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Operations Guidance Report on

WATER FACILITIES FOR

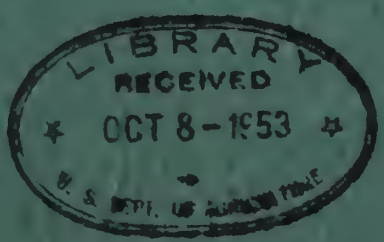
ATASCOSA RIVER WATERSHED

TEXAS

Prepared by

WATER UTILIZATION SECTION
DIVISION OF LAND ECONOMICS

September 1939



UNITED STATES DEPARTMENT OF AGRICULTURE
U.S. BUREAU OF AGRICULTURAL ECONOMICS

Operations Guidance Report on

WATER FACILITIES FOR various areas

ATASCOSA RIVER WATERSHED

TEXAS

Prepared by

WATER UTILIZATION SECTION
DIVISION OF LAND ECONOMICS

Under the Provisions of the
Water Facilities Act
(Public Law No. 399, 75th Congress)

September 1939

LIST OF TABLES

AUTHORIZATION

This report has been prepared in accordance with the provisions of the Water Facilities Program authorized under the Water Facilities Act, Public Law No. 599, 75th Congress.

The Water Facilities Board approved the Atascosa River Watershed in Atascosa, Frio, Medina, Bexar, Wilson, Karnes, McMullen, and Live Oak counties "for area planning; with operations authorized to proceed therein as rapidly as mutually agreed upon by responsible field officials of the Soil Conservation Service, Bureau of Agricultural Economics, and Farm Security Administration, except that no operations under this authorization shall be undertaken which involve development of additional ground water," at Washington, D. C., on January 18, 1939.

Formal notification of the Board's action is contained in Texas State Memorandum No. 3, dated January 19, 1939.

ATASCOSA RIVER WATERSHED

TEXAS

SUMMARY

This report presents (1) a physical description of the area, (2) a discussion of the present use of land and water resources, and (3) recommendations for future utilization of the land and water resources.

The average annual precipitation for 4 stations in the area ranges from approximately 25 inches to approximately 31 inches. The channels of the streams are narrow and are over-taxed during the flood period, making channel storage inadvisable. Likewise, there appear to be few possibilities for diversions except of a very minor nature at the source of the streams. In view of this situation and because underground water is available throughout the area, extensive development of facilities for the use of surface water is not recommended.

Until within comparatively recent years very little farming was practiced, the land being devoted mainly to cattle raising. The acreage farmed has almost doubled since 1925. Winter truck farming, with irrigation by wells, has become important. The area as a whole presents few maladjustments in land or water use. The cropland is

adapted to combination dry-land farming and ranching, and in portions of the area to winter vegetable production.

The most serious maladjustments of land and water use are found in the vicinity of Poteet where the production of truck crops is practiced with irrigation from ground water. The operating units in this portion of the area, in general, appear too small for successful farming and water is being wasted. Additional ground-water irrigation is not recommended unless the present waste of water from flowing wells is minimized. Recommendations are made by subareas, principally for livestock wells which are superior to surface tanks as a source of water. Limited flood irrigation is also recommended.

PURPOSE AND SCOPE

The purpose of this report is to present the physical and economic characteristics of the Atascosa Area, and from these data, to formulate a plan for the proper use of land and water.

The report points out certain phases of misuse and maladjustment in the utilization of both land and water and attempts to provide the criteria for guidance in a program of adjustment where such adjustment is necessary.

The report is to be regarded as preliminary in nature. Detailed information has been available for parts of the area. Such data have been supplemented by reconnaissance field work to provide essential basic information for the area as a whole as well as for its regional inter-relationships.

The report is divided into three parts. The first part presents an inventory of the physical features of the area which must serve as a basis in planning the proper use of land and water. The second part of the report reviews the present utilization of land and water, and the last part gives recommendations for certain adjustments of the use of land and water within the area to promote a better agricultural economy.

ESTIMATE OF RELIABILITY

The base map accompanying this report has been compiled from tactical quadrangle sheets of the Corps of Army Engineers and Agricultural Conservation Program aerial photographs. The geological map is an enlargement of the United States Geological Survey aerial geological map of Texas. Geological and hydrological data and descriptions have been taken mainly from the United States Geological Survey report of the "Geology and Ground Water Resources of Atascosa and Frio counties, Texas," 1930, augmented and checked by reconnaissance field work. Surface water data are based upon records published in United States Geological Survey Water Supply Papers. The period of available gauging records at Whitsett is too short to serve as a reliable basis for conclusive analyses regarding surface run-off. Other records may or may not be directly applicable. Climatological data is taken from United States Weather Bureau records and is considered applicable and adequate.

Agricultural data have been checked by County Agents and Farm Security Administration Supervisors of the counties included in the watershed. Cultivated and non-cultivated areas have been reproduced in a general way from aerial photographs but the degree

of accuracy is inadequate for acreage calculations. Well and stock tank locations appearing on Map 3 are taken mainly from County Agents' maps, some of which have been checked in the field. The degree of accuracy of the remaining locations is not known.

The information provided in this report is intended to be general in nature and must be considered in that light, but is believed to be reliable as a guide to detailed and specific planning and operation within the area.

I

PHYSICAL DESCRIPTION OF THE AREA

Location and Size

The area includes the entire drainage basin of the Atascosa River above its confluence with the Frio River in southwestern Texas. Both of these streams are a part of the major Nueces River drainage. The Atascosa River watershed is located on the east side of what is commonly known as the "Winter Garden" district, and includes nearly all of Atascosa County, as well as smaller parts of southeastern Medina, northeastern Frio, southern Bexar, southwestern Wilson and Karnes, northern Live Oak and northeastern McMullen counties. It lies between meridians 98° and 99° west longitude and parallels 28° 30' and 29° 30' north latitude, and its area is about 1,700 square miles or 1,088,000 acres.

There are no large towns or cities within the area, but the city of San Antonio, with a population of 262,000 in 1939, is located within 20 miles of the northern boundary of the area. Other towns in the area and their present populations are as follows: Pleasanton, 2,100; Poteet, 2,500; Jourdanton, 770; Charlotte, 750; Lytle, 500; Christine, 525; and Campbellton, 100; all in Atascosa County, and Whitsett, 170 in Live Oak County.

General Characteristics

The Atascosa River watershed is essentially a combination ranching-farming area with considerable minor variations in physical characteristics, but generally speaking, is an area of comparative uniformity and gradational changes as contrasted with abrupt, or pronounced variations.

Ground water dominates surface water in both present and potential utilization. With the possible exception of a restricted area in the vicinity of Potest and Pleasanton, where intensive farming under well irrigation is practiced, no excesses are apparent in water use or misuse, and no important potential possibilities have been neglected.

Some adjustment is possible in land and water use, particularly with respect to a better distribution of wells and tanks and in general a reduction in overgrazing. Erosion has not reached serious proportions within the area. Flood diversion and better storage facilities may be utilized advantageously in parts of the area.

Precipitation is of the flash type, approximately 26.0 inches average annually, but adequate for any and all types of existing cropping practices during normal years. No extensive irrigation possibilities are evident nor is irrigation necessary for the development of a sound farming economy.

Topography

In general the surface of the area presents a uniform gentle southeastward slope with a maximum length of approximately 65 miles and a maximum width of approximately 50 miles, dissected by small southeastward flowing streams. Near the northern boundary of Atascosa County in the northern part of the area is a low sand hill section, and slightly south of Campbellton toward the southern extremity of the area is another hilly section of moderate relief; which present the only significant variations from the normal rolling plane of low relief.

Elevation

Lytle, in the northern end of the area has an elevation of 730 feet above sea level; Pleasanton, near the central part of the area has an elevation of 520 feet; while Three Rivers, about 2 miles south of the extreme southern end of the area has an elevation of 145 feet.

In the vicinity of Lytle, the topography presents a rolling surface and hilly relief with land slopes up to 6 per cent. This area is generally sandy with intercalated harder ledges. The sandy areas generally support a growth of oak and other trees, but the shale and clay areas are usually covered with chaparral.

Joining this area on the south is a sandy strip approximately 7 miles in width extending from east to west across the area. The relief is moderately high and the general aspect is rolling. The excessively sandy character of the soil in some localities has resulted in the formation of small sand dunes. The vegetation is almost exclusively post oak and black jack, but in some localities some mesquite and underbrush appear.

Continuing southward the area presents a comparatively level but slightly rolling topography to the southern boundary of Atascosa County. Another hilly area 4 or 5 miles wide forming an escarpment facing the south occurs in the southern boundary of Atascosa County. South of this hilly area is another comparatively smooth plane interrupted by a narrow strip of bad land topography, between the towns of Whitsett and Pant City.

In general, the land slopes are less than one per cent but slopes as high as 6 per cent occur in the hilly portions of the watershed.

Drainage

None of the streams within the area are perennial but depend for their flow upon flood waters and waste flow of artesian wells within the area. The drainage pattern is dendritic.

The Atascosa River has its source in the extreme northwestern corner of the area and flows southeastward across the entire

area into the Frio River. The Frio River flows into the Nueces River to the south.

Tributaries in the order of their confluence with the Atascosa from north to south include Sesteadero, Galvan, Lucas and Barrego, Matate, La Parita, San Cristobal, and Weedy Creeks.

The gradient of the Atascosa River averages about 8 feet to the mile for its total course through the area. Somewhat steeper gradients occur in the upper reaches and on the tributary streams, although there are no pronounced variations.

The channel of the Atascosa as well as of the tributary streams is narrow, well defined, with relatively steep banks. In the upper portion of the area the channel bottoms are sandy to gravelly without boulders. Toward the southern part of the area the channels contain more silt and alluvium with much less sand and gravel. The streams have cut no deep canyons or valleys and no changes in stream courses are apparent.

There appear to be no possibilities for stream diversion within the area with the possible exception of very minor diversions at the heads of the streams. Channel storage is inadvisable since the channels are narrow and over-taxed during flood periods, the only time during which water is available for storage. Dam sites are scarce. Storage capacities would be low and reservoir silting rapid.

Some off-channel flood diversion storage is possible and desirable on the heads of the tributary streams in the southern half of the area but not in the northern sandier portions of the watershed.

Natural Vegetation

In the central and southern part of the area better soil types prevail. The existing vegetation and proportions of each are listed in the following tabulation. This information has been provided by the County Agents of counties within the area.

Grasses	60 per cent
Weeds	10 per cent
Shrubs	30 per cent

In the northern part of the area where the land is sandy the vegetation consists of the following:

Grasses	85 per cent
Weeds	10 per cent
Shrubs	5 per cent

Post oak trees are found particularly in the sandy areas along streams and shallow ground water.

