Report of Fisheries Investigations

Basic Survey and Inventory of Those Portions of the Brazos River Watershed, Including the Leon, Bosque, Nolan and Navasota Rivers Situated in Palo Pinto, Parker, Erath, Johnson, Hood, Somervell, Coryell, McLennan, Hill, Robertson, and Leon Counties. This Survey to Exclude Lakes Possum Kingdom, Whitney and Waco.

by

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Dingell-Johnson Project F-4-R-6, Job B-25
November 1, 1958 through October 31, 1959

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The fish taken by minnow seine were preserved in 10 percent formalin and transported to the laboratory for identification and enumeration. Specimens taken by gill net were identified in the field where lengths and weights were recorded.

The United States Geological Survey made the monthly analyses of Brazos River water available for this report. Analyses were made at two points in the area. These points were below the Possum Kingdom Dam and below the Whitney Dam. These reports were examined to determine any factors that might influence fish life.

History:

A survey of the Brazos River, between Possum Kingdom Dam and Lake Whitney, together with the Bosque River and the Leon River in Comanche, Hamilton and Coryell Counties was attempted in 1953 and 1954. The results of this survey were reported in F-4-R-1, Job B-6. The drouth conditions at that time reduced the rainfall to a point where only a few streams contained water. The water was reduced to small pools except in the Brazos where power production at the Possum Kingdom Dam resulted in an intermittent flow.

Physical Characteristics:

The Brazos River leaves Possum Kingdom Lake in a broad stream that has a sand and gravel bottom interspersed with boulders. This type of bottom gradually changes until the bottom is largely sand. The banks are alternately steep rock cliffs and shallow sloping sand or clay banks. The upper part of the watershed is generally clear but as the stream progresses toward the Gulf of Mexico more silt is acquired until the water becomes murky. This is not a muddy stream except for a short period following heavy rains.

The Bosque River is much like the Brazos in that it is essentially a clear stream. The bottom is largely gravel and sand with numerous stretches of rock hardpan. The Bosque flows into the Brazos at Waco where a dam impounds Lake Waco for a municipal water supply (Plate 1).

The Leon River is a narrow, fairly deep stream that flows through cultivated lands and is generally murky becoming muddy after rains and clearing rather slowly. This stream flows into the Little River which then joins the Brazos near Hearne, Robertson County, Texas. A dam near the juncture of the Leon with Cowhouse Creek forms the Belton Reservoir, a large impoundment (Plate 1).

The Nolan River drains the farmland of Johnson County and flows into the Brazos at the upper end of Lake Whitney. This stream is muddy after rains but clears rather quickly since the lower part is sand bottomed and flows through land that is largely used for grazing. The margins vary from shallow, sloping, grass covered clay banks to high rocky cliffs with the former predominating.

Entering the Brazos River near Navasota, Texas, is the Navasota River. This is a narrow, fairly deep stream that flows through Limestone County and drains parts of Freestone, Robertson and Leon Counties. This stream is generally murky as it flows through clay soils that are intensively cultivated and picks up much silt with each rain. A dam, at Mexia, near the upper end of the Navasota forms Ft. Parker State Park Lake which has a fairly low dam from which water is released to provide a municipal water supply for the town of Groesbeck.

Job Completion Report

State of TEXAS

Project No. F-4-R-6 Name: Fisheries Investigation and Surveys of the Waters of Region 4-B.

Job No. B-25 Title: Basic Survey and Inventory of Those Portions of the Brazos River Watershed, Including the Leon, Bosque, Nolan and Navasota Rivers Situated in Palo Pinto, Parker, Erath, Johnson, Hood, Somervell, Coryell, McLennan, Hill, Robertson, and Leon Counties. This survey to exclude Lakes Possum Kingdom, Whitney and Waco.

Period Covered: November 1, 1958 - October 31, 1959

Abstract:

Twenty collection stations were established on the Brazos River Watershed situated within the counties that make up Region 4-B. Fifteen seine collections were made along with seven gill net and one rotenone collection.

A total of 3,890 fish specimens representing 10 families, 13 genera and 24 species was taken.

The streams that make up this portion of the Brazos River Watershed are generally clear with the exception of the Leon and Navasota Rivers. The Brazos, Bosque, and Nolan Rivers have sand, gravel, and rock bottoms while the Navasota and Leon have clay bottoms.

Chemical analyses of the Brazos River water were made by the United States Geological Survey at stations established below the Possum Kingdom and Whitney Dams. Data from these stations do not indicate that the chemical content of the water is a limiting factor in fish production.

