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WATER RESOURCES IN THE SOUTHWEST

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Water is one of the major factors which determine the character, direction, and rate of growth of any region. If properly utilized and controlled, this resource can be a most valuable asset to any community, contributing to the development of prosperous agricultural areas, the establishment of an expanding industrial activity, and the growth of towns and cities. On the other hand, if development of this resource is neglected and water is wasted or allowed to become a destructive force, the productive potential of a community may be impaired permanently and the growth of its economy curtailed.

Few physical factors have been more important than water in defining the developmental pattern of the Southwest, but because of its abundance in most areas of the region the need for its management and conservation generally was not recognized prior to 1900. Up to that time, the lack of conservation and management of water resources, coupled with the steadily growing population which increased the demand for water, had been allowed to upset the natural balance between the physical forces governing water supplies. Even in the humid eastern portion of the region where supplies are apparently adequate to meet all current and potential needs if properly regulated and utilized, many complex problems arose which are still unsolved. The beating action of rains cut away much of the topsoil and reduced the productive capacity of the land; streams were partially filled with silt, and floods probably increased in intensity; and in some communities the quality of water was lowered by pollution to such an extent that it was often unfit for many uses. In the subhumid central portion of the area, cities outgrew the readily available supplies of water and had to develop other sources to meet their needs. The development of these new sources proved costly, and the water obtained was often of poor quality. In arid western parts of the region, large underground reservoirs were tapped to supplement the meager precipitation, but the water supply continued to be the primary factor limiting the growth of these areas.

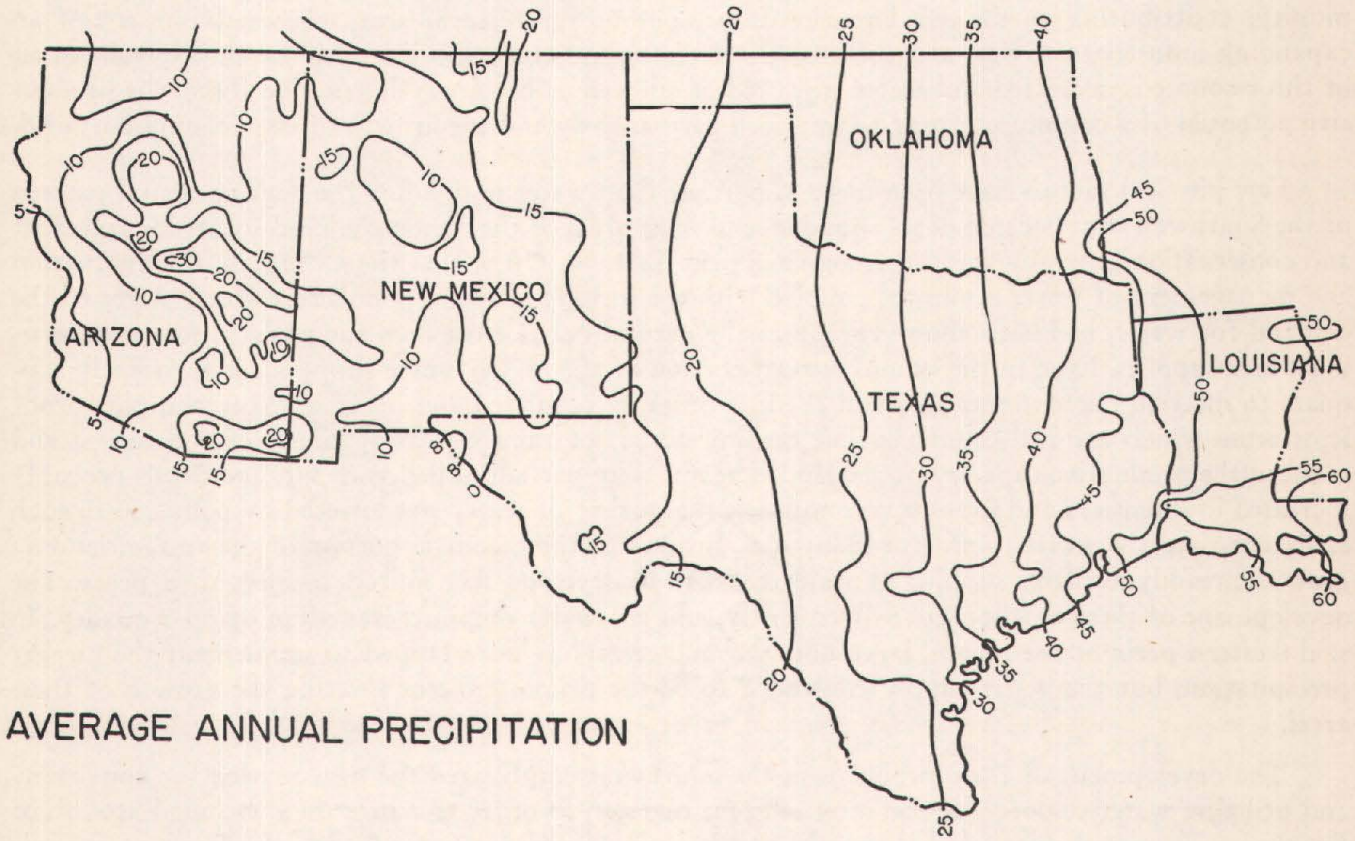
The development of these problems in the Southwest emphasized the urgent need for conserving and utilizing water resources in the most efficient manner, in order to assure the continued growth of the region. It soon was realized that these problems extended far beyond the boundaries of a single community and that their solution would require action on a state or regional basis. The governing bodies of many states, therefore, passed legislation to govern the utilization and control of water supplies. In Texas, the State Board of Water Engineers was organized in 1913 under legislative enactment. The Board was charged, first, with the administration of laws relating to the surface waters of the State and, later, with the investigation of ground water resources and control over the wastage of water from artesian wells.

Agencies of the Federal Government also have been active in the work of water conservation in most states. The United States Geological Survey has compiled data for many years on the extent and quality of ground and surface water resources. The Bureau of Reclamation of the Department of the Interior has participated actively in the development or improvement of many irrigation districts in the Southwest and has made valuable contributions to the existing knowledge of water resources and to the conservation of the supply. The Corps of Engineers, United States Army, has made a significant contribution toward conservation and improved utilization through control of surface streams and the development of navigable waters. The Soil Conservation Service, working in conjunction with local soil conservation districts, has made great progress in bringing water on the land under control and in reducing the extent of damage from water erosion.

These organizations have developed considerable information regarding the extent and nature of the water resources of the Southwest. The major requirements for water for various purposes and the annual withdrawals from ground and surface supplies have been determined within rather broad limits. This information not only will aid in determining the character and extent of the region's water problems but also will form the foundation of any program designed to correct the mismanagement and waste of this basic and necessary resource.

Extent of Water Resources

Precipitation, which is the source of all water, is affected by such varying factors as the altitude, mountain barriers, and prevailing winds, as well as the location of the area in relation to other land masses and to bodies of water. In the Southwest, supplies of water vary greatly in their extent and quality.



AVERAGE ANNUAL PRECIPITATION

The Southwest, which is shut off from the moisture-bearing winds of the Pacific Ocean by the Rocky Mountains, derives the major portion of its precipitation from the air masses which form over the Gulf of Mexico. During the winter months, air pressure over the southwestern region is generally higher than over the Gulf, causing an outward movement of the winds, which, in turn, are displaced by cold and relatively dry air from Canada. As a result, only very limited precipitation falls on the western part of the region during this season. The opposite conditions prevail during the summer

months, however, when the moisture-laden winds move inward from the Gulf over the land mass. In general, these winds move north and westward up the several river basins, depositing their moisture as they come in contact with colder air masses over the land area.

Climatic conditions in the Southwest vary from the humid eastern portion to the arid western area and from the subtropical climate of southern Texas to the area of severe winters in the northern Panhandle. As shown in the accompanying chart, the amount of annual precipitation diminishes at a fairly uniform rate from eastern Louisiana to western Texas, falling from an average of about 60 inches per year in the area east of New Orleans, Louisiana, to 8 inches per year near El Paso, Texas. In New Mexico and Arizona, where the uniform pattern is broken by mountain barriers, altitude is the major factor affecting variations in precipitation. A maximum annual average precipitation of 30 inches is recorded in the high portion of central Arizona, while a minimum of 5 inches is recorded less than 150 miles away in the lower western part of the State. Similar though less extreme variations occur in New Mexico. Within each area of the Southwest, the total annual precipitation in any year may vary sharply from the average. In the more humid areas in the eastern part of the region the deviation is low, averaging only about 17 percent; but it increases toward the west, and in the more arid sections of western Arizona, averages about 47 percent.

The variations in the seasonal distribution of rainfall between different areas within the region create serious problems in the management of water supplies and in the production of crops and livestock. In the land area adjacent to the coast line, stretching from New Orleans, Louisiana, to south of Houston, Texas, maximum precipitation generally is received in July and December. In northern Louisiana, eastern Texas, and Oklahoma, precipitation is concentrated in the winter and spring months. In the Plains area and in the far west, the period of maximum precipitation occurs during the middle or late summer. Because the flow of streams varies directly with changes in the amount of precipitation falling on the watershed, the concentration of precipitation in relatively short periods of time frequently results in the flooding of streams and the wasting of a large amount of water which may be needed at another season of the year when precipitation is scant and the flow of streams is sharply reduced.