Precipitation

Climatological data are available for Whitsett and Rossville within the area and for several stations outside but in the vicinity

of the area. All of these records have been considered since there is an appreciable variation in passing from east to west and north to south across the area.

Regional records of mean annual rainfall are as follows:

Rossville (northern part of area, 18-year record)	26.66	inches
Whitsett (southern part of area, 24-year record)	25.14	"
Pearsall (about 20 miles west of area, 25-year record)	22.96	"
San Antonio (about 15 miles north of area, 68-year record)	27.84	"
Floresville (about 8 miles northeast of area, 24-year record)	27.16	"
Karnes City (about 10 miles east of area)	31.46	"
Beeville (about 25 miles southeast of area)	30.89	"

These records indicate an increase in precipitation in passing from west to east across the area. There is also an increase in precipitation north of the area which is attributed to the uplift associated with the Balcones fault zone immediately north of San Antonio. Snow rarely occurs.

As indicate by the precipitation charts, rainfall is normally well distributed through all months of the year but is heaviest during the spring and fall and generally lightest in the summer months. Storms are frequently of the tropical variety and usually enter the region from Mexico or the Gulf of Mexico. The maximum precipitation recorded in 24 hours is 7.08 inches in October 1 and 2, 1913, at San Antonio; 4.15 inches in 12 hours at Beeville, on June 27, 1936. No records of rainfall intensities are available for points within the area.

During the years 1931 to 1938 inclusively, the average number of rainy days annually at San Antonio was 88.5 and at Whitsett 35.6.

The maximum annual and monthly rainfall occurred at both stations in 1935, 42.93 inches and 14.07 inches, respectively, at San Antonio; and 42.08 and 13.27 inches at Whitsett.

These figures show a trend toward rainfall of higher intensity and less frequency from north to south across the area.

Temperatures

The Rossville record for an 18-year period gives an all-time maximum temperature of 108° and a low of 13°. The maximum mean monthly temperature is 85° in July and the minimum mean monthly temperature is 53° at the same station.

The San Antonio record shows a high of 107° and a low of 4° with a mean monthly high of 84° in July and August and a mean monthly low of 52° in December and January.

The average growing seasons as determined by the first and last killing frosts are given for three stations in or adjacent to the area as follows:

Rossville	March 5 to November 20	260 days
Whitsett	March 9 to November 20	256 days
San Antonio	February 22 to December 1	282 days

The minimum growing season as recorded at Rossville, Dilley and Beeville is as follows:

Rossville	April 9 to October 27	201 days	(18-year record)
Dilley	February 11 to October 8	239 days	(11-year record)
Beeville	March 31 to October 2	185 days	(9-year record)

Other records are incomplete, but those available indicate a slightly longer growing season for the northern and western portions than for the southern and eastern portions of the area. Records at Dilley and Rossville show several seasons without killing frosts.

Evaporation

No stations within the area have provided information on evaporation. Incomplete evaporation records from a free-water surface have been kept for 11 years including 1938 at Dilley. The average annual evaporation from these records is 76.0 inches. The Beeville record for 9 years gives an average annual evaporation of 58.2 inches.

Since these records are for opposite sides of the area at points about equidistant from the area, it may reasonably be assumed that the mean annual evaporation within the area is approximately 67 inches, about 85 per cent of which occurs from March to October, inclusively, with the highest rate during June, July, and August.

Wind Movements

Winds generally blow from the Gulf toward the interior in this area as they do over the major part of southwest Texas. The prevailing wind direction is from the south or southeast about 95 per

cent of the time. During November, December, January, and February, north and northeast winds are frequent.

Wind velocities are generally low; 20 to 25 miles per hour winds are unusual and mean maximum for the area except for brief flurries during or immediately preceding tropical storms. On the other hand, wind-free periods are rare and a light breeze is generally in evidence during the major part of the day, velocities usually being highest during the afternoon and evening.

No records of wind movement are available for points within the area, but Table 1 presents the 43-year record at Beeville, a 5½-year record at Dilley, and a 66-year record at San Antonio, which are probably indicative of similar conditions to be expected within the Atascosa watershed. It may be significant to note that wind velocities are somewhat lower at Dilley than at Beeville and velocities in the Atascosa watershed may be assumed to fall between those recorded on opposite sides of the area.

Ranchers have reported periods as long as 20 days in which wind velocity has been insufficient to operate windmills. However, this condition is regarded as decidedly abnormal and 5-day wind-free periods may be regarded as mean maximum.

A tabulation is included to indicate performance of windmills; however, due to the usual low wind velocities in this area it is advisable to increase the size of the mill by 2 feet over that shown in Table 2 since these performances were compiled for conditions existing on the High Plains.

Table 1.—AVERAGE WIND MOVEMENT AT BEEVILLE, DILLEY, AND SAN ANTONIO, TEXAS

(in miles per hour)

	Beeville	Dilley	San Antonio
Years of record	43	3½	66
January	6.57	2.34	8.30
February	7.01	2.72	9.20
March	8.02	2.92	9.20
April	7.53	2.60	9.10
May	6.59	2.64	8.70
June	5.78	3.53	8.20
July	5.33	2.75	7.90
August	5.07	2.17	7.40
September	4.78	1.92	7.50
October	4.63	1.98	7.50
November	5.37	1.98	8.00
December	5.82	1.71	8.00
Annual	5.80	2.44	8.20

Table 2.—PERFORMANCE OF WINDMILLS PUMPING WATER AT VARIOUS LIFTS[1]

(in gallons per hour)

Wind Velocity (Miles per hr.)	Diameter of Mill Fan (Feet)	Lift in Feet									
		50	100	150	200	250	300	350	400	450	500
5	8	26.2	13.1	18.7	6.5	5.2	4.3	3.7	3.3	2.9	2.6
5	12	59.4	29.7	19.8	14.9	11.9	9.9	8.5	7.4	6.6	5.9
5	16	107.0	53.5	35.6	26.7	21.4	17.8	15.3	13.4	11.9	10.7
10	8	209.0	104.5	69.5	52.2	41.7	34.8	29.8	26.1	23.2	20.9
10	12	475.0	237.0	159.0	119.0	95.0	79.0	68.0	59.0	53.0	48.0
10	16	855.0	427.0	285.0	214.0	171.0	143.0	122.0	107.0	95.0	86.0
15	8	705.0	353.0	235.0	177.0	141.0	118.0	101.0	88.0	79.0	71.0
15	12	1600.0	800.0	535.0	400.0	321.0	267.0	229.0	200.0	179.0	160.0
15	16	2890.0	1445.0	962.0	722.0	577.0	482.0	413.0	361.0	321.0	289.0
20	8	1670.0	835.0	557.0	417.0	334.0	279.0	239.0	209.0	186.0	167.0
20	12	3810.0	1905.0	1270.0	953.0	762.0	635.0	544.0	476.0	423.0	381.0
20	16	6840.0	3420.0	2280.0	1710.0	1370.0	1140.0	977.0	855.0	760.0	684.0

1 Performance compiled for conditions existing on the High Plains.

Areal Geology

The United States Geological Survey, cooperating with the Texas Board of Water Engineers and the Engineering Experiment Station of the Agricultural and Mechanical College of Texas, made an intensive investigation of the geology and ground-water resources of Atascosa and Frio counties, Texas. The report of this investigation was published as United States Geological Survey Water Supply Paper 676. Information from this Paper has been used freely through this report.

The formations exposed in the Atascosa drainage basin are all of Tertiary age consisting chiefly of sand, sandstones, and clay. The several formations are exposed successively from older to younger from north to south across the area. The strike of these strata is approximately northeast-southwest at about right angles to the principal drainage, and the dip varies from 70 to 130 feet per mile in a southeasterly direction which is somewhat greater than the topographic slope in the same direction across the watershed. All formations present outcrop completely across the area. Plate I is an enlargement of the United States Geological Survey geological map of Texas.

Geological Formations

The oldest formation exposed in the area belongs to the Wilcox group of Eocene age represented chiefly by the Indio member.

This formation consists principally on thin-bedded sands, sandstone, and clay, and some laminated carbonaceous shales and lignite. It is exposed in the extreme northern end of the area in the vicinity of Lytle. The sands and sandstones are comparatively fine, argillaceous, and of gray to buff color, exhibiting considerable iron oxide stain. One fairly persistent sandstone bed about 50 feet thick occurs near the base and is encountered by wells in the vicinity of the Indio-Carrizo surface line of contact. These sands and sandstones are the source of ample water of fair quality for stock and domestic use.

The lithological characteristics of individual beds in the Indio, as well as in the succeeding formations to be discussed, vary considerably, making definite correlation difficult from place to place.

Unconformably overlying the Indio formation is the Carrizo formation, lowest member of the Claiborne group. It is a clean medium to coarse grained, quartz sand, interbedded with lenses of shale. This sand is pink to salmon colored upon exposures in cuts, but white in well samples and gray in long-weathered exposures. It exhibits various degrees of compaction, little or no cementation, and a high degree of porosity and permeability.

The Carrizo is an outstanding aquifer yielding excellent water. It is under artesian pressure down dip from its outcrop area throughout the Atascosa watershed. Water from this formation is used for well irrigation, particularly in the vicinity of Pleasanton and Poteet.

In the southern part of the area few wells have been drilled into this formation since it lies over 5,000 feet below the surface. Stock and domestic waters are generally available over the Carrizo outcrop area at depths of 150 feet or less.

The topography on the Carrizo outcrop is of moderately high relief. Small sand dunes are common and live oak trees dominate the vegetation. Both wind and stream erosion are rapid since the beds are usually soft and break down readily.

The Carrizo is overlain unconformably by the Mt. Solman formation (undivided). The presence of the Bigford member which overlies the Carrizo farther west cannot be definitely established east of Bigfoot, which is located slightly west of this area. The Mt. Selman is composed mainly of clays, argillaceous sandstones, and thin-bedded sandstones and shales. The sands and sandstones are finer grained and much less pure than those of the Carrizo, and ferruginous concretionary beds are common particularly in the upper part of the formation. Gypsum, glauconite, and volcanic ash are present in the formation as well as other less prominent minerals. The Mt. Selman beds vary considerably in color. Gray, brown, yellow, pink, and white outcrops may be observed on surface exposures. The upper half to two-thirds of the formation is predominately sandy, while the lower part is mainly clay with occasional sand lenses.

The thickness of the Mt. Selman is also apparently quite variable. Wells logs[1] indicate as much as 1,200 feet of Mt. Selman to

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1 Lonsdale, John T., "Geology and Ground Water Resources of Atascosa and Frio counties, Texas;" United States Geological Survey, Water Supply Paper 676, Page 83, 1935.

be present in the area and the average range is probably 900 to 1,200 feet.