Little aquatic vegetation is to be found in these streams because of the scouring effect of floods caused by heavy rains on the watershed.

Objectives:

To gather fundamental data on the above waters in regard to their physical, chemical and biological aspects. To determine the distribution of fish species present, their relative abundance and the ecological factors influencing their distribution.

Techniques:

Fish were collected at 20 stations on the watershed (Plate 1). Seine collections were made with minnow seines at 15 of these stations, while gill net collections were made at 7 stations. One rotenone collection was made.

Chemical Characteristics:

The United States Geological Survey has established sampling stations on the Brazos below the Possum Kingdom Dam and the Whitney Dam. Water samples from these stations are analyzed monthly and the results made available for this report. (Tables 5 and 6). There is some variation in the chemical composition of the water in the Brazos River at the two sample stations but these are not excessive. The water below the Possum Kingdom Dam generally contains more parts-per-million of each element or compound than the water below the Whitney Dam. This difference is not believed to be sufficient to have an appreciative effect on the fish present.

The Brazos River watershed is not subject to heavy industrial or sewage pollution in the area covered by this survey. Waco is the largest city in this area and no pollution has been noted or reported from this source, since the construction of a new sewage disposal plant some years ago.

There is some saltwater from oil operations as well as from natural salt deposits but the majority of these are located above Possum Kingdom Lake and probably account for the majority of the difference in the chemical analysis of water from the two sampling stations.

Aquatic Plants:

There is little or no aquatic vegetation in this watershed since these streams are subject to the scouring effect of intense floods. The flooding together with the release of water from the dams on the Brazos and Leon Rivers tend to prevent the growth of the large aquatic plants. Those streams that are less subject to flooding tend to be murky during a great portion of the year which tends to prevent the growth of all types of aquatic vegetation.

Results of Fish Collections:

Seining collections were made at 15 stations, gill net collections were made at 7 stations, and one rotenone collection was made (Table 4). The results of these collections are given in Tables 2 and 3. A total of 3,890 fish specimens representing 24 species and 13 genera were taken (Table 1).

Seine collections took 2,093 specimens of 9 genera and 14 species. Gill nets accounted for 1,160 specimens of 12 genera and 19 species. The single rotenone collection took 637 specimens representing 6 genera and 8 species.

ANNOTATED CHECKLIST

Lepisosteidae (gar)

Lepisosteus productus: The spotted gar was collected at four of the seven gill net stations. They appear to bother the fisherman more than they do the game fish. They are blamed for acts that are difficult to prove. They steal baits from his hook but little proof has been offered as to their damage to the game fish population.

Lepisosteus osseus: The longnose gar is often called the needle gar or fish gar and is thought by many fishermen to be responsible for lowered populations and poor take of game fish. This species appeared in five of the seven gill net collections and like the spotted gar appears to be blamed for misdeeds that have not been proven.

Clupeidae (shad)

Dorosoma cepedianum: The gizzard shad was taken in four net and four seine collections but were sufficiently numerous in those to contribute 1,797 specimens to the total specimens taken. This number was further augmented by 400 which were taken in the rotenone collection for a total of 2,197 or 56.5 percent. This species inhabits the majority of the watershed but is more prevalent in lakes and in the deeper pools of the stream.

Catostomidae (suckers and buffalo fish)

Ictiobus bubalus: Smallmouth buffalo are found throughout the watershed but during this survey they were taken at only four net stations. This is the most prominent of the commercial species in this area and supports the contract netting in Lakes Waco, Whitney, Possum Kingdom and Ft. Parker.

Carpiodes carpio: The carpsucker is found in the same waters as the buffalo but has little value from a commercial or food standpoint. This species is quite prolific and, when present in large numbers, tends to crowd out the more desirable fish. Their value as forage appears to be limited to the short period when they are small.

Cyprinidae (shiners and minnows)

Cyprinus carpio: The carp is widely distributed in the Brazos River and its tributaries. This species is badly underrated by the angler and when properly prepared is an excellent table fish. Carp were taken at three gill net stations and 10 were taken in the rotenone collection. The carp is considered to be one of the better baits for flathead catfish and is suitable for pond culture.

Notropis venustus: The spottail shiner was taken at 8 seine stations and is one of the most prominent of the bait and forage species.

