch.
Friday Afternoon, June 17:
1:30 - 2:30—Trends in the Statutory Law of Groundwater in the Western States.
2:30 - 3:30—Rights in Groundwater in Texas.
3:30 - 3:45—Recess.
3:45 - 5:00—Panel on Rights in Groundwater in Texas.
Friday Evening, June 17:
7:30 - 8:15—Analysis of Water Pollution in Texas; Types, Location and Extent.
8:15 - 9:00—Problems in Pollution, Litigation and Control.
9:00 - 10:00—Panel on Problems in Pollution, Litigation and Control.
Saturday Morning, June 18:
9:00 - 10.00—The Role of Water Districts and State in Stream Development; Planning, Control and Financing.
10:00 - 10:15—Recess.
10:15 - 11:15—Role of The Federal Government in Stream Development.
11:15 - 12 Noon—Question and Discussion Period regarding Any Water Problem.

Broadhurst Speaks In Idalou

W. L. (Bill) Broadhurst, Chief Hydrologist for the HPUWCD, spoke to approximately 150 persons at the first annual Soil, Water and Cotton Day, held in Idalou, Lubbock County, High School Gymnasium. He talked on source of our High Plains water supply, need for conservation practices, water table decline and what this decline means to water users.

The all-day program also featured Dr. Donald Ashdown, entomology expert from Texas Tech and Mr. Elmer Hudspeth, from the Lubbock Experiment Station. Insect control and farming practices were discussed by these authorities.

Programs of this type are excellent and the people of Idalou and the area's cotton gins who sponsored the day's activities are to be congratulated on their ability to see that we do have problems and that if they are not met today, then tomorrow they will be more acute. It would certainly be well if all our towns around the High Plains would take a lesson from Idalou and start local educational programs or events to help strengthen us all in the knowledge of what resources we possess and may take advantage of and then how best to prolong the economic life of these assets.

Water Depletion Ruling For Tax Purposes

On January 10, this year the High Plains Underground Water Conservation District No. 1 presented a formal request to the Commissioner of Internal Revenue, Washington, D. C. for a ruling on whether or not an expense deduction might be allowed under the present tax laws. Mr. Lloyd Croslin, attorney from Lubbock; Mr. Joe R. Greenhill, attorney from Austin; and Mr. Ray Lawrence, C.P.A. from Lubbock presented the request for the HPUWCD at this hearing.

We do not have a ruling from the Tax Commission at this time, but we have a report from Washington to the effect that our request for water depletion deduction is progressing on schedule and that we should have an answer sometime soon. We have indications that our request is being studied very carefully and that every issue involved is being scrutinized thoroughly.

We have hopes that the ruling, when it comes, will be favorable to our High Plains people, and as progress reports reach us from Washington, D. C. we will pass on the news.

THE Cross SECTION

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

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Telephone PO2-8988

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ALLAN WHITE
Editor

VIRGIL E. DODSON

AN EDITORIAL

This is the fourth in a series of articles designed to introduce the Directors of the High Plains Underground Water Conservation District to our readers. This month we present to you Mr. Virgil E. Dodson, Director from Precinct No. 4.

Mr. Virgil E. Dodson, from Hereford in Deaf Smith County, represents the people of Precinct No. 4 which includes Deaf Smith, Potter, Randall and Armstrong Counties. He is serving his second term as a member of the HPUWCD Board of Directors.

Mr. Dodson was born in Floyd County, Texas in a half dug-out, ten miles north of Lockney on April 5, 1896 to Mr. and Mrs. E. C. Dodson. Mr. Dodson's father was a stockman and farmer and he settled in Floyd County during the year 1891.. He raised registered Hereford cattle.

Our director began his schooling in Providence Rural Schools and when in the eighth grade transferred to Wayland College demonstration school to finish high school. During the summers when Mr. Dodson was finishing high school he worked with the Texas Land Development Company of Plainview, Texas.

After attending West Texas State Normal College (now W.T.S.C.) in Canyon for one year, Mr. Dodson joined the Navy in the fall of 1916. He spent one and a half years during World War II in the Navy and served on the U. S. S. Virginia. After being released from service he re-entered college at Canyon and went on to receive a B. S. degree in 1923.

Mr. Dodson taught school from 1923 until 1925 first in Northfield, Motley County, Texas, and then in Silverton, Briscoe County, Texas. At these schools he served as Principal, high school English teacher and football and basketball coach.

In 1925, our director left the teaching field for a period and went with the Nunn Electric Wholesale Company as manager of the wholesale branch in Amarillo, Texas. After one and one-half years he left and went to work for Amarillo Hardware Wholesale Company—there he stayed until 1931 when he married an instructor in the Art Department of West Texas State College in Canyon, Miss Jessie Mae Scott.

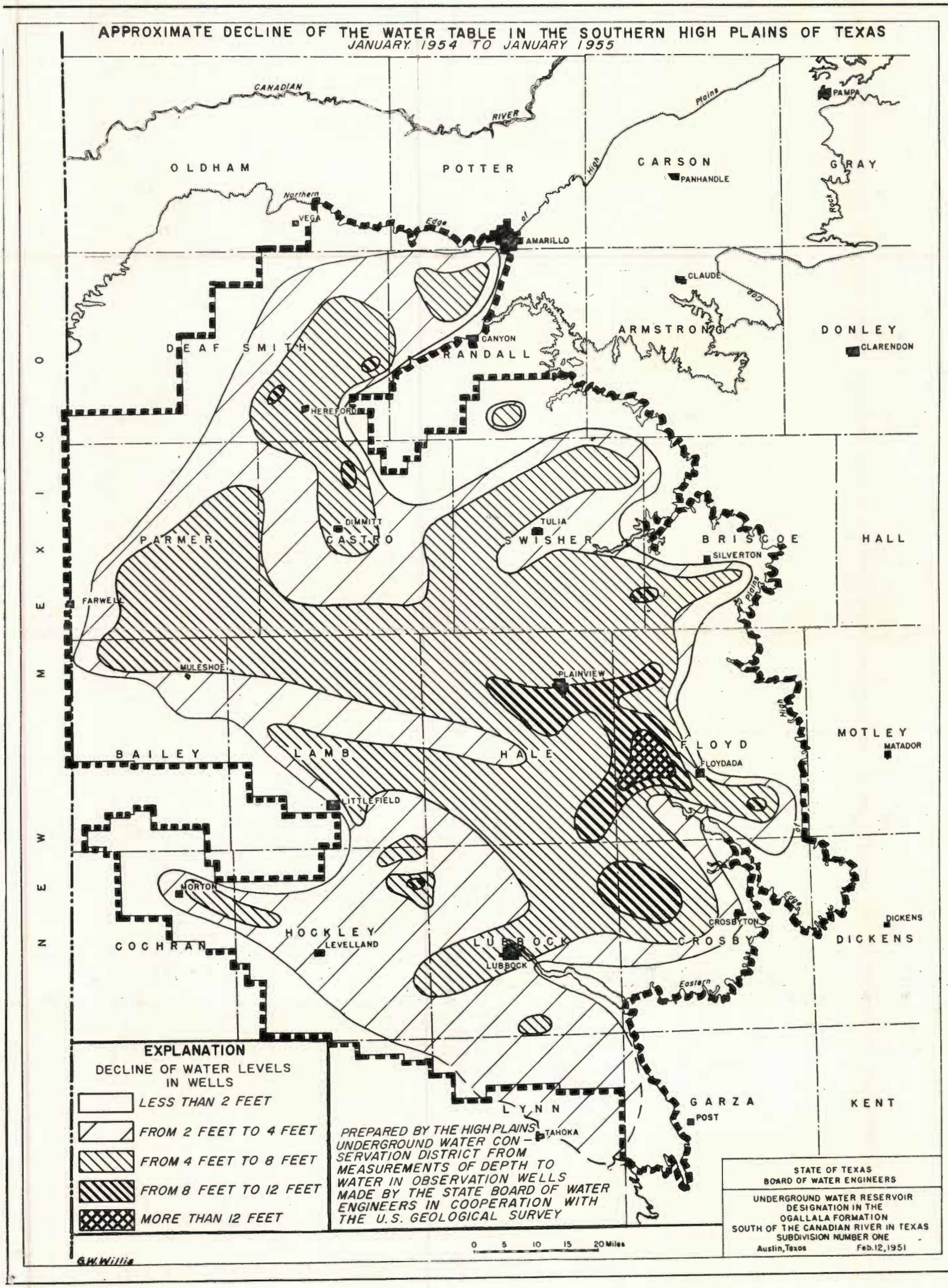
Mr. and Mrs. Dodson began teaching together at the Palo Duro school and the Jowell school in Randall County. They moved on to the Fairview school in Armstrong County and taught until moving to Deaf Smith County in 1936 and buying an irrigated farm northeast of Hereford. They later sold this farm and bought a half-section of land near-by. They live on this farm at the present time. Mr. Dodson has two irrigation wells and he likes to tell about the first well he ever drilled, back in 1936, for a complete cost of $1600.00, fully equipped. He used his farm tractor as the power unit for the pump in this well.

At present, Mr. Dodson is an Elder of the First Christian Church in Hereford and he teaches Adult Couples Sunday School class. He also serves on various church committees. He has been president of the Deaf Smith County Farm Bureau for about five years; also he is a director of Consumers Fuel and Oil Company and Hereford Grain Corp., both of Hereford. Mr. Dodson has served as chairman of the Hereford Chamber of Commerce Agricultural Committee and was on the Resolutions Committee of the Texas State Farm Bureau in 1954.

Mr. Dodson lets his wife take care of the hobbies. They usually take off during their summer vacation to some scenic spot where Mrs. Dodson paints and Mr. Dodson catches up on his relaxing.

The people of Precinct No. 4 have every reason to be proud of their representative for he has always voiced what he felt was and is their opinion on matters concerning conservation of our underground water.

"Next month, Precinct No. 3—Director Mr. W. M. Sherley, Lazbuddie, Texas."


APPROXIMATE DECLINE OF THE WATER TABLE IN THE SOUTHERN HIGH PLAINS OF TEXAS
JANUARY 1954 TO JANUARY 1955
CANADIAN RIVER
Northern Edge of High Plains
Rock
OLDHAM
POTTER
CARSON
GRAY
PAMPA
PANHANDLE
VEGA
AMARILLO
CLAUDE
DEAF SMITH
RANDALL
CANYON
ARMSTRONG
DONLEY
CLARENDON
HEREFORD
PARMER
CASTRO
DIMMITT
SWISHER
TULIA
BRISCOE
SILVERTON
HALL
FARWELL
MULESHOE
PLAINVIEW
BAILEY
LAMB
HALE
FLOYD
FLOYDADA
MOTLEY
MATADOR
LITTLEFIELD
MORTON
COCHRAN
HOCKLEY
LEVELLAND
LUBBOCK
CROSBY
CROSBYTON
DICKENS
LYNN
TAHOKA
GARZA
POST
KENT
NEW MEXICO
EXPLANATION
DECLINE OF WATER LEVELS IN WELLS
LESS THAN 2 FEET
FROM 2 FEET TO 4 FEET
FROM 4 FEET TO 8 FEET
FROM 8 FEET TO 12 FEET
MORE THAN 12 FEET
PREPARED BY THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT FROM MEASUREMENTS OF DEPTH TO WATER IN OBSERVATION WELLS MADE BY THE STATE BOARD OF WATER ENGINEERS IN COOPERATION WITH THE U.S. GEOLOGICAL SURVEY
0 5 10 15 20 Miles
G.W. Willis
STATE OF TEXAS
BOARD OF WATER ENGINEERS
UNDERGROUND WATER RESERVOIR DESIGNATION IN THE OGALLALA FORMATION SOUTH OF THE CANADIAN RIVER IN TEXAS
SUBDIVISION NUMBER ONE
Austin, Texas Feb. 12, 1951

LEGISLATIVE BRIEFS

With the closing days of the 54th Legislature coming into view, the water program still seems to be one of the most important projects undertaken this session. The problems are great and require many hours of Committee work and study particularly where the problem includes the financing of a program of several million dollars by a state tax. Several methods of financing have been suggested but to date no agreements have been reached.

* * * *

Senator Ottis E. Lock of Lufkin introduced SB 397 which is the twin to H.B. 404 introduced by Representative George Berry of Lubbock. These bills clarify and strengthen the Ground Water Law of Texas. The Senate Bill includes all the amendments passed by the Reclamation and Conservation Committee in the House. The Senate Bill received no opposition when a record vote was taken to allow its introduction.

Senator Kilmer Corbin refused to support Senate Bill 397 apparently unimpressed by the importance of the Bill to the irrigated portion of his District.

Senator Andy Rogers whose Senatorial District encompasses many counties in the High Plains Water Conservation District has spent considerable time and study of the Bill and has pledged his support to its passage. Senator Rogers stated that he could see where clarification of certain parts of the present law would be very beneficial. Senator Grady Hazelwood also has supported the Bill having two Conservation Districts in his Senatorial District.

* * * *

The House Oil, Gas and Mining Committee has been advised that H. B. 217 might endanger the entire regulatory power of the Railroad Commission. This bill would require gas companies to sell gas from their wells to farmers to run irrigation pumps on the land. Atty. Gen. Sheppard advised:

"In making the use of natural gas for irrigation pumps paramount to all other uses, and by repealing all statutes that may conflict with this use, the Legislature will perhaps be repealing the authority now vested in the Railroad Commission to regulate oil and gas production, insure ratable taking of oil and gas, and the authority to require to return natural gas to the production formation in order to increase the ultimate recovery of oil from such formation.

Representative Guy Hazlett, author of the bill, offered amendments to restrict the act to gas wells and to declare that there was no intent to damage authority of the Railroad Commission.

CONSERVATION CONVERSATION

We have been doing a lot of reading lately trying to gather some information on research and management of ground water in other sections of the United States. It amazed us to find how little is actually known about this precious resource. In fact, we saw a statement saying that there has been less money spent on study and research of ground water than any other natural resource.

There have been a lot of things about ground water research that haven't been too clear before and a lot of them aren't too clear yet, but more people have gone to work on research in ground water so in a few years we may begin to get some good information.

In appears that the complexity of the geological formations and their great variations in any one region will take a lot of studying. These studies must be made and made soon, particularly here in the High Plains, to change supposition to basic facts. Since underground water is concealed from public view it naturally has not aroused the interest that surface water has, so now we find ourselves beginning on a very important research project that should have been started several years ago.

Before agriculture began to make such heavy demands on underground water, very little research was carried out. Occasionally some municipality or industry might interest its State in setting up a two or three way cooperative program with the U. S. Geological Survey and do brief exploratory work and research on some small area, but as a whole very little is actually known about the underground water of the nation. Reconnaissance studies are available to explain the potentialities.

So we say again, before adequate management can be supplied many hours of research and study are necessary. The time to begin such studies is now, in fact in many areas it is getting late.

* * * *

TRADE

As we pay others, so we are paid.
Life gives us back just what we give;
And so, goodwill controls success,
But trade that we may truly live.
Sales may be made in money, yes.
But they are always made to men;
And so, goodwill controls success,
Bringing folks back to buy again.
He profits most whose every kindly thought
Serves to perpetuate the tale,
Of what and where and why he bought.

* * * *

The Conservation and use which we make of the water resources of our nation may in large measure determine our future progress and the standards of living of our citizens.

If we are to continue to advance agriculturally and industrially we must make the best use of every drip of water which falls on our soil or which can be extracted from the oceans.—President Eisenhower.

* * * *

The following measures are given for your information and future reference:

5 1/2 yards—1 Rod.
40 Rods—1 Furlong.
2 Furlongs—1 Mile.
3 Miles—1 League.
4 Rods—1 Chain.
1 Chain—66 Feet.
10 Square Chains or 160 Square Rods—1 Acre.
640 Acres—1 Square Mile.
1 Vara—33 1/3 Inches.

* * * *

We are having people come into our office quite often complaining about waste water getting on their land from neighbors wells and wanting us to do something about stopping it. We want to bring to our readers' attention the rules of the District pertaining to waste of water.

"Rule 1 (e)—Causing, suffering, or permitting underground water produced for irrigation to escape or to run into any river, creek, or other natural watercourse, depression, or lake, reservoir, drain, or into any sewer, street, highway, road, road ditch, or upon the land of any other person than the owner of such well, or upon public land, unless it be used for the purposes and in the manner in which it might be lawfully used on the premises of the owner of such well; (f) The willful, wanton, or habitual causing, suffering, or permitting underground water to escape from land being irrigated; Rule 2 — Underground water shall not be produced within or used within or without the boundaries of the District in such manner and under such conditions as to constitute waste."

Each person within our District should cooperate in an effort to keep this irrigation water upon the land from which it is produced. Every man that irrigates farm land knows that it is not right to let his water run all over another man's farm or to wash out a road. Besides being a financial loss to the one pumping water not being put to a useful purpose it is also a loss in most cases, to the one who is being flooded by the waste water and to the county in tax money for repairs to roads and ditches.

We do not have reference to a farmer whose irrigation ditch will occasionally break and water will escape into a lake or ditch—this will happen regardless of how carefully we watch our water and ditches. The ones who habitually waste water and make no pretense of formulating methods of taking care of their water are the ones that we are interested in.

We have farms in all sections of our Water District that are hard to irrigate, and most of the owners have made provisions to control their water.

Those who continue to waste water and make no effort to control it are admitting that the man who does have a control method working is a better farmer than he is. It is doubtful that the man who wastes water would admit even to himself that anyone could do something pertaining to farming that he could not do just as well, but for all practical purposes that is what he is doing.

If you have not been doing your best to control your water and it has been getting in the road or on your neighbor's land, please make an honest effort to put a stop to it.

You will undoubtedly have need for the following table, in determining how much more water one size pipe will carry than another size.

RELATIVE DISCHARGING CAPACITIES OF PIPES FLOWING FULL

Diam in Ins.	DIAMETER IN INCHES 1	2	3	4	5	6	8	10	12	14	15	16
16			65.77	32.01	18.31	11.60	5.65	3.23	2.05	1.39	1.17	1.
15	871.40	152.46	56.80	27.23	15.60	9.88	4.81	2.41	1.75	1.18	1.	
14	733.40	129.80	47.14	22.94	13.15	8.32	4.05	2.32	1.47	1.		
12	498.80	88.28	32.05	15.60	8.93	5.65	2.75	1.57	1.			
10	316.20	55.96	20.31	9.88	5.66	3.58	1.74	1.				
8	181.00	32.03	11.63	5.66	3.24	2.05	1.					
6	88.18	15.61	5.66	2.75	1.58	1.						
5	55.90	9.89	3.58	1.75	1.							
4	32.00	5.66	2.05	1.								
3	15.59	2.75	1.									
2	5.65	1.										
1	1.											

NOTE: This table is based on the well-known hydraulic law that the quantity of water carried by pipes of the same length and smoothness of surface, with a given loss of pressure, varies as the square roots of the fifth power of the diameters. The columns show how many pipes of the sizes printed at the top are equivalent to one pipe of the size in the first column. Thus, for example, we may answer the question, "How much water will an eight-inch pipe carry as compared with a six-inch, with the same loss of pressure?" Follow down the first column to 8; then, to the right under column headed 6, we find 2.05, which shows us that an eight-inch pipe will carry 2.05 times as much as a six-inch; or, in other words, an eight-inch pipe is a little better than two six-inch pipes.

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

Second Class Permit

Mr. Z. O. Lincoln
913 Houston
Levelland, Texas

THE Cross SECTION

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

Vol. 1 — No. 11 "THERE IS NO SUBSTITUTE FOR WATER" May 1955

WHEN TO IRRIGATE

Some day Texas Farmers may be able to find out when and how much to irrigate by turning on a radio or television set, just as they tune in for market and weather information now.

And for some large areas where weather, soil types and cropping practices are similar, the day when this badly needed service will be offered may not be far off.

For the idea is not a pipe dream. For many years, in parts of the British Isles and Europe, farmers have received such information over radio.

The riddle of when and how much to irrigate ties in closely with what is considered the Number I irrigation problem in Texas—that of water supply . . . And this when-to-irrigate question is being asked by more and more farmers every day as irrigation spreads into areas where it has never been practiced before.

When to turn on that valve, how long to leave it open—those are tough irrigation problems.

For the answers to the question, producers now at least have a direction in which to look, and the comfort that progress is being recorded. At Texas A and M College, the U. S. Department of Agriculture and the Agronomy Department of the college have a research project going which is bringing the answers closer.

In fact, the man in charge of the project, Dr. E. R. Lemon, believes the time is near when the service could be given a try, say in the South Plains cotton area where so many farmers plant at the same time and where soil type and weather conditions are so similar.

How, the producer may ask, can such information be obtained? Aren't there too many variable factors?

True, there are many factors. But in the project, Dr. Lemon and his coworker L. E. Satterwhite, are attempting to put all these factors into a formula which, when worked, will answer the when-to-irrigate question.

(Continued on Page 4)

Statistics For April

During the month of April, 548 completed wells were registered with the District office and 349 permits were issued by the County Committees. These new permits issued and completed wells follow by county:

COUNTY	Completed Wells	Permits Issued
Armstrong	3	2
Bailey	48	31
Castro	52	52
Cochran	33	26
Deaf Smith	23	25
Floyd	43	40
Hockley	72	38
Lamb	45	10
Lubbock	94	60
Lynn	47	17
Parmer	82	36
Potter	1	1
Randall	5	11

INTERFERENCE BETWEEN WELLS IN THE HIGH PLAINS

By W. L. BROADHURST

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 is expressed in feet below the land surface. In other words, static water level means water at rest or in equilibrium.

W. L. Broadhurst

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 withdrawal 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 yeild 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 State Board of Water Engineers 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,

(Continued on Page 3)

THE Cross SECTION

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ALLAN WHITE
Editor

W. M. SHERLEY

This is the last in our series of articles designed to introduce the Directors of the High Plains Underground Water Conservation District to our readers. This month we present to you Mr. W. M. Sherley, Director, Precinct 3.

Mr. W. M. Sherley, of Lazbuddy in Parmer County, is the newest member our HPUWCD Board of Directors, serving his first term and representing t people of Precinct No. 3, which is made up of Bailey, Castro and Parmer Co ties. Mr. Sherley took office this February, replacing Mr. Willis Hawkins Hart in Castro County. Mr. Sherley serves as Vice-President of the Board.

Mr. Sherley was born to Mr. and Mrs. A. Sherley on April 16, 1899 at An Collin County, Texas. He has one sister, who lives in Anna at the pres time, as does his mother. Mr. Sherley's father was a farmer and merchant.

After having finished high school in Anna, Mr. Sherley attended Te Christian University in Fort Worth. While there, he managed the ann yearbook and was business manager of the football team. He finished in 1 and received a B. B. A. degree in business administration.

Upon the completion of his formal education, Mr. Sherley moved to L buddy and began dry-land farming on a place that he had bought.

It was during 1935 when Miss Roberta Rosamond of Anna became Sherley's wife, and made a home with him in Lazbuddy. They have b blessed by a daughter, Rosamond, and a boy, Billy Bob. Billy Bob, who is years old, attends grade school and Rosamond has attended Radford Sch for Girls in El Paso and Christian College in Columbus, Missouri.

During 1942, Mr. Sherley entered the grain business in Anna and la built grain elevators in Bovina, Lariat and Farwell.

During 1955 he has helped to organize a temporary committee of Gr SorghumGrowers in Texas, Oklahoma, Kansas, Colorado and New Mexico. also represented them at a hearing before government agricultural offic in Washington, D. C. this spring. He has also served in years past on A committees of Parmer County.

Mr. Sherley was appointed to the Board of Trustees at T. C. U. in 1 and is serving in that capacity at the present time. He also is Chairman the T. C. U. Athletic Committee. He is Chairman of the Parmer County Sch Board and has served at different times on the Lazbuddy School Board.

During 1950, Mr. Sherley drilled the first irrigation well on his land Parmer County. Now, he has eleven wells on seven sections of land. A Mr. Sherley has farms in Collin and Grayson Counties and some timber l in Bowie County.

For relaxation Mr. Sherley enjoys hunting and fishing and attending sp events. He goes deer hunting each year and never misses a T. C. U. home f ball game. Of course, he also enjoys relaxing and doing things with his fam

The Sherley family belongs to the First Christian Church of Anna. Ther no Christian Church in Lazbuddy, but Mr. Sherley has helped in organi one in Muleshoe.

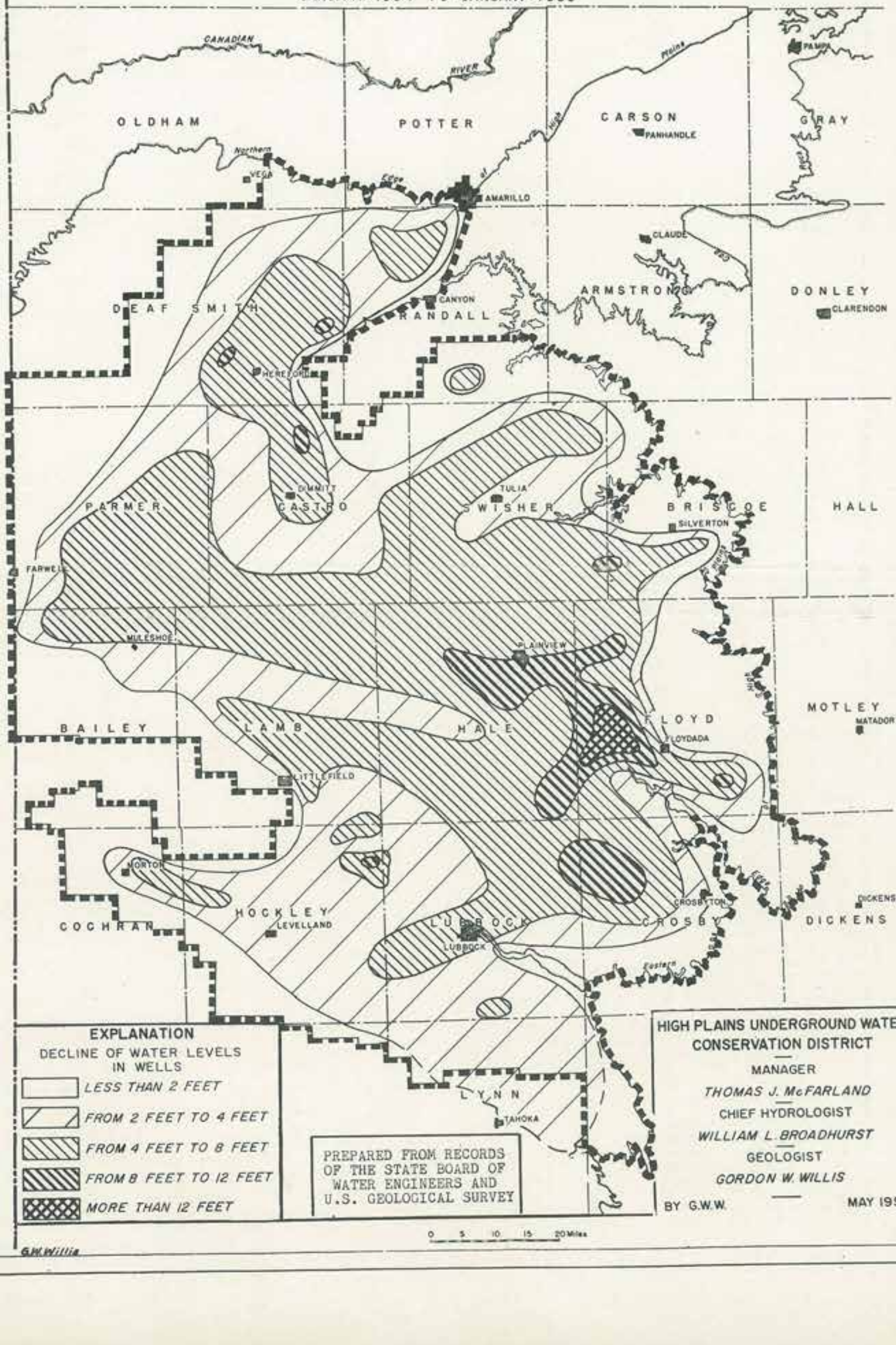
The people from our Precinct No. 3 can be proud of their elected re sentative to the Board of Directors. He not only knows and understands problems of the High Plains farmer, but he also is very influential with re sentatives of agriculture in the State and Federal governments.

When you consider a comparison between a Board of Directors made u men like Mr. Sherley who has spent his business life in West Texas with W Texans, against one made up of persons from other localities—such as w be the case if we had state ownership and control of the underground wate then you can reach only one decision. That decision is one of being proud we have a chance to prove to others that the locally-controlled water dist is the best way in which to meet and overcome our problems of conserving most vital natural resource—underground water.

We are proud to have Mr. W. M. Sherley of Lazbuddy helping us to o come these problems as they arise.