While certain horizons of the Mt. Selman yield abundant water suitable for stock and domestic use and for irrigation, it generally yields water with a much higher mineral content than the Carrizo and in considerably smaller quantities. Water from the Mt. Selman is almost always under artesian pressure, even within the outcrop area since the producing sands are generally interbedded with clays and concretionary limestones which are impervious.

Well logs indicate sandy zones in the Mt. Selman as much as 200 feet thick with only minor shale breaks. Sands 50 to 100 feet thick are common in the upper part of the formation.[1]

The Cook Mt. formation lies conformably on the Mt. Selman. It is composed of sandstone, clay, some impure limestone, and lignite. The clays are generally gypsiferous, the sandstones generally glauconitic and frequently fossiliferous, and the lignites and limestones rather insignificant. In the western part of the area a basal sandstone is present which is quite glauconitic. East of Pleasanton this member thins or grades into alternating shales and sandstones. The sandstones are mainly yellow replete with ferruginous streaks.

The formation varies in thickness from 600 to 900 feet over the area. On the outcrop area the soils commonly exhibit a characteristic chocolate brown color slightly darker than that shown by soils developed on the sandy phases of the underlying Mt. Selman.

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1 Lonsdale, John T., op. cit., P. 81.

The sandstones, particularly the basal sandstone where present, yield considerable water to wells. This water is highly variable in chemical character but usually is satisfactory for both stock and domestic use and practically always potable for stock. This is particularly true of water from the basal sandstone where this member is present. Sands are lenzy and highly mineralized, but those of approximately the lower half of the formation may usually be relied upon for suitable stock wells. The upper half of the formation is predominately clay and usually does not produce water satisfactory in quality or quantity for good wells.

The outcrop areas of the Cook Mt. have a relief quite similar to that of the Mt. Selman, less than that of the underlying Carrizo exposures but considerably greater than that of the overlying Yegua. The mesquite trees are abundant and large.

The Yegua formation conformably overlying the Cook Mt. is predominately clay, usually highly gypsiferous, and mainly yellow to brown in color, but frequently showing brown to black stains on exposure. Some beds of commercial lignite occur in the formation. Low relief, marshy land, sparse vegetation and few trees characterize the surface exposures. The outcrop area extends completely across the watershed as does that of all formations occurring in the area. This formation is 700 to 900 feet thick. While it yields some water, the water is practically unusable even for stock, since it is very highly mineralized.

The Jackson formation (undivided) consists of clay, thin sandstone, quartzite, lignitic clay, and volcanic ash. Siliceous wood, calcareous, and siliceous concretions occur in abundance. The sandstones are mainly white, but also reddish. The clays are often chocolate colored. The volcanic ash is buff to white and probably never over 15 feet thick. This formation is approximately 450 feet thick and lies conformably on the Yegua. The sandstone of the lower part of the Jackson yields small amounts of water of variable chemical quality and most of it is usable at least for stock. The Jackson exhibits a comparatively rugged topography owing to the presence of highly resistant beds in the lower part of the formation. These beds produce a rather prominent escarpment south of Campbellton.

The surface exposure of the Frio clay formation in this area is restricted to a narrow belt extending from the junction of the south line of Atascosa County and the west line of Karnes County southwestward about midway between Whitsett and Fant City across the west divide of the Atascosa drainage.

The Frio is a fine-grained tuffaceous greenish gray to buff colored clay of Oligocene age producing characteristically "bad land" topography. Its thickness is variable but apparently about 50 feet in the area. It is of no consequence as a source of water.

The Catahoula tuff formation consists of a gray volcanic tuff and tuffaceous sandstone, lying unconformably on the Frio clay and the Jackson formation, and overlaps the Frio clay. It appears to be about 150 feet thick and is insignificant as a source of

ground water. The following tabulation is a summary of the geologic formations in the area:

Age	Group	Formation	Principal water horizon	Thickness
Recent		(Gravel & alluvium	none[1]	100±
Oligocene or Miocene?	Catahoula	(Catahoula Tuff	none[1]	50±
		(Frio Clay		-
Oligocene	Jackson	(Jackson	lower part	450±
Eocene	Claiborne	(Yegua	none[1]	700 - 900
		(Cook Mt.	lower 1/2	600 - 900
		(Mt. Selman	upper 2/3	900 -1200
		(Carrizo	all	325±
	Wilcox	(Indio	limited throughout	85 - 110

Structural Geology

Structurally the Atascosa drainage basin is located on a regional southeast dipping monocline. The dip of the strata averages about 1° over the area as a whole.

The regional dip is interrupted by two anticlines; namely, the Campbellton anticline and the Somerset anticline. The Somerset faulted anticline has a northeast-southwest axis passing approximately through the town of Somerset in northwestern Atascosa County.

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1 The Yegua, Frio and Catahoula formations yield some water to wells but have no definable water horizons and the water is highly mineralized.

Neither of these structures have had any apparent effect upon the ground water of the area.

Soils

The soils in this watershed may be generally classified into three groups: dark-colored soils, light-colored soils, and red soils, according to "Soils of Texas."[1]

The southeastern 40 per cent of the area is of the dark-colored soils, including the Victoria and Goliad Series. The top soils of this group are predominantly clay to clay loam in texture and are underlain by clay sub-soils with a layer of accumulated calcium carbonate occurring at some part of the profile.

An additional 40 per cent of the watershed area in its north central and extreme northern parts is occupied by red soils, chiefly of the Duval and Webb series. The top soils of this group are principally fine sandy loams containing a relatively small amount of organic matter. The sub-soils are friable and heavy, containing larger amounts of fine material than the top soil. The layer of caliche (accumulated calcium carbonate) which is characteristic of the Rio Grande Plain soils, occurs somewhere in the substratum.

The remainder of the watershed area is occupied by light-colored soils extending in a band crossing west to east the northern

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1 Carter, W. T., "The Soils of Texas," Texas Agricultural Experiment Station, Division of Soil Survey, Bulletin 431, July 1931.

part of the area. These soils are principally of the Brennan and Nueces series and are generally characterized by fine sand to fine sandy loam top soils, grading into sand or sandy clay sub-soils. The soils were developed in this area principally from the outcrop of the Carrizo formation.

The dark-colored heavier soils of the southeastern 40 per cent of the area are not adaptable to irrigation. Soils in parts of this area contain salts of both the black and white alkali groups. Sub-soil drainage may be expected to be poor.

In other parts of the area the soils are generally sandy and drainage is adequate even when irrigated with comparatively highly mineralized ground water.

Surface Water Discharge

There are no perennial streams in this area, but as pointed out in the section discussing drainage, the Atascosa River and a few of its minor tributaries flow some water almost continuously south of Pleasanton. This flow is provided by waste water from artesian wells in the area in which they are permitted to flow continually.

The only gaging station in the area is located at Whitsett. Gaging records have been kept only spasmodically at this station, Table 3, and the length of record is inadequate for complete discharge analyses.

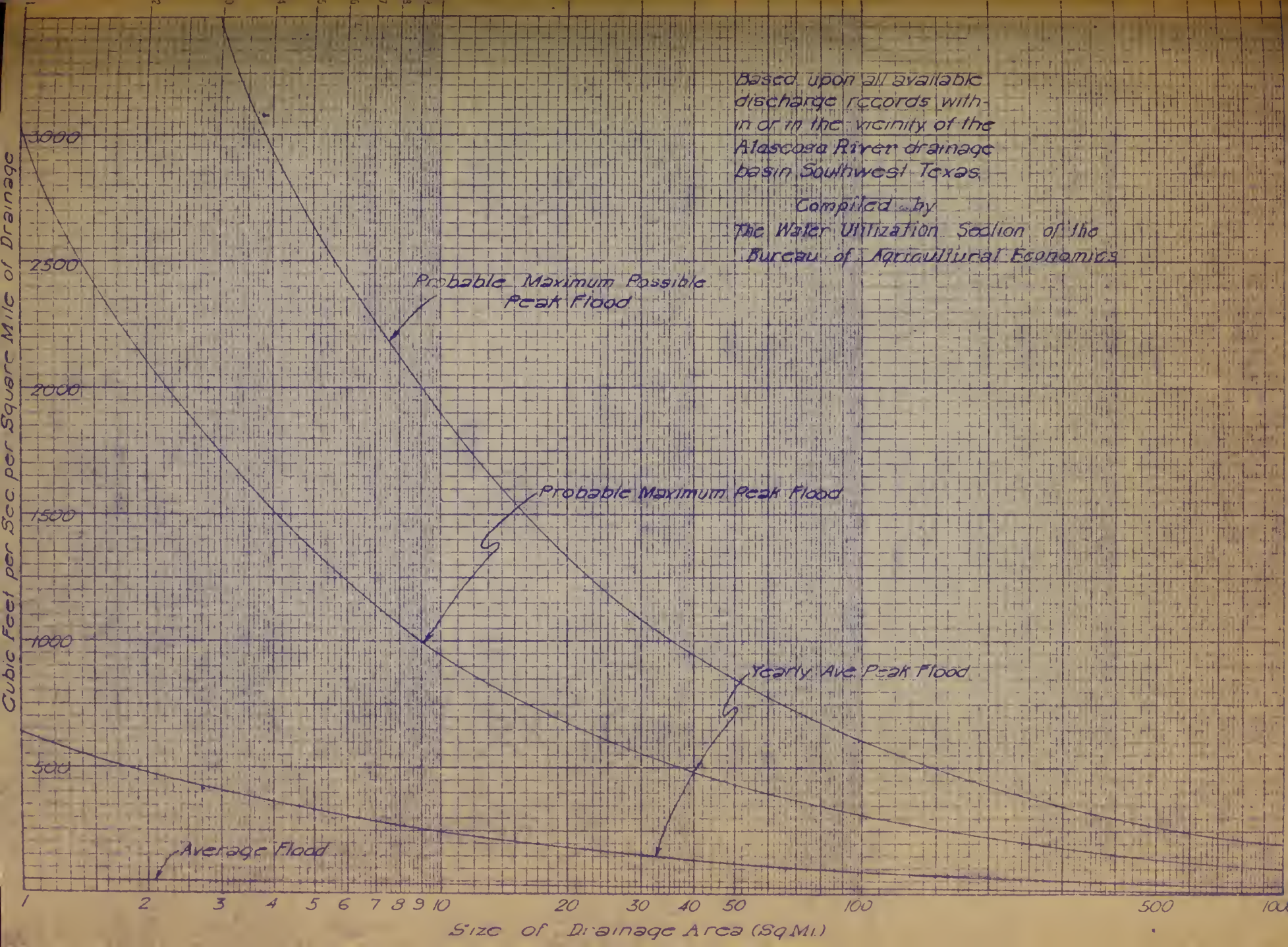
Table 3.—SURFACE WATER DISCHARGE RECORD FOR THE ATASCOSA RIVER AT WHITSETT, TEXAS[1]