Notropis lutrensis: The red shiner or redhorse shiner is the most widely distributed of the forage species. It was present in all but two of the seine collections. This species is sought after by minnow dealers and finds a ready sale. Its color and ability

to live on the hook, as bait, makes the red shiner a favorite with the angler.

Notropis volucellus: The mimic shiner was taken at only one seine station. This was in the Navasota River below Ft. Parker Dam. The species is of little significance since they are small and, on the basis of seining collections made during the study, does not appear to be very widely distributed.

Ameiuridae (freshwater catfishes)

Ictalurus punctatus: Channel catfish appeared in all of gill net collections but were not taken in any of the seine samples. They are present in the streams and appear to stay in the deeper pools making them difficult to take with seines. This is the most popular of the commercial species and supports a large trotline fishery in the lower part of the Brazos River. Bait fishermen prize the channel catfish highly as a food and sport fish. They are distributed throughout the streams of the watershed.

Ictalurus melas: The black bullhead is of little importance in the majority of the Brazos watershed. It was taken in only two seine collections and one net collection.

Ictalurus natalis: Yellow bullheads were taken at two gill net stations and appear to be of little importance. None were taken in seine samples.

Cyprinodontidae (killifishes and topminnows)

Fundulus notatus: Blackstripe topminnows have been observed in much of the Brazos watershed but were taken at only two seine stations. They have little value as a forage or bait species.

Fundulus kansae: The plains killifish was taken at only one seine station. This was a shallow, rock-bottom riffle in the Paluxy River, near Glen Rose.

Poeciliidae (mosquito fishes)

Gambusia affinis: This species is found in all parts of the watershed despite the fact that mosquito fish were collected at only six of the seine stations. The gambusia is of little value as a forage species and seldom if ever used as a bait minnow. The value of this species appears to be in the field of mosquito control. Aquatic insect larvae occupy a high place in the food items consumed by them.

Serranidae (basses)

Roccus chrysops: The white bass was introduced into the Brazos Watershed after the construction of Possum Kingdom Lake and has become well established. This species if found in abundance below the Possum Kingdom and Lake Whitney Dams. They were not taken in seine samples and appeared in only three net samples despite the fact that many are taken by hook and line. White bass are important to the fishery of the region since they may be taken on a variety of baits at almost any time during the year. A possible disadvantage lies in their reproductive capacity which, under favorable conditions, allows them to become overabundant. They are of value as a control on gizzard shad which appears to be the main source of food for adult white bass.

Centrarchidae (black basses and sunfishes)

Micropterus salmoides: Largemouth black bass are the most popular of the sport fishes in the Brazos watershed. They attract artificial lure and natural bait fishermen alike. This species is known to be present in all parts of the watershed but were absent from a majority of the collections. The float fishing that is done along the Brazos River is due almost entirely to the presence of largemouth bass in the rocky pools between Possum Kingdom Dam and the upper end of Lake Whitney.

Lepomis cyanellus: The green sunfish is locally known as the goggle-eye and is considered one of the favorite targets of the fly fisherman. This species is known to inhabit the entire watershed despite the fact that they were taken at only one seine and two gill net stations.

Lepomis microlophus: Redear sunfish are among the fish most desired by the worm fisherman. This species is game and takes flies or natural baits readily. They tend to congregate in certain areas of lakes and streams which allows the fisherman to continue to make good catches once he locates the bed. The redear is not so prolific as some of the other sunfishes and is not so likely to overpopulate the area.

Lepomis macrochirus: Bluegill sunfish have long been considered the summer companion of the small boy. They are very prolific and almost permanently hungry. This species takes worms, flies and insects with equal favor. They may be taken in great numbers at almost any time during the warmer months. They do serve as food for other more desirable fish, but their rate of reproduction is so high that they tend to over populate and crowd out the more desirable species. The bluegill is found in all parts of the watershed and was taken in all but five of the seine and net samples, and were the second most abundant species in the rotenone collection.

Lepomis humilis: Orangespotted sunfish were found at only one collection station on the Brazos River watershed. This is a small species and appears to be of little importance except as a forage fish in locations where the population is sufficiently dense to be of value.

Lepomis auritus: The yellowbelly sunfish has been introduced by fish hatcheries into almost all the lakes and streams of the Brazos watershed. It is not so prolific as the bluegill and attains a larger size than the longear and, despite the small size of the mouth, it is readily taken on flies. In recent years the yellowbelly sunfish has come to occupy a prominent place in the catch of the worm and fly fisherman of the area where it is often confused with both the bluegill and longear.