APPROXIMATE DECLINE OF THE WATER TABLE IN THE SOUTHERN HIGH PLAINS OF TEXAS

JANUARY 1954 TO JANUARY 1955



EXPLANATION

DECLINE OF WATER LEVELS IN WELLS

- *LESS THAN 2 FEET*
- *FROM 2 FEET TO 4 FEET*
- *FROM 4 FEET TO 8 FEET*
- *FROM 8 FEET TO 12 FEET*
- *MORE THAN 12 FEET*

PREPARED FROM RECORDS OF THE STATE BOARD OF WATER ENGINEERS AND U.S. GEOLOGICAL SURVEY

0 5 10 15 20 Miles

G.W. Willis

HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT

MANAGER

THOMAS J. McFARLAND

CHIEF HYDROLOGIST

WILLIAM L. BROADHURST

GEOLOGIST

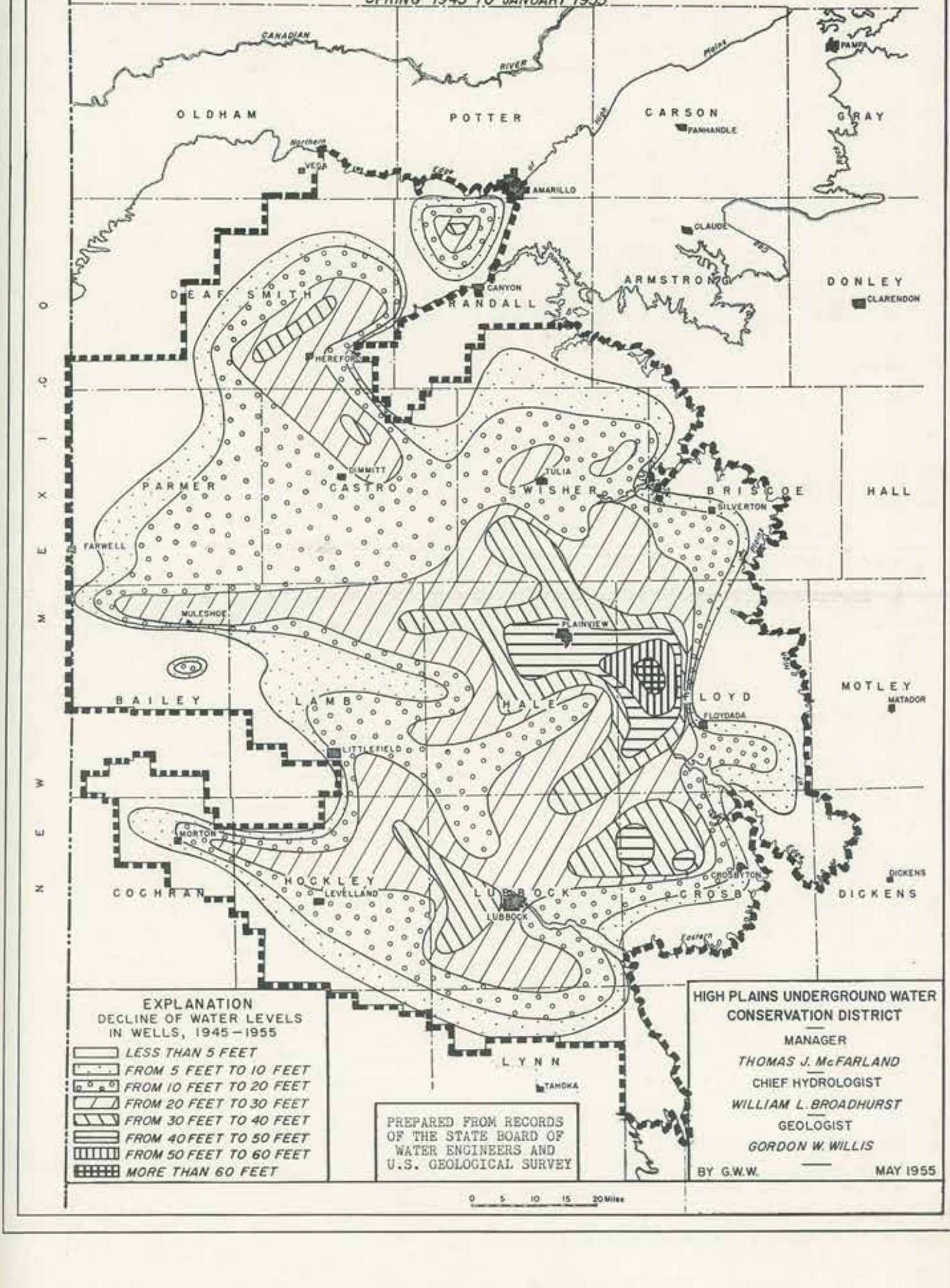
GORDON W. WILLIS

BY G.W.W.

MAY 1955

APPROXIMATE DECLINE OF THE WATER TABLE IN THE SOUTHERN HIGH PLAINS OF TEXAS

SPRING 1945 TO JANUARY 1955



Interference Between Wells In The High Plains—

(Continued from Page 1)

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 an 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.

An example of the interference between wells is illustrated in figures 1 and 2. The illustrations were compiled from information that was obtained from an actual test which was made by the Water District.

Figures 1 and 2 represent a cross section extending from the land surface down to the bottom of the water-bearing sands along a line through wells A and B. Line number 1 represents the land surface. The difference in surface elevation between the two wells is less than one inch. Line number 2 represents the static water level through wells A and B while the pumps were idle.

During the interference test, several separate steps were followed. First, the pump in well A was started, and, although because of mechanical and ditch trouble the pump was off a few times for short periods, for all practical purposes it can be reported that pump A was operated continuously for 24 hours and delivered an average of about 800 gallons a minute. At the end of the first 24-hour period, the drawdown in well A was 55 feet. The static water level—110 feet—plus the drawdown—55 feet—made a pumping level of 165 feet. During the first 24-hour period well B was idle but the drawdown in well B caused by pumping well A was 15 feet. In other words, the water level in well B was drawn down from 110 feet to 125 as a result of the interference caused by the pumping of well A. (See line 3 in figure 1).

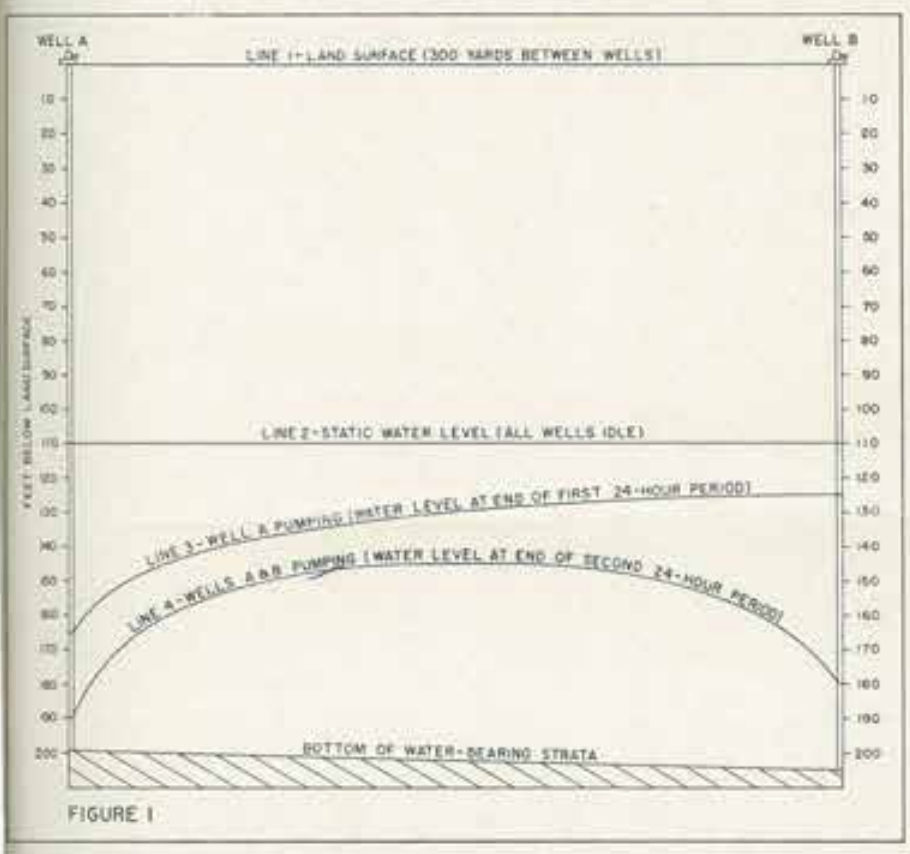


FIGURE 1

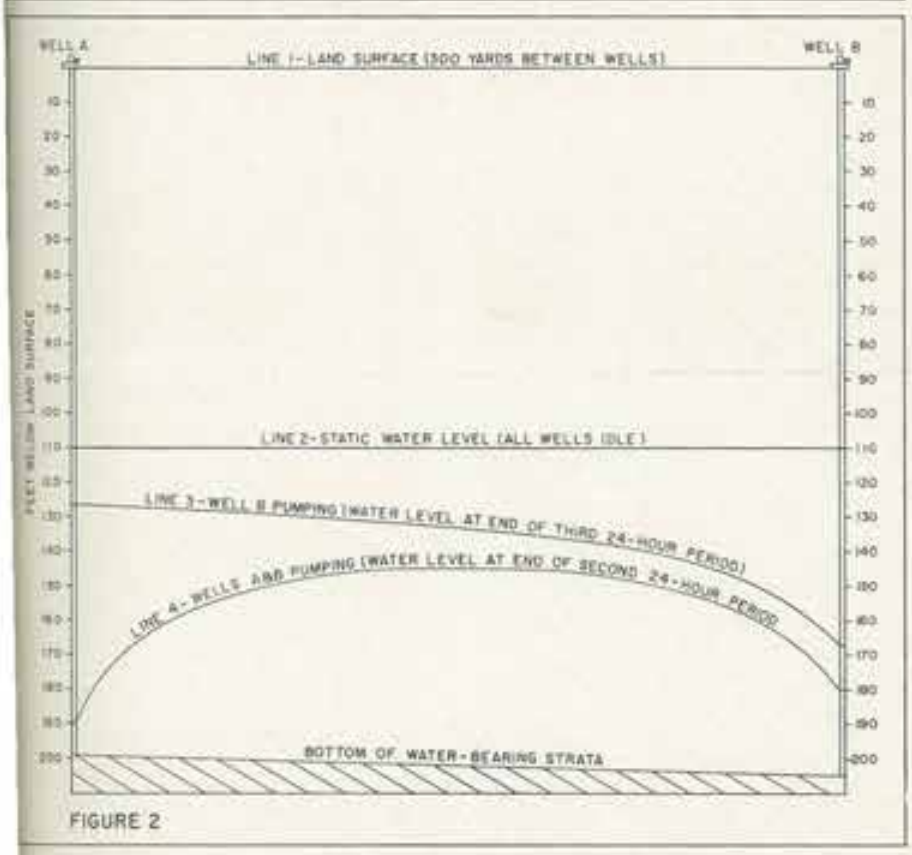


FIGURE 2

During the second step of the test, pumps A and B were both operated for a period of 24 hours. Well B delivered an average of about 820 gallons a minute and at the end of the second 24-hour period the drawdown in well B caused by its own pumping was 55 feet. The static level—110 feet—plus the drawdown caused by well A—15 feet—plus the drawdown caused by the pumping from well B—55 feet—made a pumping level of 180 feet. After well B had been pumped only 5 hours the interference was sufficient to cause the pump in well A to break suction. During the remainder of the second step the speed of pump A was decreased so that the pump continued to deliver water but at a smaller yield in gallons per minute. (See line 4).

During the third step pump A was shut off but pump B continued operating at the same speed. At the end of the third 24-hour period the pumping level in well B had risen from 180 feet to 167 feet and the yield had increased from 820 to 880 gallons per minute. During the same 24-hour period the water level in well A rose to 127 feet. (See line 5 in figure 2).

The results of the above interference test show conclusively that two wells, which were spaced only 300 yards apart, could not be operated simultaneously for any appreciable length of time at a rate of 800 gallons per minute each. Furthermore during the period while the test was being made, no other well in the vicinity was being operated. During the regular irrigation season these two wells unquestionably will be affected somewhat by interference of other nearby 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 localities 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.

Write For Subscription

If you are not on our list of subscribers and would like to get THE CROSS SECTION, then write us, giving your name and mailing address. There is no cost for receiving it each month.

JOURNAL ITEM NOTED

In thumbing through the Southwest Water Works Journal under "Letters to the Editor" column we came across an interesting item—as follows:

"Sir: I wish to commend you on your 'Know Your Neighbor' policy. I believe it will create more interest in your JOURNAL, and more people will read it. With this thought in mind, I want to tell you about our troubles and I believe you will find many more water systems are having or will have in the near future this same experience.

The people of Galveston and adjoining counties, are somewhat alarmed about the ground water resources. We are troubled with static levels dropping at a very rapid rate each year, part of which we believe is caused from high rates of irrigation well pumping and the demand for more water caused by our dry years.

We feel that something should be done to conserve our ground water, as we all know that our small districts and towns are not able to treat surface water for human consumption. We believe now is the time to educate the public as to the seriousness of conserving our ground water. One man or one community cannot do this, it will take time and lots of hard work by everyone connected with water systems throughout the whole country.

We, in this area, are now working towards forming some sort of group of people to see what can be done to conserve our ground water. We are open for any ideas or suggestions.—H. D. WINKLER, Supt.
Galveston County WC&ID No. 1
Dickinson, Texas."

Since we have had our own High Plains Water District operating for over two years, under a state statute that allows the creation of locally controlled water conservation districts, it is rather startling to us that interested people in our own state like Mr. Winkler do not know that there is a state law under which they can create water conservation districts and through which they can control the drilling of wells and conserve the underground water.

If the people in Mr. Winkler's area desire to ban together in a common effort to conserve their water they should petition the Texas State Board of Water Engineers, asking that they designate the underground water reservoir. When this designation is made then the people within the delineation vote whether or not they want to create, and participate in, a water district and begin a conservation program.

Texas definitely has not let its people down where underground water conservation is concerned. Our lawmakers have given us the means by which we can control our own problems—if we do not take advantage of their established method then it is our own fault. The High Plains people have recognized their need and are doing something about it—Mr. Winkler and his South Texas people have the same law to operate under, if they so desire.

Please Close Those Abandoned Wells!!!

When To Irrigate—

(Continued from Page 1)

For a long time scientists have attempted to put such a formula together, and with some success. Several different such formulas now exist which have been workable in various parts of the world.

Lemon and Satterwhite are at the job of adapting one of the formulas to fit Texas conditions. It's a formula worked out by an English soil scientist, H. L. Penman, and it comes closest to working in this state.

Dr. Lemon can state the project's very difficult objectives in a very simple way. The problem is like a barrel, he says. If you know how much water a barrel holds, and if you know how fast the water is running out of the barrel, it's easy to figure out when and how much water to put in to keep the barrel at the desired level.

Irrigation would be nearly as simple if the same things were known about the soil. That is, if a farmer could start the season with soil "full", to the desired level: if he knew how fast the soil was giving up moisture; if he knew exactly how much irrigation water he was putting on—then he would have the problem licked.

Among these "if's", the one getting the most attention from Lemon and Satterwhite is the one which involves the drying out of the soil. This is where their formula has given them trouble. The main factors figuring into the problem are sunlight, windspeed, relative humidity and soil temperature. Such things as rainfall, stage of crop development and various soil factors must be considered.

At this point, the producer may throw up his hands and say you will never catch him trying to figure out all that business. And that's just the point. If a workable formula can be arrived at, he won't have to. In fact, if and when the problem is whipped, a producer will probably never hear a statement of the formula or see how it is worked out mathematically. That would be done by the people offering the service, who would then advise that so much water is needed on a given crop and when.

Dr. Lemon demonstrates equipment used in project to measure soil temperature.

What, then, would a producer have to know to take advantage of the service? If he were to get the most out of it, he would at least have to know how much water he is putting out in order to follow recommendations. And this should probably be figured on something more dependable than estimating well capacity.

Who is to offer this service? There are several possibilities. It could be a government service, similar to market and weather reports. The agricultural press, radio and television would doubtless jump at the opportunity to give out such information.

The area in which a given set of irrigation recommendations would be effective would depend, of course, on the similarity of conditions through the area. This is why Dr. Lemon looks to the South Plains as the area where he'd like to see the service first t

As for areas with more varied ditions, Lemon and Satterwhite confident that one day the neces progress will be made to offer a rigation areas some help.

Reprinted from the March, 19 sue of the "Humble Farm Famil

Pre-planting irrigation. First trick in learning when to irrigate will be to know at season's start that soil holds optimum moisture level, then determine dry-out rate.

Conservation Conversation

We have read in a recent issue of one of the many trade journals that comes across our desk the following item:

"The ground-water laws of New Mexico regulate well drilling and the use of its water resources. However, wells can be drilled without limit just over the state line in Texas, since Texas has no effective law to control ground-water use. New Mexico claims the Texas wells are draining much water from the water-bearing formations in New Mexico and that something ought to be done about it. There have been suggestions from some that New Mexico ought to start legal action unless Texas remedies the situation. This argument points up only one of the many complications in ground-water control."

Since when is Texas and its people doing nothing about their underground water and the problems of its control. Our state legislature has given the people a law under which they can create a water conservation district and through this district control the drilling of wells. We, of the High Plains area—with exception of a few counties that see no need in doing anything at all about underground water conservation—have taken advantage of the legislature's effort in supplying the means and are practicing water conservation.

LETTERS TO THE EDITOR

We have received a letter t month from an interested read which we will try to answer. Also, want to urge you to write us sta any question or questions that want answered. We will try our be

The Editor,

I read your article in the A "Cross Section" telling about your ginning a "Letter to the Editor" umn. Well I have a question—I come there were more complet wells last month than permits issu

Thank you,

J. L. Smith

Route 5, Lubbock, Te

Thank you Mr. Smith for your le and this question.

During the month our County C mitteemen issue well drilling perm to applicants in their respective co ties. These permits are good for days from date of approval. Co quently, a permit might be issued month and the well perhaps not drilled until a later month. Since well is not necessarily completed ing the month the drilling permi approved, we can either have m completed wells than permits iss during any given month, or fe completed wells than permits iss

—Editor.

FRICTION LOSS IN CONCRETE IRRIGATION PIPE IN FEET PER 1,000 FEET

FLOW Gallons Per Minute	PIPE DIAMETER IN INCHES												
	6	8	10	12	14	15	16	18	20	21	24	30	3
135	2.8	0.6											
180	4.6	1.0	0.3										
225	7.2	1.6	0.5										
270	10.4	2.3	0.7	0.3									
315	14.0	3.2	1.0	0.4									
405	23.4	5.2	1.6	0.6	0.3								
449	28.8	6.4	2.0	0.8	0.4	0.2							
539	42.0	9.2	2.8	1.1	0.5	0.3	0.2						
628	56.0	12.5	3.9	1.5	0.7	0.5	0.3						
718	74.0	16.3	5.1	2.0	0.8	0.6	0.4	0.2					
808	93.0	20.7	6.5	2.4	1.1	0.8	0.5	0.3					
898	115.0	25.4	8.0	3.0	1.4	0.9	0.7	0.4	0.2				
987	140.0	30.8	9.5	3.7	1.6	1.1	0.8	0.4	0.3				
1077	165.0	36.5	11.4	4.4	1.9	1.3	1.0	0.5	0.3	0.2			
1167		43.0	13.3	5.1	2.3	1.6	1.1	0.6	0.4	0.3			
1257		50.0	15.5	5.9	2.6	1.8	1.3	0.7	0.4	0.3			
1346		57.5	17.8	6.8	3.0	2.1	1.5	0.8	0.5	0.4	0.2		
1436		65.3	20.2	7.7	3.4	2.4	1.7	0.9	0.5	0.4	0.2		
1526		73.5	22.8	8.8	3.9	2.7	1.9	1.0	0.6	0.5	0.2		
1616		82.5	25.6	9.8	4.4	3.0	2.2	1.2	0.7	0.5	0.3		
1706		92.2	28.5	10.8	4.9	3.4	2.4	1.3	0.8	0.6	0.3		
1795			31.5	12.2	5.4	3.8	2.7	1.5	0.9	0.6	0.3		
2020			39.7	15.3	6.8	4.7	3.4	1.9	1.1	0.8	0.4		
2244			48.1	18.8	8.4	5.9	4.2	2.3	1.3	1.0	0.5		
2469			59.6	22.6	10.2	7.1	5.0	2.7	1.6	1.2	0.6		
2693			70.7	27.1	12.1	8.4	6.0	3.2	1.9	1.4	0.7		
2917			82.7	31.8	14.2	9.9	7.1	3.8	2.2	1.7	0.8		
3142				36.9	16.5	11.5	8.2	4.4	2.5	2.0	1.0	0.2	
3366				42.2	18.9	13.2	9.4	5.1	2.9	2.3	1.1	0.4	
3591				48.2	21.5	15.0	10.7	5.8	3.3	2.6	1.3	0.4	
3815				54.4	24.3	16.9	12.1	6.5	3.7	2.9	1.4	0.5	
4039				61.0	27.2	19.0	13.5	7.3	4.2	3.3	1.5	0.5	
4264				68.0	30.3	21.1	15.1	8.2	4.7	3.6	1.8	0.6	

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

Second Class P

THE Cross SECTION

INDUSTRIAL AGRICULTURAL MUNICIPAL

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

Vol 1 — No. 12 "THERE IS NO SUBSTITUTE FOR WATER" *June 1955*

Rains Activate Recharge Experiment

By WILLIAM L. BROADHURST and GORDON W. WILLIS

Recharge or the replenishment of the underground water reservoir is one of the problems under study by the High Plains Underground Water Conservation District. The Water District has two recharge projects, one in Floyd County, 5 miles east of Petersburg on the Allmon farm and one in Lynn County, 4 miles west and 1 1/2 miles south of New Home.

The project in Floyd County is on a lake that lies just south of the Allmon Gin at the old Allmon School. The lake covers an area of about 40 acres, and the drainage area around the lake contains 475 acres. A topographic map of the lake bed was made by the Water District in order to establish a rating curve so that the volume of water in the lake can be determined at any time by measuring the depth of the water.

In October 1953 a well was drilled near the north edge of the lake to a depth of 377 feet. It was cased from top to bottom with 12-inch gas line casing, perforated with half-inch slots from 130 feet to the bottom. A pump was installed and the well was developed by pumping approximately 1,000 gallons a minute for several days. A pit 30 feet wide, 100 feet long, and 8 feet deep was dug around the well and the dirt was used to build a dam between the pit and the lake. An 18-inch concrete line, equipped with a 15-inch valve on the lake end and a flow meter on the pit end, was installed through the dam. Concrete was poured around the casing in the bottom of the pit and the casing was perforated from the concrete to the top. See plate 1.

The rain that fell on June 2, 1955, amounted to 2.6 inches on the watershed of the lake and the runoff to the lake was 52 acre-feet. The water stood in the lake about 30 hours to allow the heavier particles of silt to settle before the recharge experiment was started.

At 10:30 Saturday morning, June 4, the the valve was opened and water flowed from the lake into the pit surrounding the well and then through perforations in the upper part of the casing into the well.

During the first 30 minutes after the valve was opened, several thousand gallons a minute flowed past the meter from the lake and filled the pit to the same level as the water in the lake. See plate 2. As soon as the

(Continued on Page 3)

Gov. Signs H. B. 404

Gov. Allan Shivers, at 3:00 P. M. June 22nd, signed into law H. B. 404 which was passed by this 54th session of the Texas State Legislature.

The bill was introduced in the House of Representatives by the Hon. George Berry of Lubbock and will serve to strengthen the ground-water laws of Texas, as they pertain to underground water conservation districts.

The bill, in its entirety, will be published in The Cross Section next month.

Conference Attended

Representatives of the High Plains Water Conservation District attended the Water Laws Conference sponsored by the University of Texas Law School in Austin on June 17 and 18.

The program, including talks and discussions on ground water laws and ownership of ground water was very interesting.

Mr. Victor Bouldin, Houston attorney, discussed the right in ownership of diffused surface water or water that falls on the land before it forms into channels, lakes, etc.

Mr. Alex Pope, Jr., attorney from Fort Worth, discussed the work of the 54th Texas Legislature. He pointed out that 178 water bills were introduced in the session and that very few were passed.

The Honorable Will Wilson of the Texas Supreme Court and Dean A. A. White of the School of Law of the University of Houston presented a very interesting discussion on the Motl V. Boyd case which deals with riparian right.

Trends in the statutory law of ground water in the western states was a high light of the program. Mr. Wells A. Hutchins of the U. S. Department of Agricultural Research of Berkeley, California, author of several books and papers on ground water law, discussed and compared various state laws of the 17 western states.

Mr. Hutchins pointed out that few states still recognize ownership by an individual of the water beneath his land. In most states ground water is considered as public property and is so administered.

Mr. Joe R. Greenhill, attorney of Austin, and Mr. A. P. Duggan, attorney from Littlefield, followed Mr. Hutchins on the program with a discussion on rights in ground water in Texas. Mr. Greenhill discussed briefly several Texas cases dealing with the protection of ownership of ground water. Mr. Duggan presented a paper on the establishment of ground water districts under present state statutes and the relationship of state and federal projects.

Three panel discussions proved of great interest to members of the conference. The discussions were focussed on "Rights on Ground Water in Texas," "Problems in Pollution, Litigation and Control," and "Specific Bill of 54th Legislature."

Mr. John D. McCall, noted Dallas attorney, and Mr. Willard W. Gatchell of the Federal Power Commission, Washington, D. C., were the principal speakers on the program Saturday morning.

Conferences of this nature are proving to be very helpful to the people of Texas in discussing together the problems of legal rights and conservation of the water of the State of Texas.

Hydrologist Appears on Television Program

W. L. (Bill) Broadhurst, Chief Hydrologist for the HPUWCD, pictured with Dave Sherrill, Lubbock County Agent, is explaining to his television audience how a series of maps showing the thickness of the water-bearing strata in individual counties of the Southern High Plains is being prepared. These maps are being prepared by the Water District's Geologist, G. W. Willis, using information taken from the well logs that have been required in completing each drilling permit issued by the Water District's County Committees.

Studies of this type are invaluable to the High Plains people in formulating future plans for the further conservation of their underground water. By using the information that is being required of each individual who drills a well within the Water District, we can determine, approximately, the amount of water under our lands, how long it can be expected to last, at present rate of pumpage, and the thickness of the water-bearing materials. These facts have been unknown too long.

The Water District's personnel is attempting to convey to the people all the practical and technical information on hand, through television appearances on programs such as Mr. Sherrill's series "Plains Talk" presented by KDUB-TV at Lubbock, in newspaper articles, speeches and on radio programs.

Educating and informing a person is the most satisfactory method of interesting that person in a program of conservation, and it is our desire to have each individual conscious of water conservation.

Bill Broadhurst, left, pictured with Dave Sherrill, Lubbock County Agent, explains a map to the television audience.

THE Cross SECTION

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

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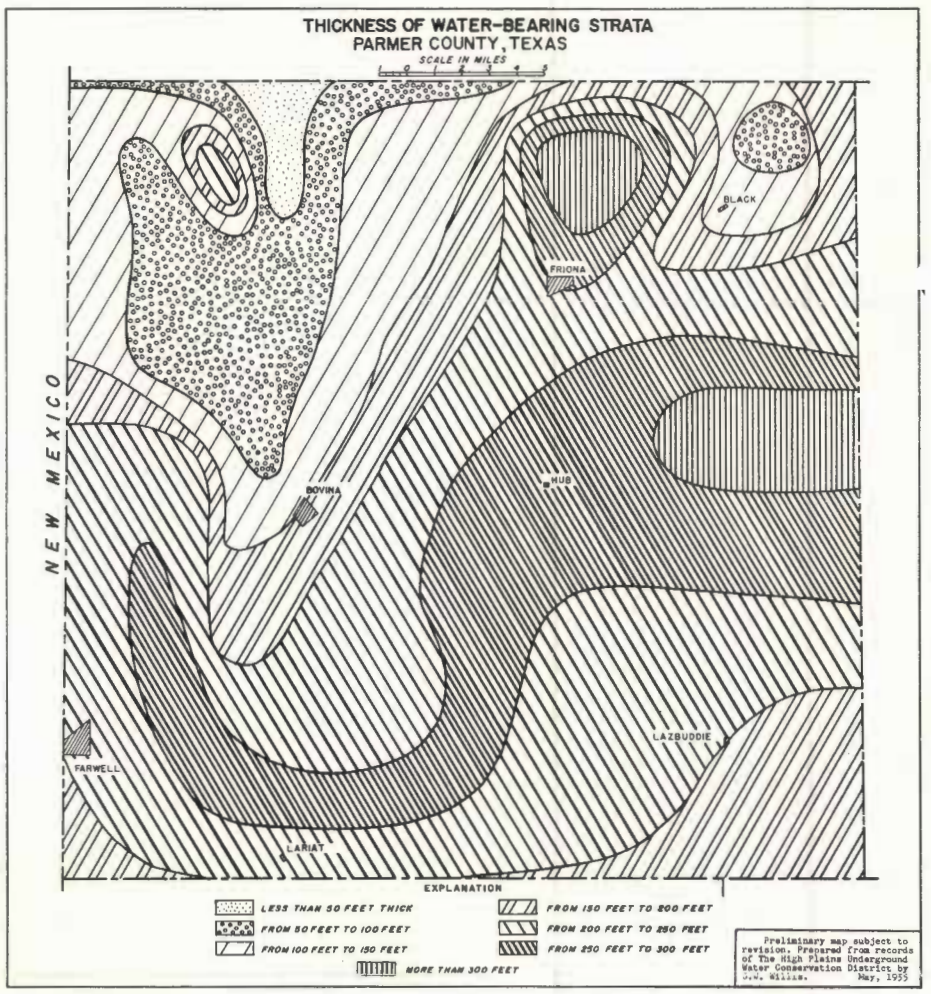
ALLAN WHITE
Editor

DISTRICT INVENTORIES WATER IN STORAGE



The accompanying map of Parmer County shows the thickness of the water-bearing strata between the water table and the top of the redbeds. The patterns on the map show the ranges of thickness of water-bearing strata throughout the county. The map and studies of this type are parts of the regular technical work in progress by the High Plains Underground Water Conservation District. This information was compiled by G. W. Willis, geologist with the Water District, from records of wells on file in the office of the Water District in Lubbock.

Parmer County contains approxilately 16,300,000 acre-feet of underground water in storage available for pumping.