Month	1926 Cu. Ft. per Sec. Maximum	1926 Cu. Ft. per Sec. Minimum	1926 Cu. Ft. per Sec. Mean	1926 A.F. Run-off	1932 Cu. Ft. per Sec. Maximum	1932 Cu. Ft. per Sec. Minimum	1932 Cu. Ft. per Sec. Mean	1932 A.F. Run-off	1938 Cu. Ft. per Sec. Maximum	1938 Cu. Ft. per Sec. Minimum	1938 Cu. Ft. per Sec. Mean	1938 A.F. Run-off
Oct.	-	-	49.2	3,020	-	-	-	-	676	1.9	20.3	1,2[illegible]
Nov.	-	-	62.5	3,720	-	-	-	-	5.7	1.7	3.61	215
Dec.	-	-	10.2	629	-	-	-	-	22	4.7	9.16	5[illegible]
Jan.	-	-	39.5	2,430	-	-	-	-	12	7.9	9.45	5[illegible]
Feb.	-	-	5.91	328	-	-	-	-	47	5.5	16.1	[illegible]
Mar.	-	-	10.4	6,420	-	-	-	-	69	3.0	9.73	[illegible]
Apr.	-	-	72.0	4,290	-	-	-	-	147	-	11.5	[illegible]
	May 1 - 8 only				May 22-31 only							
May	-	-	189	3,000	7.6	1.8	3.68	73	293	-	20.0	1,[illegible]
June	-	-	Total	23,837	1.4	-	.56	33	158	-	10.3	[illegible]
July	-	-	-	-	292	-	42.0	2,580	798	-	34.3	2,1[illegible]
Aug.	-	-	-	-	551	-	62.7	3,860	383	-	72.2	4,440
Sept.	-	-	-	-	792	2.6	161	9,580	221	-	27.8	1,65[illegible]
Year	-	-	-	-	-	-	-	-	-	-	20.4	15,[illegible]90

Table 3.—SURFACE WATER DISCHARGE RECORD FOR THE ATASCOSA RIVER AT WHITSETT, TEXAS[1]
(Continued)

Month	1934 Cu. Ft. per Sec. Maximum	1934 Cu. Ft. per Sec. Minimum	1934 Cu. Ft. per Sec. Mean	1934 A.F. Run-off	1935 Cu. Ft. per Sec. Maximum	1935 Cu. Ft. per Sec. Minimum	1935 Cu. Ft. per Sec. Mean	1935 A.F. Run-off	1936 Cu. Ft. per Sec. Maximum	1936 Cu. Ft. per Sec. Minimum	1936 Cu. Ft. per Sec. Mean	1936 A.F. Run-off
Oct.	-	-	0.65	40	871	0.00	35.5	2,180	950	24	72.6	4,460
Nov.	107	-	13.1	780	1,060	0.00	110	6,570	51	14	22.1	1,320
Dec.	3.2	-	2.16	133	1,440	6.2	114	7,020	225	14	42.0	2,580
Jan.	1,670	-	264.0	16,200	32	8.6	14.1	866	133	16	24.3	1,490
Feb.	2,300	-	106.0	5,890	1,500	8.0	160	8,880	21	14	16.9	972
Mar.	1,070	-	68.9	4,240	396	8.0	46.3	2,840	998	13	82.0	5,040
Apr.	1,200	-	157.0	9,340	1,770	7.7	176	10,460	94	8.3	14.1	837
May	-	-	6.3	387	3,430	41	551	33,870	8,220	8.6	795.0	48,860
June	-	-	1.53	91	36,800	56	3,445	205,000	-	-	169.0	10,050
July	501	-	33.1	2,040	295	23	53.4	3,280	-	-	744.0	45,720
Aug.	25	-	2.29	141	24	7.1	12.4	762	854	9.8	44.0	2,700
Sept.	165	-	15.6	928	8,940	5.9	1,010	60,090	915	12	69.1	4,110
Year	-	-	55.8	40,210	-	0.00	477	341,820	-	-	175	128,140

1 Total run-off recorded in 1925 was 15,500 acre-feet. Gaging station located 0.9 miles west of Whitsett, Live Oak County, and 4 miles below mouth of La Parita Creek. The drainage area is 1,171 square miles. Maximum discharge occurred June 14, 1935, with 38,300 cubic feet per second (slope area method). The minimum extreme was 0.0 cubic feet per second.


Based upon all available discharge records within or in the vicinity of the Atascosa River drainage basin Southwest Texas.
Compiled by
The Water Utilization Section of the Bureau of Agricultural Economics
Probable Maximum Possible Peak Flood
Probable Maximum Peak Flood
Yearly Ave Peak Flood
Average Flood
Cubic Feet per Sec per Square Mile of Drainage
3000
2500
2000
1500
1000
500
1
2
3
4
5
6
7
8
9
10
20
30
40
50
100
500
Size of Drainage Area (Sq Mi.)

Due to the brevity of the gaging record at Whitsett it seems advisable to take into consideration discharge records for streams adjacent to or in the general vicinity of the Atascosa River watershed particularly with regard to peak floods. Consequently, curves indicating maximum, probable, and average yearly peak discharge have been compiled from records for Martinez Creek, San Antonio; Atascosa River, Whitsett; San Antonio River, San Antonio; Sandies Creek, Westhaff; Sabinal River, Sabinal; Frio River, Frio Town; and Hondo Creek, Hondo, are included (following Table 3). In view of the absence of long-time record within the Atascosa watershed, the compiled record is believed to provide the most reliable index of discharge available for this area.

Based upon the discharge record at Whitsett for 1,171 square miles of the area, the average annual run-off is about 34 acre-feet per square mile.

Ground Water

Ground water recharge within the area is entirely dependent upon the infiltration of rainfall on the outcrops of formations within or immediately adjacent to the area. The porous character of the Carrizo sand which outcrops both inside and outside the Atascosa drainage basin provides an excellent recharge area for this formation. There is little surface run-off from this outcrop area. The effective Carrizo outcrop area for the recharge of this aquifer in the Atascosa watershed is approximately 260

square miles and includes no perennial streams or artificial source of ground water recharge.

Similar conditions maintain for the successively younger aquifers overlying the Carrizo. The more sandy members of the Mt. Selman, Cook Mt., Jackson, and Catahoula formation receive a small recharge from the Atascosa River, but this is relatively insignificant. The quantity of ground water withdrawal from formations overlying the Carrizo within the area has apparently been insufficient to affect the static water level since no significant drop has been noted in these wells. Withdrawal is confined mainly to that of stock and domestic wells with the exception of a few irrigation wells which extract water from the Mt. Selman formation.

At the present time only the Poteet-Pleasanton area is of any consequence in considering the effects of withdrawal upon the ground water reservoir. About 140 wells obtaining water from the Carrizo sand are either flowing or being pumped in this area. The artesian head has dropped slowly but steadily for a number of years until now a majority of the wells which once flowed are under pump.

A local committee appointed during 1936 to investigate possibilities of controlling overdraft to restore the water level to its former position, estimated the total withdrawal at that time to be approximately 8,000,000,000 gallons or approximately 24,500 acre-feet annually of which only about 3,000,000,000 gallons, or approximately 9,200 acre-feet, was actually used. The waste is attributed to the many flowing wells which are permitted to flow continuously.

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In 1930 the United States Geological Survey estimated that about 9,500 acre-feet of water was being discharged from the Carrizo sand by wells in Atascosa County.[1] Two-thirds of the water was wasted, and 4,000 additional acres might be placed under irrigation in the area without danger of overdraft if flowing wells were stopped by artificial means to eliminate waste when the water was not being used. During periods of heavy pumping, the static water level drops as much as three feet during the day, partially recovering during the night when pumping stops. Over a five-day period of pumping, the water level has dropped as much as 4.5 feet. Since 1925 the static water level has dropped 17 feet. Most of the waste of water in this area is due partially to an erroneous opinion of some that flowing wells will "sand up" and cease to flow if the continuous flow is stopped by artificial means. As the line of flowing wells shifts southward in the direction of ground water movement and more wells are necessarily placed under pump, the agitation for controlling the waste flow of the lower wells to the south increases.

There is no natural ground water discharge in the form of springs or seeps within the area.

There is at the present time an over-draft of ground water in the Poteet district. However, if the waste of flowing wells were eliminated, the present draft appears to be within limits which would permit the gradual restoration of the natural hydraulic balance.

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1 Lonsdale, John T., op. cit., P. 62.

Plate 3 shows in a general way depths to water. It is also an attempt to delimit certain subareas as suitable or unsuitable as a source of stock water.

As previously discussed in the section on geology, the lithologic and stratigraphic character of the formations is such that a great variation in depth to water and quality of water occurs over the area. For this reason, in describing conditions in any restricted area, it is necessary to consider a combination of both factors.

Consequently, the areas indicated by letters A, B, C, etc. on Plate I are outlined, not only as areas of somewhat uniform depth to water, but also as areas of some uniformity as to quality of water and are subsequently so described. Certain exceptions must be expected, since it is possible only to delineate in a general way the hydrological conditions likely to be encountered over comparatively broad areas with the limited information available in some sections of the area.

Artesian heads exist almost everywhere in the area except in some wells located in the outcrop area of the Carrizo and the Yegua formations. Consequently water lifts are not known to exceed 150 feet anywhere in the area. Many wells flow and a large majority of them encounter lifts of less than 100 feet.

A large number of well records, water analyses and logs are available for Atascosa County in United States Geological Survey Water Supply Paper 676.[1]

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[1] Lonsdale, John T., op. cit., P. 60-61, 72-87.

Subarea A is delineated as the extreme northwest corner of the Atascosa River watershed in which the Indio formation crops out at the surface. Ample and suitable water for stock wells may be obtained from the sandier underlying strata of this formation at depths ranging from 50 to 100 feet. Some highly mineralized water may be encountered in wells of this area but most of the water is very satisfactory for both stock and domestic use. The well yields and artesian heads are small. None of these wells flow and none, in all probability, may be expected to flow.

Subarea B is delineated by the drainage basin boundary line on the west, north and northeast, and by the Carrizo-Indio surface contact along the northwest corner, and on the south approximately by the line indicated as the southern limit of the section in which water may be encountered in the Carrizo sand at depths of 300 feet or less. It is the most extensive of the subareas within the watershed. In this subarea, water may be encountered usually at depths of 100 to 150 feet. Most of this area lies within its surface exposure of the Carrizo formation. All wells drilled on the surface exposures of the Carrizo extract abundant comparatively mineral-free water from this formation. None of the shallow wells have artesian heads, but the deeper wells have some artesian head.