Lepomis megalotis: Longear sunfish are found in all parts of the Brazos watershed but were collected at only two net stations. This highly colored sunfish rises readily to small flies but seldom attains sufficient size to be of interest to the fisherman. Their value as a forage fish is offset by their prolific reproduction which tends to overcrowd an area.

Pomoxis annularis: White crappie are found throughout the watershed. They were taken at 6 net stations and at only one seine station. Crappie are taken from the deeper pools throughout the watershed and are abundant in the majority of the lakes.

Sciaenidae (croakers and drums)

Aplodinotus grunniens: The freshwater drum is present throughout the watershed but was collected in only one seine sample and three gill net samples. This species is generally small and is not important in the fishery. The larger specimens are usually taken from the lakes but in the lower portion of the Brazos an occasional large drum is caught.

Prepared by Leonard D. Lamb, Project Leader Approved by Marion Toole, Director Inland Fisheries Division

Date December 11, 1959

Table 1. Checklist of Fishes, from the Brazos River Watershed within Palo Pinto, Parker, Hood, Erath, Johnson, Somervell, Comanche, Hamilton, Coryell, Bosque, Hill, McLennan, Falls, Limestone and Freestone Counties, Texas.

Scientific Name	Common Name
Lepisosteus productus	spotted gar
Lepisosteus osseus	longnose gar
Dorosoma cepedianum	gizzard shad
Carpiodes carpio	river carpsucker
Cyprinus carpio	European carp
Notropis venustus	spottail shiner
Notropis lutrensis	red shiner
Notropis volucellus	mimic shiner
Ictalurus punctatus	channel catfish
Ictalurus melas	black bullhead
Ictalurus natalis	yellow bullhead
Fundulus notatus	blackstripe topminnow
Fundulus kansae	plains killifish
Gambusia affinis	common mosquitofish
Roccus chrysops	white bass
Micropterus salmoides	largemouth bass
Lepomis cyanellus	green sunfish
Lepomis microlophus	redear sunfish
Lepomis macrochirus	bluegill sunfish
Lepomis humilis	orangespotted sunfish
Lepomis auritus	yellowbelly sunfish
Lepomis megalotis	longear sunfish
Pomoxis annularis	white crappie
Aplodinotus grunniens	freshwater drum

Table 2. Species and Number of Fish Collected at Each Seine Station on the Brazos River Watershed Lying Within Palo Pinto, Parker, Hood, Erath, Johnson, Sommervell, Comanche, Hamilton, Coryell, Bosque, Hill, McLennan, Falls, Limestone and Freestone Counties, Texas.

Species	Station Number															Totals
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Dorosoma cepedianum					184						1	959		30		1,174
Carpiodes carpio									2							2
Notropis venustus		1			2		8	17	32		4			1	2	67
Notropis lutrensis	3	278	13	6	1	3	155	14	92		30		1	3	23	622
Notropis volucellus												77				77
Ictalurus melas												1				1
Fundulus notatus								3					2			5
Fundulus kansae									4							4
Gambusia affinis							4	4	1		7	11	3			30
Micropterus salmoides	12												7			19
Lepomis cyanellus										1						1
Lepomis macrochirus	6				1		55	15				3	6			86
Lepomis humilis													2			2
Pomoxis annularis												3				3
Totals	21	279	13	6	188	3	222	53	131	1	42	1,054	21	34	25	2,093

Table 3. Species and Number of Fish Collected at Each Gill Net and Rotenone Station on the Brazos River Watershed within Palo Pinto, Parker, Hood, Erath, Johnson, Sommervell, Comanche, Hamilton, Coryell, Bosque, McLennan, Falls, Limestone and Freestone Counties, Texas.

Species	Gill Net Collection Stations								Rotenone Collection
	7	15	16	17	18	19	20	Total	
Lepisosteus productus		7	10	5	12	4		38	
Lepisosteus osseus		2		65		3	15	85	
Dorosoma cepedianum		28			421	83	91	623	400
Ictiobus bubalus		13			4	1	3	21	7
Carpiodes carpio	1	18				4	4	26	1
Cyprinus carpio		5		2			1	8	10
Ictalurus punctatus	9	8	11	22	7	16	24	97	
Ictalurus melas			11					11	
Ictalurus natalis			1		2			3	
Roccus chrysops		2				1	2	5	
Micropterus salmoides		1		10		3	12	26	
Chaenobryttus gulosus							1	1	10
Lepomis cyanellus	4		1					5	5
Lepomis microlophus	13		3					16	
Lepomis macrochirus	6	3	5	2	7	6	8	37	200
Lepomis auritus	2							2	4
Lepomis megalotis			3		1			4	
Pomoxis annularis		18	8	44	1	9	17	97	
Aplodinotus grunniens		19			35	1		55	
Totals	34	124	53	150	490	131	178	1,160	637

Table 4. Key to Fish Collection Stations on the Brazos River Watershed Within Palo Pinto, Parker, Hood, Erath, Johnson, Somervell, Comanche, Hamilton, Coryell, Bosque, Hill, McLennan, Falls, Limestone and Freestone Counties, Texas.