The quantity of water available for pumping was determined by computing the total volume of water-bearing strata in the underground reservoir in Parmer County and multiplying this total by the coefficient of storage of 15 percent. This figure of 15 percent for the coefficient of storage was determined from studies made by the Texas Board of Water Engineers in cooperation with the U. S. Geological Survey. Subsequent studies indicate that this figure is reasonably accurate in the Southern High Plains when applied as an average for all of the water-bearing strata, including the fine-grained clay and sandy clay as well as the coarser-grained sand and gravel.

The approximate quantity of underground water in storage, available for pumping, beneath an individual farm may be determined by multiplying the number of acres in the farm by the thickness of the water-bearing strata underlying the farm and then multiplying by the storage coefficient of 15 percent. Suppose the farm consists of 320 acres and has 200 feet of water-bearing strata underlying it, then 320 acres x 200 feet x 0.15 equals 9,600 acre-feet of water available for pumping. An acre-foot of water is the quantity required to cover one acre to a depth of one foot, and it is also equal to 43,560 cubic feet or 325,829 gallons.

An individual may use this information to determine, within reasonable limits, how long the quantity of underground water in storage beneath his farm will last. If he knows the thickness of the water-bearing strata and will keep records of the annual withdrawal and annual change of the water table, he can compute the approximate number of years his supply of underground water will last at any annual rate of withdrawal. This assumes, of course, that his neighbors pump a comparable amount of water per acre on their farms.

The map and the information concerning the quantity of water storage will be revised from time to time as additional information becomes available. Similar maps and information will be prepared, as rapidly as practicable, for all the counties within the Water District.

Please Close Those Abandoned Wells!!!

HYDROLOGIC ASPECTS OF GROUND WATER LAW

By THAD G. McLAUGHLIN

A paper presented on Nov. 9, 1954, at the Rocky Mountain Section Meeting, Colorado Springs, Colo., by Thad G. McLaughlin, District Geologist, Ground Water Branch, Water Resources Div., U. S. Geological Survey, Denver, Colo. Publication authorized by the Director, US Geological Survey. Reprinted from May, 1955 edition of American Water Works Journal.

In order to discuss the subject of ground water legislation with maximum competence, one would have to be trained thoroughly in both ground water hydrology and law. As the author is a ground water hydrologist with a limited knowledge of law, this article will be largely devoted to the technical features of ground water legislation.

At least a part of the difficulty in interpreting and enforcing ground water legislation is inherent in the various archaic and arbitrary legal classifications of ground water. The lawyers and the courts are not to blame for this situation, because hydrologists until recent years have not been able to evolve clear classifications. A distinguished water litigation attorney has advised the author, however, that some of the legal classifications of ground water are supported by such weighty judicial precedent that they must continue to be used, even though contradictory to fact.

Definitions taken from two judicial decisions will illustrate the problems involved. One court defined percolating water as "vagrant wandering drops moving by gravity in any and every direction along the line of least resistance." Another court stated: "The physical laws governing underground water and its subterranean progress (are) irregular and unknowable with certainty, and such water (is) changeable and uncontrollable in character (and) subject to secret and incomprehensible influences."

Ground water has been divided into many legal classes, including underground rivers, underground lakes, percolating water, diffused water, defined underground channels, and springs. The author does not know what is meant by these different classes and seriously doubts that anyone else knows either. The first two terms, underground river and underground lake, date back to the period when the subject of ground water was somewhat of a mystery, and people speculated that ground water occurred in the form of rivers and lakes just like surface water. Actually, nearly all ground water is percolating water—that is, it moves by laminar flow—whereas most surface water moves much more rapidly, by turbulent flow. Ground water is controlled largely by geology, surface water by topography, and atmospheric water by temperature and pressure. Hence, it is nearly as logical to say "underground cloud" as it is to say "underground river" or "underground lake." Even in the rare limestone and volcanic-rock terranes where ground water does move in well defined channels, by turbulent flow, other factors may make the term "underground river" inapplicable.

The inaccurate legal classification of ground water is, in the author's opinion, the principal cause of the failure of many attempts to regulate ground water use. From a technical point of view, no attempt to set up different classes of ground water is justified. A single drop of water may at one time be percolating water and in a defined underground channel, may subsequently appear as diffused surface water or in a spring, or may even contribute to the base flow of a surface water-course; it is evident, therefore, that the legal classifications of ground water are unworkable.

Ground and Surface Waters

It is also problematical whether there should be a distinction between ground water and surface water. The terms ground water, surface water, and atmospheric water do not apply to permanent states of water but merely represents water at a particular stage of the hydrologic cycle. A single drop of rain falling to earth may move into a stream and become surface water. A short distance beyond, it may be lost through the stream channel to become ground water, and a short distance farther, it may return to the stream. There is a continual interchange of ground and surface water, and the base flow of nearly all perennial streams is maintained by the discharge of ground water. There does exist one fundamental difference between ground and surface water, however, which is important in ground water legislation; runoff in streams can be measured with some degree of accuracy, and when all the water in a stream is appropriated, the fact is obvious to everyone. The increment of the ground water supply, known as recharge, is roughly analogous to surface water runoff, but there is also the factor of storage, which is not involved in surface water under natural conditions. In many places, large quantities of ground water have been stored in underground reservoirs for periods of thousands of years. When pumpage is sizable, it brings up the question of whether the recharge alone is being withdrawn or whether the storage is being depleted. The problems faced by formulators of ground water legislation can best be illustrated by discussing situations in areas where detailed information is available.

Low-Recharge Storage

The High Plains area has little natural recharge. This region is underlain by the Ogallala formation, a very productive aquifer. It extends from the Black Hills of South Dakota to the southern part of the Texas Panhandle and includes parts of South Dakota, Nebraska, Wyoming, Colorado, Kansas, Oklahoma, New Mexico, and Texas. The area comprises about 156,000 sq. miles (about the size of California), and the underlying aquifer is believed to have in storage about two billion acre-feet of ground water.

The region is almost everywhere surrounded by land at lower elevations. Thus, ground water moves away from the plains, and the ground water source must be the precipitation within the Plains. This averages only about 20 in. a year, and only a very small percentage reached the water table, so that the recharge is very low. It is believed to range from less than 1/4 in. annually in parts of Texas and New Mexico to as much as 3 in. in part of the sand hills area of Colorado and Nebraska.

(Continued on Page 4)

RECHARGE EXPERIMENT—

(Continued from Page 1)

pit filled, water entered the well and flowed out in the sand below at the rate of 1,050 gallons a minute. As was expected, the rate of flow decreased and at 3:30 in the afternoon the flow was 835 gallons a minute. At 10:30 Saturday night, 12 hours after the start, the flow was 630 gallons a minute. At the end of the first 24 hours, the well had taken 964,000 gallons and was taking water at the rate of 540 gallons a minute.

At the end of 48 hours it had taken 1,675,000 gallons and was taking water at the rate of 483 gallons a minute; at the end of 72 hours the quantity that had entered the well was 2,317,500 gallons and the rate was 415 gallons a minute; and after eight days and nights, at 10:30 Sunday morning the well had taken in 4,200,000 gallons and was still taking water at the rate of about 200 gallons a minute. This quantity of water that is now stored in the sand beneath the ground and available for future pumping is equal to about 13 acre-feet and is sufficient to put 4 inches of water on 39 acres of land.

The recharge experiment is still in progress; however, as soon as possible after this first test is completed a detailed report of the entire project will be prepared for the High Plains water users.

STATISTICS FOR MAY

During the month of May, 602 completed wells were registered with the District office and 345 permits were issued by the County Committees. These new permits issued and completed wells follow by county:

County	Completed Wells	Permits Issued
Armstrong	3	1
Bailey	45	34
Castro	57	23
Cochran	37	14
Deaf Smith	50	21
Floyd	56	34
Hockley	67	38
Lamb	82	71
Lubbock	72	40
Lynn	30	11
Parmer	85	39
Potter	0	0
Randall	18	19

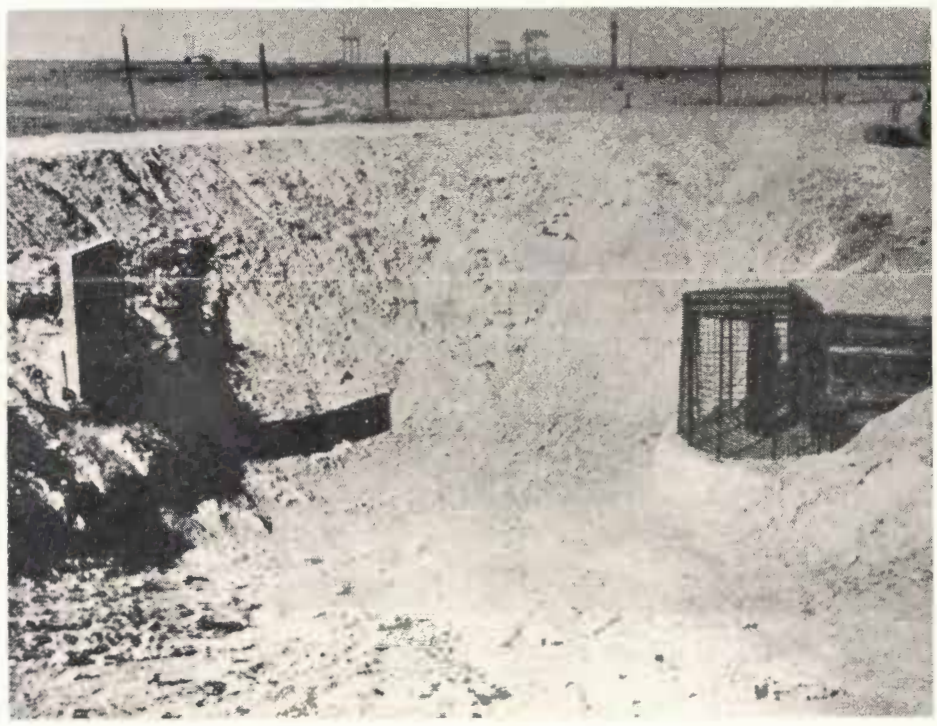


Plate 1—Shows recharge well in pit before rain.

Plate 2—Shows recharge well in pit during recharging experiment.

Hydrologic Aspects—

(Continued from Page 3)

In the High Plains of Texas, farmers pump nearly 5,000,000 acre-ft. of ground water a year in an area where the annual recharge is believed to be less than 100,000 acre-ft. Furthermore, a comparable amount of natural discharge also occurs. Although the water is being mined rapidly, the supply has already lasted 20 years and may last several decades longer, enough time for the repayment of most existing investments. Meanwhile the area is enjoying a prosperity not otherwise possible.

In the central and northern High Plains, the aquifer has not been developed to any such extent, and there is the problem of how it should be developed. It does not seem feasible to develop only the recharge and save the storage. In the first place the recharge in any aquifer cannot be fully developed until the water levels are lowered. Then the question arises as to who is entitled to the stored water that is pumped out while the water table is being lowered. In the second place, it is difficult to take the recharge without also taking the storage. Before man diverted water and drilled wells, most aquifers were in equilibrium—that is, the discharge from an aquifer over a period of years was equal to the recharge to the aquifer. Because there is little fluctuation of the water level in the aquifer in the central and northern High Plains, hydrologists know that the aquifer is still essentially in equilibrium. In order to salvage the recharge, the discharge must also be captured. If an amount equivalent to the recharge is pumped and the discharge is not stopped, the water levels will decline, and water will be withdrawn from storage.

The Frenchman Creek area in northeastern Colorado is a region where recharge alone cannot be pumped. All recharge on one side of the ground water divide moves eastward across the state line. The amount of ground water flowing across the state line annually is equivalent to the annual recharge to the ground water reservoir. It has been determined that the underflow across the state line is on the order of 100,000 acre-ft. a year, equivalent to slightly less than 1 in. of recharge annually in the area. Suppose it were decided to pump only the recharge of 100,000 acre-ft. annually. A withdrawal of 100,000 acre-ft. of water uniformly throughout the area would lower the water table over the whole region less than 1/2 ft. The thickness of water-bearing materials at the state line averages about 200 ft. The withdrawal of 100,000 acre-ft. of water, if uniform, would not change the hydraulic gradient appreciably. The withdrawal would only reduce the thickness of the section through which the water is flowing at the state line from 200 ft. to 199 1/2 ft. Consequently, the discharge would be reduced by about one part in 400. Only about 250 acre-ft. of recharge would be salvaged and the remainder of the 100,000 acre-ft. of water would come from storage. In an aquifer of this type, it appears that there is no choice but to mine the water.

High-Recharge Storage

The storage problem is considerably different in areas where the recharge is high—for example, where large amounts of surface water are spread on the land for irrigation. In the Closed Basin in the San Luis Valley, Colo., about 300,000 acre-ft. of surface water is diverted to the land annually for irrigation. During periods of low stream flow, nearly a thousand wells have been drilled to supplement the water supply. In 1951 the stream runoff reached a record low, and wells pumped nearly 300,000 acre-ft. of ground water, resulting in an average water table decline of several feet. During the following year the available surface water supply was above normal, very little ground water was pumped, and the ample artificial recharge returned water levels to normal. This area has an ideal combination of surface and ground water use. Also the ground water reservoir serves as a nearly evaporation-free reservoir to be called upon in times of surface water shortage. It would be disadvantageous to mine the ground water in this region. If the ground water is developed only to the extent of the artificial recharge, it will last as long as the recharge does. Moreover, the natural recharge can be partly salvaged, because this water is now being dissipated by evapotranspiration, which can be reduced by lowering the water table. There are similar situations in the Arkansas and South Platte valleys, where large quantities of surface water are available for recharge.

Surface and ground water uses should be coordinated in many areas rather than permitted to conflict. There are sections, for example, where it may be wise to abandon the use of surface water and do all irrigating by wells. In the Arkansas Valley in Kansas, between Hartland and Garden sas, between Hartland and Garden City, the river normally flows throughout the year. During the 1930's however, when stream flow was low and the withdrawal of water from wells was large, the water levels declined 5-10 ft., enough to cause the river to go dry. A single flood in 1941 caused the water levels to return to normal and the stream to flow again. Records show there was a loss of stream flow in that reach of the river ammounting to about 75,000 acre-ft. In other words, by using ground water and lowering the water level below that of the stream bed, there was a saving of 75,000 acre-ft. that otherwise would have gone down the river. In many places where the supply of surface water is small and not too dependable it may be well to substitute pumping in order to lower the water table and capture water by channel infiltration that would otherwise go on downstream.

Lift—

A major problem to consider is whether there should be a vested right in lift. Water cannot be withdrawn from an aquifer without lowering the water level. It is impossible to pump a large number of wells in a field without causing each well to affect the water levels in the others. If there is a vested right in lift, the well owner second in time would have to pay tribute to the first, and so on down the line until the latest comer would be paying tribute to all. It seems clear, therefore, that a vested right in lift is usually impractical. There is, however, a problem of conflicting uses of water. For example, it is questionable whether an industry that can operate profitably with a lift of 500-1,000 ft. should be allowed to lower the water level excessively in an area where the farmer's economic limit of lift is only 150-200 ft. The same conflict probably would arise between large and small farm operations. Another problem in connection with lift is the maintenance of artesian flow. The San Luis Valley for example, is filled to a depth of more than a mile with sediments consisting mainly of alternating lavers of clay and of sand and gravel. The layers of clay impede the upward movement of water, developing artesian pressures. Water from any of the beds of sand and gravel below about 100 ft. will rise to the surface and flow. The farmers in that area are drilling ever deeper wells to tap those flows. A number of recent wells are 1,000-2,000 ft. deep. The great cost of developing these wells is partly compensated by the fact that the water flows at the surface and there is no pumping expense. It appears that, in such situations, it may be necessary to protect the right in lift (or in lack of lift) in order that it may continue to be economically feasible to tap the deeper aquifers.

Effect On Streams

A touchy problem is what to do about well users who take water that would otherwise reach a stream on which there are water rights predating those of the wells. Before ground water codes can be administered properly, there will have to be considerable new thinking on this subject. In Colorado, for example, the courts have ruled that ground water users cannot take water that is tributary to a stream, and that the burden of proof is on the pumper. If this rule were enforced strictly, almost all pumping would cease, for nearly all ground water is tributary to a stream or is moving toward a stream. Much of it never reaches the stream but is lost by evapotranspiration on route.

The ground water along the western edge of the High Plains in Colorado is moving toward Big Sandy Creek, but it is doubtful if more than a few gallons in a thousand ever reaches it. Much of the water is consumed by relatively useless vegetation. To protect the few gallons of eventual surface water the remainder would have to go to waste.

In the Frenchman Creek area of Colorado and Nebraska, it has been found that the development of about 100,000 acre-ft. of ground water annually would deplete the flow of the creek by about 15,000 acre-ft. per year. In order to use the water most efficiently, therefore, it may be necessary to make an adjustment for 15,000 acre-ft. in surface water rights, so as to salvage 85,000 acre-ft. of ground water taken from storage and recharge.

In Beaver Valley, Colo., no surface water supplies are available, and irrigation is entirely by wells. The ground water, however, moves toward the South Platte River, and part of it eventually reaches the stream. If the users of surface water in the South Platte Valley were to be protected fully, all pumping in Beaver Valley would have to be stopped. The pumpage in the valley averages about 20,000 acre-ft. annually. The underflow into the South Platte Valley is about 8,600 acre-ft. annually. As the water levels have declined, the underflow has also declined by probably less than 1,000 acre-ft. annually. The pumping of 20,000 acre-ft. annually would have to be stopped in order to prevent interference with 1,000 acre-ft. of surface water rights.

When irrigation from wells was begun intensively in the South Platte Valley in the 1930's, there was great concern that the wells would cause the river to go dry. There has been no serious lowering of the water level in the valley, even though the pumpage of ground water may exceed 750,000 acre-ft. in dry years, Furthermore, a large part of the land would have been waterlogged if the ground water had not been pumped.

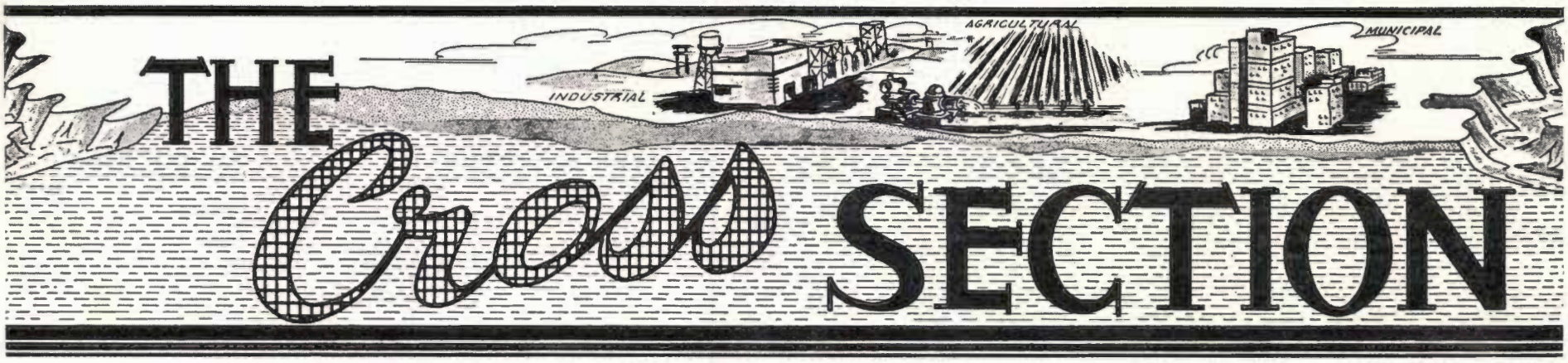
Conclusion—

As water demands increase and supply problems become more critical, far-reaching steps will have to be taken for the most efficient utilization of the available supply through careful coordination of the use of ground water and surface water. The degree of coordination that can be achieved within the framework of present and future legislation will determine how successful the effort will be.

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

Second Class Permit

Mr. Z. O. Lincoln
913 Houston
Levelland, Texas



THE Cross SECTION

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

Vol. 2 — No. 1 "THERE IS NO SUBSTITUTE FOR WATER" *July 1955*

DITCH SEEPAGE STUDY MADE

Mr. Charles T. Bourns, Irrigation Engineer, Agricultural Engineering Department, Texas Technological College, Lubbock, has recently compiled, in a pamphlet, information gained from a series of irrigation ditch seepage tests made throughout the South Plains area.

The results of these tests point out that ditch lossage due to seepage is considerably higher, generally speaking, than most people realize. Also, that losses are greater in soils of the Amarillo, Zita, Mansker, and Portales, and shallow phases of the Pullman Series. Loss due to seepage is higher in ditches during the daytime than at night, according to the results of these tests. The expense of pumping the extra water that is lost to seepage and evaporation, represents a definite monetary loss, as is pointed out in the publication, and is therefore of interest to irrigation farmers. With some present day farm prices being lowered it becomes increasingly apparent that the cutting of expenses may mean the difference in showing a profit or not.

Mr. Bourns' pamphlet was prepared to benefit residents of this area. The tests were made through the cooperation of many interested companies and organizations.

We feel sure that Mr. Bourns will be happy to send a copy of this publication to anyone who will write him in care of Texas Tech College, Lubbock.

STATISTICS FOR JUNE

During the month of June, 382 completed wells were registered with the District office and 129 permits were issued by the County Committees. These new permits issued and completed wells follow by county:

County	*Completed Wells*	*Permits Issued*
Armstrong	1	2
Bailey	17	5
Castro	39	17
Cochran	29	1
Deaf Smith	27	25
Floyd	34	10
Hockley	52	13
Lamb	30	10
Lubbock	69	21
Lynn	26	6
Parmer	43	10
Potter	1	0
Randall	14	9

HOUSE BILL No. 404

Below is H. B. 404 in its entirety, passed during the 54th session of the the Texas Legislature and signed by Gov. Allan Shivers.

The passage of this bill amends certain sections of the original groundwater law, H. B. 162 passed during the 51st session of the legislature.

An Act to amend Subsections A(5), A(6), A(9), B(3), B(4), D(4a) and adding paragraph (10) to Subsection B and Subsection D(5) of House Bill No. 162, Acts, Fifty-first Legislature, Regular Session, 1949, Chapter 306, page 559, so as to amend the difinition of a "subdivision of an underground water reservoir," contained in said Subsection A(5); to add an additional definition of waste to said Subsection, A(6); to amend Subsection A(9) dealing with the exclusion of grazing land while water is being produced only for domestic and stock raising purposes; to authorize underground water districts to require permits for the drilling, equipping and/or completion of water wells, as set forth in said Subsection B(3); to authorize spacing of water wells and regulate production therefrom as set forth in Subsection B(4); to authorize use of certain wells as provided in said Subsection D(4a); and to add an additional paragraph (10) to said Subsection B to authorize suits by landowners to enjoin and to recover damages and other relief for violation of District rules and regulations and making certain violations of rules prima-facie evidence; adding an additional paragraph D(5) providing the Act shall apply to a certain area; fixing venue for such action, and providing that such remedies shall be cumulative; providing a saving clause; and declaring an emergency.

Be It Enacted By The Legislature of The State of Texas:

Section 1. Subsection A(5) of Subsection 3c of Section 1 of House Bill No. 162, Acts, Fifty-first Legislature, 1949, Chapter 306, page 559. is hereby amended so as to hereafter read as follows:

"(5) 'Subdivision of an underground water reservoir' is that reasonably definable part of an underground water reservoir within which the underground water supply will not be unreasonably affected by withdrawals of water from any part of such reservoir, based on known geological and hydrological conditions and relationships and upon foreseeable economic development at the time of the designation or alteration of such subdivision. When the Board of Water Engineers has ascertained the boundaries of a subdivision, pursuant to this Act, its findings on the location of such boundaries, the questions of "Reasonableness' and 'Affect' in the foregoing definition, and all other questions essential to the existence of a subdivision, shall be conclusive and final unless a suit is instituted, pursuant to paragraph F hereof, within thirty (30 days from the date on which the order of such Board is entered."

Sec. 2. Subsection A(6) of Subsection 3c of Section 1 of House Bill No. 162, Acts, Fifty-first Legislature, Regular Session, 1949, Chapter 306, page 559, is hereby amended by adding the following section:

"(e) Willfully causing, suffering, or permitting underground water produced for irrigation or agricultural purposes to escape into any river, creek, or other natural watercourse, depression, or lake, reservoir, drain, or into any sewer, street, highway, road, road ditch, or upon the land of any other person than the owner of such well, or upon public land."

Sec. 3. Subsection 3c-A(9) of Section 1, House Bill No. 162, Acts, Fifty-first Legislature, Regular Session, 1949, Chapter 306, page 559, also known as Section A(9) of Article 7880-3c, Vernon's Annotated Civil Statutes, is hereby amended to read as follows:

"(9) 'Grazing land' shall mean land in tracts of not less than six hundred and forty (640) acres used exclusively for grazing purposes on which water is being produced for domestic and stock raising purposes only. Grazing land as defined above within the boundaries of an underground Water Conservation District shall, upon petition to the directors of the District, be excluded therefrom and shall not be liable for the bonded indebtedness of such District; provided that such land shall be excluded only so long as such conditions continue to exist. If, after exclusion, underground water is produced therefrom for irrigation, municipal, or industrial purposes, and in an amount in excess of one hundred thousand (100,000) gallons per day from any well, such excluded land shall promptly be brought back within the District and shall thereafter be subject to taxation and bonded indebtedness as any other land within the District, and shall thereafter be subject to the rules and regulations of the District. The lands may be brought back within the District on petition of the landowner or the owner of the water rights thereunder, or by the directors of the District on their own motion, or upon petition of any landowner in the District. The owner of the land shall be entitled to a reasonable notice and hearing to determine whether his land should be brought back within the District. The issue at such hearing before the directors of the District shall be wheth er or not water has been or is being produced for irrigation, municipal, or industrial purposes, and in an amount in excess of one hundred thousand (100,000) gallons per day from any well thereon. If the directors find, upon substantial evidence, that water is being so produced, they shall enter an order in their minutes so finding; and the land shall thereafter be a part of the District for all purposes. If the owner of the land desires to appeal from the finding of the directors, he may do so pursuant to Subsection F hereof. As a condition to such exclusion, it shall be specified and understood that when such land is excluded, no well capable of producing one hundred thousand (100,000) gallons of water per day shall be drilled thereon unless such well complies with the rules of the District. Production from any such well drilled in violation of the above condition may be enjoined by the District; or upon the land being taken back into the District, the District may regulate the production therefrom so as to protect the rights of other landowners or to prevent waste."

Sec. 4. Subsection B(3) of Subsection 3c of Section 1 of House Bill No. 162, Acts, Fifty-first Legislature, Regular Session, 1949, Chapter 306, page 559, also known as Section B(3) of Article 7880-3c, Vernon's Annotated Civil Statutes, is hereby amended so as to hereafter read as follows:

"(3) To require permits for the drilling, equipping or completion of water wells or the substantial alteration of the size of the wells or the pumps used therein, or all or any of such acts, and to issue such permits subject to the rules and regulations promulgated by the District pursuant to subparagraph (4) next below, and subject to such terms and provisions with reference to the drilling, equipping, completion or alteration thereof as may be necessary to preserve and conserve the underground water, to prevent waste, to minimize as far as practicable the drawdown of the water table or the reduction of artesian pressure, or to lessen interference between wells. No person, firm, or corporation shall hereafter begin to drill or drill a well

(Continued on Page 2)

THE Cross SECTION

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1628-B 15th Street, Lubbock, Texas

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ALLAN WHITE
Editor

H. B. No. 404—

(Continued from Page 1)

or substantially alter the size of a well or pump used therein, within the boundaries of a District organized hereunder which well could reasonably be expected to produce in excess of one hundred thousand (100,000) gallons per day from the underground water reservoir or subdivision thereof without first having applied to the Underground Water Conservation District for and had issued a permit to do so, unless the drilling and operation of the well is otherwise exempt herein.

"The District shall promptly consider and pass upon applications for permits required in the preceding Section 3. If an application shall not have been passed within twenty (20) days from the receipt thereof by the District, or has not been set down, within that time, for a hearing upon a day certain, the applicant may go into the District Court where the land lies and obtain a mandamus to compel the District to act upon the application or set it down for a hearing.

"The hearings above provided for shall be held within thirty (30) days from the date the hearing is called, and the District shall act on such application within ten (10) days after such hearing."

Sec. 5. Section 1, Subsection 3c B(4) of House Bill No. 162, Acts, Fifty-first Legislature, 1949, Chapter 306, page 559, is hereby amended to hereafter read as follows:

"(4) Either (a) to provide for the spacing of wells to be drilled for the production of water from the underground water reservoir or subdivision thereof; or, (b) to regulate the production of wells producing underground water from such source, unless such wells are otherwise exempt herein, or both (a) and (b), so as to minimize as far as practicable the drawdown of the water table or the reduction of artesian pressure; or to prevent waste. Provided further, however, that the owner of any tract of land, his heirs, assigns, and lessees who have no well capable of producing in excess of one hundred thousand (100,000) gallons per day on said tract, shall not be denied either a permit to drill a well on his land or the privilege to produce underground water from his land subject to the rules and regulations of the District."