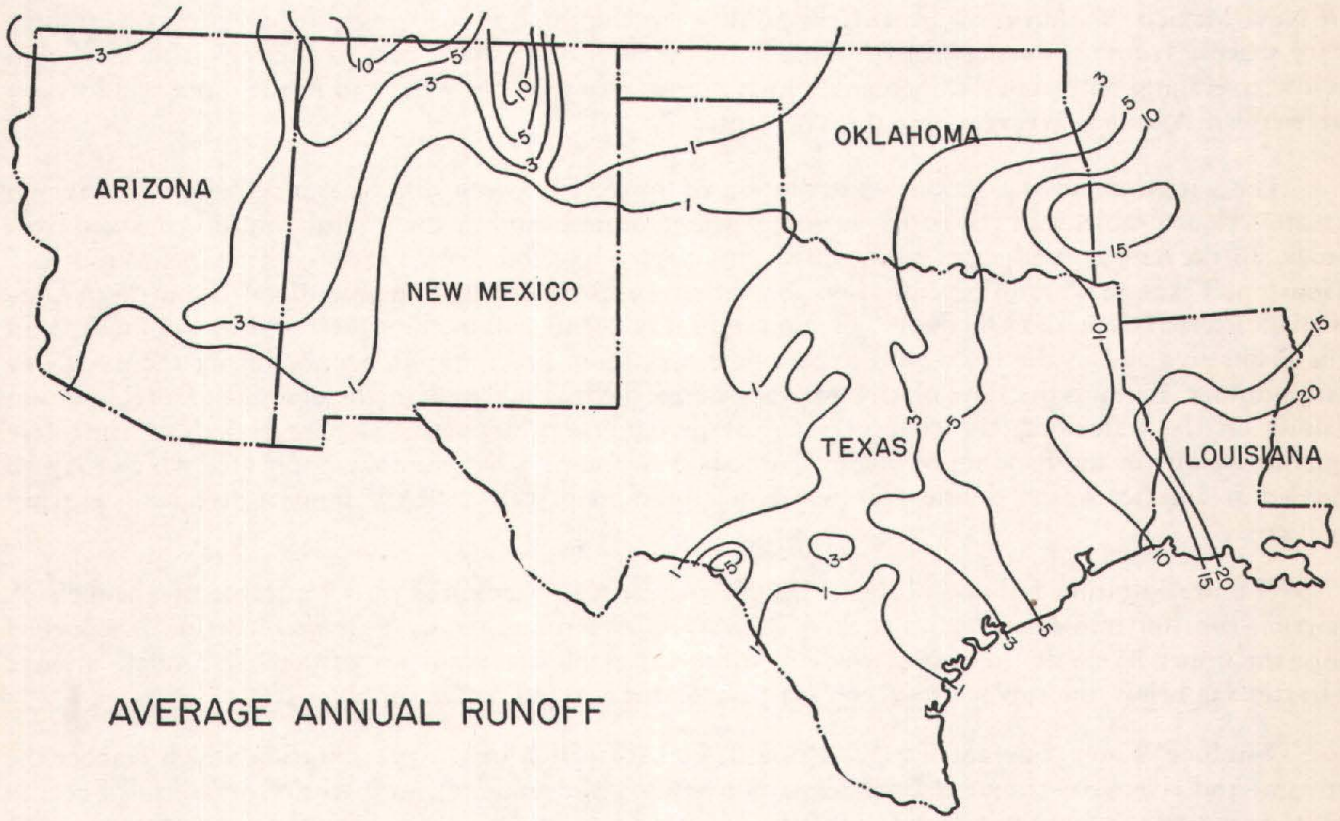
The precipitation falling on the surface of the earth is distributed into a number of channels. A portion runs off immediately and is carried away by streams and rivers; another portion is absorbed into the upper layers of the earth, where it will be available for plant growth; while a small amount filtrates far below the surface to become a part of the ground water supply.

Surface Water. Surface water, or runoff, is that portion of the precipitation which reaches the streams and rivers. Its extent is determined not only by the amount and intensity of rainfall but also by the rates of evaporation and transpiration which prevail in any area and by the absorptive capacity of the land, which is influenced by its slope, the nature of its cover, and the soil structure. In some portions of the southwestern region, precipitation is so low and the rate of evaporation so great that these areas contribute little or no surface water to the streams. The upper portions of the Brazos, Colorado, Canadian, Red, Arkansas, and Rio Grande Rivers lie within such arid sections. The rate of runoff is very great in the eastern areas, however, where precipitation is heavy and evaporation low. In some areas the extent of runoff is also affected by the discharge of ground water into streams and rivers through seeps or springs, while in other areas the runoff is reduced by the loss of surface water to underground reservoirs.

As a result of the variation in rainfall and the physical conditions encountered in various portions of the southwest region, the runoff varies widely within this section. As indicated on the accompanying map, the runoff declines from east to west, falling from an annual average of approximately 20 inches in southeast Louisiana to less than 1 inch in western Texas and southern New Mexico and Arizona. In Louisiana, where annual precipitation averages about 55 inches and high humidity reduces evaporation and transpiration, the average annual runoff is equal to about one-third of the precipitation. In Texas, where precipitation averages only about 30 inches per year and a great portion of the area is either arid or semiarid with high rates of evaporation, less than 10 percent of the precipitation

finally appears in the streams and rivers. Similarly, in New Mexico and Arizona, where precipitation and humidity are still lower, an even smaller percentage of precipitation reaches the streams.

The southwest region may be divided into three major surface water areas. From the standpoint of total volume of runoff, the most important of these is the area drained by the Mississippi and its tributaries, which includes most of Louisiana, all of Oklahoma, and the northern portion of Texas. The second most important surface water area is the Western Gulf Basin, which covers the southwestern corner of Louisiana, all of Texas except the northern portion, and the southeastern quarter of New Mexico. The Colorado River area, the third most important surface water area in the Southwest, includes all of Arizona, northwestern New Mexico, and a large section to the north and west. Like the Mississippi, the major portion of the flow of the Colorado is derived from areas outside the Southwest.

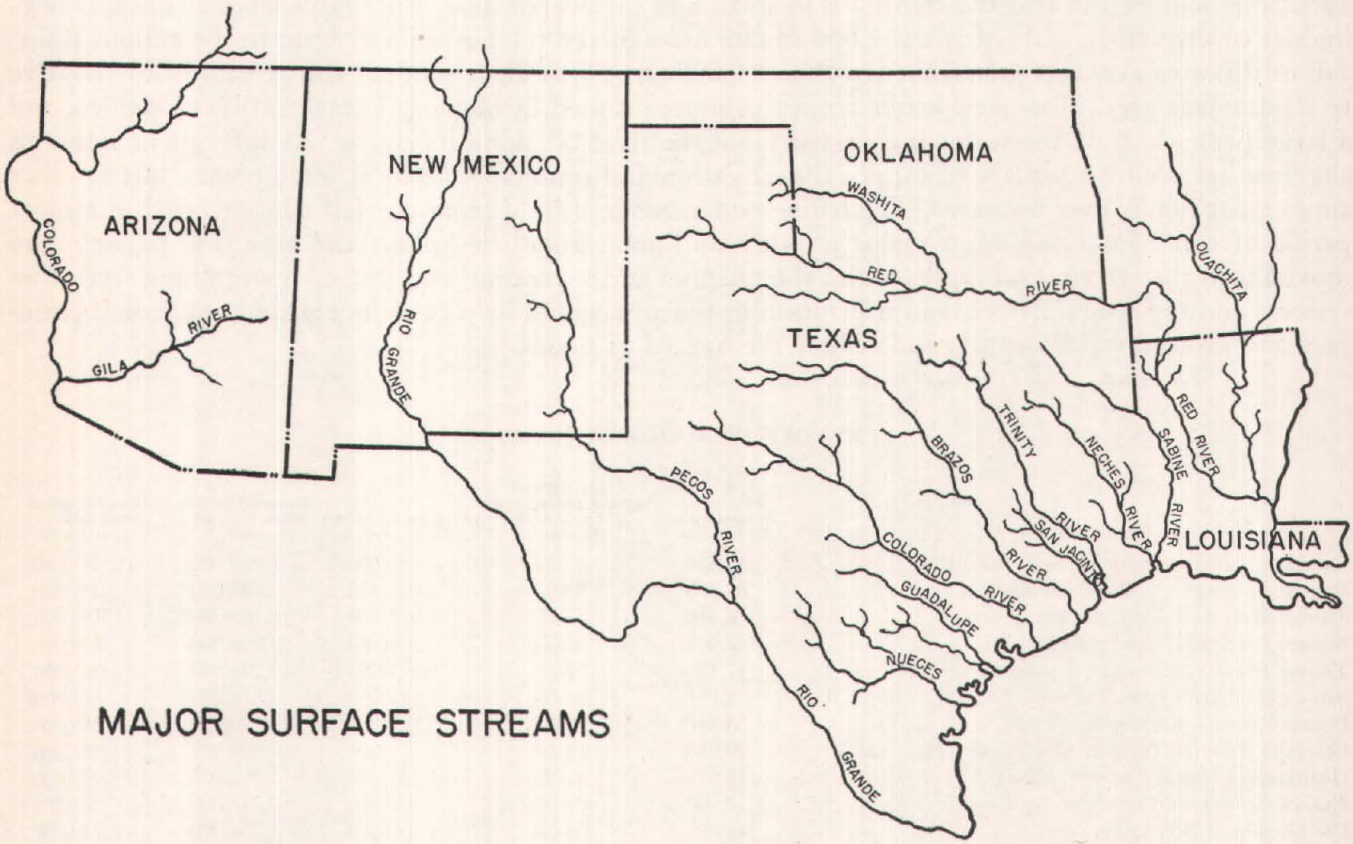


The Mississippi drainage basin includes the Arkansas, Red, Ouachita, and White Rivers and their tributaries, as well as the lower stretches of the Mississippi. From the standpoint of drainage area and total runoff, this basin includes the largest and one of the most important surface water supplies in the region. It contains 286,000 square miles or about 25 percent of the total Mississippi River drainage area but contributes only about 20 percent of the runoff carried by the Mississippi. In the lower portions of the Mississippi and its tributaries, the flow of the streams generally is in excess of the area's requirements, and major floods cause great damage in the area each year. The Red River, which is the most important stream in this drainage basin, lies almost entirely within the southwest region. This river, together with its various tributaries, has a drainage area of 69,500 square miles. The average annual precipitation ranges from 15 inches on the High Plains, where the headwaters of the river originate, to over 50 inches near its mouth in eastern Louisiana. In the upper portion of the Red River watershed, the runoff generally is small, although floods occur from time to time.

