STATE Texas

PROJECT NO. F-9-R-1, Job A-2

PERIOD July 1, 1953-May 31, 1954

JOB COMPLETION REPORT

BY

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TITLE

Basic survey of those portions of the Medina River, excluding Medina Lake, which lie within Medina, Bandera and Bexar Counties, Texas.

OBJECTIVES

To gather fundamental data on the above waters in regard to their physical, chemical and biological aspects.

METHODS

Observations were made and data recorded at fish collection and water analysis stations visited in conjunction with Job B-3. Other fundamental data were obtained from libraries and agencies associated with the Medina River.

COOPERATING AGENCIES

Texas Board of Water Engineers
United States Geological Survey
United States Soil Conservation Service
Medina Irrigation Company

HISTORY OF WATERSHED

The Rio Medina was named by Capt. Alonzo De Leon during his expedition of 1689, probably for one of the officers of the expedition. Recent civilization of the area probably began with the Lipan Apache Indians, who were later driven out by the Comanche Indians around 1750. The First major settlements of the area were the Spanish missions at San Antonio, Bexar County, founded in 1718 and the years following. Anglo-American colonization was not significant until the years 1821-1836. Colonization of Medina and Bandera Counties was greatly accelerated around 1850. The principal industry of the upper watershed in Bandera County in these early years was ranching. Farming of grain crops such as corn, barley, and wheat became important

around 1858. The cypress timber, especially cypress shingles, was also an important industry of Bandera County during this period. Farming and ranching were also the major industries of Medina and Bexar Counties during these early years.

PHYSICAL CHARACTERISTICS

The Medina River rises at small springs on the north and west prongs of the river in northwest Bandera County and flows in a southeasterly direction for approximately 116 miles through Bandera, Medina and Bexar Counties to where it enters the San Antonio River, approximately 12 miles south of San Antonio, Bexar County. The drainage area of the Medina River is 1,225 square miles. Of this total, 587 square miles are above Medina Lake Dam, which is located on the Bandera-Medina County line. The drainage area of the San Antonio River is 4,535 square miles.

A stream gaging station located on the Medina River, 5.2 miles above its junction with the San Antonio River, recorded an average discharge of 122 second-feet for an eleven year period, July 1939 through September 1950. Records for the years 1939-47 show an average runoff of 96,290 acre feet. The maximum runoff of 170,000 acre feet during this period occurred in 1940. A stream gaging station on the San Antonio River, located 3.6 miles southwest of Falls City, Karnes County, Texas, recorded an average discharge of 310 second-feet for a twenty year period, April 1925 through September 1945.

The Medina River begins well up in the Edwards Plateau in Bandera County and flows through the plateau in Bandera and upper Medina Counties. Just north of Castroville, Medina County, the Balcones Escarpment crosses Medina County in an east-west direction, and from this point southward, the river flows through the Coastal Plains in Medina and Bexar Counties. The river bed is almost totally limestone bedrock from the source to the Balcones Escarpment. The water is usually shallow with some deeper pools with gravel, rubble and silt overlaying the bedrock. Below the Balcones Escarpment, the river bed is mostly gravel, graduating to sandy loam near Lacoste, Medina County. The cut banks through the sandy loam are up to six feet in depth. Below this point, the river valley continues to widen as the soil and river bed graduates to heavy black loam. The pools become deeper and the cut banks through the black loam are fifty feet deep in places near the junction with the San Antonio River, Bexar County.

The major tributaries of the Medina River are the San Geronimo and Leon Creeks. San Geronimo Creek begins with forks in northeast Bandera and northwest Bexar Counties and flows southwardly to where it enters the Medina River just south of Rio Medina, Medina County. Leon Creek begins in central Bexar County and flows southeastwardly to where it enters the Medina River just south of San Antonio, Bexar County. San Geronimo Creek, normally, offers little water to the Medina River, except during periods of heavy runoff due to rainfall. Although the creek contains pools of water and has a good flow of spring water throughout its upper course, it is usually dry along most of the lower half of its course. It appears that most of the creeks flow is lost to the underground water table of the Edwards limestone within five miles below San Geronimo, Bexar County. Leon Creek, normally, flows only in the lower portion of its course, south of San Antonio, Bexar County. There are many small springs in this area and at times the creek's flow equals that of the Medina River at its junction with Leon Creek.