Sec. 6. Section 1, Subsection 3c, B. of House Bill No. 162, Acts, Fifty-first Legislature, 1949, Chapter 306, page 559, is hereby amended by adding thereto a new paragraph (10) at the end thereof which shall read as follows:

"(10) The drilling of any well for which a permit from the District is required and for which no permit has been obtained, or the operation of any well at a higher rate of production than the rate approved for such well, is hereby declared to be illegal, wasteful per se, and nuisance. Any person having an estate in land adjacent to or any part of which lies within one-half mile of such well may, with or without the joinder of the District, bring suit in court of competent jurisdiction to restrain or enjoin such illegal drilling or operation or both. He may also sue for and recover any damages which he may have suffered by reason of such illegal operation and such further relief as he may be entitled to in law or in equity. In any suit for damages, the existence of such well in violation of the rules of the District, or the operation thereof in violation of the rules of the District, or both, shall be taken by the courts, to constitute primafacie evidence of illegal or illegitimate drainage. Such suit may be brought in any county where (a) the illegal well is located, or (b) the affected land of the plaintiff, or any part thereof, is located. The cause of action and rights here created or recognized shall constitute a cumulative or additional remedy and shall not be considered to exclude, impair, or abridge any other rights, remedies, or causes of action which are or may be available to any individual or to the District. Such suits shall be advanced for trial and be determined as expeditiously as possible, and no postponement thereof or continuance, including a first motion therefor, shall be granted except for reasons deemed imperative by the court."

Sec. 7. Subsection D (4a) of Section 3c enacted in Section 1 of House Bill No. 162, Acts, Fifty-first Legislature, Regular Session, 1949. Chapter 306, page 559, also known as Article 7880-3c, Vernon's Annotated Civil Statutes, is hereby amended to hereafter read as follows:

"(a) The requirement of a permit for the drilling or producing of a well drilled to supply water for the drilling of any one or more wells mentioned in (3) next preceding, so long as such well and the production therefrom is being used for such purpose or purposes and not thereafter. When the well has ceased to be so used, it may thereafter be used as an ordinary water well if it meets the spacing and other rules of the District; and if used, such well shall thereafter to subject to the rules and regulations of the District."

Sec. 8. Section 1, Subsection 3c, House Bill No. 162, Acts, Fifty-first Legislature, Regular Session, 1949, Chapter 306, page 559, also known as Article 7880-3c, Vernon's Annotated Civil Statutes, is hereby amended by the addition of a new Subsection D(5) to read as follows:

"(5) The provisions of this Act and the rules and regulations promulgated hereunder shall apply only within the area designated by the Board of Water Engineers as a reservoir or a subdivision thereof over which a District shall have been organized. They shall not apply outside of such areas."

Sec. 9. If any section, clause, sentence, or provision of this Act, or rules and regulations issued pursuant thereto, as applied to a particular individual or set of circumstances shall be held for any reason to be invalid, such holding shall not affect in anywise the validity of the remaining provisions of this Act, or rules and regulations issued hereunder, or the application of this Act; and such rules and regulations to other and different individuals and circumstances not so held invalid, and all those portions of such Act or such rules and regulations not held invalid shall remain in full force and effect.

Sec. 10. The fact that it is imperative that underground water of this State be protected and conserved creates an emergency and an imperative public necessity that the Constitutional Rule requiring bills to be read on three several days in each House be suspended, and said Rule is hereby suspended, and that this Act shall take effect and be in force from and after its passage, and it is so enacted.

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GROUND-WATER INVENTORY CONTINUED—DEAF SMITH COUNTY

The portion of Deaf Smith County within the boundary of the High Plains Underground Water Conservation District covers about 632,000 acres of land. (The total area of the county is 964,480 acres.) The underground reservoir in the Ogallala formation beneath the area within the district contains approximately 13,700,000 acre-feet of ground water in storage available for pumping.

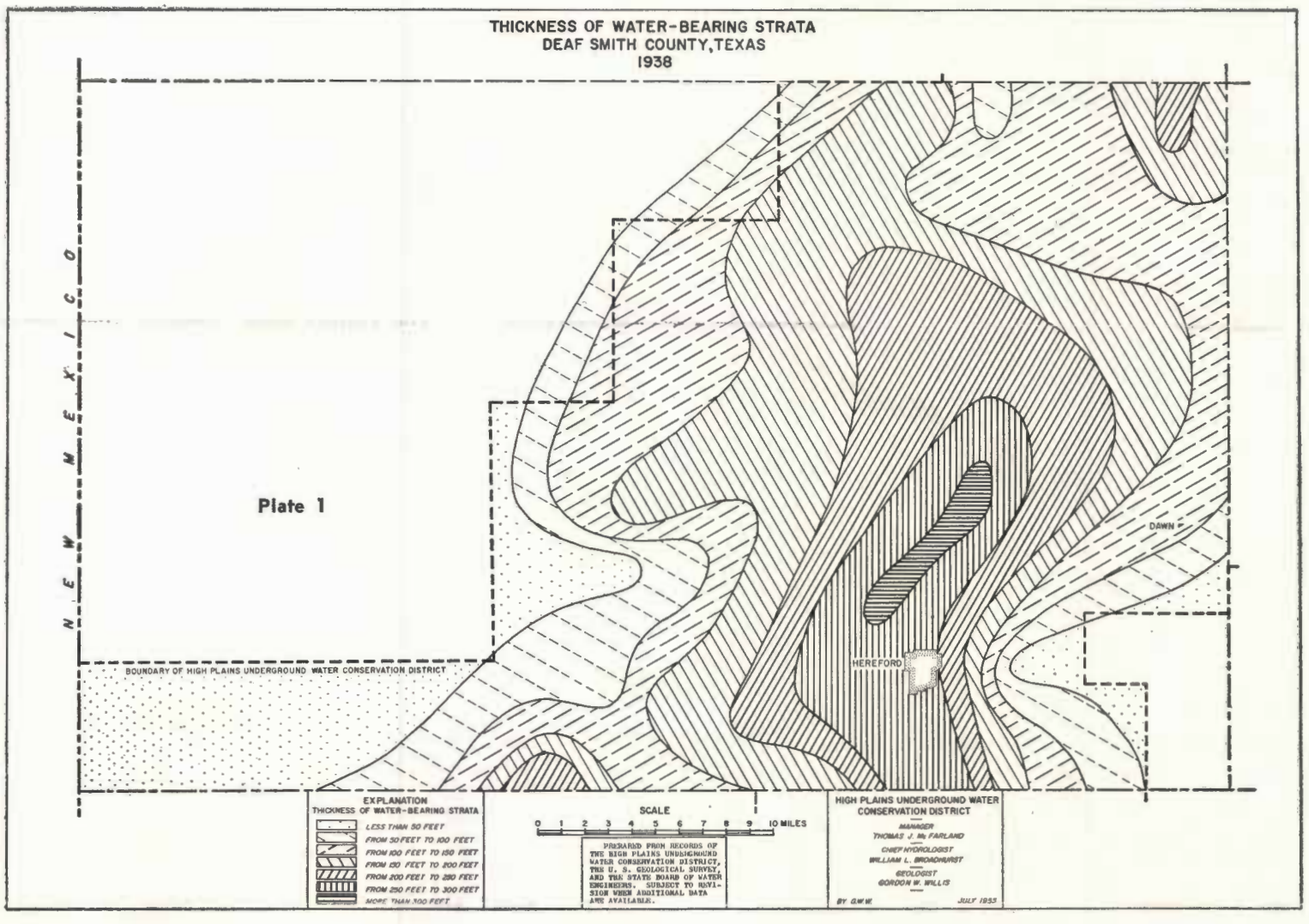
The map in plate 1 shows the thickness of the water-bearing strata between the water table and the redbeds in 1938 before an appreciable amount of water had been pumped from the reservoir. The map in plate 2 shows the decline of the water table from the spring of 1938 to January 1955.

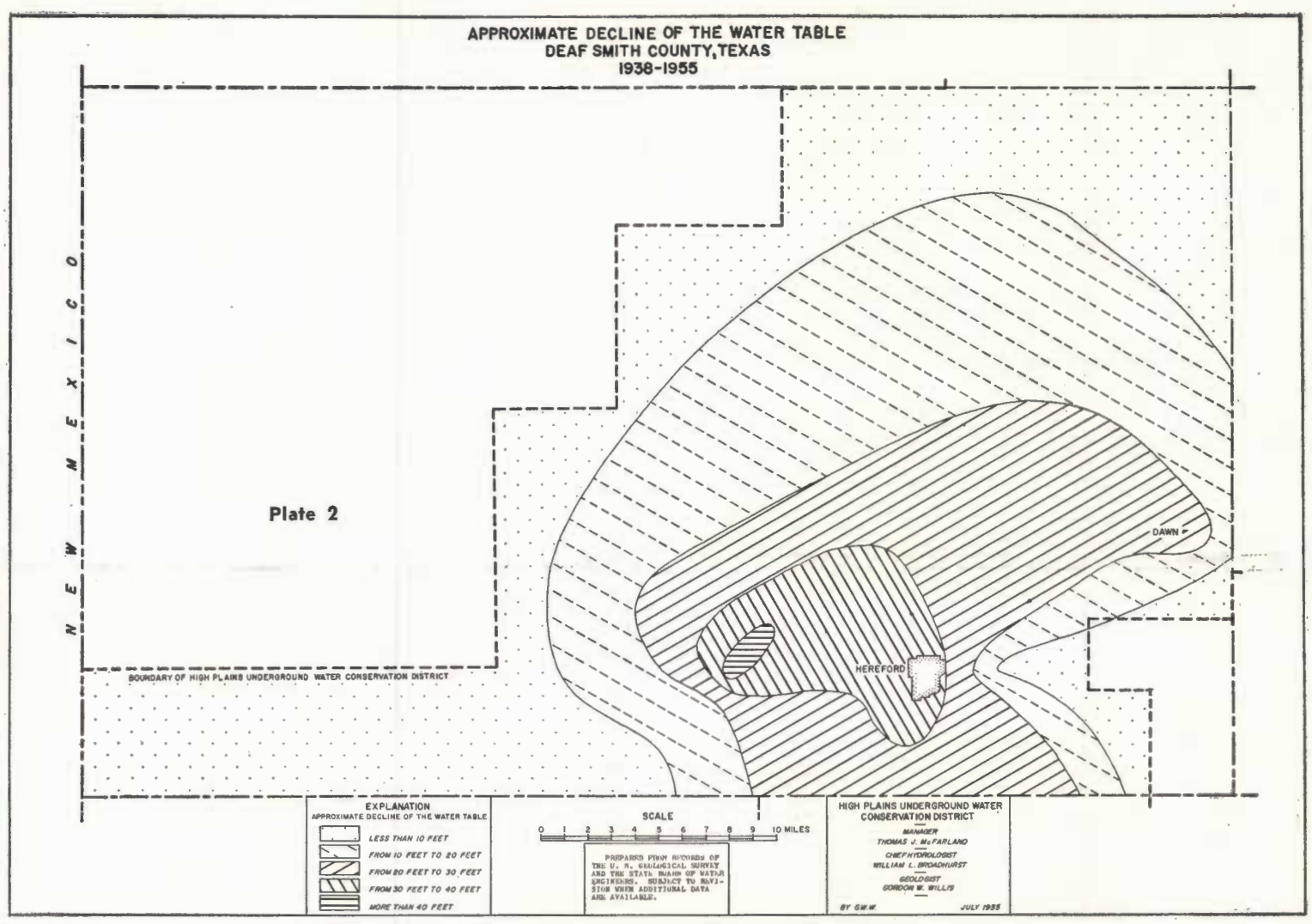
The volume of water remaining in the underground reservoir was determined by subtracting the volume of material unwatered since 1938 from the total volume of saturated material in 1938 and multiplying the remainder by the coefficient of storage of 15 percent.

These data show that 15,000,000 acre-feet of water was in storage available for pumping in 1938, and that 1,300,000 acre-feet of water has been removed from storage since 1938. In other words, 8.7 percent of the volume of the available water has been removed from storage since 1938. Approximately 900,000 acre-feet or about 70 percent of the volume of water removed from storage was pumped during the 5-year period from January 1950 to January 1955.

The approximate quantity of underground water in storage, available for pumping, beneath an individual farm may be determined by multiplying the number of acres in the farm by the thickness of the water-bearing strata underlying the farm and then multiplying by the storage coefficient of 15 percent. Suppose the farm consists of 320 acres and has 200 ft. of water-bearing strata underlying it, then 320 acres x 200 feet x 0.15 equals 9,600 acre-feet of water available for pumping. An acre-foot of water is the quantity required to cover one acre to a depth of one foot, and it is also equal to 43,560 cubic feet or 325,829 gallons.

An individual may use this information to determine, within reasonable limits, how long the quantity of underground water in storage beneath his farm will last at any annual rate of withdrawal. This assumes, of course, that his neighbors pump a comparable amount of water per acre on their farms.

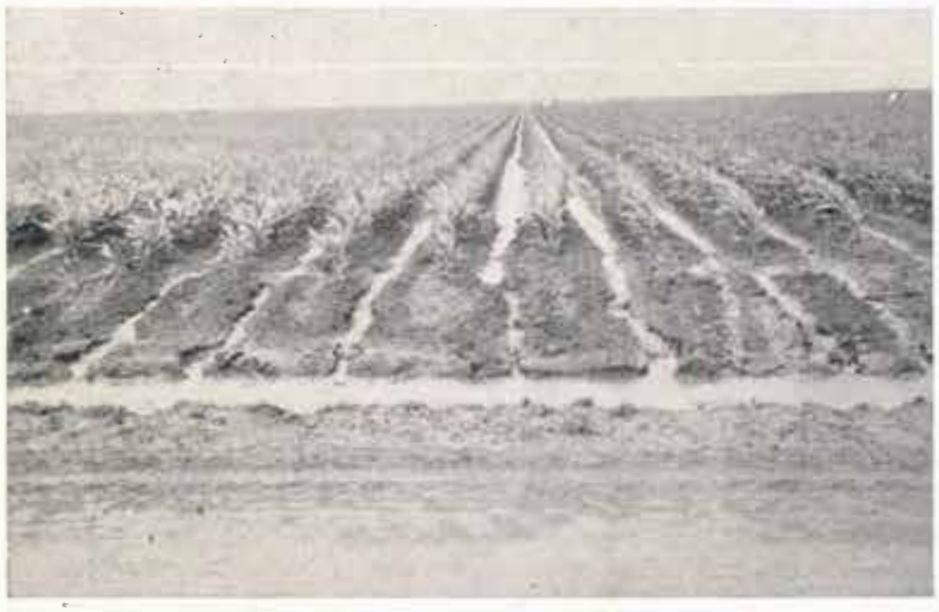




These maps and studies of this type are parts of the regular hydrological work in progress by the staff of the Water District. Similar maps and information will be prepared, as rapidly as practicable, for all the counties within the Water District. Maps of Deaf Smith and Parmer Counties are now available.

Does This Constitute Waste?

These pictures were made during July, 1955 on the High Plains.



The above picture was made of a milo field with rows 9/10ths of a mile long and with no steps taken to keep irrigation water from emptying into county road bar-ditch.

This picture of water produced for irrigation uses was made after following it for 2 1/2 miles from point where it left the land upon which it was pumped.

This picture was taken of a county road rendered impassable by water pumped for irrigation. No provision had been made to keep the well water on the farm from which it was produced.

Here is another picture that shows water pumped for irrigation purposes in a county road bar-ditch running 4 miles to a wet-weather lake.

This picture shows several acres of farm land rendered unuseable by water pumped for irrigation from several neighboring farms' wells spilling onto it. Part of this water had travelled from as far away as 7 miles.

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

Second Class Permit

Mr. Z. O. Lincoln
913 Houston
Levelland, Texas

THE Cross SECTION

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

Vol. 2 — No. 2 "THERE IS NO SUBSTITUTE FOR WATER" *August 1955*

LAWS OF FLORIDA GOVERNING WATER USE

By FRANK E. MALONEY

Reprinted from JOURNAL American Water Works Association, Vol. 47, No. 5, May, 1955, by permission of the Association.

A paper presented on Nov. 9, 1954, at the Florida Section Meeting, St. Petersburg, Fla., by Frank E. Maloney, Prof. of Law, University of Florida, Gainesville, Fla.

During the last 50 years, use of water from public, industrial, and irrigation supplies has increased tremendously in the United States. Not only has the per capita use grown, but the water-using population has doubled during the same period, thus further multiplying the demand. Between 1890 and 1945 water use increased from 2,050 mgd to 12,030 mgd, almost six fold in 55 years, and growth since 1945 has been at an even faster pace.

The former chairman of the National Water Resources Committee predicted in 1952 that industrial demand for water in the United States would double in the next 10 years and that this increased demand would still represent only about 25-35 percent of the total water consumption because the demand for other uses, such as irrigation and steam power, would correspondingly increase. An extensive growth of industrial demand in the Southeast is occurring. Two of the industries which are expanding—pulp and paper, and steel—lead all others in industrial water requirements. Further, the use of water for irrigation, although still in its infancy in this region, is showing signs of rapid and vigorous growth.

A recent survey in South Carolina, now blessed (like Florida) with an abundant water supply, indicates that between 1945 and 1950 industrial use of water in that state increased 350 percent; use by cities in the same period increased 80 percent; and use on farms almost doubled. Farmers in South Carolina, as elsewhere, are suddenly realizing the tremendous value of irrigation in increasing farm production and reducing the risk of damage from droughts. A similar upsurge in the demand for water for irrigation in Kentucky has led to several recent studies of the laws governing use of water for that purpose in the state.

Florida Problem

Past and potential increase in irrigation and industrial demand in Florida, added to the problems created by salt water intrusion in many areas along the coasts, call for a re-evaluation of Florida's water laws in the light of present and future needs. Other southeastern states are already tackling the problem—South Carolina in 1953 created a water policy committee to recommend steps to bring about full use and protection of state water resources. This committee, guided in part by a study made in 1952 by the U. S. Soil Conservation Service, has recommended legislation drastically changing South Carolina water laws. A similar study is being conducted in Mississippi and another, with proposed corrective legislation, was made in Wisconsin in 1953.

One of the first projects of the new Bureau of Water Research, following activation in July 1955 at the University of Florida, will be a complete review of the state statutory and common law having to do with the conservation and use of surface and ground water. It may be appropriate at this time, however, to consider in broad outline the present state of Florida water law and to point out the need for more detailed study aimed at corrective legislation.

This survey does not consider the legal problems involved in pollution, although that naturally affects the amount of water available for use in Florida. Further, the survey does not deal with flood control, although impoundments for this purpose will make tremendous additional quantities of water available in certain areas of southern Florida.

Law of Watercourses

There are three different judicial views on the use of water from running streams. The oldest is the English natural-flow rule, under which an upper riparian owner may not alter the natural flow of a stream except to make use of the water for purely domestic purposes. This rule was adopted in England when the use of water for industry and irrigation was still on a very minor scale and the predominant problems was prevention of pollution. The law met the social needs of the time, but it is not adequate for today's greatly expanded economy. Rigid adherence to this antiquated doctrine aggravated the problems in South Carolina and helped bring about proposals for a comprehensive code providing for a modified system of prior appropriation. The recommendations follow closely the present Kansas code.

Under the prior-appropriation doctrine as judicially enunciated in the western and Rocky Mountain states, a riparian or other owner could appropriate the right to use as much water as he could successfully divert and beneficially employ, so long as his appropriation was prior in time to that of others; in an extreme case, his right (on a sort of first come, first served basis) might extend to exhausting the flow of the stream. This doctrine, with modifications, is now confirmed by legislation in most western states.

The third approach is through the theory of reasonable use. This modification of the natural-flow rule entitles a riparian complainant to protection only when the defendant's diversion unreasonably interferes with the complainant's use of the water. The doctrine emphasizes full use of the available water supply, and each riparian owner may make beneficial use of the water for any purpose to the extent that his use does not unreasonably interfere with the beneficial uses of others.

The exact state of the law as to

(Continued on Page 3)

RECHARGE EXPERIMENT IN ARKANSAS VISITED

Research in the methods and techniques of recharge of an underground water reservoir is in progress in the rice growing region of Arkansas known as the Grand Prairie. This region has an area of about 1,000 square miles and lies about 30 miles southeast of Little Rock. Stuttgart is the principle city and trade center in the region.

The research experiment is being conducted by the Ground - Water Branch of the U. S. Geological Survey in cooperation with the U. S. Army Corps of Engineers, the University of Arkansas and various other agencies and organizations. The work is under the direct supervision of Mr. P. E. Dennis, District Geologist, Mr. Richard T. Sniegocki, geologist, and the staff of the Arkansas District of the Geological Survey. Gordon W. Willis, geologist with the High Plains Underground Water Conservation District, visited the staff and the site of the experiment in July to obtain first hand information on the methods and techniques of the experiment.

The site of the experiment is on the farm of the University of Arkansas Agricultural Experiment Station about 12 miles east of Stuttgart. The Experiment Station is centrally located in the rice growing region. Irrigation with underground water has been practiced in the region since about 1904, and a considerable part of the underground water reservoir has been depleted.

The Grand Prairie Region has an annual rainfall of about 47 inches; however, the larger part of this rainfall occurs at times other than the growing season. It is, therefore, necessary for the rice growers to depend on irrigation in order to maintain the proper growing conditions for rice. A large part of the irrigation water is obtained from wells, and since the growing of rice takes a considerable amount of water the withdrawal of water from the underground reservoir has exceeded the natural recharge.

The underground reservoir or aquifer in the region lies about 220 feet below the land surface and is covered by strata of tight, relatively impervious clay. The aquifer itself consists of discontinuous strata of stream deposited sand and gravel, and the thickness of these strata averages about 75 feet. Water in the aquifer was formerly under artesian pressure, but withdrawals from the aquifer have relieved the artesian pressure and unwatering of the strata within the aquifer has taken place.

Natural recharge to the aquifer takes place around the edges of the region in places where the sand and gravel of the aquifer crop out at the surface. The natural recharge is so much less than the withdrawal of water that artificial recharge in an amount that would keep the reservoir more nearly in balance would be most desirable for the continuation of the rice industry in the region.

Recharge by artificial methods is not a simple and inexpensive process. Merely drilling a recharge well into the aquifer and letting water drain into it is not very satisfactory. Much information should be obtained before artificial recharge is attempted on a large scale. The physical characteristics of the aquifer such as the volume of space available for recharg-

(Continued on Page 4)

Wife Of Lynn Committeeman Dies In Tahoka

Mrs. Pauline Hagens, wife of Arthur Hagens, member of our Lynn County Committee, passed away August 5th at the Tahoka Hospital in Tahoka, after a long illness.

Mrs. Hagens left two daughters, Geraldine and Mary and three sons, Arthur Jr., Cordell, and Marvin.

Through three years of association with Mr. Hagens as a committeeman for Lynn County, we learned to know the Hagen Family very well. They were a family that enjoyed their home and many friends. They enjoyed living and working together and never passed by the opportunity to help a friend of their community.

The District Board, the office staff, and all those associated with Mr. Hagens, wish to express our deepest sympathy to the family on the loss of such a wonderful wife and mother.

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ALLAN WHITE
Editor

CONSERVATION CONVERSATION

We have been doing a lot of reading lately especially about soil and water.

Many interesting things have happened that should be a guidepost for present and future generations.

For example, history records some 18 or 20 civilizations that rose to great heights in power and influence in the history of man. Those same great and powerful civilizations fell from internal struggle. Such internal struggles were struggles for the fundamental things of life, good water and fertile soil. When one or the other, productive soil or adequate, usable water, or both are insufficient to support a people, they go to war to secure these essentials. A nation or a man cannot live long without water.

A great similarity exists between the early development of the Yucatan and the Southern Plains of Texas.

Although the Southern High Plains was not covered by the dense forest growth that the Mayas encountered on their migration into Yucatan, there was a great similarity in rich fertile land and abundance of good water. The Maya people prospered and their civilization became highly intellectual, but little thought was given to the prolonging of the resources that supported the country's basic economy—agriculture. The soil gave way, the rain fell on rock plateaus and disappeared.

It is hard to believe that the flat plains country would ever have the erosion problem that faced the Mayan but the water problem could be greater. The complete story of the rise and fall of the Maya communities would include many factors but regardless of war, political strife or other forces that played upon them, one certainly stands out. It was what happened to the water when it fell upon the land. and the way it escaped, as the ability of the soil to hold it and make it serve declined, that brought the disintegration of the Maya Culture.

As we drive along the roads and witness the thousands of acre-feet of precious water escaping from the farms daily, we get to thinking about our future and comparing it with the past. We cannot say "it can't happen here."

Other communities and nations, once prosperous have died, just because they suffered a water shortage. Think about it!

* * * *

The Texas State Board of Water Engineers has announced completion of a map and field notes describing the underground reservoir subdivision in the Dell City area of Hudspeth County. The persons who are promoting a new underground water district there will receive the data shortly. The area within the subdivision consists of 284 sections of land and is all in one county. Since the Water Board has jurisdiction only where parts of two or more counties are involved, the county commissioner's court will create the new district.

It has been reported that the Dell City reservoir contains an immense quantity of water, and the water is at a shallow depth.

Some wells produce as much as 7,000 gallons per minute continuously without any drawdown. The land put under irrigation thus far is producing in excess of two bales of cotton per acre average.

Dell City is located between Carlsbad, N. M. and El Paso, just over the state line in Texas.

* * * *

We have just completed a very extensive advertising campaign, through the weekly and daily newspapers in our district, in an effort to inform underground water users of the district's regulation which forbids the waste of water produced for irrigation purposes. We trust that everyone who irrigates within the boundaries of the water district is aware of the fact that underground water is not to wilfully and habitually escape from the land upon which it was originally produced.

* * * *

We have recently completed a spot check of wells drilled against the measurements submitted by the applicant on his permit.

In the main, the wells checked out very well; however we have found a few discrepancies.

We would like to impress on each drilling permit applicant the importance of measuring the distances required. A little time spent originally in measuring the distances may prevent the applicant from finding later that his well is in violation to the district's rules.

* * * *

Industrialists, farmers and municipalities have looked long and hopeful for the time converted sea water might become available for their respective uses.

The Department of the Interior has extended its research program on salt water conversion to 1963. The program was due to end in 1958. New provision in legislation includes a $10 million annual expenditure over the previous $6 million annual program and the use of private research facilities as well as governmental.

The big problem in salt water conversion is the high cost in doing the job. In the past few years, research has lowered the cost by some 75 percent which is still too high for fresh water to be used for irrigation and some industrial uses.

Today the approximate cost would run $125 per foot. Experts figure that the conversion price must be well below $40 per foot before agriculture could consider the use of converted sea water in irrigation programs.

STATISTICS FOR JULY

During the month of July, 313 completed wells were registered with the District office and 149 permits were issued by the County Committees. These new permits issued and completed wells follow by county:

County	*Completed Wells*	*Permits Issued*
Armstrong	0	0
Bailey	32	10
Castro	47	11
Cochran	12	15
Deaf Smith	31	25
Floyd	24	6
Hockley	33	19
Lamb	33	11
Lubbock	35	20
Lynn	8	1
Parmer	38	27
Potter	0	0
Randall	20	4

Florida Water Laws—

(Continued from Page 1)

supply from water-courses in Florida is not too clear. In one early case, where the primary consideration was the pollution of an "underground stream" used as a source of water supply by Tampa, the Supreme Court of Florida restated the common-law riparian rule along with the reasonable-use modification:

The right to the benefit and advantage of the water flowing past one owner's land is subject to the similar rights of all proprietors on the banks of the stream to the reasonable enjoyment of a natural bounty, and it is therefore only for an unauthorized and unreasonable use of a common benefit that any one has just cause to complain.

Because the court was not called upon to consider to what extent the doctrine of reasonable use in Florida may permit the diversion and use of surface water for such purposes as irrigation or manufacturing, the case does not establish a binding precedent on those points. In the absence of a legislative adoption of the prior-appropriation doctrine, it is probable that when the problem is squarely presented to the Florida court, it will follow in the path of most of the other southeastern states: placing the stress on the reasonable-use aspect of the common-law doctrine and permitting diversions which do not unreasonably interfere with the use by other riparian owners.

The reasonable-use theory, although it permits much broader and more nearly complete utilization of the water than the older natural-flow theory, has two advantages. It lacks certainty, because what constitutes reasonable use depends, among other things, on the prospective use of all other riparian owners on the stream. Further, the theory allows use of the water only by riparian owners and does not permit diversion for use on nonriparian lands. The doctrine does have the advantage of being flexible as against the prior-appropriation theory. The latter tends to fix the use of water in a permanent pattern which, although it may be in the public interest today, may be considered wasteful in the light of later technical developments.

Ground Water

Legally speaking, ground waters are of two types: those which flow in definite channels, and those without definite channels, classified as percolating waters. In the Tampa case, Florida applied the principle of reasonable use to an underground stream, treating it in the same manner as a surface stream. The real problem in such cases is the practical one of proving that the stream has a definite underground channel. Most ground water, however, falls within the percolating-water classification. Concerning the use of such water, there are again three legal approaches. The first of these, the so-called English rule, rests on the concept that he who owns the surface of the earth owns from the center of the earth to the center of the heavens. In a jurisdiction applying this concept, an owner has an absolute right to sink a well on his land and withdraw all the percolating water he can, without regard to the effect on adjoining owners. There is some language in the Tampa case that seems to support this view. The western states differ from the English view and apply the doctrine of prior appropriation to both ground water and surface streams.

In Florida a modification of the English rule has developed and may have become the law. This view, sometimes referred to as the doctrine of correlative rights, parallels the reasonable-use theory, which developed out of the earlier natural-flow doctrine in the case of surface water-courses. Under the correlative-rights theory as applied in some jurisdictions, a taker is limited to his proportionate share of ground water according to his surface area as compared with the whole area overlying the water supply. Other courts have used the term as limiting the taker not on a proportionate basis, but rather on a reasonable-use basis. This interpretation places no limitation upon the quantity of water to be taken so long as the use is reasonable and is made in connection with the utilization of the surface. Under this rule, however, a court may prevent the transfer of ground water from the land from which it is lifted if this operation is detrimental to a neighbor's extraction and use on his own premises.