In a relatively narrow strip within subarea B, but south of the Carrizo-Mt. Selman contact, water is available in ample quantities for stock and domestic use at depths of 100 to 150 feet,

but the Mt. Selman wells have lower specific yields, and the water shows greater mineralization, but not sufficiently so to prohibit its use for either stock or domestic use. Water in this narrow belt is under artesian pressure and some of these wells flow. Wells located adjacent to the Carrizo-Mt. Selman contact extract water from the Carrizo sands while those a mile or more south of this line derive water from the Mt. Selman. The water from the Mt. Selman is satisfactory for irrigation if used on the lighter sandier soils. However, Mt. Selman wells are unlikely to produce sufficient quantities for extensive irrigation in this subarea, although enough may be available for small garden irrigation. Minerals present in the Mt. Selman water are mainly of the "white alkali" group and not likely to prove injurious if used on sandy soils.

Subarea C extends from east to west across the watershed from the southern limit of subarea B to the surface contact of the Cook Mt. and Yegua formations with the exception of three minor subareas of somewhat indefinite delineation to be discussed as subareas "D." In general, it may be stated that the depth to water in this area varies from 150 to 200 feet. Water is obtained from the upper part of the Mt. Selman formation in approximately the northern one-third of the area, and from the lower part of the Cook Mt. formation in a narrow east-west belt roughly parallel to and slightly south of the Mt. Selman-Cook Mt. contact. In the remaining parts of subarea C, water is obtained from various upper

horizons of the Cook Mt. and usually occurs at depths between 150 and 200 feet, and ordinarily in amounts adequate for stock and domestic use. The degree of mineralization is highly variable, and the water is frequently unfit for domestic use, although it is usually potable for stock.

In the northern part of subarea C, the water is mineralized to some extent but suitable for both stock and domestic use. In the southern two-thirds of this area the water from the Cook Mt. formation is more highly mineralized and much more variable in degree of mineralization. Minerals of the black alkali group are more abundant rendering the water less fit for irrigation. The soils in this area are also heavier and can be irrigated only with caution.

In subareas D wells range in depth from 300 to 550 feet. These wells apparently obtain water from the lower part of the Cook Mt. formation, the upper portions of the formation being practically devoid of water. The water extracted is of comparatively good quality for both stock and domestic use and is under artesian head but does not flow. The water level usually stands less than 100 feet below the surface.

Subarea E is located along the western boundary of the watershed west of an imaginary N—S line one or two miles west of Jourdanton to the northeastern corner of McMullen County and south of a latitudinal line slightly south of Jourdanton. There are very few wells in this area and ground water is obtained with great

difficulty. There are a few shallow wells along the stream channels. The water is highly mineralized and barely fit for stock.

Subarea F is delineated mainly by depth to water, depths ranging from 150 to 200 feet. The water is all rather highly mineralized - the mineralization including both white and black alkali groups. Most of it is potable for stock and some of it is potable for human beings. The Yegua, Jackson, and Catahoula formations serve as a source of water. Artesian heads are reported along the Atascosa and Barrego Rivers and wells near these streams usually provide adequate quantities of water for stock. In other parts of this area, water is frequently difficult to obtain.

Subarea G comprises a small comparatively shallow water belt mainly in the surface outcrop area of the Yegua formation in the eastern half of the watershed. Depths range from 75 to 150 feet. The water is slightly less mineralized in general than that in subarea F.

Subarea H is a deep water area located in a rather hilly section of the Jackson exposure in the eastern half of the watershed. Wells vary from 200 to 300 feet in depth or slightly deeper. The water is highly mineralized and very seldom used domestically although generally potable for stock.

Subarea I is a shallow well area in the extreme southern end of the drainage basin in the vicinity of the settlement, Nell. Depths to water average 100 to 150 feet and only small quantities of water are available. Mineralization is high. The area lies

in the outcrop area of the Catahoula tuff which serves as the source of water. The water is potable for stock only.

In subarea J the depth to water is 50 to 150 feet. Water derived from the Catahoula formation, which is at the surface, is impotable to man or beast.

II

PRESENT USE OF AREA

Ground Water Irrigation

Irrigation within the Atascosa River drainage basin is mainly confined to well irrigation from artesian flows from the Carrizo sands in an area around Poteet about 3 miles wide and 12 miles long. There are also smaller isolated irrigation areas near Pleasanton obtaining water from the same source. Near Coughran, McCoy, and Campbellton, some wells derive water under artesian head from the Mt. Selman formation.

As previously mentioned there are about 140 irrigation wells in the Poteet-Pleasanton area at the present time. In 1929-30, the United States Geological Survey estimated that there were about 1,350 acres irrigated by Carrizo wells in Atascosa County and suggested that about 4,000 additional acres could be placed under irrigation in Atascosa and Frio counties if the waste of water was eliminated.[1] The exact acreage under irrigation from the Carrizo sand at the present time has not been accurately determined but has apparently more than doubled and is estimated at approximately 3,000 acres. Practically all of this acreage is located in the Pleasanton-Poteet area.

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1 Lonsdale, John T., op. cit., P. 63.

Intensive farming is typical of the area. Tracts are generally small, 5 to 30 acres. Strawberries and truck vegetables are the principal crops produced. An average annual duty of 18 inches to 20 inches of water is required for the strawberries and about 14 to 16 inches for the vegetables. The soils are in general very sandy and no drainage problem exists.

In studies made by the United States Geological Survey the annual duty of water was placed at 2.4 acre-feet in Atascosa County. This figure was used for purposes of calculating withdrawals and appears to be a little high.

Irrigation wells in the area vary in depth from about 550 feet to 1,100 feet and most of those which do not flow have pumping lifts not exceeding 30 feet. Most of them are 8 inches in diameter at the top and 4 to 6 inches at the bottom. Casing practices are generally bad, showing great variation in types, sizes, and extent. Very few of the wells are completely cased to the water sand.

The pumping plants consist of centrifugal, turbine, and air lift pumps powered mainly by gasoline motors although a few electric installations exist. The average yield of these wells is about 250 gallons per minute.

In the Campbellton and McCoy areas the wells are from 70 to 900 feet deep but the high mineralization of the water makes irrigation impractical on the heavier soils which occupy this area.

Most of the wells are in the lower areas near the Atascosa River or some tributary. The shallow wells withdraw water from Yegua, but the deeper wells are in all probability obtaining water from the Cook Mt. formation.

A well about 3 miles east of Campbellton, on the Smith-Mowinkle ranch and three wells about 3 miles northwest of Campbellton on the Harris-Abercombie ranch draw water from the Carrizo sands encountered at depths of 4,000 to 4,400 feet. The water is used extensively for irrigation of cropland and for pasture irrigation. These wells are the only ones in which the water is sufficiently free from mineral to be used for irrigation in this area.

The wells in the Coughran Area obtain water from the Mt. Selman formation. Although slightly mineralized and unfit for irrigation on the heavier types of soil this water is in use on the sandy soil without injurious effects. There are approximately 15 or 20 wells in the area of which 10 or 12 are in use at present time, or are able to be used. The others have been abandoned and allowed to flow into a stream as source of stock water, or have ceased to flow. The casing practices vary considerably and those improperly cased are in most instances in bad condition.

The majority of the installations consist of 6 or 8 inch centrifugal pumps powered by gasoline motors since this fuel is more economical than electricity in this area. In some locations power lines are relatively inaccessible. Electric power rates are

based on the schedules of $0.03 per kilowatt hour with a minimum of $1.50 per acre and $2.00 per horse power based on motor rating. Distillate and cheaper grades of gasoline usually used are available to farmers at 5 to 10 cents per gallon. Drilling costs range from $1.25 to $1.50 per foot up to 1,000 feet and increase with greater depth.

The acre-foot cost of irrigation water varies from $1.50 to $5.00, depending on the lift required and the efficiency of the pumping plants. Lifts in the Poteet district are usually less than 20 feet. In the vicinity of Campbellton lifts generally range from 50 to 100 feet. In other parts of the area the maximum lift encountered is about 150 feet. Flowing wells may be found in topographically low locations in almost all parts of the watershed.

Miscellaneous Ground Water Use

There are no industrial, recreational, or power facilities utilizing ground water within the area. However, municipalities in the area do make use of the ground water supply.

The following tabulation presents data on the most significant municipal water plants within the area:

Town	Depth	Aquifer	Rate G.P.M.	Daily Consump.	Plant Descrip.	Remarks
Jourdanton	1,640	Mt.Selman	250	40,000	8" G.M.C. 6 stage 15 H.P. 1,800 R.P.M.	9' pump head 17' drawdown

Town	Depth	Aquifer	Rate G.P.M.	Daily Consump.	Plant Descrip.	Remarks
Pleasanton	800	Mt.Selman	200	60,000	4 in.Pomona 5 H.P. 1,500 R.P.M.	Head formerly +4 ft. Head now 0 20 ft. drawdown
Poteet	880	Carrizo	450	75,000	3 in.Fairbanks Morse 20 H.P. 3,600 R.P.M.	Flowing well Booster pump head dropped 4.5 ft. on 60 day pump. Lift to tank 300 ft.

Ground Water Control

The only legal ground water control in Texas is provided for by the following articles:

Revised Civil Statutes
Taken From
Vernon's Texas Statutes - 1936

Art. 7600: Artesian well defined. An artesian well is defined for the purposes of this chapter to be an artificial well in which, if properly cased, the waters will rise by natural pressure above the first impervious stratum below the surface of the ground. (Id. sec. 90).

Art. 7601: When artesian well declared a public nuisance. Any artesian well which is not tightly cased, capped and furnished with such mechanical appliances as will readily and effectively arrest and prevent the flow from such well, either over the surface of the ground about the well, or wasting from the well through the strata through which it passes, is hereby declared a public nuisance and subject to be abated as such, upon the order of the Texas Board of Water Engineers. (Id. sec. 91).

Art. 7602: Waste defined. Waste is defined for the purposes of this act, in relation to artesian wells to be the causing, suffering or permitting the waters of an artesian well to run into any river, creek or other natural watercourse or drain, superficial underground

channel, bayou, or into any sewer, or street, road, highway, or upon the land of any other person than that of the owner of such well, or upon the public lands or to run or percolate through the strata above that in which the water is found, unless it be used for the purposes and in the manner in which it may be lawfully used on the premises of the owner of such well. (Id. p. 233, sec. 92).

Art. 7603: Proper irrigation of trees etc. Nothing in the preceding article shall be construed to prevent the use of such water, if suitable for proper irrigation of trees standing along or upon any street, road or highway, or for ornamental ponds or fountains, or the propagation of fish, or for the purposes authorized in this chapter. (Id. p. 223, sec. 92).