The Western Gulf Basin, which includes all of the drainage areas between the Mississippi and the Rio Grande Rivers, is the only major surface water area falling entirely within the Southwest. This basin includes all of the Texas rivers emptying into the Gulf of Mexico.

The Sabine-Neches Basin, located in southeastern Texas and southwestern Louisiana, has an average rainfall ranging from about 40 to 60 inches and a very high rate of runoff. Only about one-fourth of the area included in the drainage basin of these rivers is used for crop production; most of the remainder is in forest or cutover land. Therefore, erosion and silting have been less severe in this area than in sections where most of the native cover has been removed. Pollution of the water, however, does pose a serious problem. During periods of low flow, salt water moves up the streams from the Gulf to such an extent as to affect seriously the water supplies of the municipalities along the Coast and occasionally to cause considerable damage to the rice crop grown in the area. In the upper stretches of these rivers, waste from cities and industrial plants and salt water from the East Texas oil fields have been discharged into the streams and have so polluted the water that in some areas it is unfit for any use.

The Trinity-San Jacinto Basin is an area about 70 miles wide, extending from the northern part of Texas in a southeasterly direction for about 350 miles to the Gulf. Much of the rainfall in this drainage basin is concentrated in severe storms, which cause large floods. Pollution of streams with sewage and industrial waste or through erosion has created many problems of utilization of available water supplies from these sources, and floods have caused great loss of property in the lower portions of the streams.



MAJOR SURFACE STREAMS

The drainage basins of the Brazos and Colorado Rivers of Texas cover a district about 250 miles wide and 600 miles long, extending from the headwaters on the southern High Plains southeastwardly across central Texas to the Gulf. Within this area there are five major physiographic sections in which the varying physical conditions affect the rates of runoff and quality of water. Precipitation, which varies from about 14 to 20 inches in the South High Plains, increases steadily toward the southeast, reaching an average of 40 to 45 inches along the Coast. Rainfall throughout much of this area is erratic and often occurs in intense localized storms, which result in flash floods along portions of these streams. The rate of runoff through the years has increased substantially in this area because of continuous and heavy grazing of range land and the lack of soil conservation measures on cultivated lands.

The Guadalupe Basin, which contains the Lavaca, Guadalupe, and San Antonio Rivers and several small coastal streams, extends from the Edwards Plateau southeastward to the Gulf. The upper portion

of this basin receives intensive rainfall of moderate duration, while the lower portion in the coastal area has intense rains of long duration. These are extreme year-to-year variations in precipitation, and frequent floods occur. Improper range management, lack of soil conservation measures, and poor cultural practices generally have accelerated the runoff and have contributed materially to floods. The basin includes some of the largest springs in the southwestern part of the United States, which contribute to the surface water supplies of the area and assure a year-around flow of most of the streams. In spite of the fact that some of the water in these streams is obtained from perennial springs, stream flow varies widely.

The Nueces Basin is located entirely in the subhumid zone, with annual precipitation ranging from 20 to 30 inches. Extremes in annual precipitation range from 8 to 45 inches. The headwaters of the Nueces River are located in the Edwards Plateau in an area of steep slopes and little cover. Some of the water draining into the upper portion of the Nueces system is lost to underground reservoirs where the river crosses a faulted and porous zone of Carrizo sandstone below the Balcones fault.

The Rio Grande, together with its tributaries, is the largest single drainage area in the Southwest. The total area within the outer realm of the Rio Grande Basin is about 335,000 square miles, but in about one-half of the area the rainfall is so small and the evaporation is so high that the runoff is negligible; consequently, only about 171,000 square miles of the total area contribute to the runoff. Rainfall in this area averages somewhat less than 15 inches, so that the runoff of this stream is low relative to its drainage area. Moreover, water from this source is used in Mexico, Texas, and New Mexico, and a large proportion of the water is diverted from the river all along its course. At infrequent intervals the flow has been inadequate to supply the irrigation and municipal needs at some points, but at other times great floods have occurred. The basin is characterized by intense rainfall concentrated in a short period of time. Soil erosion is a major problem and great quantities of silt and other soil particles are moved into the stream each year, filling the channel and increasing the cost of maintaining irrigation systems and reservoirs. Better land utilization in the area would help to reduce silting, increase the surface and ground water supply, and reduce the hazard of floods.

RUNOFF OF MAJOR STREAMS

Stream	Contributing drainage area (In sq. miles)	Range of annual average precipitation in drainage area (In inches)	Average annual runoff (In acre feet)	Maximum annual runoff recorded (In acre feet)	Minimum annual runoff recorded (In acre feet)
Canadian River near Amarillo, Texas	19,830	15-20	640,000	1,702,000	83,680
Red River near Colbert, Oklahoma	38,330	20-35	4,022,000	9,738,000	1,068,000
Sabine River near Ruliff, Texas	9,440	35-55	5,977,000	12,460,000	1,240,000
Neches River at Evadale, Texas	7,908	40-50	4,566,000	9,206,000	720,000
Trinity River at Romayor, Texas	17,190	30-50	5,471,000	12,260,000	660,000
San Jacinto River near Huffman, Texas	2,791	40-50	1,372,000	4,518,000	416,800
Brazos River at Richmond, Texas	34,810	20-45	5,827,000	16,120,000	1,240,000
Colorado River of Texas at Columbus, Texas	29,040	15-40	2,614,000	6,660,000	472,000
Guadalupe River at Victoria, Texas	5,676	25-35	1,141,000	3,092,000	437,000
Nueces River near Three Rivers, Texas	15,600	20-30	605,300	2,547,000	54,200
Rio Grande at Roma, Texas	171,000	8-25	4,450,000	8,254,000	2,720,000
Colorado River at Grand Canyon, Arizona	N.A.	5-30	12,830,000	N.A.	N.A.

N.A.–Not available.

The third important drainage basin in the southwest region is the Colorado River area, which covers all of Arizona, northwestern New Mexico, and parts of the states to the north and west. This drainage area includes the Colorado River and its five major tributaries: the Green, Upper Colorado, San Juan, Little Colorado, and Gila Rivers. The flow of this stream is carefully regulated by a series of storage reservoirs, and there is relatively little variation in its flow.

Stream flow records for the Southwest indicate that many streams either go dry in some seasons or that their flow drops to quantities insufficient to meet the water requirements of the region. At other times the flow increases to such an extent that in some areas the streams spill over their banks and cause

severe flood damage. To correct this situation and to make possible the fuller utilization of water resources, many areas have found it advisable to construct storage facilities, which aid in the regulation of stream flow. These facilities enable the communities to store a portion of the flood flow for use during seasons when the natural flow is inadequate to meet their needs. In addition to providing municipal supplies and aiding in the control of floods, some reservoirs have facilities to supply water for irrigation and hydroelectric power.

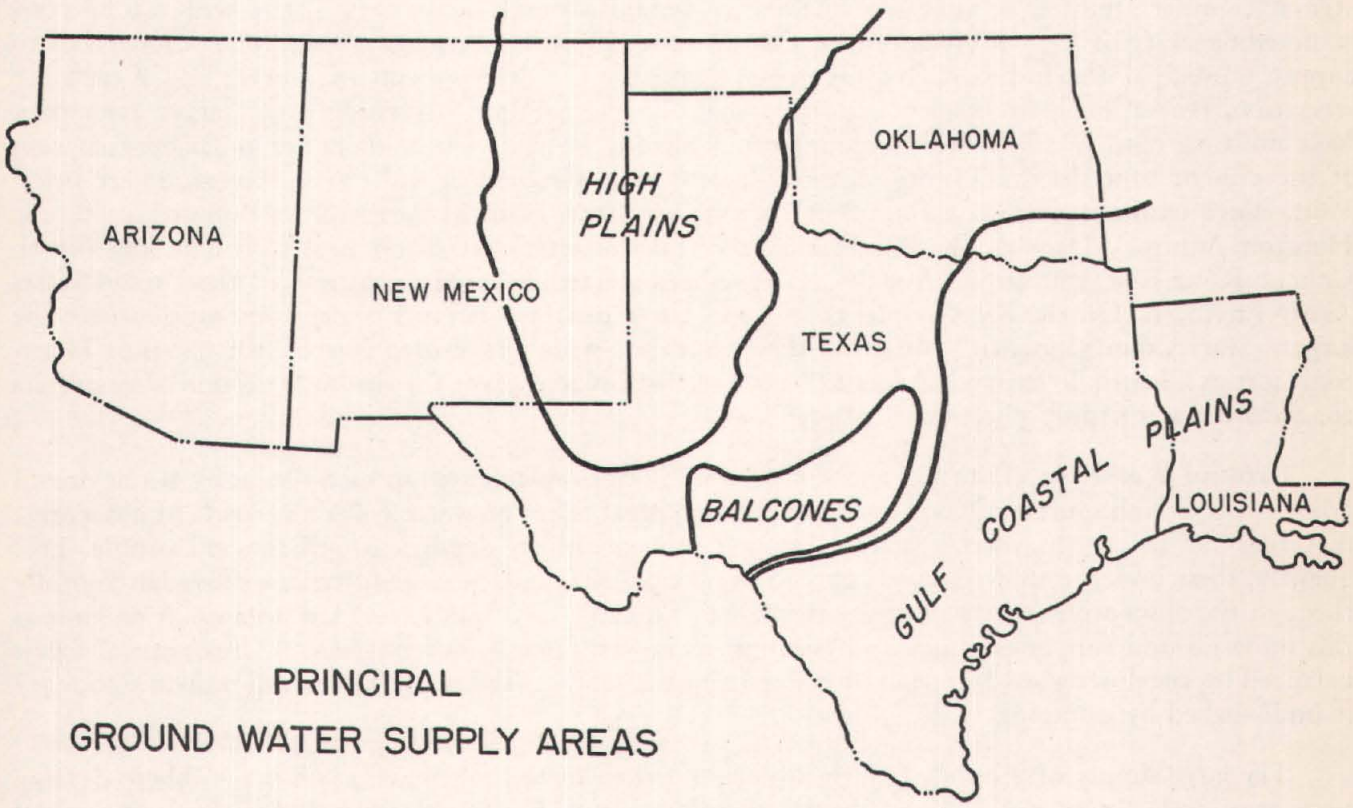
The impounding of flood flows in storage reservoirs is comparatively new in the Southwest. In Texas, Bachman Lake, constructed near Dallas in 1902-03, probably was the first reservoir of considerable size used to impound flood water for municipal purposes. Since that time, other areas have constructed similar facilities, so that now there are 34 major storage facilities in Texas, with a total constructed capacity of 12,256,840 acre feet. Of this total, 25 are single purpose reservoirs: 15 are used to supply municipal and industrial requirements; 4 are for the development of power; and 2 each for irrigation, recreational, or flood-control purposes. The remaining 9, including the larger reservoirs, have multiple uses. In addition to these reservoirs already in use, several others are under construction at the present time. In the Trinity watershed, Benbrook, Grapevine, and Lavon Reservoirs are being built. Work has been started on Dam B on the Neches River. Addicks Reservoir on Buffalo Bayou near Houston, Whitney Dam on the Brazos at Waco, Hoards Creek Reservoir near Coleman, and North Concho River Reservoir at San Angelo also have been started under the direction of the United States Army Engineers. On the Rio Grande, the first of three proposed dams is under construction near the Zapata-Starr County line. In addition to these reservoirs which have been started, the Cities of Houston, Corpus Christi, Tyler, and Colorado City have formulated plans for the construction of reservoirs for future water supply purposes.