In two recent cases the Supreme Court of Florida has apparently adopted the doctrine of correlative rights with respect to percolating water, but in neither instance was the court concerned with the problem of how much water a defendant could take. The issue of the right of a municipal water works to make unlimited withdrawals was presented in 1953. Because of salt water intrusion along the coast, the county-owned Pinellas County water system decided to sink wells in an inland county road right-of-way. The circuit court for the county enjoined the drilling of the wells but did not, however, pass on the basic problem of the amount of water that could be withdrawn. Instead, the court granted the injunction on the ground that the county had only an easement for road purposes and that the abutting owners possessed the fee interest in the road where the wells were to be drilled. The county would therefore be required to condemn a fee interest before it could drill the proposed wells. How much water it could withdraw after acquiring such an interest is still undetermined, but that question may be answered in pending litigation involving another well field in the same system.

It is evident that in ground water, as in surface water-courses, the law of Florida does not provide very definite answers about the amount of water that may be taken by an overlying landowner, nor does the current law give to the first user any assurance that he will be permitted to continue appropriating the same amount of water when later users begin to compete for a limited supply. Moreover, even if the legal rules governing use under the doctrine of correlative rights are formalized, the practical difficulties in establishing the land area overlying the water supply and the extent of the supply itself might place the cost of ground water litigation beyond the reach of the individual landowner. In that event, in areas of shortage, economic competition might well take the place of litigation, with those who could afford the highest lift getting the water. Such has apparently been the experience in parts of California.

Possible Legislation

One remedy for the uncertainties in Florida's water law would be the replacement of case law with a comprehensive water code. The code could establish a new administrative agency with power to allocate and control the use of water in Florida, perhaps placing usage on a prior-appropriation basis, as has recently been done in Kansas and has been suggested in South Carolina. Such a solution provides a certain and definite guide for future users, and is, therefore, attractive. Legislative adoption of the prior-appropriation doctrine in the Southeast has been urged.

Any attempt to change the water law of Florida drastically would raise serious legal problems. The Fourteenth Amendment to the U. S. Constitution provides that no state shall deprive any person of property without due process of law. The Declaration of Rights of Florida Constitution contains a similar due-process provision. The common law has traditionally looked upon water rights as property rights rather than rights of use, and such property rights, attached to the land to which they are appurtenant, are not lost through non-use. Hence, to extinguish water rights legislatively without compensation, by establishing the doctrine of prior appropriation, under which the total supply might go to a prior appropriator, would seem to be a violation of due process of law.

A state does, however, have a right under the police power to regulate various activities of its citizens, including the use of their property, if such regulation is necessary to protect health, safety, and welfare. It is upon this basis that Kansas, where the supply of water is limited, can legally bring about a statutory change from the common-law approach to the doctrine of prior appropriation. It is one thing, however, to use this justification in a semiarid state like Kansas, and another to argue it successfully in a state like Florida, in most parts of which the supply far exceeds the demand. If an attempt is made to introduce prior appropriation, a preamble to the statute might be helpful. Such a preamble, indicating that changed economic conditions have created an emergency in which the public welfare demands the maximum beneficial use of this natural resource, might provide justification for the legislation. Even so, it seems doubtful that such a law would be held constitutional in Florida under present conditions of water use. It is pointed out, however, that a change to a modified form of appropriation, justified as a legitimate exercise of the police power based on economic necessity, is feasible in Wisconsin, a state with problems like those of Florida.

An alternative approach is suggested be recent legislation in New Jersey. The legislature in 1947 empowered the division of water policy and supply of the State Dept. of Conservation to delineate areas where diversion of the subsurface and percolating waters exceeds or threatens to exceed the natural replenishment. In these special areas, the law forbids new withdrawals in excess of 100,000 gallons without a permit from the Division of Water Policy and Supply, and the permit may be refused if necessary to conserve the subsurface waters. The law also provides for the sealing of abandoned wells and for supervision of the drilling of new wells in such areas.

A law allowing all landowners to make sufficient withdrawals for domestic use, but regulating excessive withdrawals in designated areas of control while protecting already existing interests, is clearly a justifiable exercise of the police power when limited to critical areas where demand exceeds supply. Moreover, it avoids one objectionable feature of the prior appropriation doctrine: it does not freeze the use of water in what may become an uneconomic pattern, but is sufficiently flexible to adjust to the changing needs of the times.

Summary and Conclusions

As water use in certain areas of Florida approaches or overruns the available supply, the public interest demands an accommodation of the increasing uses to constant supply, so that the maximum economic advantage, both for the present and future, can be secured from the resource. The attainment of that end will depend upon the state's water law, which will determine whether maximum economic benefits are to be obtained or whether one segment of the economy is to benefit to the detriment of the rest.

The present status of the laws governing use of water in Florida is extremely uncertain. Older case law, enunciated before the turn of the century, adopts the English common-law approach of maximum protection of riparian owners on surface streams while allowing complete freedom of withdrawal to the owners of land overlying ground water supplies. Decisions in later cases seemingly modify these rules by engrafting the principle of reasonable use as a limitation on the landowner's absolute rights, thus making the supply at least partially available for other uses. These rulings, however, have not yet attained the stature of precedent. The resulting uncertainty may have the disadvantage of discouraging potential users whose presence would be of great economic benefit to the state. Because in most areas of Florida, supply still exceeds demand, it may be fortunate that the law has not yet become fixed. Corrective action can be taken if the state becomes aware of the need for laws to encourage the most beneficial use of the available water supply. As more extensive demands are made, there will be a rapidly increasing need to develop an integrated system of laws for controlling the use of both surface and ground water. These laws must be specific enough to encourage maximum use by agriculture, industry, and the public. At the same time they must be sufficiently flexible to permit the state to benefit from technological advances, and must not freeze water use in a pattern that may at some later date prove uneconomical.

A study is now needed to determine and evaluate the existing water law of Florida, both statewide and local. In addition, a thorough study should be made of the water law of those states where the problem became acute at an earlier period and resulted in legislation which has been in operation long enough to be intelligently appraised. Any such study must necessarily include an evaluation of the measures adopted to control pollution which blights the usable supply. These studies would provide the basis for a water doctrine under which the surface and ground water resources of the state could be developed with maximum benefit to the overall economy.

Florida is awakening to the problem. One of the first acts of its new governor has been the appointment of a citizens' committee on water resources. When this committee becomes aware of the need, it may supply the impetus for the development of up-to-date water laws designed to make and keep available Florida's greatest natural resource for the best use of all its people.

GROUND-WATER INVENTORY CONTINUED—CASTRO COUNTY

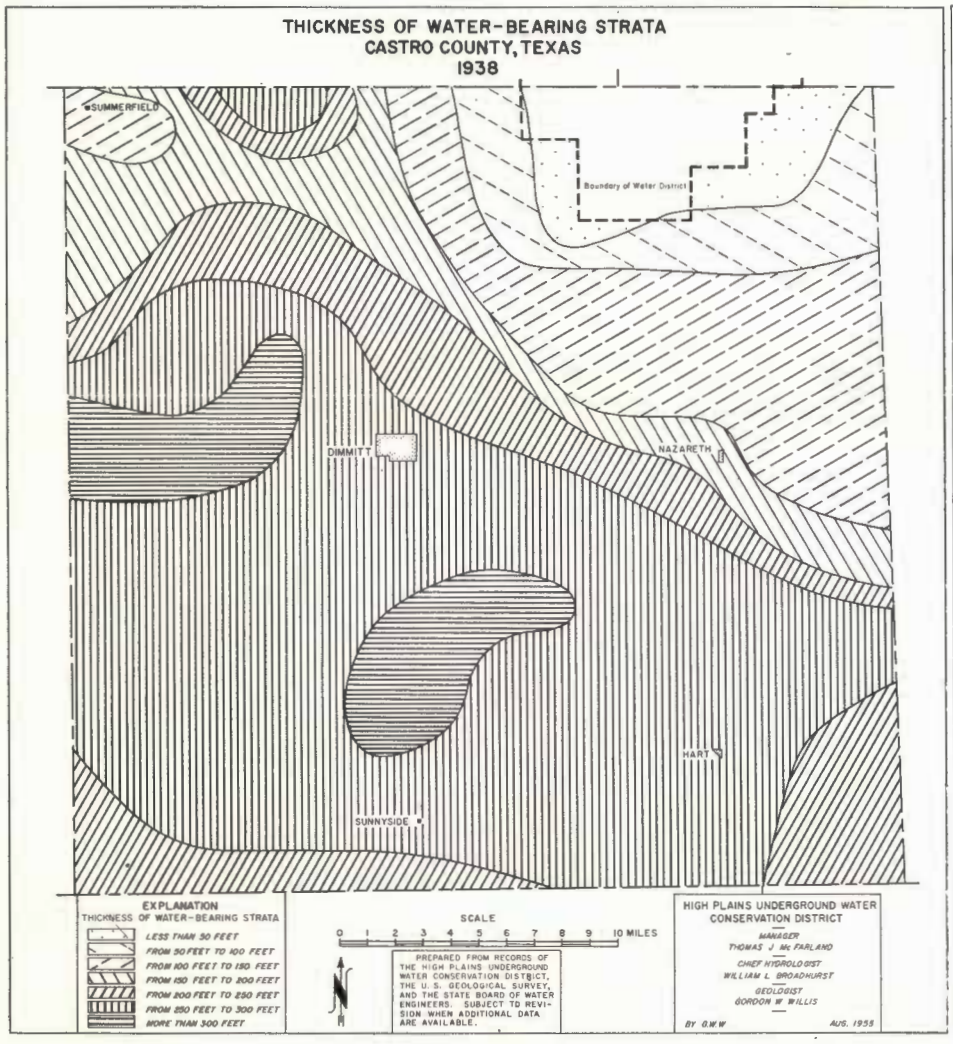

PLATE 1

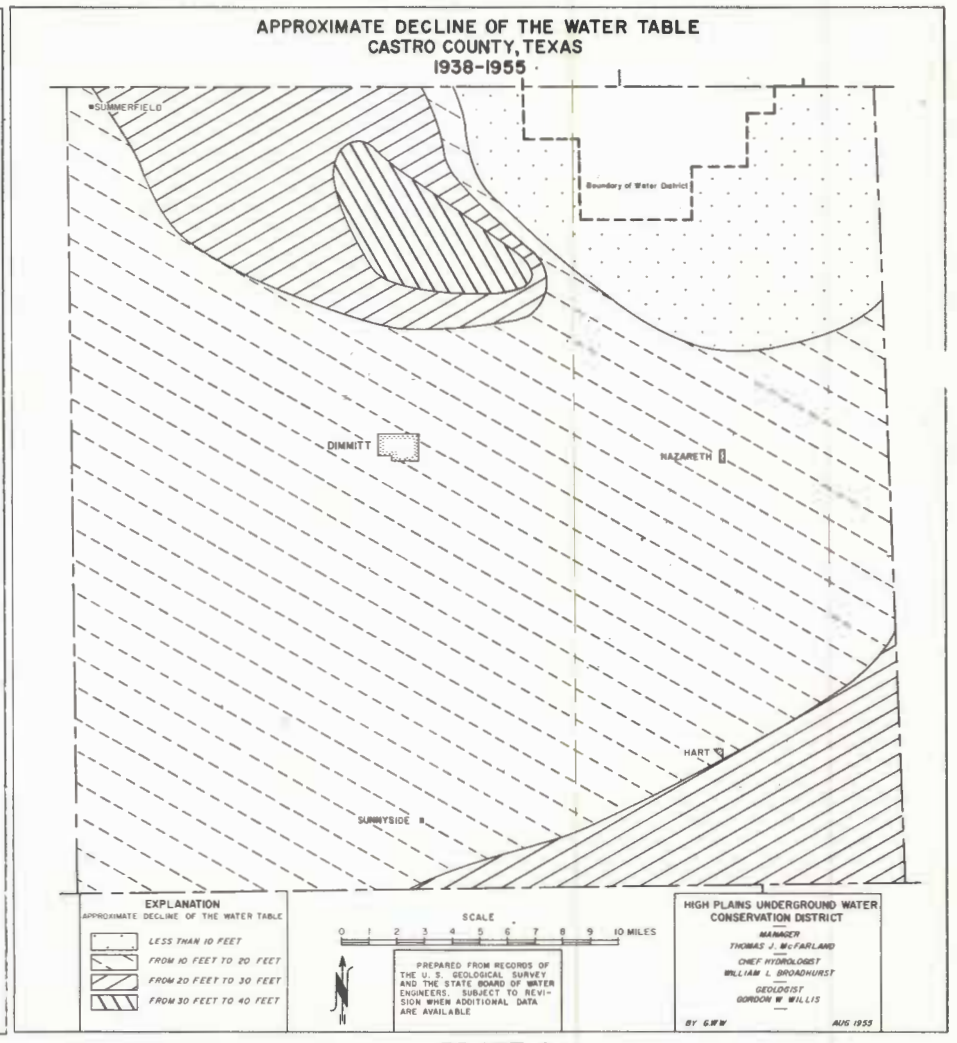

PLATE 2

The portion of Castro County within the boundary of the High Plains Underground Water Conservation District covers about 540,000 acres of land. (The total area of the county is 560,640 acres.) The underground reservoir in the Ogallala formation beneath the area within the district contains approximately 15,900,000 acre-feet of ground water in storage available for pumping.

The map in plate 1 shows the thickness of the water-bearing strata between the water table and the redbeds in 1938 before an appreciable amount of water had been pumped from the reservoir. The map in plate 2 shows the decline of the water table from the spring of 1938 to January 1955.

The volume of water remaining in the underground reservoir was determined by subtracting the volume of material unwatered since 1938 from the total volue of saturated material in 1938 and multiplying the remainder by the coefficient of storage of 15 percent.

These data show that 17,200,000 acre-feet of water was in storage available for pumping in 1938, and that 1,300,000 acre-feet of water has been removed from storage since 1938. In other words, 7.6 percent of the volume of the available water has been removed from storage since 1938. Approximately 850,000 acre-feet or about 65 percent of the volume of water removed from storage was pumped during the 5-year period from January 1950 to January 1955.

The approximate quantity of underground water in storage, available for pumping, beneath an individual farm may be determined by multiplying the number of acres in the farm by the thickness of the water-bearing strata underlying the farm and then multiplying by the storage coefficient of 15 percent. Suppose the farm consists of 320 acres and has 200 feet of water-bearing strata underlying it, then 320 acres x 200 feet x 0.15 equals 9,600 acre-feet of water available for pumping. An acre-foot of water is the quantity required to cover one acre to a depth of one foot, and it is also equal to 43,560 cubic feet or 325,829 gallons.

An individual may use this information to determine, within reasonable limits, how long the quantity of underground water in storage beneath his farm will last at any annual rate of withdrawal. This assumes of course, that his neighbors pump a comparable amount of water per acre on their farms.

These maps and studies of this type are parts of the regular hydrological work in progress by the staff of the Water District. Similar maps and information will be prepared, as rapidly as practicable, for all the counties within the Water District. Maps of Deaf Smith, Parmer and Castro Counties are now available.

Recharge—

(Continued from Page 1)

ing and the ability of the aquifer to transmit the recharge water should be determined. The chemical and bacterial quality, the silt and clay content, and the forms of organic life that are present in the water used for recharge have very definite affects on the rate at which some aquifers will take water. Data regarding the physical characteristics of the aquifer and the affect of impurities in the recharge water can be obtained by carefully controlled experiments. These data can then be used to aid in the design of the most practical and, in the long run, the most economical methods of accomplishing artificial recharge.

The staff of men who are making these experiments are very capable scientists, and their progress will be followed with a great amount of interest. Their's is a program of research, and the data that they will compile will be of inestimatable value in the field of artificial recharge to underground water reservoirs.

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

Second Class Permit

Mr. Z. O. Lincoln
913 Houston
Levelland, Texas

THE Cross SECTION

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

Vol. 2 — No. 3 "THERE IS NO SUBSTITUTE FOR WATER" *September 1955*

WATER RIGHT CONFLICTS GROWING

NATIONAL WATER LAWS URGED BY FEDERAL FARM BUREAU OFFICIAL

Congress and the states had better get down to the serious business of passing some laws about water, a Farm Bureau federal official says.

Conflicts over water rights and use are growing in the East where state surface water laws are "extremely inadequate," warned Charles C. Butler, director of the farm group's land and water use division.

Even the water-conscious, dry areas of the West face trouble because few of the states have adequate legal controls over the use of ground water supply, Butler said.

The facts "do not add up to a very pretty picture of the management of this nation's greatest natural resource," he charged in a recent speech. There is no national policy to guide water resource development, he asserted.

Not that there isn't a lot of water around. Scientists figure 75 percent of the earth's surface is covered by water. Pour it all on the dry-land of the earth and they'd be covered by two miles of water.

But most of that water is too salty for drinking, washing, irrigating crops and use in industrial plants. Scientists are only now beginning to develop commercially practical methods for purifying salt and brackish water.

Water shortages, always a problem in much of the West, lately have begun to plague the East which always took water for granted, Butler said.

In most eastern states, what water law there is depends on the ancient principle of riparian rights. That is, a man whose property borders a stream can take out as much as he needs but, he must not reduce the flow.

The volume of water at the downstream end of the property must be as great as the volume entering at the upstream end.

When streams are low and property owners seek to use water for irrigation and other uses, the prospects for squabbles are boundless.

The amount of water available in the East has not diminished in recent years, Butler insisted, but the demand for water has risen. The nation's population has climbed from 90 million to 165 million in a half century and still is growing. Homes equipped with clothes and dishwashing machines use more water than grandpa did with a family clothes tub in the basement and a Saturday night bath schedule.

Modern steel plants need 100,000 gallons of water to make a ton of steel and some chemicals require up to 300,000 gallons of water a ton.

On the farm, water consumption also is rising sharply. Mississippi water use rose from 55 million gallons a day to several billion gallons daily this year, Butler asserted. In 14 northeastern states, he said, farmers this year are irrigating 230,000 acres—a 75 percent gain in four years.

"The results of these demands are falling water tables, salt water encroachment, numerous conflicts over the use of water, and evidence of the lack of adequate water laws," Butler said.

"Without water all life would disappear," he said. "Yet man still considers water, second only to air, as something that should always be available and at little or no cost."

ARKANSAS GROUP VISITS WATER DISTRICT

A group of eight engineers and geologists from Arkansas flew to Lubbock in a Corps of Engineers amphibian airplane to visit the High Plains Water District on September 8th and 9th. The group consisted of Kyle Engler and J. R. Bissett of The University of Arkansas, R. T. Sniegocki and H. B. Counts of the Little Rock office of the U. S. Geological Survey, and J. T. Pegg and F. H. Bayley of the Vicksburg District of the Corps of Engineers.

These men are engaged in research experiments in artificial recharge in the rice growing area of the Grand Prairie Region of Arkansas. The Water District's recharge project at Allmon Gin in the southwestern part of Floyd County was observed by the group. Data from many recharge projects over the United States are being used in the research program in Arkansas.

The results of the experiments in Arkansas will be published at a later date when the project is completed. The technical staff of the Water District has been invited to observe these experiments, and the CROSS SECTION will publish progress reports of the experiments as they are released from time to time.

COUNTY COMMITTEEMEN TACKLE WASTE WATER PROBLEMS

County Committeemen from the counties within our Water District have begun an intensive effort to secure the help of their people in doing away with one of the largest obstacles confronting us at the present time—waste of underground water.

It has been the thinking of the District's Board members, in matters of this nature, to work out a plan of handling the situation which will not only get the job done, but also be in accordance with the will of a majority of the people that will be affected.

The above picture shows a cotton field with a heavy border pulled up at the end of the rows in an effort to keep irrigation water from escaping.

Since waste of our most precious natural resource, underground water, is a matter of utmost importance to each person who lives in this area, it becomes every person's obligation to take care that his water is used in a beneficial and productive manner.

Several persons who have been contacted in regard to water running off their land and eventually finding its way to a lake or bar-ditch and growing nothing more beneficial than weeds and Johnson grass, have asked how best to keep their water from escaping the land from which it was produced. Questions of this nature are very difficult to answer since many things will enter into a well planned program of farming without loss of precious water. Things like slope of land, texture of soil, amount of water being used, and other things all enter into the picture and must be taken into consideration.

We have talked with several farmers in various areas, concerning practices that they employ in a effort to obtain the maximum benefit from the underground water pumped and also from the rainfall. From the majority came suggestions to bench level land and thereby take maximum advantage of any rainfall that comes; shorten rows to cut down length of each setting; throw up heavy borders at the end of rows to stop tailwater from escaping the land; plant cover crops or row crops at end of rows being watered to catch and use the tail-water. Many farmers report highly productive crops produced in this manner with no water except that tailwater which otherwise would have been lost to bar-ditches and lakes.

Of course, in the case of more sloping land, the problem becomes more acute and naturally harder to work with and to solve. After talking with some operators who have a situation like this with which to cope, we suggest the following methods being used: shorten rows, use smaller irrigation tubes and shorten the length of each set. Where this can not be done, a sump could perhaps be prepared at the lowest point on the farm where the tail-water could drain. In this sump a centrifugal pump could be placed with an automatic float switch to cut the pump on and off. This pump would send the tail-water back to a point where it could be used again. Also, a sprinkler type irrigation sys-

(Continued on Page 3)

THE Cross SECTION

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

Published monthly by the High Plains Underground Water Conservation District No. 1 1628-B 15th Street, Lubbock, Texas

Telephone PO2-8088

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ALLAN WHITE
Editor

CONSERVATION CONVERSATION

We came across a very interesting article released by the Texas Department of Agriculture, which we have reprinted below.

"Fifty years ago, the Texas Legislature foresaw that the rapidly developing state would eventually come face to face with an obstacle that could block further expansion— a water shortage.

That prediction has become a reality, after four years of state-wide drouth, broken only recently by rains. But the problem is still with us—and the Legislature still has not found a solution.

Part of the blame rests on the fact that opposite political views block attempts to draft a master water plan. Yet, the public, too, must share some of the responsibility for this failure. When financial plans are proposed, people fear burdensome taxes will be imposed in areas which will receive only nominal benefits from such a program.

As it now stands, the problem will never be solved until political factions and the public are willing to assume a rightful share of responsibility—both administrative and financial.

The water problem is two-fold. Our largest supplies lie in underground reservoirs. Most of our municipal and irrigation supplies come from wells. Yet, surface water impounded behind dams will become increasingly important in future years. A great deal of progress has been made in conserving underground water supplies. Water districts were created, giving local authorities the power to regulate and control water usage, to a certain extent. This type of conservation has been particularly effective in the High Plains district where board members estimate they have saved farmers some $20 million by regulating the spacing of irrigation wells. This money might otherwise have been wasted by drilling wells too close together, thereby diminishing the effectiveness of water production in the immediate area.

Any future legislation must recognize that underground and surface water supplies constitute two separate problems—each must be treated differently. However, both must be integrated into a master plan which will assure Texas of adequate water in years to come."

* * * *

We have been receiving complaints from practically every county in the water district, pertaining to abandoned wells being left open by their owners.

This is not only against the law, but, of course, is against all rules of good judgment.

As an aftermath of a California State tragedy, when a small girl fell into an abandoned well and was recovered dead, the Texas Legislature passed a bill providing that it shall be unlawful for any person who shall drill, dig, or otherwise create, or cause to be drilled, dug, or otherwise created, any hole or well as much as ten (10) feet in depth and more than ten (10) inches in diameter, to abandon said well or hole without first completely filling same from its total depth to the surface of the ground or plugging said well or hole with a permanent type plug at a depth of not less than ten (10) feet from the surface and completely filling said well or hole from the plug to the surface. This law further provides that it shall be unlawful for the owner of any well or cistern to fail to keep it entirely covered at all times with a covering capable of sustaining weight of not less than 200 pounds, except when such well or cistern is in actual use by the owner or operator. Also, any person violating the above provisions shall be guilty of a misdemeanor and shall be subject to a fine of not less than $100 and not more than $500.

The above law, Article 1721, Texas Revised Civil Statutes, is called to your attention in an effort to obtain your consideration of the seriousness of leaving wells open on your property. Even if there were not a law against this practice, would you not be the last one to want to be the cause of an accident that perhaps would result in a terrible tragedy.

Please adhere to this urgent request for all persons who have wells that are open or not closed properly, please close them according to this law.

If you have any respect for your neighbors and for your community, please take the time necessary to close any open wells on your land.

"A LITTLE LIFE IS WORTH MORE THAN A LITTLE TIME."

* * * *

The Hoover Commission is again making recommendations to the Congress on water resources and recommendations for a federal water program.

The report consists of two volumes, a majority and minority report.

Volume one contains the findings, conclusions and recommendations of the majority.

Recommendation No. 1

"That the Congress adopt a national water policy on the following nine points:

(a) That water resources should be developed to assure their optimum use and their maximum contribution to the national economic growth, strength, and general welfare.

(b) That water resources development should be generally undertaken by drainage areas—locally and regionally.

(c) That the Federal Government should assume responsibility when participation or initiative is necessary to further or safeguard the national interest or to accomplish broad national objectives, where projects, because of size or complexity or potential multiple purposes or benefits, are beyond the means or the needs of local or private enterprise. Under other circumstances the responsibility for development should be discharged by State or local governments, or by local organizations, or by private enterprise.

(d) That in participating in water resources and power development, the Federal Government without waiving its constitutional rights should take account of the rights and laws of the separate States concerning appropriation, use, control, and development of waters within their boundaries.

(e) That the Federal Government should provide advisory assistance to those local and State agencies that are undertaking water resource and power development projects.

(f) That before Congress authorizes or appropriates funds for Federal participation in any water resource project, it should have substantial evidence that the project is economically justified and financially feasible, and

(Continued on Page 4)

KNOW YOUR COUNTY NEIGHBORS

W. R. (RICHARD) Key, of Route 1, Morton, is a member of the Cochran County Committee. His term of office will expire January, 1957.

Mr. Key and his wife, Zelma, have one daughter, Linda Gay, 10, and two sons, Richard Dan, 19, and Robbie, 18. Both Richard and Robbie are married and each have a son. They are both farmers. Linda is in school.

Mr. Key and his family attend church at the Morton Methodist Church. He is a member of the Farm Bureau.

In 1952, Mr. Key drilled his first irrigation well, and at the present time operates 280 acres of land and two wells. Both of these wells are on sprinkler systems.

* * * *

VERNICE FORD, Committeeman from Lubbock County, lives at 3013 20th Street, Lubbock, with his wife Jean.

Mr. Ford attended the Gainesville Business College at Gainesville, Texas. He is very active in the First Baptist Church of Lubbock, where he and his wife attend. He is a very prominent business man as well as a farmer in the Lubbock area.

Mr. Ford has four irrigation wells on 380 acres of land, with the first being drilled in 1940. He also farms approximately 180 acres of dry land.

Mr. Ford enjoys hunting in his spare time, and his hobby is photography. He tells us he is merely an amateur shutter-snapper, but from what we hear about some of his pictures we are inclined to believe he is being rather modest.

Mr. Ford will serve as a member of the Lubbock County Committee until January, 1958.

* * * *

MRS. JEAN LANCASTER, Secretary for the Lubbock and Lynn County Committees, lives at 3711 23rd Street in Lubbock. Her husband, Eldon, is in the Army and is stationed with the infantry in Hawaii.

Before going to the Army, Mr. Lancaster farmed 320 acres of irrigated land near Slaton. He operated three irrigation wells.

Mrs. Lancaster attended public school in Odell, Texas and Draughon's Business College in Lubbock. She attends the Calvary Baptist Church.

During her time off, Mrs. Lancaster enjoys spending her idle hours skating and playing the piano.

* * * *

CECIL T. PACE is a member of the Hockley County Committee from Clauene.

Clauene is a community in the southern part of the county and is where Mr. Pace has lived most of his life. He attended school there.

Mr. Pace and his wife, Emilie have four daughters, Nancy, 15, Margie, 12, Joan, 9, ,and Sharon, 3. They attend the First Methodist Church of Levelland where Mr. Pace is a Steward and Trustee.

In 1946, Mr. Pace drilled his first irrigation well and now operates six wells and farms approximately 850 acres of land.

Besides farming, Mr. Pace is interested in other business activities. He also tells us that he likes to travel, and that fishing is his hobby.

Mr. Pace, whose term of office expires January, 1958, is one of the Hockley County Committee's newest members.

* * * *

STEVE BROCKMAN is chairman of the Castro County Committee and long time resident of Nazareth in the eastern part of the county.

Mr. Brockman attended public school in Nazareth. He has grown up with the Plains of Texas and has seen many changes take place.

Mr. Brockman attends the Catholic Church and belongs to the Castro County Farm Bureau.

In 1948, Mr. Brockman drilled his first and only irrigation well. He waters 325 acres of land and farms about 100 acres of dry land.

Mr. Brockman, only 1 of 65 County Committeemen, holds the very unique position of being the only bachelor. This, consequently, gives him a little extra time to do some hunting and fishing.

Geology and water have always been of particular interest to him.

Mr. Brockman's term of office expires January, 1956.

Please Close Those Abandoned Wells!!!

WASTE PROBLEMS—

(Continued from Page 1)

tem has been suggested for use on land which has a considerable amount of slope.

Many other ways of controlling tailwater have been devised by resourceful farmers in our area. These are merely a few of the more common methods.

Economics must be taken into consideration in a farming operation as it must in other business endeavors. One might get the idea that if practices such as those mentioned above were put into use the cost of farming the land would be too great and a profit could not be realized. This, of course, is not entirely true. It would cost some money to put anyone of these things into practice; however, analyze the problem a little farther and find some of the cost savings to be had. The cost of pumping water that is not used to grow a crop could be saved as well as precious top soil carried with the waste water into lakes and depressions. This cost to the land owner is tremendous in decreased productivity of the soil and to an operator in eventual commercial fertilizer costs and its cost of application. We feel the saving which will eventually mean the most to the individual farmer is that one of leaving that underground water in the underlying formation which would otherwise be spent in bar-ditch evaporation or producing weeds and Johnson grass.