There are several small, low dams on the north and south prongs of the Medina River near its headwaters. Medina Lake is located on the Bandera-Medina County line. The dam was completed late in 1912 and water storage began on May 7, 1913. It is a concrete gravity type dam which gives the lake a total capacity of 254,000 acre feet of water. The Diversion Dam Reservoir below Medina Lake was also completed at this time. It was designed for a capacity of 4,500 acre feet of water to be diverted by gravity flow to Chacon Lake in southeast Medina County. Chacon Lake has an estimated capacity of 2,000 acre feet and a surface acreage of 174 acres. A permit was granted to divert 300,000 acre feet of water to irrigate 150,000 acres in Bexar, Medina and Atascosa Counties. Water from the diversion canal is also used for irrigation in Medina County above Chican Lake. The lowermost dam on the river is a small dam at Castroville, Medina County. This dam furnished water power for a mill at one time and the water has also been used for irrigation.

There are many small springs on the north and west prongs of the Medina River. There are also several springs in the Rio Medina area of Medina County. There are also permanent springs far downstream near Macdona, Bexar County. In addition to these springs, there are other small permanent springs scattered along the river and some of its creeks, as well as many intermittent springs along the course of the river that fluctuate with the water table. The Medina River has been regarded as a perennial stream until the recent years of drought. Studies in Uvalde and Medina Counties indicate that the Nueces, Dry Frio, Frio, Sabinal, and Medina Rivers and Hondo Creek lost as much as 150,000 acre feet of water a year or about 134,000,000 gallons a day to the Edwards limestone. It was estimated that the Medina River, below Medina Lake, lost nearly 16,000 acre feet of water to the underground water supply in 1930. In spite of this large annual loss, the river continued to flow throughout its course until the recent drought years. During the period of observation under this project, July 1953-May 1954, the north prong of the Medina River dried up into holes in several localities, even though springs continued to flow, thus indicating a loss to the underground reserve in this area. The west prong of the river was dry down to where a small dam impounded water about three miles above the junction with the north prong. The river was dried up into large pools from Medina almost to Bandera Falls, Bandera County. Larger springs near Bandera Falls furnished enough water for the river to flow down to Medina Lake. The river was again dry below Diversion Lake to where springs began to flow again near Rio Medina, Medina County. This above area is probably the area of greatest loss to the underground reserve. The river continued to flow from near Rio Medina to about two miles below Castroville, Medina County. The river was then again dried up into small holes down to Macdona, Bexar County, where springs again caused the river to flow down to the junction with the San Antonio River.

Medina Lake was extremely low during the years 1948-1950; yet irrigation was continued during this period. The lake contained only 3,010 acre feet of water on September 30, 1950. During the time covered by this project, the lake has risen from approximately 40 to 60 feet deep at the dam. This rise has been due to the suspension of irrigation and a moderate rainfall during the Fall of 1953 and Spring of 1954.

CHEMICAL CHARACTERISTICS

The pH of the waters of the Medina River and its tributaries rangeo from 7.6 to 9.1 with most waters being 8.6, which was also the average pH reading. The summer water temperatures during July ranged from 82.5°F. to 94°F., although the temperature of the springs remains rather constant near 72°F. all year. The winter water temperatures ranged from 56° F. to 78°F. The dissolved oxygen content of the water varied from 0.6 parts per million in a shallow, stagnant pool of water during July, when the water temperature was 94°F. to 12.8 parts per million in flowing water during the winter when the water temperature was 58°F. The average dissolved oxygen content of the water was 7.5 parts per million. The carbon dioxide content of the water ranged from 1.0 to 21.5 parts per million with an average of 6.7 parts per million. The spring water, normally, contained larger amounts of carbon dioxide. Alkalinity was due entirely to bicarbonate alkalinity. The total alkalinity ranged from 135 to 314 parts per million with an average of 239 parts per million. The alkalinity was usually lower in spring areas and increased greatly far downstream. The flowing waters of the Medina River are clear down to the vicinity of Lacoste, Medina County, where the turbidity increases downstream to the junction with the San Antonio River. The turbidity is not extremely high in this area, however. The larger pools of standing water, beginning just above Bandera, Bandera County, down to the junction with the San Antonio River are always moderately to highly turbid due to siltation and the presence of large numbers of rough fish. Medina Lake has been extremely clear with a good bloom of phytoplankters since the Fall of 1953.