Ground Water. Precipitation and surface water are supplemented in many areas by water drawn from underground sources. Over a very long period, great stores of water collect in strata of absorptive materials far below the earth's surface, as precipitation filters down through the soil profile. Frequently, these underground reservoirs extend over wide areas and, in some instances, move horizontally through the absorptive strata, generally flowing in the same direction as surface streams. A portion of this underground supply is discharged through springs and seeps, but, in general, this natural loss is balanced by the downward filtration of water from the surface, and water tables will remain stationary if undisturbed by pumping.

The large supply of ground water in the arid portions of the Southwest made it possible to develop these areas and continues to support their economic activity. Even in the portions of the region where rainfall is adequate and runoff is large enough to meet most demands, many municipalities and industries tap underground supplies because the flow and quality of water from that source does not vary as much as water in surface streams. Moreover, supplies from this source are affected little by droughts, seldom vary in temperature, and can be developed quickly and at relatively little expense. Some areas, however, are unable to depend upon ground water as a source of supply either because it is not available in adequate quantity or because it has a higher mineral content than is found in surface streams and, as a result, is sometimes unsuitable for irrigation and many industrial uses.

The Balcones fault zone, which extends in a belt of varying width from a point northeast of Austin southwestward to the vicinity of Del Rio, is one of the most productive sources of ground water in Texas. Underlying this belt are extensive underground reservoirs which yield very large quantities of water. The reservoirs in the fault zone are fed by the perennial streams which carry both rain and spring water down from the Edwards Plateau. These spring-fed streams are estimated to add, on the average, 150,000 acre feet per year to the fault zone reservoirs. The ground water of the fault zone moves in a southeasterly direction, and the principal outlets from the reservoirs are the series of large springs along the southern and eastern edge of the zone. These include Barton Springs at Austin, San Marcos Springs at San Marcos, Comal Springs at New Braunfels, the San Antonio and San Pedro Springs at San Antonio, Las Moras Springs at Brackettville, and San Felipe Springs at Del Rio. These springs are among the largest and best known in the southwestern part of the United States and are the sources of good-sized rivers and creeks which furnish water to many towns and cities in south Texas.

The underground reservoirs of the Coastal Plains Area are another important source of ground water in the Southwest. Although there are a series of underground reservoirs within this major area, they do not appear to be connected; and there are sections in this area, such as the Lower Rio Grande Valley, where underground supplies of usable quality do not exist. This area extends from the Rio Grande eastward across the southern portion of the United States to the Atlantic Ocean and includes all of south and east Texas, as well as Louisiana. Water from this source is used for irrigation in the Winter Garden Area below the fault zone and for a considerable part of the rice acreage near Houston. In addition, several coastal and eastern Texas communities secure water from this source to fill most of their public and industrial requirements.



In the Winter Garden Area, irrigation water is secured from an outcrop of Carrizo sand, which extends across a portion of Dimmitt, Zavala, Maverick, and Uvalde Counties and varies between 1½ and 5 miles in width. The water-bearing sands in this area average about 200 feet in thickness, and water is reached at a depth of 1,000 feet within a considerable portion of the area. Seepage from the Nueces River contributes a small amount of water to the underground reservoir, but most of the supply results from the downward filtration of water falling on the outcrop itself. The rate of removal of water from this reservoir has exceeded the rate of replacement, and, as a result, the water level has declined. Records of the Texas Board of Water Engineers indicate that between 1930 and 1946 the average decline in water levels in the principal irrigated areas in Dimmitt and Zavala Counties ranged from 4.5 feet in the Catarina area to 28.9 feet at Crystal City.

In the Houston district, steadily increasing amounts of water have been drawn from underground sources to meet the demand of the growing population and expanded industrial and agricultural requirements. Withdrawals from wells serving the City of Houston increased over 60 percent between 1930 and 1945; withdrawals from wells in the industrial area along the ship channel rose 380 percent; and withdrawals for irrigation of rice from wells in the Katy Area, near Houston, increased approximately 175 percent. In spite of this tremendous increase in withdrawals, however, no material decline has occurred in the outcrop area north and northwest of Houston, which is the source of the ground water supply in the area. It is concluded, therefore, that contributions to storage in the outcrop area have equaled or exceeded the rate of removal in the heavily pumped section.

A similar large increase has occurred in the withdrawals of ground water from the reservoirs south and east of those serving Houston, located in the Galveston-Texas City-Baytown district. Withdrawals in this area in recent years, however, have resulted in a steady decline in the artesian pressure and a considerable increase in the mineral content of ground water.

In east Texas, heaviest withdrawal of ground water occurs in the Lufkin-Nacogdoches area. Water is secured from underground sources to meet the needs of Lufkin, Nacogdoches, and several smaller communities, as well as to fill the large requirements of the paper industry located in the area. The number of new wells drilled in this area in 1939 expanded the withdrawal of ground water, and the water level was lowered sharply. Between 1939 and 1941, the water level in a test well near the paper mill fell approximately 120 feet, while the water level of one of the wells serving the City of Lufkin declined 90 feet. Declines were also noted in wells of the surrounding territory, with the amount of the decline varying approximately with the distance of the well from those in the vicinity of Lufkin. Between 1941 and 1944, the rate of pumping remained fairly constant in the area and the rate of decline was small. Since that time, however, the rate of pumping was again stepped up, and a second sharp drop occurred in the water level.

In the High Plains, a large supply of usable ground water is found in the layer of sands and gravels which covers most of the area just below the surface and extends down to a depth of between 200 and 300 feet, known as the Ogallala formation. The Ogallala formation is underlain by a layer of older rock which also contains deposits of water, but the water in this older formation is so highly mineralized that it is unfit for most uses. The upper or Ogallala formation has been eroded down to the bedrock on the eastern and western boundaries and through the center along the Canadian River. The water-bearing formation from which the area draws its water, therefore, is cut off from all underground streams which might bring water from the Rocky Mountain Area, except possibly through the older rock layer which underlies the area. The Texas Board of Water Engineers has stated that if water moved upward through this layer of older rock into the upper layer of sands and gravels, it would become highly mineralized. It has been concluded, therefore, that since the water in the Ogallala formation is not highly mineralized, it has not moved up from streams below the older rock and that the fresh water in this formation is supplied from the rain and snow that fall on the surface of the area. Of the total precipitation, the greater part is lost through evaporation, transpiration, or runoff, but a very small part filters downward to the underground pools.

Wells have been concentrated in the portion of the High Plains where the water table is 80 feet or less below the surface. Wells generally are drilled to a lower depth, however, and most of the water is drawn from the water-bearing sands or gravel at a depth of about 100 to 300 feet below the surface. Water removed by pumping is replaced partially by the annual downward filtration from the surface or by the lateral flow of water from adjacent unpumped areas.

Well irrigation was started in the High Plains Area, near Plainview, in 1911; but the amount of water removed was small, and records of the Texas Board of Water Engineers indicate that little change occurred in the water level prior to 1934. Since that time, however, pumping areas have been extended and the separating belts between irrigation districts have been narrowed or, in some cases, have disappeared. Therefore, contribution through lateral movement of underground water from unpumped areas has been reduced. The rate of water removal from underground sources over a period of years has exceeded the rate of recharge, and water levels in the area have fallen. Even though the water levels rose temporarily after the unusually heavy precipitation in 1941, records indicate that over a period of years a substantial fall in water levels occurred and, also, that the amount of the decline has varied considerably between areas, depending upon the rate of pumping. The accompanying table indicates the extent of the decline in water levels in the most important irrigation districts in the High Plains.

DECLINES IN PUMPING LEVELS IN WELLS

County	1938 Average pumping level in feet	1946 Average pumping level in feet	1938 to 1946 Average decline in pumping level in feet
Bailey	37	53	16
Castro	106	120	14
Deaf Smith	92	108	16
Floyd	97	121	24
Hale	87	97	10
Swisher	102	107	5
City of Lubbock (Municipal wells)	93	118	25

SOURCE: *Ground Water in High Plains in Texas*, Progress Report No. 6, Texas Board of Water Engineers, November 1946, with appendum January 1947.