It is every man and woman's responsibility to themselves, their neighbors and this great High Plains area to do everything possible to prevent waste of a resource which God gave to our people so that prosperity could flourish. Please do your part in working with these County Committeemen in an effort to prevent waste of underground water. Your suggestions will be appreciated.

This picture shows level borders and bench leveling being used to hold irrigation water on crop land. Also, with this method, rainfall can be captured and put to beneficial use.

STATISTICS FOR AUGUST

During the month of August, 277 completed wells were registered with the District office and 188 permits were issued by the County Committees. These new permits issued and completed wells follow by county:

County	*Completed Wells*	*Permits Issued*
Armstrong	0	0
Bailey	22	23
Castro	27	21
Cochran	13	9
Deaf Smith	25	19
Floyd	43	9
Hockley	43	14
Lamb	30	27
Lubbock	29	38
Lynn	6	1
Parmer	21	17
Potter	0	0
Randall	18	10

Willis Returns After Operation In Temple

Gordon "Doc" Willis, District Geologist, has returned to work after undergoing a major operation at the Scott and White Hospital and Clinic in Temple, Texas.

Mr. Willis has been devoting the majority of his time to compiling information for the preparation of the various county maps which show the thickness of the water-bearing strata and the approximate decline of the water table.

We are glad to have him back on the job.

EDITOR
THE CROSS SECTION
1628-B 15th Street
Lubbock, Texas

Dear Sir:

Please send the Cross Section each month, Free of any charge, to me at the address given below.

Name_____

Street Address_____

City and State_____

(Please cut out and mail to our address)

GROUND-WATER INVENTORY CONTINUED—IN A PORTION OF POTTER COUNTY

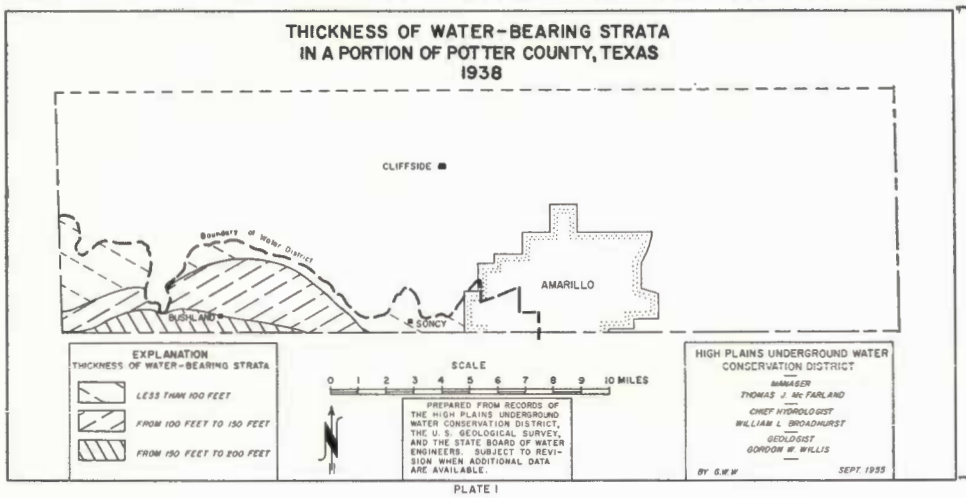

PLATE 1

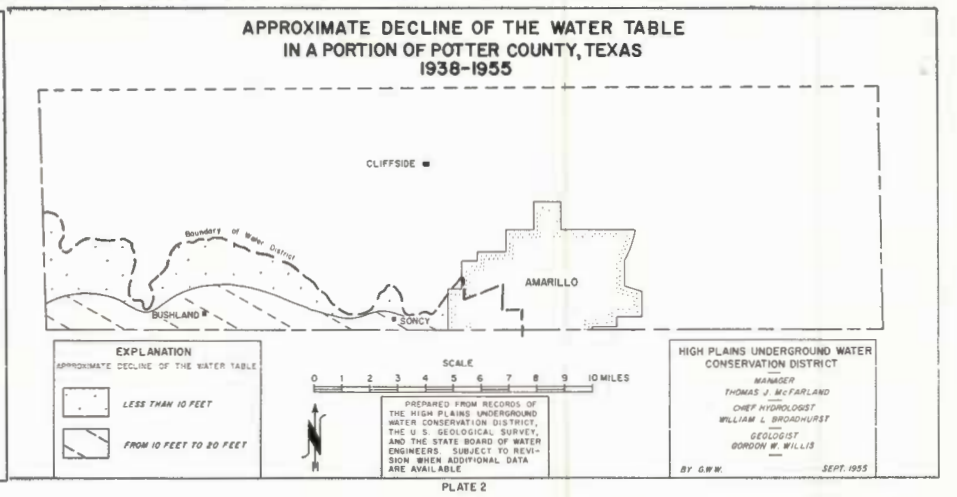

PLATE 2

The portion of Potter County within the boundary of the High Plains Underground Water Conservation District covers approximately 23,000 acres of land. The underground reservoir in the Ogallala formation beneath the area within the Water District contains approximately 344,000 acre-feet of ground water in storage available for pumping.

The map in plate 1 shows the thickness of the water-bearing strata between the water table and the redbeds in 1938 before an appreciable amount of water had been pumped from the reservoir. The map in Plate 2 shows the decline of the water table from the spring of 1938 to January, 1955.

The volume of water remaining in the underground reservoir was determined by subtracting the volume of material unwatered since 1938 from the total volume of saturated material in 1938 and multiplying the remainder by the coefficient of storage of 15 percent.

These data show about 376,000 acre-feet of water was in storage available for pumping in 1938, and about 32,000 acre-feet of water has been removed from storage since 1938. In other words approximately 8.5 percent of the volume of the available water has been removed since 1938.

The approximate quantity of underground water in storage, available for pumping, beneath an individual farm may be determined by multiplying the number of acres in the farm by the thickness of the water-bearing strata underlying the farm and then multiplying by the storage coefficient of 15 percent.

Suppose the farm consists of 160 acres and has 150 feet of water-bearing strata underlying it, then 160 acres x 150 feet x 0.15 percent equals 3600 acre-feet of water available for pumping. An acre-foot of water is the quantity to cover one acre to a depth of one foot, and it is also equal to 43,560 cubic feet or 325,829 gallons.

An individual may use this information to determine, within reasonable limits, how long the quantity of underground water in storage beneath his farm will last at any annual rate of withdrawal. This assumes of course, that his neighbors pump a comparable amount of water per acre on their farms.

These maps and studies of this type are parts of the regular hydrological work in progress by the staff of the Water District. Similar maps and information will be prepared, as rapidly as practicable, for all the counties within the Water District. Maps of Deaf Smith, Parmer, Castro Counties and a portion of Potter County are now available.

CONSERVATION CONVERSATION

that such project is essential to national interest.

(g) That one Federal agency should be made responsible for collecting and reviewing the adequacy of hydrologic data.

(h) That all Federal agencies administering revenue-producing water resource and power projects should pay all cash revenues to the Treasury as miscellaneous receipts, and receive an annual appropriation for cash operating expenditures.

(i) That regulation of rates for sale of electrical energy by all Federal agencies be vested in the Federal Power Commission."

* * * *

The Water District's technical staff has prepared a demonstration of a basic hydraulic principal and is to be set up at the South Plains and Panhandle Fair in Lubbock in the Agriculture Building. It consists of two water supply lines extending from a small pump to the underside of two vertical cylinders; one cylinder being 5-inches in diameter and one 10-inches. The two supply lines have check valves and pressure gauges installed to show that the pressure on the lines is identical. At the top of each cylinder a small spigot has been installed, and the demonstration shows that the same amount of water is discharged from each spigot, even though one cylinder is twice as large as the other. The only difference being the time elapsed in originally filling each cylinder.

This demonstration has been made to show what actually happens when two separate irrigation pumps are producing a like quantity of water from the same depth, and one being of larger size than the other. If one of these pumps is a 6-inch column size and the other an 8-inch, and assuming that the bowl efficiency is the same for each ,then the same amount of power would be required for each. This assumes the friction-loss in each column to be negligible.

Also, a large graph will be on exhibit during the fair. This graph is designed to show the annual rainfall, number of irrigated acres, number of irrigation wells and the number of acre-feet of underground water pumped annually within the underground reservoir in the Ogallala formation, south of the Canadian River. The graph covers the period between 1910 and 1955.

LETTERS TO THE EDITOR

We have received the following card and appreciate it very much:
The Cross Section:

Please send me the August edition of "The Cross Section." You have a very valuable publication in this little paper and a great service to the farmer.

On the little map of the Water District (on page 2) why are Swisher and Hale Counties in white. Is there no water in these counties?

Thank you.

Yours sincerely,
Mrs. W. C. Huff,
Littlefield, Texas

The reason for Swisher and Hale, as well as Briscoe, Crosby, Dickens, Garza, Oldham and Terry Counties being in white on the little map of the district is that the people within the bounds of the underground reservoir in these counties voted to not participate in the activities of this locally-controlled district.

One of the first steps in establishing an underground water conservation district is for the Board of Water Engineers to establish and designate the boundary of the reservoir. After this has been done an election is called in the portion of each county lying within this established boundary. The people vote, and the majority decides whether or not that county will join with the others in a locally-controlled organization and in a unified effort of conserving and preserving the underground water.

Within the boundaries of our own reservoir there are all or parts of twenty-one counties. At the time of the vote, thirteen counties decided to organize together in a district. These counties are in black on the small map. —Editor.

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

Second Class Permit

Mr. Z. O. Lincoln
913 Houston
Levelland, Texas

THE Cross SECTION

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

Vol. 2 — No. 4 "THERE IS NO SUBSTITUTE FOR WATER" October 1955

TEXAS WATER CONSERVATION ASSOCIATION CONVENTION HELD

The 11th Annual Convention of the Texas Water Conservation Association was held in Galveston on October 9, 10 and 11.

Judge Guy C. Jackson who had served as President of the Association since its birth, stepped down and was succeeded by H. F. Mitchell of Corsicana.

Mr. Mitchell, an oil man and an engineer, is a former member of the State Highway Commission. He has been a very active member of the Texas Water Conservation Association since its beginning.

The High Plains Water Conservation District was proud to have the convention adopt its resolution opposing the theory that ground water as well as surface water should be developed by river basin authorities. The Resolution passed by the Convention read as follows:

RESOLUTION

WHEREAS, efforts are being made to establish a national water policy for the United States based on major river basins as the unit for ground water as well as surface water resource development program; and

WHEREAS, ground water development and conservation are important and of imminent national concern; and

WHEREAS, it is not practicable usually to conserve and develop ground water with major river basins as a unit, in view of the fact ground water is often found in reservoirs crossed by more than one river basin, many conservation measures appropriate for ground water are not appropriate for surface water, and basic ground water laws conflict sharply among some states touched or crossed by one river;

NOW, THEREFORE, BE IT RESOLVED, That the Texas Water Conservation Association recommend that any national water policy include the following framework in regard to ground water:

NATIONAL GROUND WATER POLICY

Each state that has not already done so should adopt comprehensive laws, consistent with its established property rights, with the objectives of gathering data on, dissemination of information concerning, and for effectively developing, conserving, preserving, protecting and recharging the ground water of ground water reservoirs and/or subdivisions of such reservoirs, and, toward those ends, authorizing cooperation among appropriate local, state and federal agencies.

Power To Pump Water Vs. Size Of Column Pipe

By W. L. BROADHURST

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 1000 gallons a minute; but, unfortunately, some of them now deliver only half-a-pipe, 400 to 500 gallons a minute.

W. L. Broadhurst

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 my statement. I did not say you can 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, we built a model which is shown in the picture. It consists of a table on which is 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.

(Continued on Page 4)

FACTS AFFECTING A NATIONAL WATER POLICY

Dent Congratulates Water District

The Board of Directors of the Water District has received a letter from Mr. O. F. Dent, member of the Board of Water Engineers in Austin, stating that the High Plains Underground Water Conservation District No. 1 is the first ground-water district to register with their office, in accordance with House Bill No. 27 passed by the 54th Legislature. Also, Mr. Dent states that the documents transmitted to them are in order and in accordance with the provisions of the Bill as they interpret it.

The High Plains Underground Water Conservation District desires to cooperate in the formulation of a National Water Policy, especially in so far as that policy applied to managing the development and use of ground water. In regard to that desire, Mr. Arthur P. Duggan, Jr., attorney, who represents the District on various occasions, prepared the resolution, which appears elsewhere in this issue, pertaining to a National Ground Water Policy. That resolution was adopted by the Texas Water Conservation Association at its recent meeting in Galveston. The Association will submit the resolution to the National Reclamation Association which will meet October 24-26, 1955, in Lincoln, Nebraska. Copies of Mr. Duggan's material were submitted to Dr. A. N. Sayre, Chief of the Ground Water Branch of the U. S. Geological Survey, for criticism and suggestions. Dr. Sayre, who is recognized for his work in the field of ground water not only in the United States but throughout many regions of the World, has given permission for the reproduction of his reply to Mr. Duggan.

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

October 10, 1955

Mr. Arthur P. Duggan, Jr.
Attorney at Law
Littlefield, Texas

Dear Mr. Duggan:

The interesting statement of which a carbon copy is attached to your letter of September 22 makes several very good points. The principal one is that plans for regional water development must take into account the fact that ground-water reservoirs do not always coincide with river basins. A better example than the Ogallala formation could hardly be cited. As an aquifer, the Ogallala is divided into segments by streams, either almost completely as in the case of the Canadian River or partially as in the case of some of the streams farther north. These segments between streams might well prove to constitute hydrologic units that could be managed more effectively than could the drainage basins of which each segment would contain parts of two—between which parts is a surface divide of indefinite location and little hydrologic significance, inasmuch as the segments may contribute little water to the bounding streams and may do so

(Continued on Page 4)

THE Cross SECTION

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

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ALLAN WHITE
Editor

COUNTY COMMITTEEMEN

Armstrong County

John Patterson, Happy

John Patterson	Happy, Texas
James Bible, Chairman	Wayside, Texas
Floyd B. Adams	Wayside, Texas
Guy Watson	Wayside, Texas
Bill Heisler	Wayside, Texas

Bailey County

Mrs. Doris Traweek, Bailey County Farm Bureau Office, Muleshoe

Buck Gregory	Route 2, Muleshoe, Texas
Bill Garrett	Route 2, Muleshoe, Texas
W. R. Carter	Muleshoe, Texas
Robert F. Byrd	Route 2, Muleshoe, Texas
D. V. Terrell	Morton, Texas

Castro County

Eugene Ivey, Dimmitt

Ivor Baggwell	Route 4, Dimmitt, Texas
Sid Sheffy	Dimmitt, Texas
T. R. Davis	Hart, Texas
H. F. Benson	Star Route 1, Hereford, Texas
Steve Brockman	Nazareth, Texas

Cochran County

J. B. Knox, Western Abstract Co., Morton

Max Bowers, Chairman	Morton, Texas
Hume Russell	Morton, Texas
Herbert Cadenhead	Route 1, Morton, Texas
W. R. Key	Morton, Texas
S. B. Stovall	Star Route 2, Morton, Texas

Committeemen meet first Tuesday night of each month, Cochran County Farm Bureau Office, Basement of Court House, Morton.

Deaf Smith County

Mrs. Pat Loerwald, Deaf Smith County Farm Bureau Office, Hereford

Frank J. Bezner, Chmn, Box 14,	Hereford, Tex
Ed Druluk, Sr.	Route 2, Hereford, Texas
Ralph Hastings	Route 4, Hereford, Texas
Floyd Walton	Route 5, Hereford, Texas
J. N. Fish	Hereford, Texas

Committeemen meet the first Monday of each month in the Farm Bureau Office, Hereford, 7:30 p. m.

Floyd County

Mrs. Ida Puckett, 319 South Main Street, Floydada

Tate Jones	Floydada, Texas
J. R. Belt	Lockney, Texas
R. C. Mitchell	Lockney, Texas
Robert L. Smith	Lockney, Texas
Lee Trice	Route 1, Floydada, Texas

Hockley County

Z. O. Lincoln, 913 Houston, Levelland

Henry Schmidley	Route 3, Levelland, Texas
Cecil Pace	Levelland, Texas
J. J. Hobgood	Route 2, Anton, Texas
W. H. Cunningham	Star Rt. 4, Levelland, Texas

Committeemen meet first and third Fridays of each month at 1:30 p. m. 913 Houston, Levelland.

Lamb County

Jess Everett, Chamber of Commerce Office, Littlefield

V. M. Peterman, Chmn,	Route 1 Amherst, Texas
Elmer McGill	Olton, Texas
Roy McQuatters	Route 1, Anton, Texas
L. Z. Anglin	Box 86, Earth, Texas
Bill Nix	Sudan, Texas

Lubbock County

Mrs. Jean Lancaster, 1628-B 15th Street, Lubbock

Earl Weaver	Idalou, Texas
Earl Reasoner	Box 335, Slaton, Texas
Leroy Johnson	Shallowater, Texas
Howard Alford	Route 4, Lubbock, Texas
Vernice Ford	3013 20th St., Lubbock, Texas

Committeemen meet on the 7th of Nov. at 2:00 P. M. in the District Office, 1628-B 15th Street, Lubbock, Texas.

Lynn County

Mrs. Jean Lancaster, 1628-B 15th Street, Lubbock

Roger Blakney	Route 1, Wilson, Texas
E. L. Blankenship	Route 2, Wilson, Texas
Joe D. Unfred	Route 4, Tahoka, Texas
A. E. Hagens	Route 1, Wilson, Texas
H. D. Dean	Route 6, Lubbock, Texas

Committeemen meet the first and third Tuesdays of each month at 10:00 a. m. in the District Office, 1628-B 15th Street, Lubbock.

Parmer County

Aubrey Brock, Bovina

John Gammon, Chmn.	Friona, Texas
Walter Kaltwasser	Rt. 1, Farwell, Texas
D. B. Ivy	Rt. 1, Friona, Texas
C. V. Potts	Rt. 2, Friona, Texas
Matt Jesko	Rt. 1, Muleshoe, Texas

Committeemen meet first and third Thursday nights at 8:00 p. m. in Bovina.

Potter County

Jim Line, Box 87, Bushland

R. C. Sampson, Jr.	Box 86, Bushland, Texas
Earl Barclay	Bushland, Texas
Jim Line	Box 87, Bushland, Texas
E. L. Milhoan	Box 45, Bushland, Texas
T. G. Baldwin	Bushland, Texas

Randall County

Mrs. Don Olson, Rt. 4, Box 388, Amarillo

J. L. Weick	Rt. 1, Canyon, Texas
Frank Begert	Rt. 1, Canyon, Texas
Donald Olson	Rt. 4, Amarillo, Texas
D. L. Allison	Happy, Texas
W. C. Angel	Rt. 2, Canyon, Texas

Committeemen meet first Monday night each month at 8:00 p. m., County Agent's Office, Canyon, Texas.

Meet D. V. Terrell of Route 1, Morton, who is a member of the Bailey County Committee. His present term of office will expire in January 1956.

Mr. Terrell and his wife, Ruth, have

two children, Barbara Jean, 16, and Tommy, who is 8. Both attend public school.

Mr. Terrell was formally schooled in Littlefield, Texas, where he finished high school. The family attends the Methodist Church, and Mr. Terrell is a member of the Farm Bureau.

Mr. Terrell stays busy farming his 480 acres of dry land and 160 acres of irrigated land. He operates 1 irrigation well, which was drilled in 1951. However, occasionally he does manage to slip in a fast fishing trip.

"Thanks," goes to Mr. Terrell for his efforts in behalf of the Bailey County people in the water district.

* * * *

Meet L. Z. Anglin of Earth, who has served as a member of the Lamb County Committee for the past three years.

Mr. Anglin has two girls in his family — Alma, his wife; and Gayle, his daughter. The family attends the Methodist Church in Earth. Mr. Anglin is a Mason.

As were so many of our West Texas people, Mr. Anglin was raised in Oklahoma. He finished his formal education in Vinson, Oklahoma.

Mr. Anglin farms a considerable amount of irrigated land, and operates eleven irrigation wells. His first well was drilled in 1947. Except for an occasional fishing trip, Mr. Anglin sticks pretty close to his farming operations.

Mr. Anglin has done a fine job as a member of the Lamb County Committee, and he deserves a big "thank you" from all the people in his county as his term of office expires in January 1956.

* * * *

Meet Joe D. Unfred, of Route 4, Tahoka, who is a member of the Lynn County Committee. Mr. Unfred and his wife, Betty, have three little Unfred's, David, 9, Nancy, 6, and Vicki

Jo, 3. Their home is near the New Home community, where the family attends the Baptist Church.

Mr. Unfred attended the Petty and New Home public schools and Texas Tech College in Lubbock. He is a member of the New Home Civic Club.

In conjunction with his 320 acres of dry farming land, Mr. Unfred works 420 acres of irrigated land, and operates 9 irrigation wells. He drilled his first well in 1947.

During the Unfred family's summer vacations, Mr. Unfred takes movie pictures of their activities.

Mr. Unfred's present term of office on the Lynn County Committee will expire in January 1956.

* * * *

Meet R. L. Trice, of Route 1, Floydada, who is a county committeeman in Floyd County. He and his wife, Ethel, have one daughter, Mrs. Peggy Ann McClure, and one son, Loy Lee

Trice. They also have four grandchildren, 2 girls and 2 boys.

Mr. Trice attended public school in Chickasha, Oklahoma. He is a Farm Bureau member, and a director in several different cooperative organizations.

In 1943, Mr. Trice drilled his first irrigation well, and now operates two wells. He farms 320 acres of irrigated land.

Mr. and Mrs. Trice attend church at the Floydada Church of Christ.

As a hobby, Mr. Trice raises and races horses.

In January 1956, Mr. Trice will complete his term of office as a county committeeman.

* * * *

Meet Max M. Bowers, Route 2, Morton, Chairman of the Cochran County Committee.

Mr. Bowers and his wife, Leora, have one daughter, Maxine, 19, who

is a Texas Tech student, and one son, Joe H., 7. The family attends the Baptist Church of Morton.

Mr. Bowers attended Texas Tech College. He belongs to several farm organizations, and aside from farming 500 acres of irrigated land and 50 acres of dry land, he has an interest in a cotton gin.

Back in 1948, Mr. Bowers drilled his first irrigation well and at the present time operates five wells.

In the hobby department, Mr. Bowers flies, is an enthusiastic fisherman and enjoys travelling. He has a trailer for camping trips.

Mr. Bowers will serve on the Cochran County Committee until January 1956.

Please Close Those Abandoned Wells!!!

GROUND-WATER INVENTORY CONTINUED—IN PORTIONS OF RANDALL AND ARMSTRONG COUNTIES

The portions of Randall and Armstrong Counties within the boundary of the High Plains Underground Water Conservation District have been combined on the accompanying maps. About 275,000 acres of Randall County and about 39,000 acres of Armstrong County are within the boundary of the Water District.

The area within the Water District in Randall County contains about 3,380,000 acre-feet of ground water in storage available for pumping. In Armstrong County the amount of ground water in storage available for pumping is about 279,000 acre-feet.

The map in plate 1 shows the thickness of the water-bearing strata between the water table and the redbeds in 1938 before an appreciable amount of water had been pumped from the reservoir. The map in plate 2 shows the decline of the water table from the spring of 1938 to January 1955.

The volume of water remaining in the underground reservoir was determined by subtracting the volume of material unwatered since 1938 from the total volume of saturated material in 1938 and multiplying the remainder by the coefficient of storage of 15 percent.

These data show about 3,940,000 acre-feet of water was in storage in Randall County available for pumping in 1938, and about 557,000 acre-feet of water, or about 14 percent, has been removed from storage since 1938.

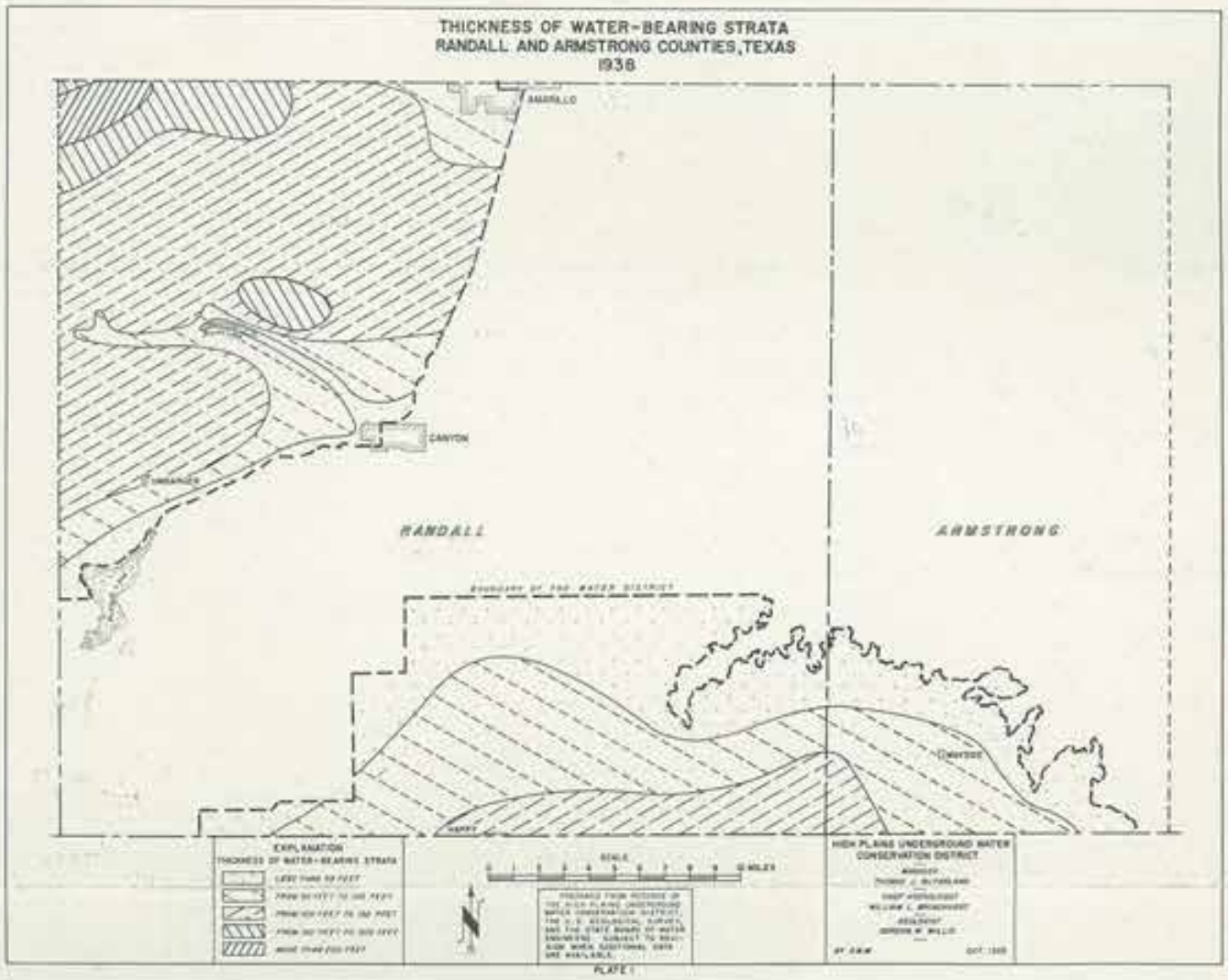
In Armstrong County, the data show about 325,000 acre-feet of water was in storage available for pumping in 1938, and about 46,000 acre-feet of water, or about 14 percent, has been removed from storage since 1938.