SOILS, VEGETATION AND LAND USE

The upper reaches of the Medina River lie in Bandera County, which comprises 765 square miles. The altitude ranges from 1,200 to 2,400 feet. Bandera County has three distinct soil groups. Around 90% of the county consists of moderate to high, rough, stony limestone hills and plateaus. The soils here are very shallow, consisting of dark, fertile soil and adobe soil with much outcropping of limestone rocks and ledges. Erosion has removed much of the surface soil, as the slopes range from one to twenty per cent and more. The vegetative cover in this area consist of sparce to very heavy growths of cedar and scrub oaks. The native grass cover is very poor to only moderately good in a few places. The second soil group consists of mixed valley fill material, and occurs along the Medina River and its tributaries. The soil is dark and fine textured and varies in depth from ten inches to more than two feet. The slopes in this area range from almost level to five per cent. Must of this land is in cultivation. The third soil group comprises the bottomland soils of the flood plain of the Medina River. This soil group comprises less than one per cent of the county while the above soil group comprises less than ten per cent of the county. The soils of this area are deep loam and the land almost level. Practically all of this land is in cultivation. Erosion in Bandera County is moderate to severe with the greatest flood damage occurring along the Medina River and its tributaries. There are approximately 25,000 acres in cultivation in Bandera County, most of this land occurring along the Medina River and its tributaries. There are approximately 25,000 acres in cultivation in Bandera County, most of this land occurring along the Medina River and its tributaries. Crops consits mostly

of corn, grain sorghums, cane, sudan grass, oats, wheat, barley, speltz, and some legumes such as clover and peas. The majority of the small grain crops are used for temporary and supplemental pastures for grazing as the major industry of the country is ranching, with sheep and goats of primary importance over beef cattle. The average annual rainfall over many years averages 29 inches. The rainfall varies from about 27 inches in the western portion to about 32 inches in the eastern portion of the county. The heaviest rain on any one day occurred on July 16, 1900 when approximately 30 inches fell.

Medina County comprises 1,353 square miles and has an elevation of 650 to 1,900 feet. The eastern portion of the county is drained by the Medina River and the western portion by the Frio River. The northern third of the county is high, rough limestone hills with soils and vegetation the same as that of the majority of Bandera County. North of Castroville, near Rio Medina, the Balcones Escarpment crosses Medina County in an east-west direction. North of this fault zone, the entire Medina River Watershed is located in the Edwards Plateau. South of this fault zone, the land slopes gently toward the south and becomes the Costal Plains. There is a small amount of grain farming in the limestone soils north of Rio Medina. Below Rio Medina, about 2/3 of the watershed east of the river is cultivated mostly with grain crops. The soils of this area are heavy, black loams. The watershed on the west side of the river from Rio Medina almost to Lacoste is very badly eroded. The soils of this area are black to light colored loams with flint rock. The vegetation is sparce to heavy growths of mesquite and desert willow. The majority of the lower watershed in Medina County is heavy black loam with some areas of sand and sandy loam near Lacoste. The limestone soils near Rio Medina have a pH of 8.3. The pH of the black loams near Castroville is 7.6 with some as low as 7.3. The sandy and flint soils, especially near Lacoste are about neutral. The calcium content of the soils of the area is above normal in most cases, with high to very high contents in the limestone soils near Rio Medina. The average annual rainfall amounts to between 28 and 29 inches in Medina County.

Bexar County comprises 1,247 square miles and has an elevation of 500 to 1,500 feet. The southwestern portion of the county, in the watershed of the Medina River, lies on an undulating prairie and brush-covered Costal Plain. The river is bordered with heavy black loam to its junction with the San Antonio River. The black loam belt on the southern watershed varies from about 8 miles wide below Lacoste to about one mile wide near the mouth of the river. This black loam is bordered on the south by an acidic sandy loam, which is also drained by the Medina River. The Post Oak Belt approaches the Medina River from the south near its mouth. The majority of the black loam soils along the Medina River in Bexar County are cultivated with grain crops. Much of the black loam along Leon Creekis covered with moderate to heavy growths of mesquite. In fact much of the land of the watershed of the Medina River in Bexar County, exclusive of the cultivated land in the immediate vicinity of the river, is covered with mesquite and brush with very poor to moderate growths of native grasses. The annual rainfall of Bexar County is approximately 28 inches.