Although ground water surveys have not been made in all areas of the Southwest, it is known that important though small deposits of ground water exist in other parts of the region. In Texas, there are small supplies in the northern and eastern parts of the State, in addition to the important underground supplies in the Balcones fault, Coastal Plains, and High Plains regions. For the State as a whole, it is known that underground supplies are very large and, if intelligently used, should continue to fill the needs of many areas in the State indefinitely. Ground water supplies in the northern and western parts of Louisiana are generally similar in character and extent to those found in eastern Texas. In the eastern portion of Louisiana, very abundant quantities of water suitable for household use are found at depths of 100 to 1,500 feet. In the alluvial valleys of that State the water table is near the surface, but, because of pollution, such supplies are frequently unfit for most uses. Because of the scarcity of rainfall and surface water, ground water supplies are of great economic importance in New Mexico and Arizona. The potentialities of this supply have not been explored completely, and the extent of known ground water is very limited. A few deep wells in these States have yielded water of good quality, but many attempts at well drilling either have resulted in securing water of very low quality or have proved to be dry holes. In Oklahoma, meager to moderately abundant supplies of water are obtained from underground sources, although much of this water is highly mineralized, particularly in the more arid western portion.

Quality of Water

The quality of water, which determines its usability, is equally as important to a community as the amount of water available. A variety of factors affect the quality of water: chemicals in the soil or rock with which water comes in contact may be dissolved, affecting the chemical character of the supply; erosion carries soil particles into streams and rivers and increases the amount of solid material suspended in the water; and pollution of both ground and surface supplies with waste from towns and industrial plants increases the concentration of organic or other foreign materials in the supply. Moreover, the quality of surface water is affected by the stream flow: the concentration of impurities is generally low when the rate of flow is high but increases as the rate of flow declines.

In general, supplies of water in the humid portion of the Southwest are of usable quality or can be made usable at relatively low cost. The quality in the drier western areas is lower, however, and frequently even the meager supplies are reduced further because the quality of the water makes it unfit for any use. However, considerable variation occurs in the quality of water, even in the humid area: water may be unfit for use during some seasons or from portions of any stream. Therefore, it is necessary for water users to have detailed information on the quality of water throughout the year. The United States Geological Survey, the Texas Board of Water Engineers, and other cooperating agencies have made considerable progress in supplying this information, although, as indicated in a recent Progress Report of the Texas Board of Water Engineers, many deficiencies still exist in these data and further analysis will be required if expanding demands for good quality water are to be met.

Conclusion

The extent and quality of water resources in the Southwest appear likely to have an even more important effect upon the prosperity and growth of the region in the future. The growth of population and the increase in industrialization which have occurred in recent years have increased the demand for water to the point where communities throughout the region suffer from occasional shortages. As the region continues to grow, water requirements will increase and the problems connected with management and conservation of water supplies may become more complex. Because of their importance to the Southwest, these problems will be considered in more detail in a second article which will be published in the August 1 issue of the *Monthly Business Review* of the Federal Reserve Bank of Dallas.

Review of Business, Industrial, Agricultural, and Financial Conditions

DISTRICT SUMMARY

The outlook for crop production and livestock ranges was improved by the widespread rains late in May, although moisture supplies are still inadequate in much of the western portion of the District. Moreover, the high temperatures and hot winds prevailing since early June are depleting surface moisture throughout most of the District. Feed crops have made generally favorable progress. The cotton crop, although later than usual, is developing normally and fields generally are clean and well cultivated. Wheat harvest is progressing rapidly, with yields exceeding earlier expectations. Livestock are gaining weight where ranges are providing ample grazing, but their condition is below average for this season of the year.

The dollar value of department store sales in May was maintained at about the April level, although an increase usually occurs in that month. The year-to-year gain dropped to 6 percent in May as compared with 15 percent in April and 11 percent during the first five months of the year. Sales at furniture stores increased slightly from April to May and were 9 percent larger than in May last year.

Daily average production of crude oil increased further in May, reaching a new all-time peak at a level about 10 percent higher than in the same month last year. The value of construction contracts awarded in the District rose sharply in May, reaching a new postwar peak and exceeding by a wide margin the total for May last year. The gain was very pronounced in awards for residential building, which had shown a downward trend during the preceding four months.

The deposits and investments of reporting member banks in leading cities of the Eleventh District showed a further sharp increase during the five weeks ended June 16. On the other hand, loans declined substantially during the period, more than offsetting the increase during the preceding four weeks.

BUSINESS

The dollar value of department store sales was maintained in May at approximately the same level as in March and April, although May sales normally show a moderate increase over those in April. Moreover, the gain in sales over those in the corresponding month of last year dropped to 6 percent in May from 15 percent in April. In view of the fact that sales failed to show the usual expansion in May, the adjusted index of sales, which makes allowance for seasonal changes, declined from 448 percent of the 1935-39 average in April to 418 percent in May. The latter figure, however, is higher than that for any other month of the current year and compares with an average of 381 percent for the first quarter of 1948 and 388 percent for the fourth quarter of 1947. In January and February of this year sales were affected adversely by the severe weather and poor shopping conditions. The early date of Easter and better weather conditions in March stimulated buying, and sales rose substantially but were below expectations of stores generally. In April, the widespread after-Easter clearance sales, the continuance of favorable weather, and the general optimism prevailing among consumers combined to sustain the dollar value of sales. In fact, the failure of sales to show the usual increase in May, despite the reduction of income taxes and the high level of consumer incomes, may be attributed in part to the heavy buying in April. For the five months—January through May—of this year cumulative sales were 11 percent higher than in the corresponding period of 1947. This year-to-year percentage gain exceeded that of any other Federal Reserve district and was substantially above the national average.

The dollar value of merchandise inventories at department stores in the District declined 3 percent in May, after having increased steadily during the preceding four months. The increases in March and April, however, were smaller than usual at that season. As a result, the adjusted index of department store stocks, which takes into account normal seasonal changes, declined from the all-time peak reached in February—424 percent of the 1935-39 average—to 417 percent in May or only slightly under the February peak. The value of inventories during the first five months of both 1947 and 1948 followed a similar course, but the end-of-month totals this year have averaged about 25 percent higher than the respective amounts for the corresponding months of last year.

WHOLESALE AND RETAIL TRADE STATISTICS

	Number of reporting firms	Percentage change in Net sales: May 1948 from May 1947	Net sales: May 1948 from April 1948	Net sales: Jan. 1 to May 31, 1948 from 1947	Stocks‡: May 1948 from May 1947	Stocks‡: May 1948 from April 1948
Retail trade:						
Department stores:						
Total 11th Dist.....	48	6	— 1	11	28	— 3
Corpus Christi.....	4	— 4	2	— 2	— 1	— 4
Dallas.....	7	— †	— 1	5	16	— 3
Fort Worth.....	4	3	— 1	9	31	— 3
Houston.....	7	18	— †	23	54	— 1
San Antonio.....	5	7	— 4	10	24	— 6
Shreveport, La.....	3	21	7	20	..	..
Other cities.....	18	4	— 2	7	..	— 3
Furniture stores:						
Total 11th Dist.....	38	9	3	..	†	— 3
Dallas.....	3	21	20	..	—11	— 8
Houston.....	4	25	19	..	..	..
Port Arthur.....	3	7	24	..	..	..
San Antonio.....	4	5	—14	..	..	..
Wholesale trade:*						
Machinery, equip't, and supplies.....	3	14	—22	..	..	..
Industrial supplies..	3	13	8	..	22	— 2
Automotive supplies	3	— 7	— 9	..	..	..
Jewelry.....	3	30	27	..	13	— 3
Drugs.....	4	2	— 6	†	—16	— 7
Surgical, medical equip't, supplies..	3	— 2	— 8	..	..	..
Groceries.....	28	15	— 4	7	38	— †
Dry goods.....	5	— 5	—23	..	13	2
Hardware.....	8	5	†	5	15	— 2
Tobacco & products.	8	— 2	No change	— †	20	— 1

*Compiled by United States Bureau of Census. (Wholesale trade figures preliminary.)
‡Stocks at end of month. †Indicates change less than one-half of one percent.

INDEXES OF DEPARTMENT STORE SALES AND STOCKS

Daily average sales—(1935-39=100)

	Unadjusted* May 1948	Unadjusted* April 1948	Unadjusted* March 1948	Unadjusted* May 1947	Adjusted May 1948	Adjusted April 1948	Adjusted March 1948	Adjusted May 1947
11th District.	393	399	384	356	418	448	384	378r
Dallas.....	354	363	363	343	377	374	374	365
Houston.....	453	453	447	370	472	472	502	385r

Stocks—(1935-39=100)

	Unadjusted* May 1948	Unadjusted* April 1948	Unadjusted* March 1948	Unadjusted* May 1947	Adjusted May 1948	Adjusted April 1948	Adjusted March 1948	Adjusted May 1947
11th District.	396	409	399	316	417	422r	420	333

*Unadjusted for seasonal variation. r–Revised.

Outstanding orders also have followed a similar course in the two years, but the decline this year has been slightly less pronounced than it was in 1947. At the end of May the total was only 1 percent above the low level reached in the spring of 1947 and was considerably lower in relation both to sales and inventories. The present level of outstanding orders reflects chiefly the cautious policies of department store executives who are following consumer reactions closely. While consumer buying has been maintained at a high level, there appears to be an increasing selectivity in purchasing and resistance to rising prices. The maintenance of sales in many soft goods lines is becoming more dependent upon special promotions and the offering of a greater volume of lower priced lines. In consequence, large-scale orders are being deferred pending a more accurate appraisal of trends in business and industrial activity, prices and consumer attitudes.

Collections during May on accounts outstanding at the beginning of the month showed little change, being 54 percent on regular charge accounts and 19 percent on instalment accounts.

At reporting furniture stores in the District the dollar value of sales in May continued the upward trend in evidence during the preceding two months, being 3 percent higher than in April and 9 percent above those in May 1947. Cash sales during May turned downward and were about 18 percent lower than in the corresponding month last year. On the other hand, credit sales continued to expand and exceeded those a year ago by about 15 percent. As a consequence, credit sales constituted about 87 percent of the total sales in May this year as compared with only 83 percent in May of last year.