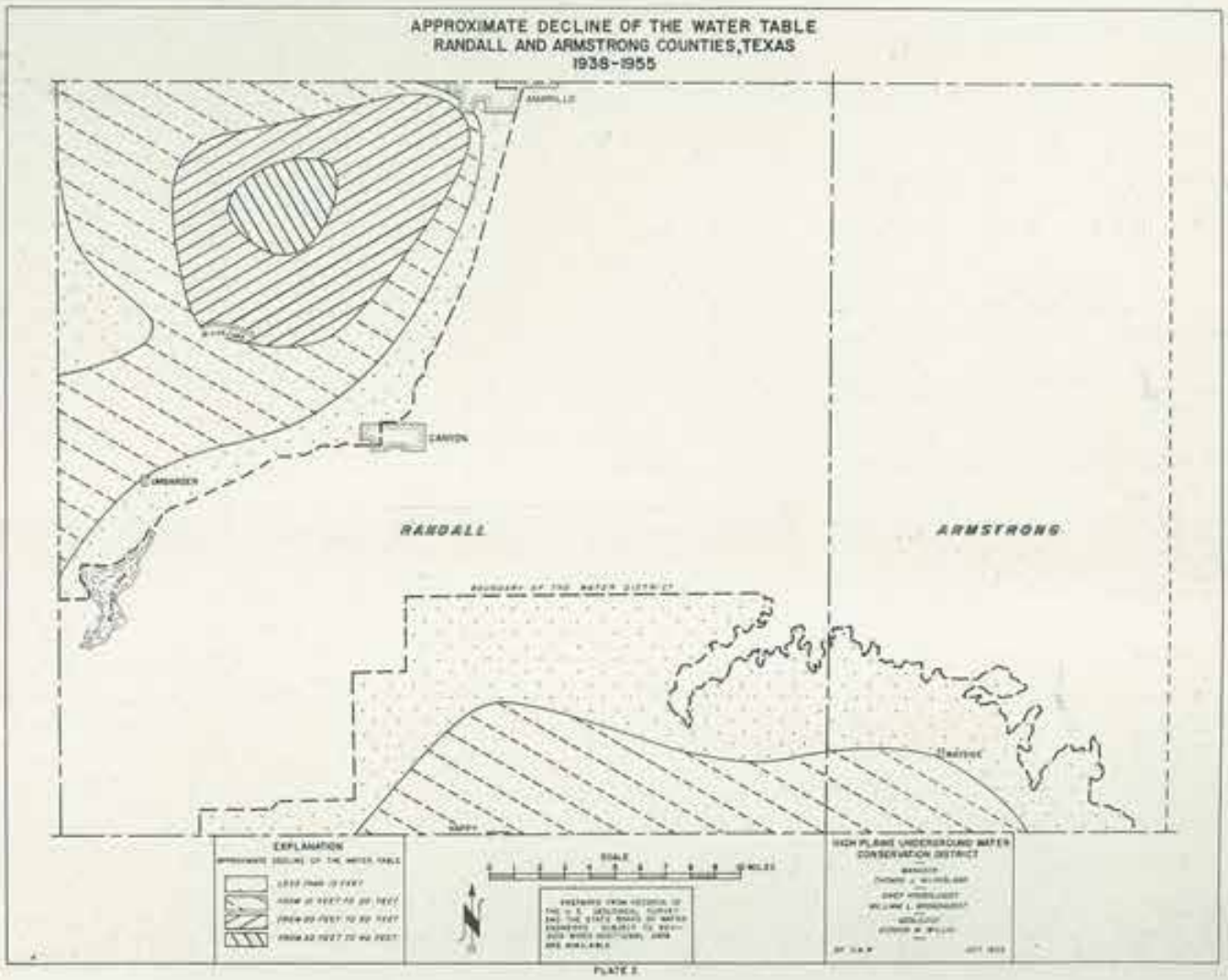
The approximate quantity of underground water in storage, available for pumping, beneath an individual farm may be determined by multiplying the number of acres in the farm by the thickness of the water-bearing strata underlying the farm and then multiplying by the storage coefficient of 15 percent.

Suppose the farm consists of 160 acres and has 150 feet of water-bearing strata underlying it, then 160 acres x 150 feet x 0.15 percent equals 3600 acre-feet of water available for pumping. An acre-foot of water is the quantity to cover one acre to a depth of one foot, and it is also equal to 43,560 cubic feet or 325,829 gallons.

An individual may use this information to determine, within reasonable limits, how long the quantity of underground water in storage beneath his farm will last at any annual rate of withdrawal. This assumes of course, that his neighbors pump a comparable amount of water per acre on their farms.

These maps and studies of this type are parts of the regular hydrological work in progress by the staff of the Water District. Similar maps and information will be prepared, as rapidly as practicable, for all the counties within the Water District. Maps of Deaf Smith, Parmer, Castro, Potter, Randall and Armstrong Counties are now available.





Water Resources Committee Members

Governor Allan Shivers completed the Texas Water Resources Committee appointments last week when he appointed Mr. Howard Boswell of Temple to the Committee.

Mr. Boswell will replace E. H. Kline of Amarillo. Mr. Marvin C. Nichols of Ft. Worth and Mr. O. G. McClain of Corpus Christi were reappointed.

The Committee is now complete with Sen. Frank Owens III of El Paso, Sen. George Parkhouse of Dallas, Sen. Ray Roberts of McKinney, Reps. Stanley Banks of San Antonio, LeRoy Saul of Kress and Bill Wood of Tyler.

CONSERVATION CONVERSATION

Pictured above is one method of properly closing an abandoned well.

There are several satisfactory methods of properly closing abandoned wells. One of these methods is pictured above. The 16-inch casing which the well was originally cased with has been left in the well and a short length of the same diameter casing spot welded to it. This is done so that the well can easily be seen while plowing and working near it.

You will note the square steel plate over the top of the casing— this plate appears to be only resting in this position; however it is actually attached by spot welds to the length of casing. This is an excellent manner in which to cover the top of a well, since children that are attracted to the well are unable to uncover it.

If you have a well that is standing open on your land, please protect your own children and your neighbor's children by closing it properly. Boys and girls are not always so careful as adults, and when you properly cover your well you will be affording protection to them. Also, you will be protecting yourself from possible legal liability.

There are many adequate methods of closing wells that have been abandoned either permanently or temporarily—the one discussed and pictured above is one of these methods.

* * * *

There has been some misunderstanding as to where a well must be drilled in order for it to comply with the rules of the district.

First, it should be stated that the district does not tell you where you can drill a well, but rather, if you space from existing wells you may drill your well anywhere on your land that you desire. This is the only condition that must be met in order to qualify for a permit to drill a well. There is some additional information that the county secretary must have to assist in filling out the permit; the exact location of the well site; the owner and legal description of the land upon which the well will be drilled; and the distance to the nearest three existing wells, within one-fourth of a mile.

On the surface, it does not appear that it would be necessary to get the exact location of the site of the well to be drilled, but think about it a little—if you get a permit to drill an 8-inch well 100 yards from your north line and 100 yards from your west line, and your neighbor to the west gets a permit, without your knowledge, to drill on his land, an 8-inch well, 300 yards from his east line and 100 yards from the north line. He has planned to space his well 400 yards from yours. Then suppose you move, still without knowing that your neighbor has a drilling permit, and commence drilling your well 20 yards from the west line and 100 yards from the north line. You have begun drilling your well at a location different from that specified on your permit. You are in violation of the rules of the district for having moved more than 10 yards from the specified location as stated on your permit—you have also decreased the distance between your well and your neighbor's permit site to 310 yards from the original 400 yards. You are, therefore in error on two counts—one, drilling at a location more than 10 yards from the location specified on your permit; and second, drilling a well at a distance less than the minimum distance for an 8-inch well.

If this should happen, even though with no intention of hurting anyone, it would cost a considerable amount of money to relocate the well after the drilling had been started.

In conclusion, obtain your drilling permit for the location that you desire, and drill the well at that exact location.

Power Vs. Pipe—

(Continued from Page 1)

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.

USE OF RUNOFF WATER IS CONSERVATION

Mr. W. O. Fortenberry, who is serving effectively as President of the Board of Directors of the Water District, is practicing water conservation on his farms in Lubbock County. One of his farms east of New Deal has a considerable slope toward a wet-weather lake. In order to irrigate land and at the same time practice water conservation, Mr. Fortenberry drilled a triple-purpose well. The well was drilled at the lowest point on the farm near the edge of the lake. The first purpose of the well is to produce ground water, which is delivered to the high point in the field through underground concrete pipe. He then irrigates the rows down the slope and, as the second purpose, 'tail water' from the field returns into the well through an intake pipe and a valve shown in the accompaning picture. When the lake catches runoff water from precipitation as it did from October 1 to 4, 1955, as the third purpose, he merely opens the valve and the lake water runs into the well to recharge the sands.

Records are being collected now to determine both the quantity of water that is being placed in the underground reservoir and also the percentage of the total runoff that is being salvaged through this method of water conservation.

The above picture shows the triple-purpose well on the W. O. Fortenberry farm near New Deal in Lubbock County.

Water Policy—

(Continued from Page 1)

from subsurface divides that have no relation to the surface divides.

Because ground-water reservoirs cross both surface drainage divides and political boundaries, it is likely that no consistent scheme of managing a major reservoir could be devised. This factor should tend to prevent any attempt to place the management of ground water in major drainage basins under a single river authority, as your letter indicates you fear may happen. Federal or interstate river development programs must be planned so as to take into account the differences in water law from State to State, and under our present system of government I cannot conceive of attempts by Federal or interstate bodies to regulate the use of ground water within individual States except with the consent of those States and in accordance with their laws. Interstate agreements that will be necessary to the efficient development of major aquifers doubtless will be made by compact between States, whether or not a particular aquifer falls in whole or part within a major river basin for which a Federal or other interstate development program is being set up.

I thank you for the opportunity of examining your statement, and I will be glad to hear further from you whenever you have something to report on legal developments relating to water.

Very truly yours,
A. N. Sayre,
Chief, Ground Water Branch

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

Second Class Permit

THE Cross SECTION

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

Vol. 2 — No. 5 "THERE IS NO SUBSTITUTE FOR WATER" *November 1955*

NATIONAL RECLAMATION ASSOCIATION RECOGNIZES GROUND-WATER PROBLEMS

The 24th Annual Convention of the National Reclamation Association, which was held in Lincoln, Nebraska on October 24-25-26, proved to be one of the most successful conventions ever held by the Association.

The meeting was held in Lincoln in honor of Senator C. Petrus Peterson, a long time member of the organization and retiring President.

Judge Guy C. Jackson, Anahuac, Texas, who for many years has been active in the development and use of water, was elected President of the Association for the coming year.

The program of work, the business meetings, and the selection of speakers for the convention all reflected many hours of planning and preparation by the Board of Directors and the General Manager.

All the seventeen western states were well represented in Lincoln, with one state having forty-four delegates present. The High Plains Water District was represented by T. J. McFarland, W. L. Broadhurst, and A. P. Duggan, Jr.

Some of the high-lights of the convention were talks presented by the Hon. Douglas McKay, Secretary of the Interior, Senator Frank Barrett of Wyoming, Senator Arthur Watkins of Utah, Wilbur A. Dexheimer, Commissioner of the Bureau of Reclamation, and Lt. Col. Samuel D. Sturgis, Chief of Corps of Engineers. Many other very interesting and informative talks, all centering around the future of reclamation and conservation for the western states, were made throughout the 3-day meeting.

In the past the principal objectives of the association have revolved around the development of the arid lands of the west and the economic use of surface water with very little concern being shown for the vast ground water basins of the member states.

One disturbing fact of the convention was the lack of knowledge among the delegates relating to the importance of ground water in the development and use of such water.

A recent report of the Hoover Commission, and a U. S. Supreme Court decision regarding the Pelton Dam case in Oregon, which has been interpreted as setting forth the paramount right of the Federal Government to develop ground water without compliance with state laws, have caused some of the leaders in the field of Reclamation and Conservation to start thinking of more comprehensive state laws governing the development and use of ground water. These laws are necessary particularly in the western

(Continued on Page 3)

Randall County Office Moved

MRS. EUTHA HAMBLEN

The Randall County office of the High Plains Water District has been moved from the home of Mrs. Donald Olson, north of Canyon, to a new location—1710 5th Avenue, Canyon.

Mrs. Olson has turned over her duties as County Secretary to Eutha S. Hamblen. Mrs. Hamblen has application forms for well drilling permits at the new office location and will assist Randall County landowners or their agents in filling them in.

Mrs. Hamblen and her husband, Alfred, live in Canyon. He farms 240 acres of irrigated land and 360 acres of dry land. He operates 3 irrigation wells.

Mrs. Hamblen attended West Texas State College in Canyon. She attends the Methodist Church and belongs to the V.F.W. Auxiliary and Wesleyan Service Guild. She and Mr. Hamblen have four married children, two boys and two girls and one son at home; they also have nine grandchildren.

Collecting antique dishes, reading, photography, and home movies are hobbies that are enjoyed by Mrs. Hamblen in her spare time.

We would like to publicly express our appreciation to Mrs. Olson for her wonderful work in behalf of Randall County and the Water District.

WATER CONDITIONS IN OCTOBER 1955

Record breaking floods on the Pecos River tributaries near Red Bluff Reservoir combined with floods at Wichita Falls, Clarksville, and other localities in the Red, Brazos, and upper Colorado River basins at the beginning of October were in sharp contrast with generally deficient runoff at month end. The U. S. Geological Survey cooperating with the Texas Board of Water Engineers continued making surveys that were started in late September to determine peak discharges at numerous streamflow gaging stations and at miscellaneous sites that were inaccessible while flooding occurred. Extensive damage to highways, county roads and bridges, railways, industrial, commercial and residential property, and agricultural developments resulted from floods following the series of storms across the State from Lubbock eastward and to the south. Many small reservoirs filled and spilled, and Lake Kemp on the Wichita River reached the second highest level since storage began in 1922.

Streamflow was at summertime low in most streams outside the flood areas except for released waters in the lower Colorado and Brazos Rivers. Flow from Comal Spring at New Braunfels continued near the lowest of record but showed some increase over September.

Total storage in major reservoirs increased only 2 percent although significant increases occurred in Lake Kemp and Red Bluff Reservoir.

Water levels continued to rise in four out of eight selected observation wells across the State with the largest rise occurring in a well at Uvalde; however, levels were generally below previous record lows for October.

Average rainfall over the State was about half of normal, but the average in the Lubbock and Wichita Falls areas was high.

Precipitation

Preliminary rainfall figures, compiled by the U. S. Agricultural Marketing Service cooperating with the Texas Agricultural Extension Service from data collected by the U. S. Weather Bureau for about 120 selected rainfall gaging stations, indicate an average rainfall for the State during October of about 1.25 inches, or 46 percent of normal. Extremes in average rainfall varied from about 0.2 inch in the upper Panhandle to about 3.8 in the Wichita Falls area. Nearly 10 inches of rain was reported southwest of Lubbock, and about 9 inches was reported on the headwaters of Wichita River. Many localities in the upper Colorado, Brazos, and Red River watersheds received 5 and 6-inch rains. Heavy rains fell on the watersheds of the Delaware River and Salt (Screwbean) Draw—Pecos River tributaries—but no reports on amounts have been received. The drought continued in other parts of the State, particularly in south central Texas where the deficiency in rainfall increased.

Ground Water

Water levels continued to rise during October in four out of eight selected observation wells across Texas from El Paso to Houston. The greatest rise from the September measurement was 7.4 feet in a well in Uvalde, Texas. The other three rises were 2.1 feet in the El Paso area, 2.5 feet near Pasadena, and 0.4 foot at Alief, both in Harris County. Despite the rise in Uvalde, the water level in the well was still 0.4 foot below the previous record Oc-

(Continued on Page 3)

THE STATISTICS

During the month of September, 148 completed wells were registered with the District office and 219 permits were issued by the County Committees. During the month of October, 177 completed wells were registered and 202 permits were issued. These new permits issued and completed wells follow by county:

	Completed Wells		*Permits Issued*	
County	*September*	*October*	*September*	*October*
Armstrong	0	2	0	0
Bailey	7	17	24	16
Castro	13	10	23	4
Cochran	16	3	12	6
Deaf Smith	16	20	13	14
Floyd	12	27	7	26
Hockley	23	14	56	27
Lamb	12	37	18	39
Lubbock	17	30	32	42
Lynn	2	5	12	22
Parmer	19	7	13	3
Potter	0	0	0	0
Randall	11	5	9	3

THE Cross SECTION

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

Published monthly by the High Plains Underground Water Conservation District No. 1
1628-B 15th Street, Lubbock, Texas

Telephone PO2-8088

Entered as second-class matter June 22, 1954, at the Post Office at Lubbock, Texas, under Act of August 24, 1912, as amended by the Act of August 4, 1947.

ALLAN WHITE
Editor

Meet Leroy Johnson of Shallowater, in the northwest part of Lubbock County. He is completing his present term of office as a member of the Lubbock County Committee in January, 1956.

Mr. Johnson and his wife, Christine, have one son, Phillip, who is 7 years old. They attend the First Baptist Church of Shallowater.

Mr. Johnson attended grade school in Tahoka and graduated from the Shallowater High School in 1942. He belongs to the Masonic Lodge and the Shallowater Lions Club.

Mr. Johnson owns and operates the Johnson Hardware and Supply Company of Shallowater. He owns 80 acres of farm land in Lubbock County, on which he drilled an irrigation well in 1950.

For relaxation and enjoyment, Mr. Johnson likes to go up into the mountains where he can fish and hunt.

* * * * *

Meet John Patterson, who lives near Wayside in Armstrong County. Mr. Patterson is Secretary of the Armstrong County Committee and will complete his present term of office as a member of the committee this coming January.

Mr. Patterson is another of our many committeemen who has a house full of women bosses — his wife, Letha, and 3 daughters, LaQuita, Betty Sue and Patricia. The family attend the Baptist Church at Wayside.

Mr. Patterson finished high school in Sentinel, Oklahoma. He is a Mason and a member of the Farm Bureau.

In 1951, Mr. Patterson drilled the first of two irrigation wells with which he now waters 250 acres of land. He also farms 150 acres of dry land.

* * * * *

Meet V. M. (Pete) Peterman, of Amherst, who is chairman of the Lamb County Committee. He and his wife, Emily, live with their son, Joe, 17, on their farm northeast of Amherst.

Mr. Peterman attended Meridian High School and Oklahoma University. He is a member of the Amherst Lions Club.

In 1948, Mr. Peterman drilled his first irrigation well and now waters 354 acres of land with 3 wells. He also farms 150 acres of dry land.

When Mr. Peterman is not driving a tractor or setting irrigation tubes he is tending to his pure-bred livestock. He is widely known for his diligent work in fairs and livestock exhibitions around the southwest. He has held almost every position that there is in fairs of this area. He has business interests in conjunction with his farming activities.

Mr. Peterman will complete his present term of office on the County Committee in January, 1956.

* * * * *

Meet H. F. Benson, of Star Route, Hereford, who is a member of the Castro County Committee.

Mr. Benson has four girls in his family—his wife, Verdie, and his three daughters, Evelyn, Sherry and Genelle.

Mr. Benson attended public school in Wellington, Texas. He works 322 acres of irrigated farm land and operates two wells. He drilled his first well back during the year 1937. In conjunction with his farming operation, Mr. Benson, also has an interested in a vegetable packing house.

The Benson family attends the Nazarene Church in Hereford.

Mr. Benson has been a very faithful member of the Castro County Committee, and is serving ably. His present term of office expires in January, 1956.

* * * * *

Meet J. H. Fish, who lives at 200 Lake Street in Hereford, member of the Deaf Smith County Committee.

Mr. Fish and his wife, Lillie, have three grown children, Howard V., Buryl G. and Mrs. Wanda M. Johnson.

The family attends church at the First Christian Church in Hereford; also Mr. Fish belongs to the Chamber of Commerce.

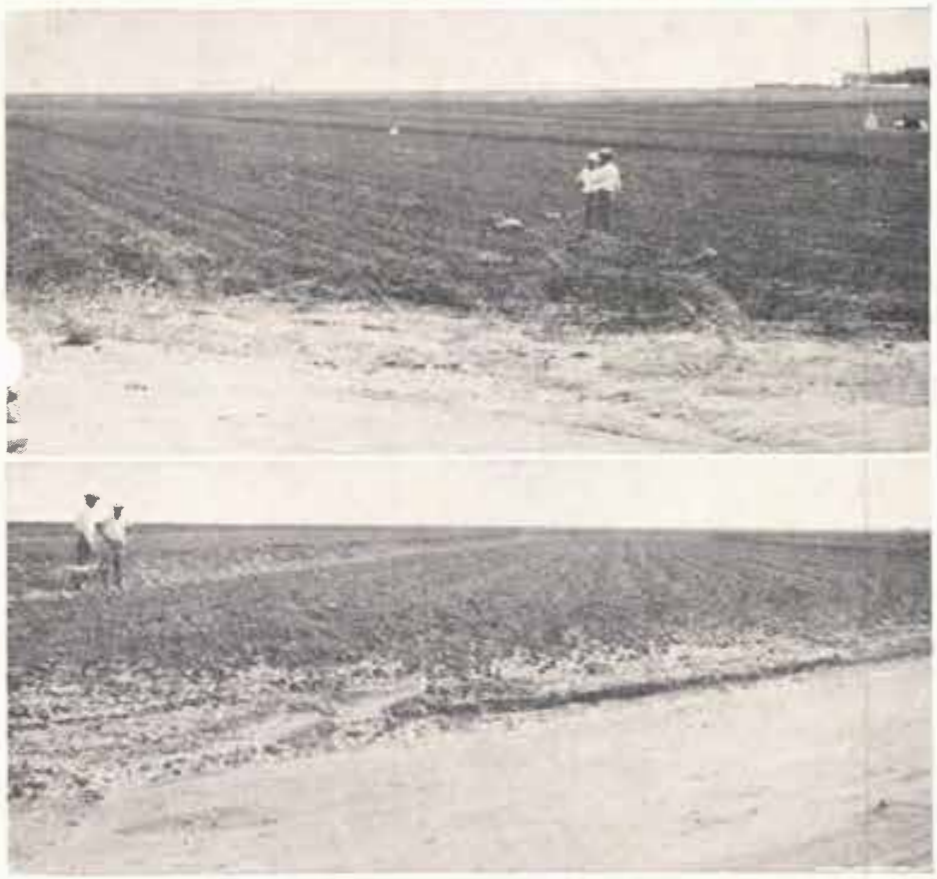
He farms 628 acres of irrigated land and operates 6 wells. Mr. Fish has been irrigating since 1950, when he drilled his first well. Aside from farming, Mr. Fish is also an irrigation well driller.

Mr. Fish tells us that he does not have time for any hobbies, and one can well believe this after learning of his business and farming activities.

Mr. Fish will complete his present term of office on the water committee in January, 1956.

Please Close Those Abandoned Wells!!!

WATER CONSERVATION PRACTICES



"BENCH LEVELING" to prevent runoff of precipitation and irrigation water, to prevent soil erosion, and to provide for more uniform distribution of soil moisture in order to produce greater crop yield. Notice the wide borders and no point rows. Cost? $15 - $20 per acre.

"COTTON BURS" added to a field to increase the amount of humus in the soil, to increase the infiltration rate of both precipitation and irrigation water, and provide a mulch to reduce evaporation. Cost? $1.50 - $2 per ton.

"TRIPLE-PURPOSE WELL" located at the lowest point on the farm (1) to obtain ground water for irrigation at maximum distance from existing wells, (2) to recover 'tail water,' and (3) to salvage water from a wet-weather lake which otherwise would be lost by evaporation. Cost? Pipe line to deliver water to field, which is desirable anyway to reduce water losses from open ditch.

CONSERVATION CONVERSATION

The United States Department of Agriculture has released its yearbook for 1955, entitled *Water*.

The committee that planned the scope of the book set forth this aim at the beginning for the guidance of the men who wrote the chapters:

"Our primary aim is to explain the nature, behavior, and conservation of water in agriculture, we address ourselves to farm people and to all those interested in rural living. As our population increases, more demands are being made on our water resources; the effective use and conservation of water on farms will become increasingly important, and conflicts over water use will have to be resolved. Some of the broad problems are forecast, but our main emphasis is on the facts and basic principles that will help people in reaching the best decisions. Hydroelectric power, navigation, industrial use, pollution, and other aspects are touched on, but this book is concerned almost entirely with water in agriculture."

Copies of the yearbook, at $2.00 each, are now available from the Superintendent of Documents, Washington 25, D. C.

* * * * *

Mr. Robert T. Littleton has been employed by the Board of Water Engineers to head its ground-water division. He has been with the U. S. Geological Survey almost continuously since 1938, with most of this time being spent on the Brewster County underground studies at Alpine.

Mr. Littleton is a graduate of Oregon State College with a major in geology.

* * * * *

The size or capacity of the pump on an existing well should not be changed to a larger size or capacity so as to increase the rate of production of the well without first having obtained a permit from your County Committee.

* * * * *

The volume of underground water in storage available for pumping in the Southern High Plains in Texas from the Canadian River southward to Brownfield and Tahoka is more than 10 times the volume of the total storage capacity of all the surface-water reservoirs in the state of Texas.

Less than 10 percent of the total volume of underground water that was in storage available for pumping in 1938 has been depleted.

* * * * *

Several persons have indicated during the past weeks that a misunderstanding is prevalent among some of our people. This misunderstanding has to do with the drilling of domestic wells. We bring up this matter in an effort to correct some of the thinking on the subject.

Do you need a permit to drill a house well?

A permit must be approved by the County Committee before any well is drilled that is to be produced at a rate of 100,000 gallons per day, or more. The quantity of water to be taken from the well per minute determines the spacing from existing wells.

If a well will not be equipped with a pump capable of producing 100,000 gallons per day, (69.4 gallons per minute) then a permit is not required.

* * * * *

As the water levels on the High Plains decline the yields of wells will be reduced and the water must be lifted from greater depths. At some depths below the surface an economic limit of pumping may be reached long before the supply is exhausted.

Reclamation Ass'n—

(Continued from Page 1)

states where development is rapidly increasing with more and more demands being made by municipalities, industries, and agriculture on the underground supplies.

Mr. R. D. Collins of Mineral Wells very ably represented Texas on the Resolution Committee and presented a resolution contrary to the Hoover Commission Recommendation.

The Texas delegation went on record as favoring the development of ground water by individual reservoirs or subdivisions thereof. It was the recommendation of the Hoover Commission that "Major River Basins" be used as the unit for underground as well as surface water development.

It is not practicable, under our present form of government, for either the Federal Government or a Major River Basin Authority solely to regulate ground water development by river basins because, among other reasons' sharply conflicting state laws of ground-water ownership stand in the way of a single theory approach. Each state must set it's own theory of property rights and should provide for development, conservation, and reclamation of it's own ground water.

Water Conditions In October 1955—

(Continued from Page 1)

tober low established in 1953. New record October lows were established also in wells at San Antonio, in Travis County near Buda, in Atascosa County near Poteet, and in the Winter Garden area near La Pryor.

—Press Release by Texas Board of Water Engineers.

EDITOR
THE CROSS SECTION
1628-B 15th Street
Lubbock, Texas

Dear Sir:

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_____

City and State_____

(Please cut out and mail to our address)

GROUND-WATER INVENTORY CONTINUED—FLOYD COUNTY

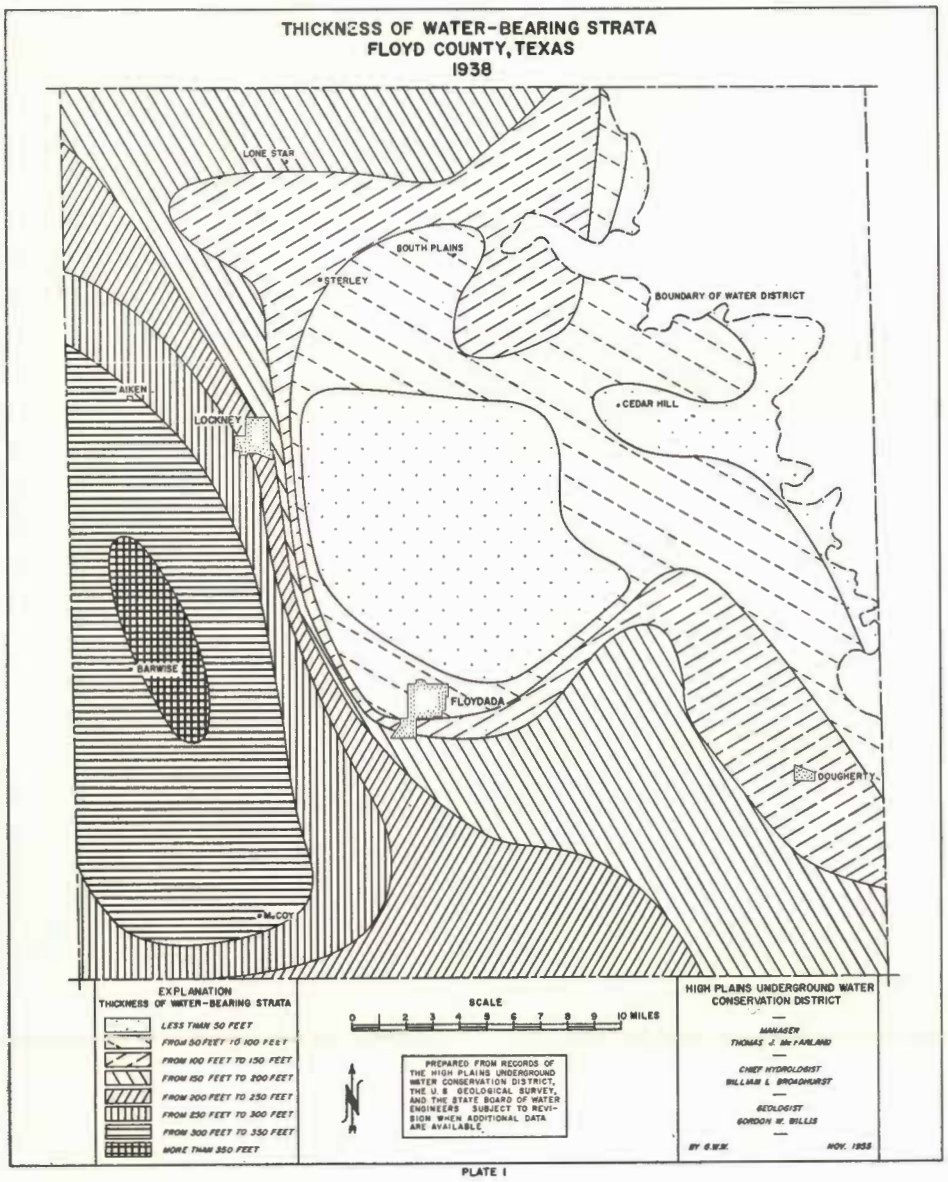


PLATE 1

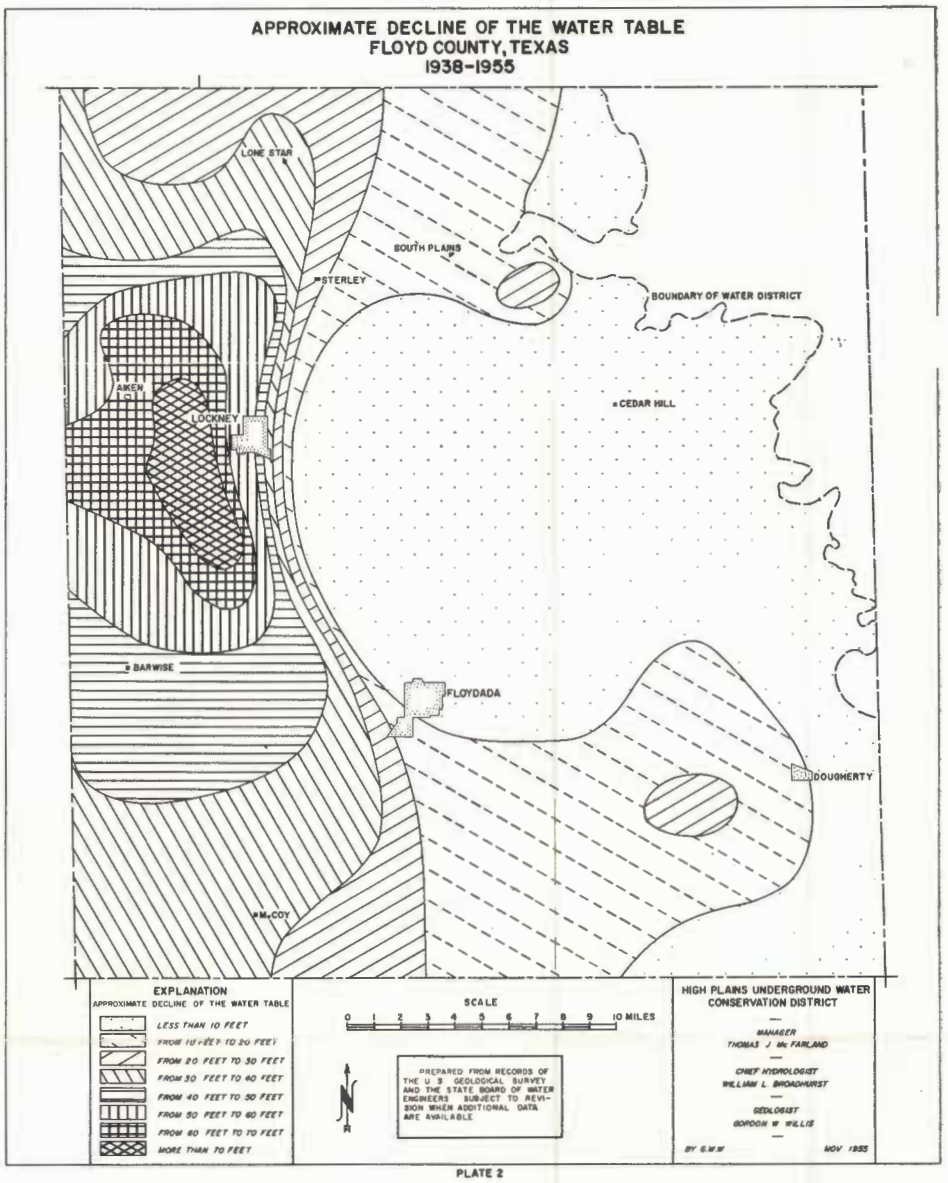


PLATE 2

The portion of Floyd County within the boundary of the High Plains Underground Water Conservation District covers about 600,000 acres of land. (The total area of the county is 635,520 acres.) The underground reservoir in the Ogallala formation beneath the area within the district contained approximately 12,500,000 acre-feet of ground water in storage available for pumping in January 1955. The above maps were prepared from data compiled from a study of 831 logs of water wells and about 700 measurements of water levels in wells.