Art. 7604: Well properly cased. Whenever any person desires to drill a well upon his own land for domestic purposes or for use for stock raising purposes or use that comes within the definition of artesian well, as defined in this chapter, he shall have the right to do so without subjecting himself to the provisions of this chapter, provided that said well shall be properly and securely cased, and whenever water is reached containing mineral or other substances injurious to vegetation or agriculture, it shall be the duty of the owner of said well to securely cap same or to control its flow so as not to injure the land of any other person, or to fill it up so as to prevent the water of said well to rise above the first impervious stratum below the surface of the ground. (Id. sec. 93).

Art. 7605: Accurate record kept. Any person boring or causing to be bored any artesian well shall keep a complete and accurate record of the depth and thickness and character of the different strata penetrating, and when such well is completed shall transmit by registered mail to the Board of Water Engineers the copy of such record. (Id. sec. 94).

Art. 7613: Penalty for permitting waste. Whoever willfully causes or knowingly permits waste as defined in this chapter, shall be fined in any sum not exceeding $500.00, or shall be imprisoned in jail not more than 90 days, or by both such fine and imprisonment. (Acts 1917 p. 234, sec. 101).

Art. 7614: Sworn statement. Any person, association of persons, corporation, or water improvement or irrigation district, owning or operating any artesian well, as defined for the purposes of this chapter, at the time of its taking effect, shall, within one year thereafter, transmit to the Board of Water Engineers a sworn statement showing results of such test, together with the declaration

of the use or uses to which the newly developed supply will be devoted, and the contemplated extent of such use. (Id. p. 235, sec. 102.)

Art. 7615: Detailed statement furnished. On or before the first day of March of each year, every person, association of persons, corporation, water improvement or irrigation district who, during any part of the preceding calendar year, owned or operated any artesian well for any purpose other than that of domestic use, shall furnish, under oath, to the Board of Water Engineers, upon blanks to be furnished by the Board, a detailed statement showing quantity of water which has been derived from such well and the character of such use to which the same has been applied, together with the change in level of water table of said well, and if used in irrigation, the acreage and yield of each crop, together with such additional data as the Board of Water Engineers may require. (Id. sec. 103).

It will be noted that the law relates only to wastage of ground water and not to control of rates of ground water withdrawal. Hence, the law has not proved as effective as might be desired. The enforcement of the law requires an injunction against the violator and the burden of proof rests upon the complainant. The Texas Board of Water Engineers is charged with the enforcement of the law.

No other ground water control is exercised by public or quasi-public agencies in Texas.

Land Use

Farming in the area to some extent is still in the transition stage. Until within comparatively recent years very little farming was carried on and practically the entire area was devoted to cattle

raising. Some of the famous early Texas ranches were located in this vicinity.

In recent years farming has been on the increase. This is especially true since 1925 during which time the farming acreage almost doubled. Cotton was (prior to the advent of the Agricultural Conservation Program) the leading crop. At present, under the guidance of various Federal and state agencies, a more balanced program is in progress.

Plate II shows areas in cultivation and areas in native pasture at the present time. The total acreage in the area is about 1,088,000. Of this amount approximately 526,000 acres, or 30 per cent, are under cultivation as follows:

Crop	Per cent of cultivated area	Acreage
Cotton	22	71,700
Corn	18	58,700
Vegetables	12	39,100
Peanuts	6	19,500
General	42	137,000
Total	100	526,000

The present cropping trend is toward a reduction in cotton acreage and an increase in the acreage devoted to feed crops.

The size of operating unit in this area varies greatly. In the irrigated district near Poteet most of the units are small and probably average about 30 acres. Dry farming units are much larger. Dry farming units average about 235 acres of which an average of 110 acres is in cultivated land and 125 acres in pasture. Cultivated

pasture has an average carrying capacity of about 8.0 acres per animal unit.

Winter truck farming, with irrigation by wells, has become important within this area. The Poteet area furnishes a large amount of early strawberries and vegetables.

Table 4 lists the usual crops grown and their approximate yield.

Table 4.—CROPS AND YIELDS
IN THE ATASCOSA RIVER WATERSHED AREA

	Yield Per Acre		
		Dry Land	
Crop	Irrigation	Product	Hay
Sweet potatoes	200 bu.		
Irish potatoes	200 bu.		
Strawberries	200 crates		
Lettuce	100 crates		
Spinach	100 bu.		
Tomatoes	200 bu.		
Onions	70 bu.		
Radishes	200 bu.		
Carrots	300 bu.		
Cantaloupes	300 bu.		
Eggplant	150 bu.		
Cabbage	10 tons		
Squash	500 bu.		
Okra	250 bu.		
Watermelons	3 tons	2 tons	
Peanuts		20 bu.	¼ ton
Flax		20 bu.	
Corn		18 bu.	
Small grains			3 tons
Peas (green snaps)		3 tons	
Beans (green snaps)		1¼ tons	
Cotton		120 lbs.	
Sudan		pasture	

About 70 per cent of the area, constituting approximately 761,000 acres, is range land. As pointed out, the native vegetation in the southern part of the area is slightly more abundant and somewhat superior to that in the northern part of the area.

During years of normal rainfall the carrying capacity of the range land is 13 acres per animal unit; 1 cow, 1 horse, or 5 sheep constituting an animal unit. At the present time the range in general is overgrazed and the carrying capacity is considerably below normal. This condition is also partially due to the subnormal precipitation of the last 2 years.

Land Ownership and Valuation

There are approximately 2,850 operating units in the area, Table 5. About 57 per cent of these units are owned by residents. More than 41 per cent of the units are owned by non-residents and about 2 per cent by corporations. The assessed valuation and the tax rate per $100 valuation are also given in Table 5.

Loans and Relief

During the last two years loan defaults, commodity grants and direct relief have been increasing and are expected to continue to increase for some time until an adjustment can be established. Table 6 provides current data on these items for the area as a whole.

Table 5.—OWNERSHIP, LAND VALUATION AND TAXES[1]
IN THE ATASCOSA RIVER WATERSHED, 1939

County	Owners			Land Valuation[2]			Taxes[3]								
	Resident	Non-Resident	Corp.	Cultivated Irr.	Cultivated Dry	Pasture	State	County	Road 1	Road 2	Road 3	Road 3a	School Low	School High	School Ave.
Atascosa	1112	870	19	40.00	20.00	9.00 5.00/4	0.49	0.69	0.07	0.12	0.27	1.25	0.10	1.00	0.44
McMullen	2	2	0			2.50	0.49		No road or tax district in area						
Frio	27	29	2		6.00		0.49	1.29	No road or tax district.				Only 1 sch.		1.00
Medina	40	50	5	40.00	18.00	6.00	0.49	1.00	"	"	"	"	"	"	1.00
Bexar	48	27	2	40.00	8.00 12.00/5	4.00 6.00/5	0.49	0.65	"	"	"	"	0.10	0.75	0.45
Wilson	93	41	5		12.00 5.00/6	8.00 4.00/6	0.49	0.68				Dist#5 0.50	0.00	0.25	0.12
Karnes	40	87	2		8.00	6.00	0.49	0.77				Dist#3 0.52	0.10	0.75	0.43
Live Oak	267	71	8		10.00	6.00	0.49	1.50	No road tax district				0.25	1.00	0.67
Total in area-	1629	1177	43												

1 Data taken from County Tax Assessor's records.

2 Assessed valuation.

3 Tax rate per $100 valuation.

4 Plate IV — area in vicinity of subarea VI

5 Plate IV — area in vicinity of subarea I

6 Plate IV — area in vicinity of Oakley school in subarea II

Table 6.—LOANS AND RELIEF TO FARM OPERATORS IN THE ATASCOSA RIVER WATERSHED[1]

Loans	No.	Amount	Per cent def.	Grants No.	Grants Amt.	No. projects	No. Employed	No. families
	1937							
Feed	29	2,660.00	4					
	1938							
Feed	0	0	0					
	1938							
Seed	46	7,800.00	4					
F.S.A.	124	74,800.00	14	21	$510			
Federal Land bank	712	2,168,880.00	12					
W.P.A.	113					2	13	
Direct relief								355 or 1,374 persons

1 Data from records of the Regional Agricultural Credit Corporation.

III

RECOMMENDED FUTURE AREA UTILIZATION

Land Use

The area as a whole presents few major maladjustments in land or water use. Certain adjustments are to be recommended for subareas within the area to promote proper land use. In general, it may be stated that the greater part of the cropland in the area is adapted to combination dry land farming and ranching. In parts of the area, the proper use of land will be attained in a ranching program. Additional ground water irrigation is not to be encouraged in any part of the area. Surface water irrigation by flood water diversion is feasible in some parts of the area occupied by sandy soils. The wholesale clearing of brush is not to be recommended but the gradual clearing of small areas of brush to increase the acreage of farm land or to improve pasture particularly on the smaller operating units is recommended.

Experiments conducted on the Soil Conservation Service demonstration project near Kennedy in Karnes County indicate that the carrying capacity of pasture land can be increased about 30 per cent by flood water irrigation. Experiments on the King ranch in reseeding with Rhodes grass increased the carrying capacity 20

per cent. The clearing of brush and reseeding to pasture results in much superior grazing conditions. The cost of clearing should average $5.00 to $8.00 per acre, although in areas of exceptionally dense growth the cost may be as much as $20.00 per acre. Spreader terraces will vary considerably in cost but experience in the area indicates a normal cost of about $2.00 per 100 linear feet.

Ground Water Use

A better distribution of water facilities is very desirable over the area in general. At the present time many stock tanks exist which have never been filled with water. Many of these tanks have been constructed under the Agricultural Conservation Program and in many instances a well would have been a more desirable facility, but because of initial cost a tank was substituted. At the present time most farmers and ranchers in the area prefer a well to a tank whenever well water can be obtained. In general, wells are to be recommended in preference to tanks for stock purposes throughout the area since water potable to stock can usually be obtained at comparatively shallow depths. Water lifts are usually low; wells offer a more dependable water supply, are a longer lived facility, and the ultimate cost is usually less than that of tanks. In parts of the area wells need re-casing, but this condition is not acute and no salt contamination has been noted.

Subarea Recommendations

In an attempt to make more specific suggestions for land utilization and adjustment the area has been subdivided into 6 subareas as indicated on Plate 4. Each subarea presents comparatively uniform physical features and is being considered as a unit in recommending land use practices within the area.

In subarea 1 little or no adjustment is suggested. This area contains about 3,700 acres of irrigated land included in the Medina irrigation district. It is located in the extreme northern end of the Atascosa watershed. The cost of water in this district is $1.00 per acre flat rate and 25 cents per irrigation irrespective of the amount of water used. No records are available on the duty of water, but it is estimated at approximately 20 inches annually.

Wells appear to be more desirable than tanks for stock water in this subarea.