Station Number	Collection Number	Location
1	S-1	West Fork of Nolan River at Godley.
2	S-2	Nolan River at Hiway 174 Bridge near Rio Vista.
3	S-3	Hackberry Creek at Hillsboro Hiway 22 Bridge.
4	S-4	Aquilla Creek between West and Aquilla.
5	S-5	Brazos River below Lake Whitney Dam.
6	S-6	Rock Creek at Hiway 22, Lake Whitney-Meridian.
7	S-7, G-4	Meridian State Park Lake.
8	S-8	North Bosque River at Iredell Hiway 22.
9	S-9	Paluxy River at Glen Rose.
10	S-10	Squaw Creek at Hiway 144 near Glen Rose.
11	S-11	Brazos River near mouth of Paluxy River.
12	S-12	Navasota River below Ft. Parker Dam.
13	S-13	Marlin City Lake.
14	S-14	Mesquite Creek near Lake Whitney.
15	S-15, R-1, G-5	Cedar Creek near Lake Whitney.
16	G-1	Teague City Lake.
17	G-2	Lake Creek Lake.
18	G-3	Ft. Parker State Park Lake.
19	G-6	Cedar Creek arm, Possum Kingdom.
20	G-7	Rock Creek arm, Possum Kingdom.

Table 5. Water Analysis of Brazos River below Possum Kingdom Dam.

	Monthly Variation in Parts Per Million							
	Nov.	Dec.	Jan.	Feb.	March	April	May	June
Silica (SiO_2)	7.8	8.8	10	7.6	10	8.8	7.8	8.6
Calcium (Ca)	110	102	103	104	104	105	104	110
Magnesium (Mg)	19	18	19	19	19	20	17	20
Sodium + Potassium (Na+K)	249	238	232	232	229	233	238	240
Bicarbonate (HCO_3)	119	115	118	118	114	119	119	124
Sulfate (SO_4)	211	191	197	198	195	195	203	215
Chloride (Cl)	408	392	382	382	382	392	380	392
Nitrate (NO_3)	1.0	0.8	0.0	0.5	1.0	0.8	1.0	0.5
Dissolved Solids	1,060	1,010	1,000	1,000	996	1,020	1,010	1,050
Hardness as ($CaCo_3$)	352	328	335	338	338	344	330	356
Non-Carbonate hardness	225	234	238	241	244	246	232	255
Percent Sodium	61	61	60	60	60	59	61	59
Sodium adsorption Ratio (S.A.R.)	5.8	5.7	5.5	5.5	5.4	5.5	5.7	5.5
Specific conductance (Micromhos at 25°C)	1,900	1,770	1,770	1,780	1,780	1,780	1,790	1,840
PH	7.8	7.3	7.8	7.9	7.7	7.4	7.5	7.4

Table 6. Water Analysis of Brazos River below Whitney Dam.

	Monthly Variation in Parts Per Million							
	Nov.	Dec.	Jan.	Feb.	March	April	May	June
Silica (SiO_2)	9.8	11	11	11	11	8.4	7.4	11
Calcium (Ca)	94	94	96	93	99	100	98	94
Magnesium (Mg)	32	16	18	18	18	19	19	19
Sodium + Potassium (Na+K)	168	201	191	196	199	192	190	191
Bicarbonate (HCO_3)	131	136	133	114	134	140	141	140
Sulfate (SO_4)	167	166	173	176	178	185	174	170
Chloride (Cl)	318	322	322	322	325	318	310	308
Nitrate (NO_3)	1.0	0.2	0.5	0.5	0.5	0.5	2.0	1.0
Dissolved Solids	930	925	913	947	896	898	946	909
Hardness as ($CaCo_3$)	366	300	314	306	321	328	322	312
Non-Carbonate hardness	258	189	204	212	211	213	207	198
Percent Sodium	50	59	56	58	57	56	56	57
Sodium adsorption Ratio (S.A.R.)	3.8	5.1	4.7	4.9	4.8	4.6	4.6	4.7
Specific conductance (Micrombs at 25°C)	1,540	1,570	1,560	1,560	1,570	1,600	1,560	1,500
PH	8.0	8.3	8.2	7.6	7.8	7.9	7.7	7.2

Plate 1. Map of Brazos River Watershed, situated within Region 4-B, showing the various collecting stations.