The map in plate 1 shows the thickness of the water-bearing strata between the water table and the redbeds in 1938 before an appreciable amount of water had been pumped from the reservoir. The map in plate 2 shows the decline of the water table from the spring of 1938 to January 1955.

The volume of water remaining in the underground reservoir was determined by subtracting the volume of material unwatered since 1938 from the total volume of saturated material in 1938 and multiplying the remainder by the coefficient of storage of 15 percent.

These data show that 14,000,000 acre-feet of water was in storage available for pumping in 1938, and that 1,900,000 acre-feet of water has been removed from storage since 1938. In other words, 13 percent of the volume of the available water has been removed from storage since 1938. In the portion of the county within the Water District, about 75 percent of the water removed from storage was removed from about 36 percent of the area.

The approximate quantity of underground water in storage, available for pumping, beneath an individual farm may be determined by multiplying the number of acres in the farm by the thickness of the water-bearing strata underlying the farm and then multiplying by the storage coefficient of 15 percent. Suppose the farm consists of 320 acres and has 200 feet of water-bearing strata underlying it, then 320 acres x 200 feet x 0.15 equals 9,600 acre-feet of water available for pumping. An acre-foot of water is the quantity required to cover one acre to a depth of one foot, and it is also equal to 43,560 cubic feet or 325,829 gallons.

An individual may use this information to determine, within reasonable limits, how long the quantity of underground water in storage beneath his farm will last at any annual rate of withdrawal. This assumes of course, that his neighbors pump a comparable amount of water per acre on their farms.

These maps and studies of this type are parts of the regular hydrological work in progress by the staff of the Water District. Similar maps and information will be prepared as rapidly as practicable, for all the counties within the Water District. Maps of Deaf Smith, Parmer, Castro, Potter, Randall, Armstrong, and Floyd Counties are now available.

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

Second Class Permit

Mr. Z. O. Lincoln
913 Houston
Levelland, Texas

THE Cross SECTION

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

Volume 2—No. 6 "THERE IS NO SUBSTITUTE FOR WATER" *December 1955*

WATER DISTRICT SUIT ON WELL SPACING HELD IN LEVELLAND

After about four years of operation and the issuing of some 3,000 well permits, it became necessary for the District to take injunctive action on a well drilled without a permit and in violation of the District's spacing rules.

The well was drilled by a Hockley County farmer within 74 yards of a neighboring well. It is the policy of the District to arbitrate if possible where two well locations are made too close together. This has been the first case where such an agreement was not reached before actual drilling was begun.

Many people throughout the High Plains have been very interested in the case including the agencies making the loans for wells. An opinion has been expressed that "our loans will be repaid by the production of crops and not from salvaged equipment rendered useless by economic exhaustion of wells drilled too close together."

The trial was viewed as a test case which will have an effect on future operation of ground-water districts thruout Texas.

All parties to the suit agreed to the plaintiff's motion that the case be decided by the 72nd District Judge, Victor H. Lindsey, on the basis that the case involves only questions of law and no material facts which would be in the province of a jury to decide. Judge Lindsey's decision will not be declared until January 1st or later.

County Secretaries Hold Meeting In Lubbock

County Secretaries of the Water District met at the Caprock Hotel in Lubbock on November 30th to discuss problems of issuing and handling well drilling permits.

Those who attended the meeting were: Mrs. Pat Loerwald, Deaf Smith County; Mrs. Ida Puckett, Floyd County; Mrs. Doris Traweek, Bailey County; Aubrey Brock, Parmer County; Z. O. Lincoln, Hockley County; Jim Line, Potter County; and John Patterson, Armstrong County.

Mr. Allan White, District Secretary for the Water District, represented Lubbock and Lynn Counties.

Plans were discussed in detail as to the handling of deposits made by the permit applicant against the return of well log and registration forms. Each applicant must leave a deposit with the County Secretary at

(Continued on Page 3)

Annual Water District Elections To Be Held January 10, 1956

Each year on the second Tuesday of January the counties that participate in the Water District hold elections so that their people can choose representatives to the District Board of Directors and County Committees.

This coming election finds two new committeemen from each county to be selected and two District Precinct Directors.

Those nominated by your County Committees to fill these positions are as follows:

DISTRICT DIRECTOR PRECINCT NO. 2
(Cochran, Hockley and Lamb Counties)
Gus Parish, Springlake
Clayton H. Stokes, Morton
L. Sherrod, Levelland

DISTRICT DIRECTOR PRECINCT NO. 5
(Floyd County Only)
Marvin Shurbet, Petersburg

COUNTY COMMITTEEMEN NOMINATIONS

ARMSTRONG COUNTY
Clifford Stevens, Happy
H. C. Newsome, Wayside
Robert Adams, Wayside
Charles Kennedy, Happy

BAILEY COUNTY
Kline Buhrman, Muleshoe
Robert Blackwood, Muleshoe
W. H. Eubanks, Maple
A. H. Daricek, Maple

CASTRO COUNTY
C. N. McClure, Hereford
J. H. Dobbs, Hereford
Geo. H. DeLozier, Hereford
L. H. Gladden, Hereford
Frank Annen, Dimmitt
Andrew Acker, Nazareth

COCHRAN COUNTY
Max M. Bowers, Morton
Haskell Milligan, Morton
B. R. Stovall, Morton
W. A. Woods, Morton

DEAF SMITH COUNTY
Clarence A. Betzen, Hereford
J. H. Fish, Hereford
George K. Muse, Hereford
C. J. Berend, Hereford
George T. Turrentine, Hereford

FLOYD COUNTY
Ernest Lee Thomas, Floydada
L. D. (Buster) Simpson, Floydada
Robert Lee Smith, Lockney

(Continued on Page 3)

BOARD OF DIRECTORS PASS NEW RULE CONCERNING PERMIT DEPOSIT

Order Number 4 of the Rules and Regulations of the Water District has been duly passed and published by the Board of Directors.

The new order sets forth provisions for a $10.00 deposit being required of each person making application for a well drilling permit.

The provisions of this rule went into effect December 1, 1955. The Order in its entirety is as follows:

ORDER NO. 4
RULES OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1
RULES CONCERNING DEPOSIT TO ACCOMPANY APPLICATION FOR PERMIT

Effective Date—Dec. 1, 1955

In accordance with an pursuant to the authority of Section 59 a, b, and c of Article XVI of the Constitution of Texas and of Section 3c, Article 7880, Texas Revised Civil Statutes, as amended by the Acts of the 51st Legislature of the State of Texas, and as amended by Chapter 10, Acts of the 53rd Legislature of Texas, 1953, and as amended by Chapter 196, Acts of the 54th Legislature of Texas, 1954,

(Continued on Page 3)

Ground - Water Problems Discussed With USGS And Board

The High Plains Water District was favored recently by a visit from Mr. A. G. Winslow, Assistant District Geologist from Austin and J. G. Cronin, Hydraulic Engineer from Plainview, both with the U. S. Geological Survey, and Mr. R. T. Littleton, who was recently appointed to head the ground-water section of the State Board of Water Engineers.

One subject of discussion was the forthcoming public hearing to be held in Seminole on January 12, 1956, at which time the Board of Water Engineers will receive data regarding the designation of another ground-water subdivision south of the High Plains District. Residents of that area petitioned the Board for such a designation in order to create another Ground Water Conservation District.

Another important subject that was discussed at length was the need for revision and expansion of the observation well program for the Southern High Plains. The current program includes some 500 wells in which the

(Continued on Page 3)

Oklahoma Irrigation Farmers Win Major Victory

The Amarillo Daily News has released news of Texas County, Oklahoma land owners counting the decision of a special panel of three federal judges at Oklahoma City a major victory in their two-year campaign to buy natural gas to operate pumps for irrigation. The judges dismissed a suit filed by Phillips Petroleum Company, of Bartlesville, Oklahoma, which contended the new natural gas law passed by the last Oklahoma legislature violated a federal constitutional provision forbidding the taking of private property without due process of law. The law provides that gas well operators must supply natural gas at a price not less than cost to the property owners for operation of irrigation wells located on the leased land. The State Corporation Commission is named as arbitrator to determine fair prices and sales agreements between the gas producers and the land owner.

This case has been watched very closely by irrigation farmers of the North Plains District where similar problems exist.

STATISTICS FOR NOVEMBER

During the month of November, 161 completed wells were registered with the District office and 225 permits were issued by the County Committees. These new permits issued and completed wells follow by county:

County	*Completed Wells*	*Permits Issued*
Armstrong	0	0
Bailey	14	10
Castro	10	10
Cochran	10	11
Deaf Smith	3	10
Floyd	12	16
Hockley	42	60
Lamb	8	23
Lubbock	27	34
Lynn	16	34
Parmer	9	9
Potter	0	0
Randall	10	8

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ALLAN WHITE
Editor

Meet Bill Heisler, of the Wayside community in Armstrong County. He is a Committeeman from that County and completes his present term of office in Jan. 1956.

Mr. Heisler attended the Wayside High School.

He and his wife, Louise, have one daughter, Frances, who is 8 years old. They attend church at the Wayside Community Church. Mr. Heisler belongs to the Masonic Lodge.

In 1953, Mr. Heisler drilled his first irrigation well and now has two with which he waters 180 acres of land. He also farms 220 acres of dry land and runs cattle on several acres of grass land.

Mr. Heisler's hobby is carpentry. He tells us that he is thinking of giving Mrs. Heisler a new electric portable hand saw for Christmas. He better be kidding!

* * * * *

Meet Donald M. Olson, of Canyon, County Committeeman from Randall County. Mr. Olson really knows what it means to have a part in the workings of the Water District because his wife, Martha, acted as Randall County Secretary until just recently and filed drilling applications at their home.

Mr. Olson attended public school in Canyon and A & M College. He is a Farm Bureau member, an ASC committeeman, and a past commander of the National Guard unit in Canyon.

Mr. and Mrs. Olson have three children, Mark 7, Jamie, 5 and Chris, 3. The family attends the First Presbyterian Church of Canyon.

In 1949, Mr. Olson drilled his first irrigation well and operates three at present on 700 acres of land.

Mr. Olson says that his hobby is sleeping, but that he gets little opportunity to follow it.

In January 1956, Mr. Olson will complete his present term of office.

* * * * *

Meet Mr. Robert Byrd, County Committeeman from Bailey County, who lives at Muleshoe.

Mr. Byrd is originally from Petersburg where he attended public school.

Mr. Byrd and his wife, Ethel, have one daughter, Barbara Ann, 15, and three boys, Bob, 25, Gorman, 23, and Gerald, 22.

The family attends the Baptist Church in Muleshoe.

To keep four irrigation wells running and to water 480 acres of land is a big job in itself, but to also have 656 acres of dry land to farm is really an enormous task. Mr. Byrd does just that.

He also finds time for an occasional fishing trip.

Mr. Byrd completes his present term of office on the County Committee in January 1956.

* * * * *

Meet Frank J. Bezner, of Hereford, who is chairman of the Deaf Smith County Committee. His term of office will expire January 1956.

Mr. Bezner and his wife, Beatrice, have six daughters, Marcella Marie ,17, Bernadette, 15, Carol Ann, 14, Laverne Cecilia, 11, Janie Elaine, 4, and Judith Patricia, 3. They also have a one year old boy, Frank, Jr., who is the pride of the family. Frank, Jr., never lacks for a baby sitter.

The family attends the Catholic Church in Hereford. Mr. Bezner also belongs to the Rotary Club and Knights of Columbus.

Mr. Bezner has been irrigating since he drilled his first well in 1940. He now has two wells with which he waters 385 acres of land.

Mr. Bezner's spare time is spent enjoying himself with his family.

* * * * *

Meet A. E. Hagens, Route 1, Wilson, who serves on the Lynn County Committee.

Mr. Hagens attended school at Wilson.

He has 2 daughters, Geraldine, 18, and Mary Lou, 14, and three boys, A. E., Jr., 25, Marvin, 23, and Cordell, 21. The family attends church at the Lutheran Church.

Mr. Hagens is known throughout Lynn County, and he is a member of the Farm Bureau.

He waters 100 acres of land with 3 small irrigation wells, with his first being drilled in 1947. He also farms 65 acres of dry land.

Mr. Hagens is a fisherman, but he doesn't get much chance to practice with his many duties pressing for his time. His present term of office on the County Committee expires in January 1956.

CORRECTION

In the Ground-Water Inventory of Floyd County story, published last month, a typographical error was made.

The number of acre-feet of water in storage available for pumping in 1938 should have been 14,400,000 instead of 14,000,000.

County Secretaries—

(Continued from Page 1)

County Secretaries meeting held in Lubbock was attended by: seated from left to right, Mrs. Pat Loerwald, Hereford; Mrs. Doris Traweek, Muleshoe; Mrs. Ida Puckett, Floydada; and standing from left to right, Allan White, Lubbock, Aubrey Brock, Bovina; Z. O. Lincoln, Levelland; Jim Line, Bushland; and John Patterson, Wayside.

the time the application is filled in. When the well is completed, a drilling log of the formation encountered and a description of the equipment installed must be furnished the County Committee. When this information is received, or a notice that the well site is abandoned, then the deposit is refunded.

Suggestions on various phases of the work were made by the secretaries assembled and these were discussed at length.

Mr. Z. O. Lincoln, of Hockley County, explained at length the procedure followed by his County office in handling a drilling permit application.

Representatives from Castro, Cochran, Lamb and Randall Counties were unable to attend the meeting.

New Rule—

(Continued from Page 1)

the High Plains Underground Water Conservation District No. 1, by and through its duly elected and qualified Directors, does hereby enact the following rules and regulations governing deposit to accompany application for a permit:

RULE 1—DEPOSIT

Each application to High Plains Underground Water Conservation District No. 1, hereinafter called District, for a permit shall be accompanied by a $10.00 deposit which shall be accepted by the County Committee to which the application is presented. Said deposit shall be returned to the applicant by the County Committee if (1) the application is denied, or (2) upon receipt of correctly completed registration and log of the well, or (3) if said permit location is abandoned, upon receipt of said permit marked "abandoned" by the applicant; in event neither the registration and log of the well nor the permit marked 'abandoned' is returned to the County Committee with which deposit was made within six months from the approval date of the permit, the said deposit shall become the property of the District and be paid by said County Committee to the District; all deposits heretofore made shall become the property of the District and be paid to the District by the County Committee with which the deposit was made if such registration and log or permit has not been returned or is not returned to the County Committee with which deposit was made within six months after approval date of the permit.

RULE 2—SAVING CLAUSE

If any section, sentence, paragraph, clause, or part of these regulations, for any reason, be held or declared invalid, such decision or holding shall not affect the validity of the remaining portions of these regulations; and the Board does hereby declare that it would have passed such remaining portions of such regulations irrespective of the fact that any other sentence, section, paragraph, clause, or part thereof may be declared invalid.

RULE 3—PUBLICATION

These rules and regulations shall be published once a week for two (2) consecutive weeks in one or more newspapers having general circulation within the District and shall become effective December 1, 1955, at 12:00 o'Clock noon.

HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1
W. O. Fortenberry, President
Board of Directors

ATTEST:
Marvin Shurbet,
Secretary

Conservation Conversation

Approximately 80 percent of our High Plains irrigation wells have been drilled since 1946.

* * * * *

Studies have shown that in general it takes 2 acre-feet of water (rainfall and/or irrigation) to produce 1 bale of cotton. An acre-foot of water is 325,829 gallons.

* * * * *

The terms of office of the Committeemen from each County or portion of each County located within the bounds of the District have been staggered so that not more than two County Committeemen will be elected in any one year (2-2-1) resulting in at least three County Committeemen having had at least one or more years experience as County Committeeman.

Annual Elections—

(Continued from Page 1)

HOCKLEY COUNTY
Joe W. Cook, Jr., Ropesville
A. J. Dunavant, Ropesville
W. S. Carter, Levelland
H. C. Janes, Levelland

LAMB COUNTY
Price Hamilton, Earth
W. O. Woods, Earth
J. B. Davis, Amherst
Doyle Tapley, Amherst

LUBBOCK COUNTY
Howard Alford, Lubbock
Jimmie McDonald, Lubbock
Leroy Johnson, Shallowater
H. V. Newman, Shallowater

LYNN COUNTY
Walter Maeker, Wilson
Aubrey Smith, Wilson
Erwin Sander, Wilson
Melvin Weunsche, Wilson
Lit H. Moore, Wilson

PARMER COUNTY
Dick Rockey, Friona
Steve Struve, Friona
Carl Schlenker, Friona
W. E. Thornton, Bovina

POTTER COUNTY
James W. Walton, Bushland
R. C. Potts, Amarillo
Leo Bezner, Bushland
W. J. Hill, Sr., Bushland

RANDALL COUNTY
John Butler, Happy
Wendell Sims, Happy
E. E. Sharp, Wildorado
L. E. Mason, Wildorado

The polling place nearest you will be published in your county newspapers in the near future.

We urge everyone who is interested in this area and its underground water to express themselves at the polls on January 10th.

Ground-Water Problems—

(Continued from Page 1)

depths to water from the land surface are measured accurately each winter or early spring before pumping starts in order to determine the net annual change in the water table. This program was started in 1937, but most of the observation wells were located within the areas of more intensive irrigation development. Since 1937 the irrigated region has expanded greatly, but because of other work the observation well program has lagged behind.

The Water District, which has records of several thousand wells, will cooperate fully in selecting the wells for expansion of the program in order to provide more complete coverage and will assist in making the winter measurements.

Special thanks for additional observation wells are extended to Mr. R. W. Sundstrom, District Engineer for the Ground Water Branch of the U. S. G. S., and to the Board of Water Engineers, especially the West Texas member, Judge Otha Dent of Lamb County.

Please Close Those Abandoned Wells!!!

United States Geological Survey and Board of Water Engineers officials visit the Water District. From left to right are, R. T. Littleton, head of the ground-water section of the Board of Water Engineers, Austin; G. W. (Doc) Willis, District Geologist; J. G. Cronin, Engineer with USGS from Plainview; A. G. Winslow, Geologist with USGS from Austin; and W. L. Broadhurst, District Chief Hydrologist.

EDITOR
THE CROSS SECTION
1628-B 15th Street
Lubbock, Texas

Dear Sir:

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_____

City and State_____

(Please cut out and mail to our address)

GROUND-WATER INVENTORY CONTINUED—BAILEY COUNTY

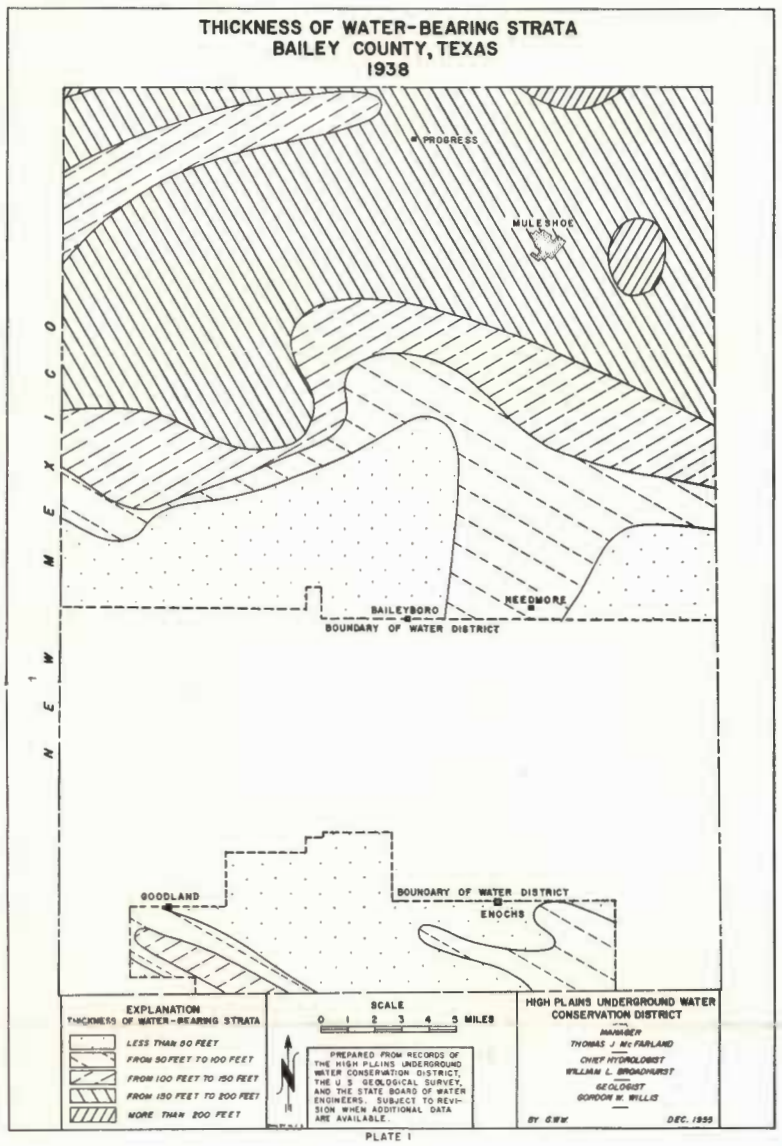

PLATE 1

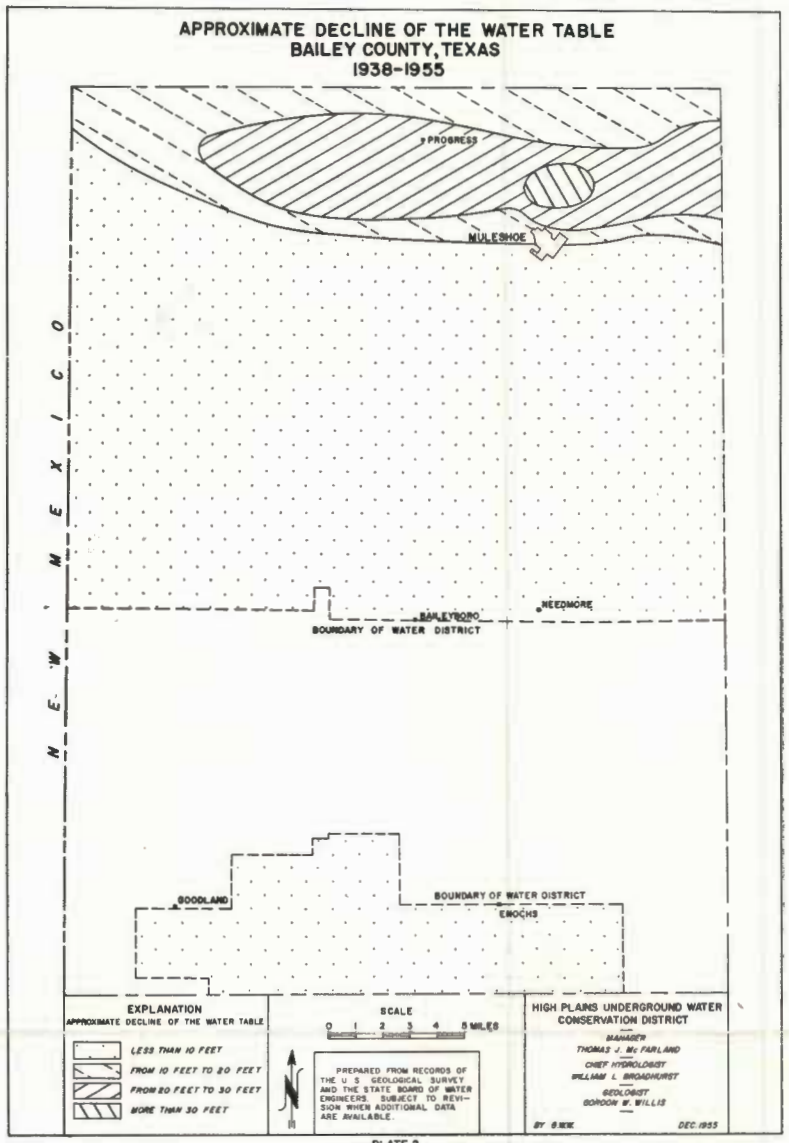

PLATE 2

The portion of Bailey County within the boundary of the High Plains Underground Water Conservation District covers about 362,000 acres of land. (The total area of the county is about 532,000 acres.) The underground reservoir in the Ogallala formation beneath the area within the district contained approximately 5,770,000 acre-feet of ground water in storage available for pumping in January 1955. The above maps were prepared from data compiled from a study of about 500 logs of water wells and about 250 measurements of water levels in wells.

The map in plate 1 shows the thickness of the water-bearing strata between the water table and the redbeds in 1938 before an appreciable amount of water had been pumped from the reservoir. The map in plate 2 shows the decline of the water table from the spring of 1938 to January 1955.

The volume of water remaining in the underground reservoir was determined by subtracting the volume of material unwatered since 1938 from the total volume of saturated material in 1938 and multiplying the remainder by the coefficient of storage of 15 percent.

These data show that 6,100,000 acre-feet of water was in storage available for pumping in 1938, and that the net decrease in storage from 1938 to 1955 was 330,000 acre-feet. In other words, the net decrease in storage is 5 percent of the quantity available in 1938. The total pumpage, however, from 1938 to 1955 was considerably more than 330,000 acre-feet. The recharge which took place after the exceptionally heavy precipitation in 1941 added a large quantity of water to the underground reservoir. The 330,000 acre-feet plus the quantity added by recharge has been withdrawn by pumping.

The approximate quantity of underground water in storage, available for pumping, beneath an individual farm may be determined by multiplying the number of acres in the farm by the thickness of the water-bearing strata underlying the farm and then multiplying by the storage coefficient of 15 percent. Suppose the farm consists of 320 acres and has 200 feet of water-bearing strata underlying it, then 320 acres x 200 feet x 0.15 equals 9,600 acre-feet of water available for pumping. An acre-foot of water is the quantity required to cover one acre to a depth of one foot, and it it also equal to 43,560 cubic feet or 325,829 gallons.

An individual may use this information to determine, within reasonable limits, how long the quantity of underground water in storage beneath his farm will last at any annual rate of withdrawal. This assumes of course, that his neighbors pump a comparable amount of water per acre on their farms.

These maps and studies of this type are parts of the regular hydrological work in progress by the staff of the Water District. Similar maps and information will be prepared as rapidly as practicable, for all the counties within the Water District. Maps of Deaf Smith, Parmer, Castro, Potter, Randall, Armstrong, Floyd and Bailey Counties are now available.

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

Second Class Permit

Mr. Z. O. Lincoln
913 Houston
Levelland, Texas