Subarea 2 is delineated roughly as an area of sandy phase soils extending over a large part of the drainage basin. The major portion of this subarea is farmed (especially in the vicinity of Charlotte and Pleasanton) but some of it is utilized in ranching. The soils of the area are generally well suited to supplemental irrigation by either ground water or surface flood water diversion. However, no ground-water irrigation is advocated except for small gardens. Combination farming and ranching seems best adapted to the area. Wells are preferable to tanks as a source of water for stock and domestic use.

Only a small portion of subarea 3 at the present time is being farmed. It is a deep sand area approximately coincident with the outcrop of the Indio and Carrizo formations, which has been seriously affected by wind erosion, particularly in its cultivated portions. Its productivity is comparatively low. The area, as a whole, is suitable for grazing although its carrying capacity is also low. It is questionable as to whether or not clearing of brush and reseeding to pasture is economically justifiable and no brush should be cleared without reseeding in this area. No land should be cultivated. Surface water retention structures are not adaptable to this area.

Subarea 4 is delineated as the ground water irrigation area in the vicinity of Poteet. In this area the soils are primarily sandy and well adapted to the cultivation of strawberries, melons, and truck vegetables. It probably presents the major problem area of the entire watershed. On the average, operating units appear to be too small for sound farm economy.[1] Ground water control is essential. The present waste of water from flowing wells should be eliminated. When this is accomplished some additional irrigation appears feasible. Stock wells should be drilled to the Mt. Selman rather than to the Carrizo where possible.

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[1] From discussions with County Agent of Atascosa County, County Supervisor of F. S. A., and District Supervisor of F. S. A.

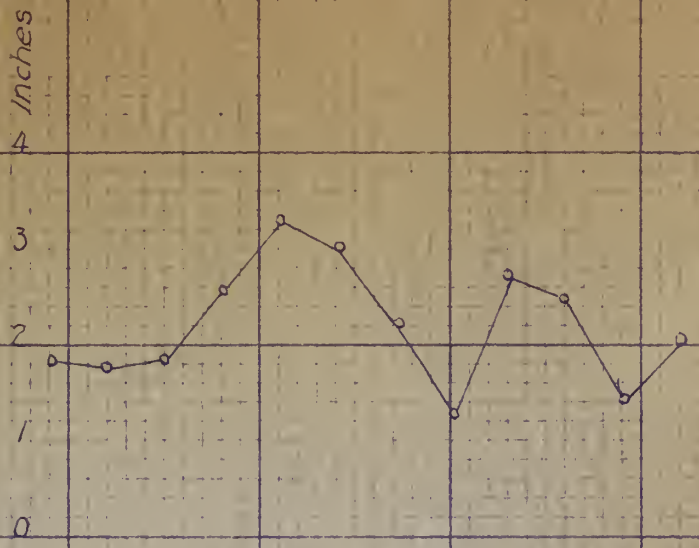
Subarea 5 occupies approximately the southeastern one-fourth of the area. A large percentage of this land is farmed, particularly in the eastern part of the subarea. Much of the land is level with dark colored clay and clay-loam soils. This is probably the best farming district in the area. Clearing of brush is recommended. Operating units can be smaller in this subarea than in any of the subareas except in the irrigated districts. Wells are slightly superior to tanks as a source of water for stock and domestic use throughout most of this subarea.

Subarea 6 occupies about the southwestern one-fourth of the watershed. With the exception of small sections in the vicinity of Christine and south of Charlotte, Jourdanton, and Pleasanton, which are under cultivation, the area is utilized for ranching and some of the largest ranches in the region are located in this subarea. The more level land in this subarea compares favorably with that of subarea 5 for farming purposes but the annual precipitation averages an inch to two inches less than that of subarea 5. Wells in this subarea generally yield highly mineralized water. Therefore, surface water retention structures are more desirable than wells as a source for stock water.

APPENDIX I

PRECIPITATION CHARTS

Contents



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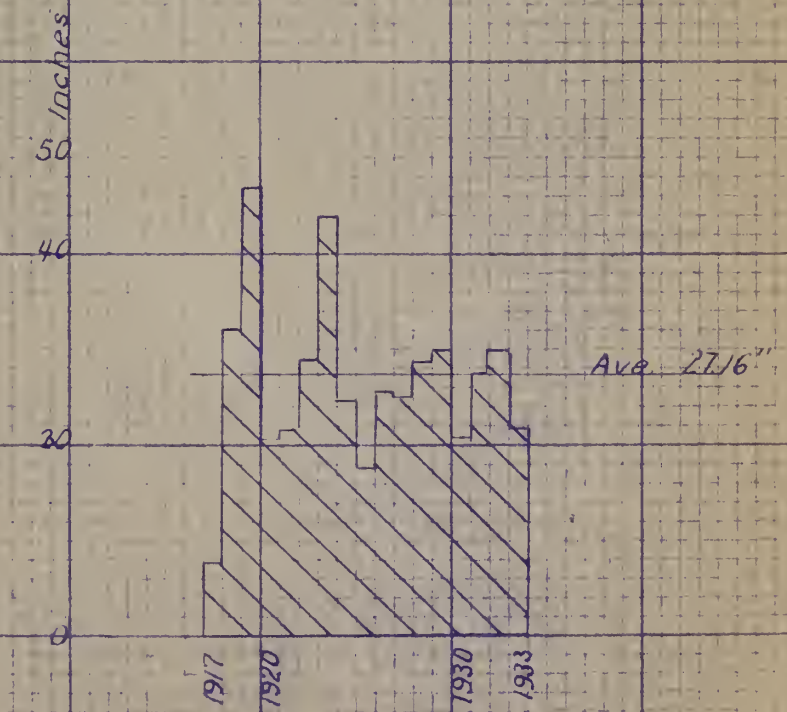
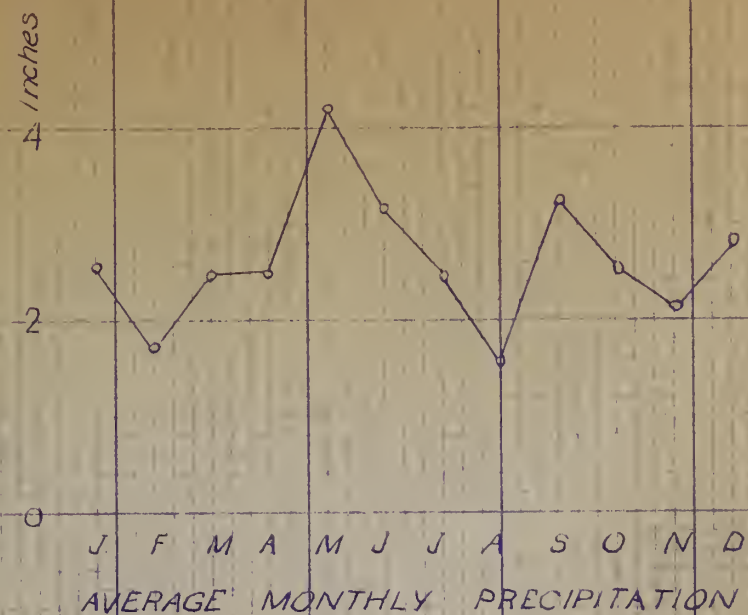


ANNUAL PRECIPITATION

FLORESVILLE STATION

WILSON COUNTY, TEX.



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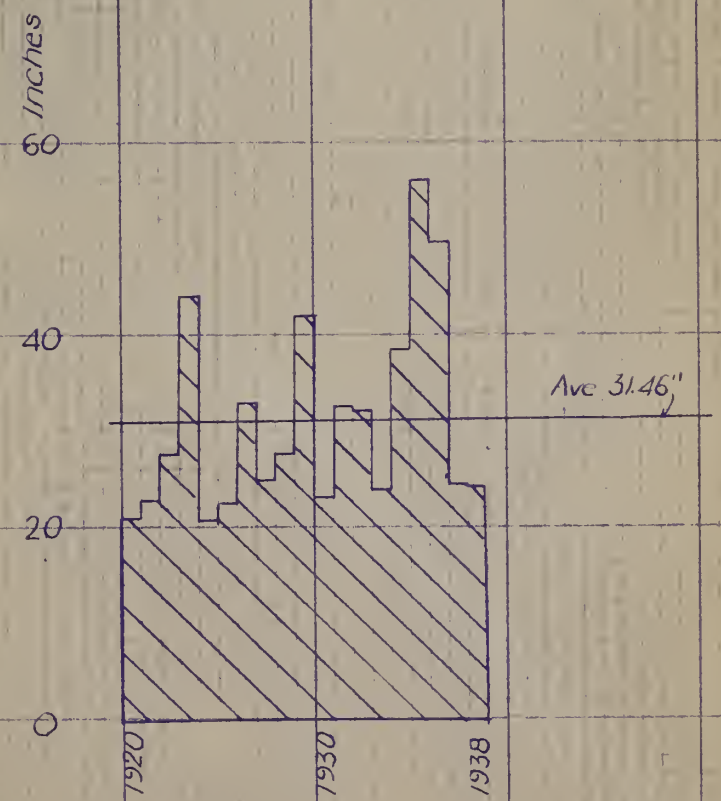
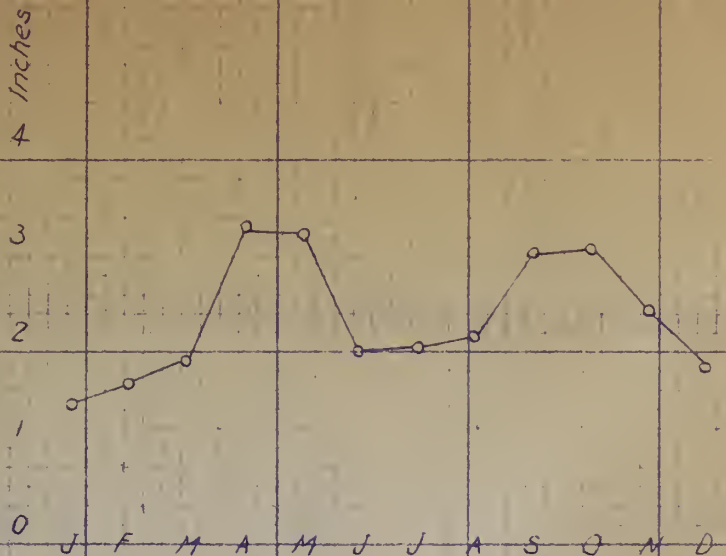


ANNUAL PRECIPITATION
19 Yr Rec.