Accounts receivable at the end of May were about 3 percent greater than in the preceding month and exceeded those a year earlier by about 54 percent. Collections in May were up 4 percent from those in April and were 15 percent greater than in May last year.

The dollar value of inventories, which had shown a steady increase during the first four months of the year, declined 3 percent in May and was approximately the same as at the end of May last year.

AGRICULTURE

Crop and range feed prospects were improved in most parts of the District by rains late in May, but high temperatures and winds during June have reduced moisture supplies and most areas are now in need of rain. Moisture conditions still are fairly favorable in most of the eastern part of the District and sufficient for current needs in northcentral and northwestern areas. Drought conditions prevail in western and some southern counties, however, with crops and ranges showing deterioration. Field work made good progress after the May rains, and planting of all crops is nearing completion. The flax harvest was completed in May, and the harvest of small grains is drawing to a close in all areas except the High Plains.

The May rains checked the general deterioration of wheat in the High Plains and improved the late crop materially. The June 1 estimate of the 1948 Texas wheat crop was placed at 55,278,000 bushels, an increase of 6,142,000 bushels or approximately 13 percent over the previous estimate. Indicated production is 56 percent below the record harvest of last year but is 21 percent above the 10-year (1937-46) average and is the fifth largest crop of record. Harvest is nearing completion in central Texas and is proceeding rapidly in the High Plains. The indicated per acre yield of 9 bushels on June 1 compares with 17 bushels in 1947 and a 10-year average of 11.6 bushels. The acreage being harvested, estimated at 6,142,000 acres, is about 16 percent below the record of 7,310,000 acres harvested last year but about 55 percent above the 10-year average of 3,952,000 acres.

The Texas oat crop, estimated at 17,356,300 bushels on June 1, is sharply lower than the 1947 harvest of 31,248,000 bushels and the 10-year average production of 34,370,000. The small production reflects the heavy acreage abandonment and the lowest per acre yield of record, resulting from the mid-March freeze and the spring drought conditions. The Texas barley crop, which was damaged less seriously by the freeze and drought, is indicated at 2,050,000 bushels, approximately 19 percent less than the crop harvested last year and 49 percent below average. Planting of peanuts was completed early in June, and although many areas need additional moisture, the crop is making favorable progress. Seeding of rice and the harvesting of flax have been completed.

Prospects are favorable for early corn in the principal corn-producing areas of Texas. The crop is making good progress in the northern part of the State, except for scattered areas where rain is needed. In southern counties early corn has matured, but the late crop needs additional moisture. Dry weather lowered prospects in some southcentral counties, and badly fired corn has been grazed or cut for fodder or ensilage. Grain sorghums are making good progress throughout most of the District, and harvesting is under way in south Texas. In the High Plains, planting continued under favorable conditions, with over half the acreage seeded.

Cotton generally made good progress in most areas during May and the first half of June, with the crop maturing in some non-irrigated fields in the Lower Rio Grande Valley. Cotton is fruiting rapidly in south Texas, but some counties are in need of rain. Although later than usual, the crop is making good growth in northcentral and eastern counties of Texas and in northern Louisiana. In Oklahoma and the Plains area of Texas, planting is near completion and most of the acreage is up to a good stand. Insect damage has been small in most areas, although boll weevils and flea hoppers have increased in some scattered sections.

Supplies of commercial vegetables were abundant during the latter part of May and early June as harvesting progressed under favorable conditions in most commercial truck crop areas. Movement of tomatoes from the Rio Grande Valley continues active, and harvest of the east Texas crop is well advanced in all areas except in the extreme northeastern counties. Green corn, cantaloupe, potato, and watermelon shipments are being made at all midseason points. Harvest of onions is nearing completion, and the harvest of spring potatoes is active. Growing crops are making good progress in most areas, and moisture supplies are adequate except for some late sections.

CASH RECEIPTS FROM FARM MARKETINGS

(In thousands of dollars)

State	April 1948 Crops	April 1948 Livestock	April 1948 Total	April 1947 Total	Cumulative receipts—Jan. 1 to April 30— 1948	1947
Arizona	$ 16,148	$ 8,598	$ 24,746	$ 17,466	$ 75,689	$ 57,621
Louisiana	19,952	6,864	26,816	13,693	96,109	61,398
New Mexico	1,896	10,149	12,045	10,024	42,310	34,750
Oklahoma	8,772	23,572	32,344	35,289	150,286	150,689
Texas	48,673	104,505	153,178	127,202	564,413	414,445
Total	$ 95,441	$153,688	$249,129	$203,674	$928,807	$718,903

SOURCE: United States Department of Agriculture.

A peach crop of only 961,000 bushels was forecast for Texas on June 1—approximately 43 percent below both the 1947 and the 10-year average crops. Pear prospects also are unfavorable, and the 214,000 bushels forecast for the State on June 1 are 188,000 bushels below last year's crop and 180,000 bushels below average. The outlook for pecans is good, however, as moisture conditions have been favorable and insect damage light. The Texas citrus crop was improved by the drought-breaking rains in the Lower Rio Grande Valley in late May. Shedding of the younger trees was checked, although older trees have not responded readily to the better moisture conditions.

Range feed is plentiful in all eastern areas, although some counties in south Texas need additional moisture for further development. Ranges were revived in the High and Low Rolling Plains and in some scattered areas in the Edwards Plateau and Trans-Pecos, but additional rains are needed to assure summer grazing. In the Plains area, volunteer wheat, abandoned for grain, has furnished some additional grazing. Drought conditions persist in many areas in western Texas, southwestern New Mexico, and southern Arizona. Ranges are short in these areas, and supplemental feeding is continuing. In spite of the improvement in feed supplies in many areas, for the District as a whole

the condition of ranges is well below that of a year ago and below average.

Cattle and calves are in good flesh in eastern and northeastern counties of Texas, where range feed has been plentiful, and are expected to respond in western counties as ranges improve. In the Trans-Pecos region, however, supplemental feeding of herds is being continued. On June 1, the condition of cattle and calves in Texas was reported at 81 percent—7 points below that on the same date last year and 4 points below the 10-year (1937-46) average. The April movement of 201,000 head of cattle to Kansas and Oklahoma pastures was the second highest of record, exceeded only by the 226,000 head moved in April 1946. The condition of Texas sheep and lambs on June 1, reported at 75 percent, is the lowest for that date in the 25 years of record. Ewes and lambs are in fair to good flesh in a few northeastern Plateau counties where new feed was started by late April rains, but in the western Plateau and Trans-Pecos counties ewes are thin and development of lambs has been slow. Death losses of ewes and lambs have been heavier than usual. The rains late in May improved prospects for summer feed in parts of the dry areas, and some improvement in the condition of sheep is expected. Volume marketings of spring lambs are under way, and the unusually heavy movement of goats continues.

The movement of Texas livestock to market increased seasonally during May, but shipments of cattle and sheep were substantially below those of May last year. Receipts of cattle and calves at the Fort Worth and San Antonio markets, combined, were 5 percent above those of the preceding month but were about 6 percent below those of May 1947. Shipments of sheep and lambs to market were substantially larger than in April but fell 12 percent below those of the same month last year. May receipts of hogs at the two markets were 14 percent above those of the preceding month and more than double those of the same month a year earlier.

LIVESTOCK RECEIPTS—(Number)

Class	Fort Worth			San Antonio		
	May 1948	May 1947	April 1948	May 1948	May 1947	April 1948
Cattle	83,269	90,899	85,583	33,724	38,661	32,849
Calves	22,637	27,143	14,318	21,225	16,804	22,649
Hogs	112,227	51,708	97,001	8,709	6,067	9,177
Sheep	290,762	356,764	143,232	72,154	56,784	58,397

COMPARATIVE TOP LIVESTOCK PRICES
(Dollars per hundredweight)

Class	Fort Worth			San Antonio		
	May 1948	May 1947	April 1948	May 1948	May 1947	April 1948
Beef steers	$32.00	$26.00	$30.50	$30.00	$22.25	$30.50
Stocker steers	28.00	21.00	28.50	.....	.....	.....
Heifers and yearlings	32.50	26.00	30.00	30.00	21.50	30.50
Butcher cows	25.25	18.25	24.00	24.00	17.50	23.50
Calves	31.00	24.00	30.00	30.15	23.00	30.00
Hogs	25.00	25.00	22.50	24.50	24.00	21.75
Lambs	29.00	24.00	25.00	26.50	22.00	23.50

Prices received by Texas farmers averaged slightly higher on May 15 than a month earlier and were substantially above those on the same date last year, according to the midmonth price report of the United States Department of Agriculture. During the month ended May 15, prices of meat animals advanced sharply and, with the exception of hogs, reached peak levels. Prices received for cotton, dairy products, and most grains varied little from the previous month. Irish potato prices were substantially lower, and moderate declines were registered for oranges, cowpeas, hay, and eggs. Wool and grapefruit prices advanced sharply, and moderate increases occurred in prices of peanuts, cottonseed, and sweet potatoes.

Reports from spot commodity markets indicated that between mid-May and mid-June further substantial increases occurred in prices received for all classes of livestock, while prices of most other farm products tended downward. Corn prices were slightly higher, but cotton, oats, and barley declined moderately and a substantial decline occurred in the prices of wheat and grain sorghums.

FINANCE

During the five-week period from May 12 to June 16, the trend of loans of member banks in leading cities in the Eleventh District continued its gradual downward movement. Selected member banks in these cities reported a decline in total loans of $13,423,000, resulting principally as a consequence of a contraction of commercial, industrial, and agricultural loans from approximately $705,000,000 to about $688,000,000, offset in part by increases in loans for security trading and in real-estate loans of approximately $2,400,000 and $2,000,000, respectively.