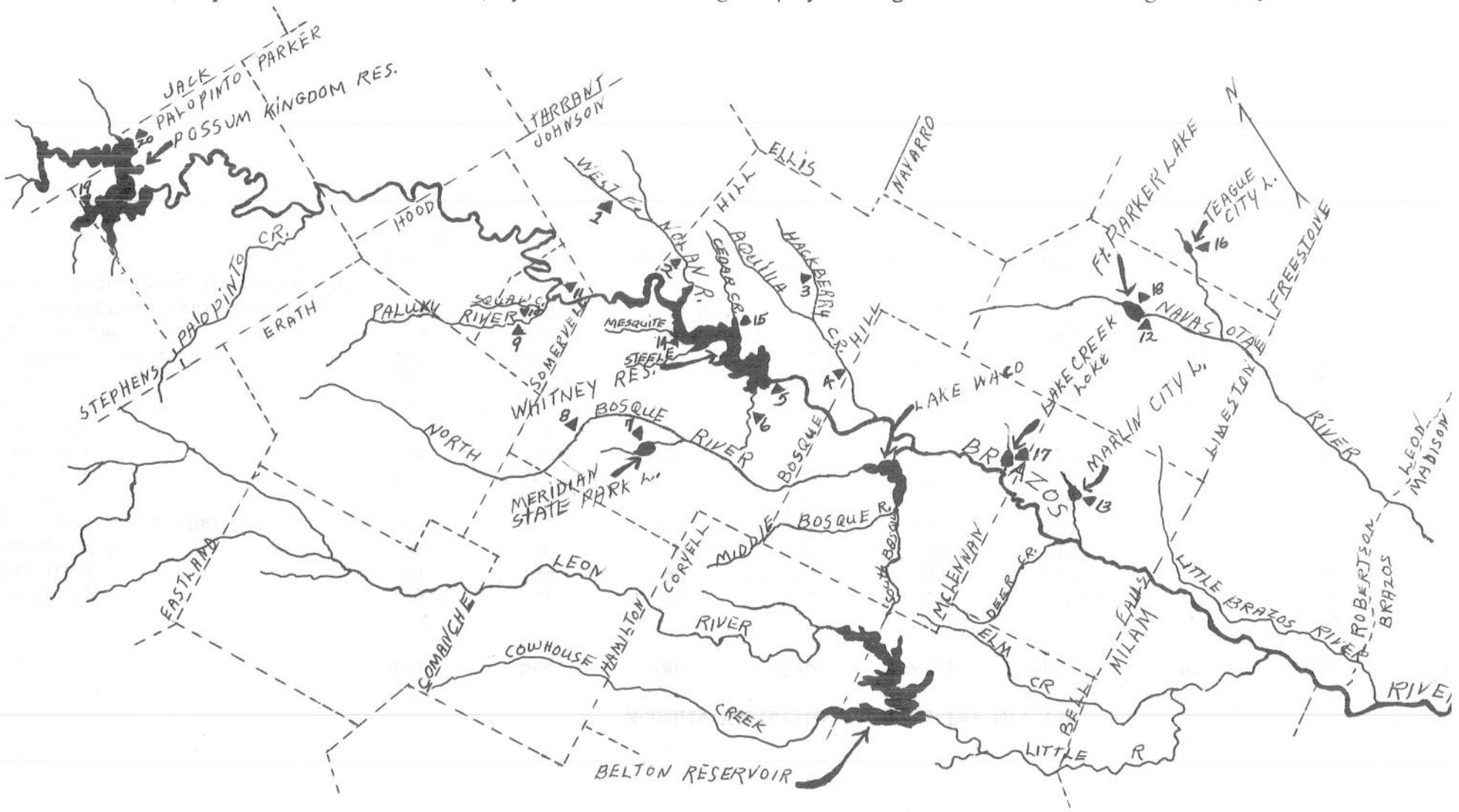

Plate 2. Vicinity map of Brazos River Watershed.