KARNES CITY STA

KARNES COUNTY TEX



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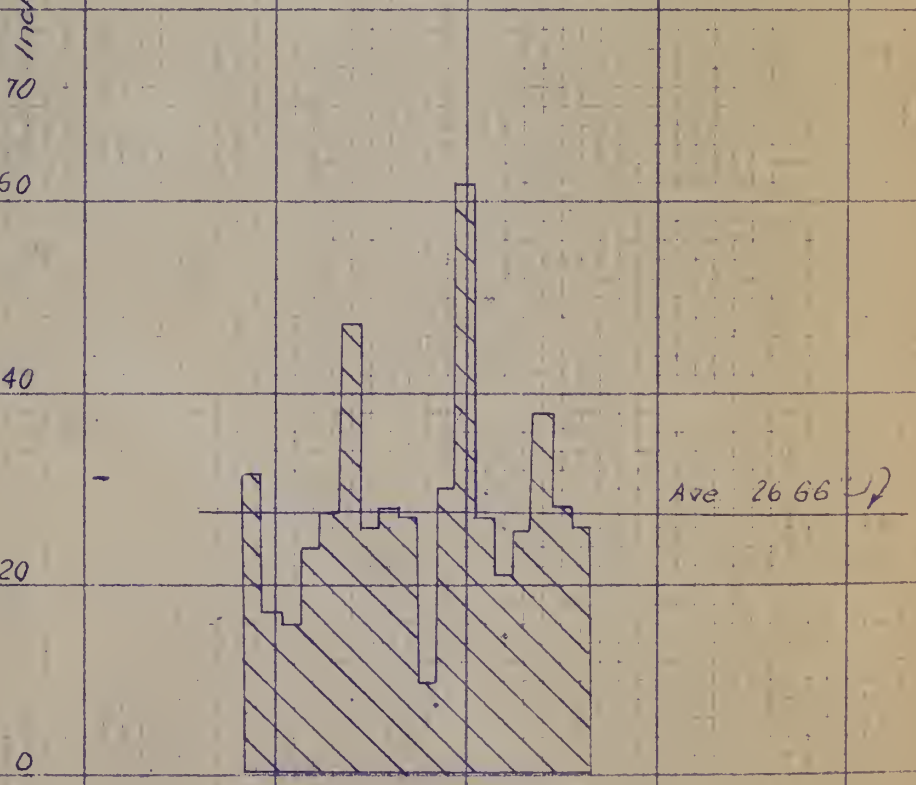
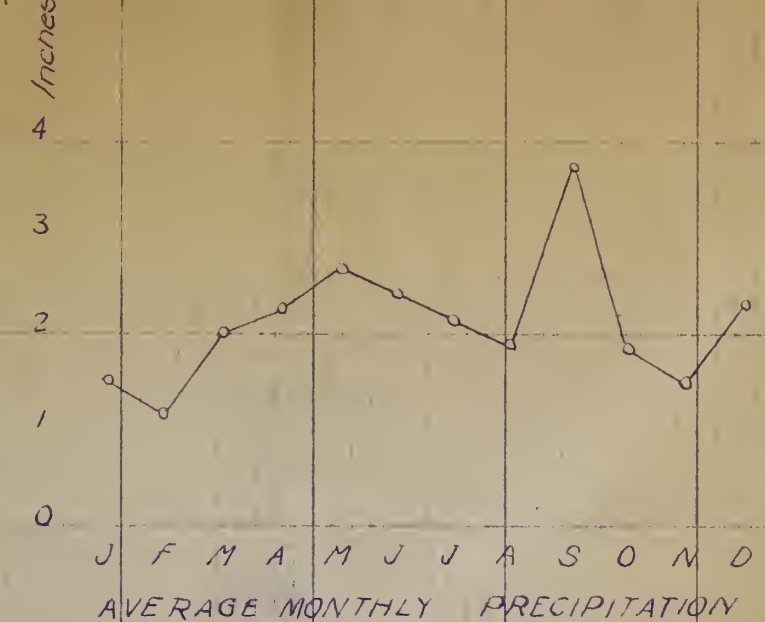


ANNUAL PRECIPITATION

(18 Yr Rec)

ROSSVILLE STATION

ATASCOSA COUNTY, TEXAS



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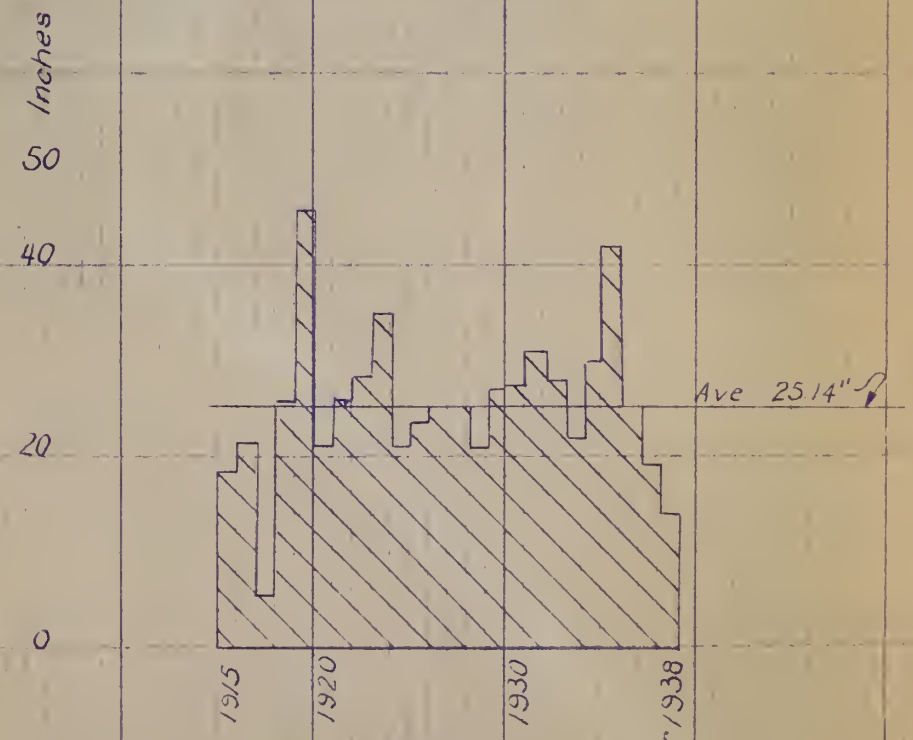

ANNUAL PRECIPITATION
(18 Yr. Rec)

WHITSETT STA
LIVE OAK COUNTY, TEX.

APPENDIX II

MAPS

Contents

Map 1

ATASCOSA RIVER WATERSHED

GEOLOGY

Prepared by
WATER UTILIZATION SECTION
DIVISION OF LAND ECONOMICS
BUREAU OF AGRICULTURAL ECONOMICS
UNITED STATES DEPARTMENT OF AGRICULTURE

Under the provisions of the
Water Facilities Act, Public
Law No. [illegible] 78th Congress
MAY [illegible]

Base Compiled from:
Triple A Aerial Photography
U.S. Army Tactical Maps
Field work by the Bureau of Agricultural Economics
Water Utilization Section

Age	Group	Formation	Symbol
Miocene or Oligocene	Catahoula	Catahoula Tuff	Mct
		Frio Clay	Φf
Eocene	Jackson	Jackson	Ej
	Claiborne	Yegua	Ey
		Cook Mt.	Ecms
		Mt. Selman	Ems
		Carrizo	Ec
	Wilcox	Indio	Ewi

KEY MAP

PLATE NO. 1

Map 2

ATASCOSA RIVER WATERSHED
GENERALIZED LAND USE AND EXISTING WATER FACILITIES

Prepared by
WATER UTILIZATION SECTION
DIVISION OF LAND ECONOMICS
BUREAU OF AGRICULTURAL ECONOMICS
UNITED STATES DEPARTMENT OF AGRICULTURE

Under Watershed Protection Work of the Water Facilities Act, Public Law No. 399 — 75th Congress

1939

LEGEND

- Cultivated Land (Non-Irrigated)
- Cultivated Land (Irrigated)
- Stock Tanks
- Stock and Domestic Wells
- Irrigation Wells

KEY MAP

PLATE NO. 2

Map 3


ATASCOSA RIVER WATERSHED
AVAILABILITY AND POTABILITY OF GROUND WATER FOR STOCK AND DOMESTIC USE
Prepared By
WATER UTILIZATION SECTION
DIVISION OF LAND ECONOMICS
BUREAU OF AGRICULTURAL ECONOMICS
UNITED STATES DEPARTMENT OF AGRICULTURE
Under the Provisions of the Water Facilities Act, Public Law No 399 75th Congress
MAY 1939
LEGEND
A Shallow potable water from Indio formation
B Water of excellent quality from Carrizo formation and Water of good quality from Mt. Selman formation
C Water of variable quality from Mt. Selman & Cook Mt formation
D Meagre water supply of fair quality from lower part of Cook Mt. formation
E Ground water scarce: highly mineralized, from upper part of Cook Mt. formation
F Usually highly mineralized ground water from Vegua, Jackson and Catahoula formations
G Ground water of doubtful potability from Vegua formation
H Deep, highly mineralized groundwater from Jackson formation
I Scanty supply of highly mineralized water from Catahoula formation
J Impotable water from Catahoula formation
Change in potability
E Potability
100-150 Drilling depth
Base Compiled from:
Triple A Aerial Photography
U.S. Army Tactical Maps
Field work by the Bureau of Agricultural Economics
Water Utilization Section
KEY MAP
A 100-150
50-100
B 100-150
B 150-200
B 150-200
C 100-150
C 150-200
C 150-200
D 400-550
D 250-500
D 325-550
E 200-300
F 150-200
F 150-200
G 100-150
H 200-300
I 100-150
J 100-150
MEDINA CO.
FRIO CO.
ATASCOSA CO.
BEXAR CO.
WILSON CO.
KARNES CO.
LIVE OAK CO.
MCMULLEN CO.
Fairview
Anchorage
Three Oaks
Charlotte
Devine
Pleasanton
Poteet
Jourdanton
La Parita
Campbellton
PLATE NO. 3

Map 4

ATASCOSA RIVER WATERSHED

PROJECTED LAND USE

"WATER UTILIZATION IN SECTION
DIVISION OF LAND ECONOMICS
BUREAU OF AGRICULTURAL ECONOMICS
UNITED STATES DEPARTMENT OF AGRICULTURE"

MEDINA CO
FRIO CO
ATASCOSA CO
TEXAS
ARIZONA

LEGEND

1. No major adjustment necessary. Wells preferable to tanks for stock water.
2. Combination farming-ranching area. Wells preferable to tanks for stock water.
3. Recommended for retirement to grazing. Wells preferable to tanks for stock water.
4. Mainly an intensive farming area. Larger operating units recommended. Stock water to be derived from Mt Selman formation when possible. No additional groundwater irrigation until waste of water from flowing wells is eliminated.
5. Recommended for dry farming and clearing of brush and reseeding to pasture. Wells generally preferable to tanks for stock water.
6. Suitable for farming or ranching. Tanks generally preferable to wells for stock water.

PLATE NO. 4