Other principal items of the selected member banks in leading cities of the District showed rather substantial increases. Total holdings of United States Government securities rose by almost $67,000,000 as these banks added substantially to their holdings of United States Treasury bills, certificates of indebtedness, and United States Government bonds. Demand deposits adjusted as reported by these member banks and also interbank deposits increased substantially during the latter part of the five-week period to bring the total of adjusted demand deposits to $1,919,000,000 or approximately $25,000,000 higher than on May 12 and the total of interbank deposits to $557,000,000 or approximately $26,000,000 higher than the amount reported five weeks earlier.

CONDITION STATISTICS OF WEEKLY REPORTING MEMBER BANKS IN LEADING CITIES—Eleventh Federal Reserve District
(In thousands of dollars)

Item	June 16, 1948	June 18, 1947	May 12, 1948
Total loans and investments	$2,238,926	$2,081,225	$2,187,646
Total loans	1,008,551	815,151	1,021,974
Commercial, industrial, and agricultural loans	688,435	536,877	705,054
Loans to brokers and dealers in securities	5,756	7,031	6,255
Other loans for purchasing or carrying securities	62,002	70,641	59,604
Real-estate loans	83,790	72,215	81,831
Loans to banks	404	414	466
All other loans	168,164	127,973	168,764
Total investments	1,230,375	1,266,074	1,165,672
U. S. Treasury bills	36,340	39,215	19,582
U. S. Treasury certificates of indebtedness	195,836	231,902	163,558
U. S. Treasury notes	94,018	115,963	93,418
U. S. Government bonds (incl. gtd. obligations)	791,366	781,975	774,089
Other securities	112,815	97,019	115,025
Reserves with Federal Reserve Bank	493,018	459,001	492,069
Balances with domestic banks	337,520	293,215	316,032
Demand deposits—adjusted*	1,919,033	1,756,532	1,893,801
Time deposits	399,908	379,096	398,367
United States Government deposits	30,738	18,024	42,491
Interbank deposits	557,154	557,266	531,000
Borrowings from Federal Reserve Bank	None	None	None

*Includes all demand deposits other than interbank and United States Government, less cash items reported as on hand or in process of collection.

In contrast with reports of selected banks in leading cities, reports received from all member banks in the District showing developments during the month of May reflected a slight decline of about $4,000,000 in loans and discounts, representing the first decline reported since February of this year. During 1948, two conflicting trends have been apparent among the member banks of the District. Selected member banks in leading cities in the District have reported a decline in loans, broken only occasionally by moderate increases during a few weeks of the period. In contrast with that trend, figures obtained from non-weekly reporting banks in the District have shown a steady increase in the volume of loans outstanding. During May, non-reporting banks continued to show a slight increase in loans, which was more than offset, however, during that month by the decline in loans at banks in leading cities. In other words, during the past five and a half months contraction of loans has been taking place at the banks in the larger cities in the District, while

rather steady expansion has been characteristic of the loan portfolios of the so-called country banks of the District.

The trend of gross demand deposits of all member banks in the District was reversed during May for the first time this year as total demand deposits of all member banks rose from about $4,988,000,000 to $4,998,000,000. The trend of deposits during May, however, was in contrast at the reserve city banks with the trend at the country banks of the District. Reserve city banks reported an increase of approximately $30,000,000 in gross demand deposits, while country banks reported a decline of approximately $20,000,000. Time deposits of the member banks of the District declined by about $5,000,000 during May, with reports of reserve city banks accounting for slightly more than $3,000,000 of the shrinkage.

GROSS DEMAND AND TIME DEPOSITS OF MEMBER BANKS

Eleventh Federal Reserve District

(Averages of daily figures. In thousands of dollars)

Date	Combined total: Gross demand	Combined total: Time	Reserve city banks: Gross demand	Reserve city banks: Time	Country banks: Gross demand	Country banks: Time
May 1946	$4,966,772	$480,926	$2,480,288	$305,520	$2,486,484	$175,406
May 1947	4,600,179	533,254	2,207,446	335,549	2,392,733	197,705
January 1948	5,319,138	557,571	2,527,706	349,429	2,791,432	208,142
February 1948	5,088,150	564,973	2,392,425	355,853	2,695,725	209,120
March 1948	5,019,464	569,800	2,357,864	357,605	2,661,600	212,195
April 1948	4,987,656	574,507	2,354,485	362,306	2,633,171	212,201
May 1948	4,997,789	569,656	2,384,586	358,943	2,613,203	210,713

Reports showing the trend of savings deposits at 102 reporting member banks located throughout the District show that the decline in savings deposits, although slight, has been rather widespread over the District. For example, during May savings deposits declined fractionally in 10 of the leading cities in the District, with only Galveston and Houston reporting slight increases. Also, reports from banks located in smaller cities and towns throughout the District showed a fractional decline. That trend is in line with other evidence which indicates a growing tendency on the part of a larger number of individuals to dissave as the high cost of living and possibly the demand for a miscellany of goods and services have led individuals to draw upon their savings in one form or another.

SAVINGS DEPOSITS

Eleventh Federal Reserve District

City	Number of reporting banks	May 31, 1948: Number of savings depositors	May 31, 1948: Amount of savings deposits	Percentage change in savings deposits from: May 31, 1947	Percentage change in savings deposits from: April 30, 1948
Louisiana: Shreveport	3	32,729	$ 25,372,958	— 3.6	— 0.7
Texas:					
Beaumont	3	12,057	6,316,006	—10.6	— 0.3
Dallas	8	139,551	78,618,897	0.7	— 0.03
El Paso	2	35,628	23,176,832	— 3.2	— 0.6
Fort Worth	4	43,007	34,492,872	— 1.1	— 0.4
Galveston	4	23,137	21,928,333	3.2	0.1
Houston	8	105,888	72,270,201	2.1	0.3
Lubbock	2	1,409	1,772,491	— 3.1	— 2.8
Port Arthur	2	6,228	4,896,436	— 8.7	— 0.6
San Antonio	5	38,790	46,689,447	0.2	— 0.9
Waco	3	10,125	9,547,103	— 0.8	— 0.5
Wichita Falls	3	6,945	4,530,259	— 1.4	— 0.2
All other	55	62,868	54,116,429	0.3	— 0.4
Total	102	518,362	$383,728,264	— 0.1	— 0.3

Reports of bank debits and turnover of deposits from 24 cities in the District show a decline of 3 percent in debits during May, accompanied by a slowing down of the annual rate of turnover from 13.1 during April to 12.6 during May. These data also reflect what is apparently a general trend over the District, inasmuch as a majority of the cities reporting showed a decline in debits and a decline in annual rate of turnover. The annual rate of turnover of deposits in the principal cities of the District varies widely. Most rapid turnover is found in such cities as Dallas, Houston, Fort Worth, and Amarillo, while the slowest turnover is reported from such smaller cities as Corsicana, Texarkana, Wichita Falls, and others.

BANK DEBITS, END-OF-MONTH DEPOSITS, AND ANNUAL RATE OF TURNOVER OF DEPOSITS

(Amounts in thousands of dollars)

City	Debits: May 1948	Debits: Petg.change over May 1947	Debits: Petg.change over April 1948	End-of-month deposits* May 31, 1948	Annual rate of turnover: May 1948	Annual rate of turnover: May 1947	Annual rate of turnover: April 1948
Arizona: Tucson	$ 61,316	16	— 1	$ 84,674	8.6	7.9	8.6
Louisiana:							
Monroe	32,377	21	1	38,367	9.8	8.9	9.5
Shreveport	128,179	19	— 5	157,519	9.8	9.0	10.4
New Mexico: Roswell	13,586	13	1	17,339	9.2	8.4	9.1
Texas:							
Abilene	32,318	22	— 4	40,973	9.5	8.6	10.0
Amarillo	91,860	32	6	82,220	13.2	11.2	12.4
Austin	96,064	7	—14	103,755	11.2	11.0	13.1
Beaumont	93,998	33	— †	93,193	12.0	10.4	11.9
Corpus Christi	77,749	16	2	71,239	12.7	12.2	12.5
Corsicana	9,130	12	—14	18,993	5.8	5.0	6.6
Dallas	916,673	12	— 8	699,989	15.7	15.1	17.2
El Paso	114,345	17	— 7	123,026	11.5	11.2	12.7
Fort Worth	311,582	12	3	274,797	13.7	12.2	13.4
Galveston	66,620	10	— 1	92,275	8.6	8.3	8.8
Houston	1,023,417	30	— 1	846,276	14.4	12.6	14.8
Laredo	17,875	7	— 7	23,228	9.2	9.6	10.2
Lubbock	59,461	22	—12	68,226	10.3	10.6	11.5
Port Arthur	35,027	9	2	38,922	10.7	10.0	10.4
San Angelo	31,149	33	2	39,240	9.7	8.3	9.8
San Antonio	249,359	7	†	313,558	9.6	8.9	9.5
Texarkana‡	14,069	6	— 8	21,658	7.7	7.3	8.2
Tyler	38,795	9	— 9	52,108	9.0	9.5	10.2
Waco	48,064	15	4	62,655	9.2	8.3	9.0
Wichita Falls	54,651	24	2	77,171	8.5	8.2	8.4
Total—24 cities	$3,617,564	18	— 3	$3,441,402	12.6	11.6	13.1

*Demand and time deposits at the end of the month include certified and officers' checks outstanding but exclude deposits to the credit of banks.

†Indicates change of less than one-half of one percent.

‡This figure includes only one bank in Texarkana, Texas. Total debits for all banks in Texarkana, Texas-Arkansas, including two banks located in the Eighth District, amounted to $23,360.

NEW PAR BANK

The Almeda State Bank, Houston, Texas, a newly organized nonmember bank located in the terrritory served by the Houston Branch of the Federal Reserve Bank of Dallas, was added to the Federal Reserve Par List on its opening date, June 15, 1948. This bank has total capital funds of $250,000, including capital of $200,000, surplus of $25,000, and undivided profits of $25,000. Its officers are: J. W. Keeland, President; W. P. Taylor, Vice President and Cashier; and David T. Searls, Vice President.