Available records show that up until the time of suspension of irrigation, there were 34,500 acres under irrigation from the Diversion Dam Reservoir, with 60% of this total in Medina County 35% in Bexar County, and 5% in Atascosa County.

Cypress trees are found from the headwaters of the Medina River downstream to near Macdona, Bexar County. The cypress is most numerous in Bandera and Medina Counties, where it was cut for timber until recent years. Pecan trees are found from the headwaters of the river to its mouth. Heavy growths occur in spring areas and along the lower reaches of the river south of Castroville. The black willow tree is also found throughout the course of the river. Cottonwood trees are found throughout the course of the river, but are not numerous except in a few scattered localities.

AQUATIC PLANTS

The following aquatic plants occur in the Medina River:

Yellow waterlily (spatterdock)--Nuphar advena

Cattail-Typha latifolia

Bulrush-Scirpus etuberculatus

Sedges-Cyperus sp. and Eleocharis sp.

Water Plantin-Alisma sp.

Water pennywort-Hydrocotyle umbellata

Water cress-Nasturtium sp.

Pondweeds-Potamogeton sps.

Water milfoil-Myriophyllum sp. (emergent and submerged)

Coontail (Hornwort)-Ceratophyllum sp.

Bluegreen algae-Cyanophyceae

Green algae-Chlorophyceae-Spirogyra sp.

Muskgrass-Chara vulgaris

Bladderwort-Utricularia sp.

The yellow water lily is found throughout the river, but is most common in the larger pools of standing water. It has become a nuisance in many areas of the river in Bandera and Medina Counties. The most common submerged plant of the shallow, clear, fast-flowing waters of the river is short, stubble growths of Potamogeton. The majority of the plants in the upper river bottom is mostly limestone bedrock in this area. The aquatic vegetation of the river is typical of the rivers and streams of Texas which are fed by springs from the underground reservoir of the Edwards Plateau.

SUMMARY

1. Important colonization of the watershed of the Medina River, bringing farming and ranching, took place from 1821 to 1836. This colonization was greatly accelerated around 1850.

2. The Medina River rises at small springs, well up in the Edwards Plateau, in Bandera County, and flows approximately 116 miles through

Bandera, Medina, and Bexar Counties Texas, to its junction with the San Antonio River on the Costal Plains. The drainage area is 1,225 square miles.

3. The river has been regarded as a perennial stream, until the recent drought years, in spite of a tremendous loss of water to the underground water supply of the Edwards Limestone.

4. The two major dams on the Medina River, built for irrigation, are the Medina Lake Dam with a storage capacity of 254,000 acre feet of water and the Diversion Dam, immediately below, with a capacity of 4,500 acre feet. Due to several years of drought and heavy irrigation, the lakes have remained consistently low for the past years. Irrigation has now been suspended and the water depth of Medina Lake has risen from approximately 40 to 60 feet during the period covered by this project.

5. The pH of the waters of the Medina River and its tributaries ranged from 7.6 to 9.1 with an average of 8.6. Summer water temperatures ranged from 82.5°F. to 94°F. Winter water temperatures ranged from 56°F. to 78°F. The spring waters of the river have a constant year-round temperature of approximately 72°F. The dissolved oxygen content of the water ranged from 0.6 to 12.8 with an average of 7.5 parts per million. The carbon dioxide content ranged from 1.0 to 21.5 with an average of 6.7 parts per million. The total alkalinity ranged from 135 to 314 with an average of 239 parts per million.

6. Approximately 90% of the watershed of the river in the Edwards Plateau is composed of moderate to high limestone hills with very shallow soils, producing heavy growths of cedar and scrub oaks and very poor to moderate growths of native grasses. This land is used for sheep and goat grazing and is subject to extremely heavy runoffs during periods of rain. Below the Balcones Escarpment, the watershed is composed mostly of heavy black loam soils. Much of the land along the river is farmed with grain crops. However, there are large areas covered with mesquite and brush with very poor to moderate growths of native grasses. The average annual rainfall of the entire watershed of the Medina River is approximately 29 inches.

7. The aquatic vegetation of the Medina River is typical of the rivers and streams of Texas which are fed by springs from the underground resevoir of the Edwards Plateau. The yellow water lily has become a nuisance in many of the larger pools of standing water.