Principal changes during the month ended June 15 in the condition of the Federal Reserve Bank of Dallas included an increase in total earning assets of approximately $18,000,000, accounted for by increased holdings of United States Government securities totaling slightly more than $15,000,000 and increases in foreign loans on gold of approximately $3,000,000. Federal Reserve notes of this bank in actual circulation rose from approximately $587,700,000 on May 15 to about $594,700,000

CONDITION OF THE FEDERAL RESERVE BANK OF DALLAS

(In thousands of dollars)

Item	June 15, 1948	June 15, 1947	May 15, 1948
Total gold certificate reserves	$563,406	$484,062	$554,203
Discounts for member banks	720	100	795
Foreign loans on gold	8,058	809	5,338
U. S. Government securities	939,650	891,730	924,029
Total earning assets	948,428	892,639	930,162
Member bank reserve deposits	844,937	756,978	822,066
Federal Reserve notes in actual circulation	594,669	576,615	587,678

on June 15. The increase in Federal Reserve notes in actual circulation during that period was the first increase for such a 30-day period during 1948. Although Federal Reserve notes of this bank in actual circulation declined gradually during the first four and a half months of this year, the amount outstanding on

June 15 was approximately $18,000,000 more than on the comparable date of last year.

MEMBER BANK RESERVES AND RELATED FACTORS

Eleventh Federal Reserve District

(In millions of dollars)

Item	Changes in weeks ended June 16, 1948	June 9, 1948	June 2, 1948	May 26, 1948	May 19, 1948	Cumulative changes 5 weeks ended June 16, 1948	Jan. 1 to June 16, 1948
Federal Reserve credit—local	5.9	— 3.2	5.8	— 5.6	0.7	3.6	— 0.1
Interdistrict commercial & financial transactions	10.0	—17.3	5.4	— 0.8	—29.6	—32.3	—58.7
Treasury operations	1.7	30.9	5.8	0.1	8.9	47.4	— 4.8
Currency transactions	3.5	— 2.3	— 9.1	— 2.6	3.6	— 6.9	33.7
Other deposits at the Federal Reserve Bank	0.3	0.2	— 0.3	..	0.8	1.0	0.7
Other Federal Reserve accounts	— 0.1	..	— 0.1	— 0.1	— 0.7	— 1.0	3.7
Member bank reserve balances	21.3	8.3	7.5	— 9.0	—16.3	11.8	—25.5

Note: Amounts preceded by a minus sign reduce reserves; all others add to reserves.

INDUSTRY

The daily average production of crude petroleum increased slightly in May, reaching new all-time peaks of 2,659,000 barrels in the Eleventh District and 5,430,000 barrels in the United States. Current production levels represent increases over those a year ago of 10 percent and 8 percent, respectively. The steadily rising production reflects the strong demand for petroleum and petroleum products throughout the country. Despite the high level of production and increasing imports, stocks of crude petroleum in the United States at the end of May amounted to only 221,652,000 barrels, a decrease of about 18,000,000 barrels from a year ago. Crude oil runs to refinery stills in the United States, which averaged about 5,600,000 barrels daily in May, were up nearly 15 percent from May last year; in this District refinery operations were about 28 percent higher. In order to meet current and anticipated demand for gasoline, the percentage yield from crude oil has been increased, and in the final week of May output of gasoline was about 20 percent greater than in the corresponding week last year. Due to the maintenance of a high level of production, the decline of 4,000,000 barrels in gasoline stocks during May was only about one-half that which occurred in May last year, and at the end of the month total stocks, which aggregated 107,185,000 barrels, were about 11,300,000 barrels larger than a year ago. During recent months, the strong demand for crude petroleum has led to the payment of larger premiums over posted prices for an increasing volume of crude petroleum. According to trade sources, an extension of this practice during the summer months might result in a general increase in posted prices.

CRUDE OIL PRODUCTION—(Barrels)

Area	May 1948 Total production	May 1948 Daily avg. production	Increase or decrease in daily average production from April 1948	Increase or decrease in daily average production from May 1947
Texas:				
District 1	833,900	26,900	1,120	5,824
2	5,333,250	172,040	—195	12,967
3	15,286,300	493,106	—79	8,271
4	7,924,400	255,626	2,236	12,328
5	1,437,450	46,369	379	8,038
6	9,419,400	303,852	—13,018	—33,940
Other 6	3,780,100	121,939	549	9,512
7b	1,399,450	45,143	678	7,025
7c	1,396,200	45,039	639	8,273
8	21,328,700	688,023	9,443	160,926
9	4,293,100	138,487	997	798
10	2,621,550	84,566	361	—1,587
Total Texas	75,053,800	2,421,090	3,140	198,435
New Mexico	3,910,900	126,158	—1,517	20,526
North Louisiana	3,458,400	111,561	2,208	13,858
Total Eleventh District	82,423,100	2,658,810	3,832	232,820
Outside Eleventh District	85,894,800	2,770,800	30,414	187,595
United States	168,317,900	5,429,610	34,245	420,415

SOURCE: Estimated from American Petroleum Institute weekly reports.

The value of construction contracts awarded in this District increased sharply during May and reached the highest level since 1942, when awards for war construction were at a peak. Total awards for the month aggregated $92,617,000 as compared with $54,124,000 in April and $54,423,000 in May. 1947. During the first five months of 1948, the value of awards amounted to $339,798,000, representing an increase of nearly 20 percent over that during the corresponding period of 1947.

VALUE OF CONSTRUCTION CONTRACTS AWARDED

(In thousands of dollars)

	May 1948	May 1947	April 1948	January 1 to May 31 1948	January 1 to May 31 1947
Eleventh District—total	$ 92,617	$ 54,423	$ 54,124	$ 339,798	$ 285,618
Residential	29,099	19,186	19,697	121,570	108,260
All other	63,518	35,237	34,427	218,228	177,358
United States*—total	970,789	674,657	873,882	3,831,607	2,887,575
Residential	369,780	254,085	351,604	1,469,273	1,259,444
All other	601,009	420,572	522,278	2,362,334	1,628,131

*37 states east of the Rocky Mountains.

SOURCE: F. W. Dodge Corporation.

The increase in awards during May was general among all the major categories of construction, but the gain was especially noteworthy in the case of awards for residential building, which had been declining in the preceding months of the year. The awards for residential building during May rose to $29,099,000, representing an increase of about 50 percent over April this year and May last year, and brought total awards for the first five months of the year to $121,570,000 or about 12 percent higher than in the corresponding period of 1947. Moreover, the May total is the largest reported in two years and is the fourth highest of record. Awards for nonresidential building in May also increased sharply and were at the highest level since 1942. Public works awards were nearly double the small April total but were smaller than those in some other recent months.

BUILDING PERMITS

City	May 1948 No.	May 1948 Valuation	Percentage change valuation from May 1947	Percentage change valuation from April 1948	Jan. 1 to May 31, 1948 No.	Jan. 1 to May 31, 1948 Valuation	Percentage change valuation from 1947
Louisiana:							
Shreveport	388	$ 1,839,609	104	62	1,637	$ 19,409,305	333
Texas:							
Abilene	103	378,270	52	—52	479	2,450,715	15
Amarillo	209	1,280,715	98	104	916	4,656,685	66
Austin	305	1,883,850	12	—41	1,679	11,123,199	44
Beaumont	361	733,019	64	—37	1,716	3,766,115	104
Corpus Christi	300	921,555	23	—34	1,491	8,583,088	44
Dallas	1,491	9,059,360	141	—10	6,736	45,826,826	130
El Paso	116	1,076,035	69	— 2	587	4,716,668	58
Fort Worth	658	2,448,766	8	—34	2,651	11,416,098	19
Galveston	153	220,149	— 4	—48	796	1,325,852	35
Houston	698	7,966,350	52	3	3,979	47,564,217	98
Lubbock	214	960,715	—17	—12	1,188	5,179,591	7
Port Arthur	120	207,401	29	—15	605	923,958	— 1
San Antonio	1,370	3,357,615	23	13	6,546	16,127,766	64
Waco	138	743,316	32	—15	746	5,802,493	109
Wichita Falls	62	161,660	41	—72	347	1,967,311	179
Total	6,686	$33,238,385	54	—10	32,099	$190,839,887	88

DOMESTIC CONSUMPTION AND STOCKS OF COTTON—(Bales)

	May 1948	May 1947	April 1948	August 1 to May 31 This season	August 1 to May 31 Last season
Consumptaion at:					
Texas mills	12,435	12,346	13,338	129,802	175,707
United States mills	785,440	807,135	829,730	7,917,696	8,617,619
U. S. stocks—end of month:					
In consuming estabm'ts	2,006,617	1,926,659	2,195,881	.....	.....
Public stg. & compresses	2,232,274	1,842,566	2,860,277	.....	.....

COTTONSEED AND COTTONSEED PRODUCTS

May 1948

	Texas August 1 to May 31 This season	Texas August 1 to May 31 Last season	United States August 1 to May 31 This season	United States August 1 to May 31 Last season
Cottonseed received at mills (tons)	1,122,403	565,842	3,957,796	2,991,540
Cottonseed crushed (tons)	1,116,864	602,553	3,869,340	2,946,198
Cottonseed on hand May 31 (tons)	59,967	20,543	187,984	163,048
Production of products:				
Crude oil (thousand pounds)	346,920	182,475	1,204,362	925,530
Cake and meal (tons)	525,268	283,046	1,793,606	1,298,195
Hulls (tons)	253,693	134,053	871,979	692,741
Linters (running bales)	370,499	205,663	1,213,034	945,732
Stocks on hand May 31:				
Crude oil (thousand pounds)	3,032	704	11,206	10,639
Cake and meal (tons)	29,367	22,214	100,037	117,052
Hulls (tons)	13,373	8,895	44,254	44,105
Linters (running bales)	51,397	14,899	132,728	99,190

SOURCE: United States Bureau of Census.