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UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Bureau of Sport Fisheries and Wildlife
Southwest Region
Albuquerque, New Mexico

FISH AND WILDLIFE RESOURCES
OF THE
BRAZOS RIVER SUBBASIN
TEXAS

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Report Prepared by the Branch of River Basin Studies
Albuquerque, New Mexico
August 1960

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8/3/60

Memorandum

To: Regional Director, Region 5, Bureau of Reclamation,
Amarillo, Texas

From: Regional Director

Subject: Brazos River Subbasin, Texas (BR) - Bureau of Sport
Fisheries and Wildlife Report

Attached is our report on the fish and wildlife resources of the Brazos River Subbasin of the Texas Gulf Basins. This report has been prepared to relate the problems of attaining reasonable fish and wildlife conservation and use to water-development plans for this subbasin. A general inventory of the fish and wildlife resources of the subbasin together with present and expected future use of these resources are presented in the report. The problems affecting optimum development of the fish and wildlife resources are discussed, and possible solutions to these problems are advanced. The intention of this report is to serve as an over-all statement preceding individual reports for water-development projects in this subbasin.

Authority to conduct the investigation and to prepare this report is provided by the Fish and Wildlife Coordination Act, 48 Stat. 401, as amended; 16 U.S.C. 661 et seq. The Bureau of Sport Fisheries and Wildlife has coordinated this report with the Bureau of Commercial Fisheries. The Texas Game and Fish Commission has cooperated in this study and has concurred in the report by letter

dated _____, 1960, signed by Executive Secretary H. D. Dodgen, copy of which is appended to this report.

Present fishing needs by residents of the Brazos River Watershed amount to about 3,540,000 man-days annually. Except in the lower portion of the subbasin fishing facilities are adequate to take care of existing demands. By the year 2010, however, the demand for fishing opportunities is expected to rise to about 7,560,000 man-days annually, and additional facilities will be required to meet the needs of the subbasin. Present demands for marine sport fishing in the subbasin are greater than the habitat can support, and many fishermen travel to other parts of the coastal area and the Gulf of Mexico associated with other subbasins.

Sufficient carp, buffalofishes, and freshwater drum are available within the subbasin to meet the needs for these food fishes. The marine commercial fisheries in the watershed are important to a portion of the coastal economy, and present needs for marine fish, shrimp, and oysters are being met. Gulf of Mexico waters associated with the Brazos River Subbasin produced a harvest in 1957 of about 120,000 pounds of fish and 10,500,000 pounds of shrimp.

A principal problem affecting utilization of the fishery resources is the reduction of fish production potential due to oil well, chemical, sewage, and silt pollution. Lack of public access to fishing facilities is an ever-growing problem, and some fishermen

must travel long distances to find adequate fishing opportunities. Drainage of brackish marshlands for agriculture and industry has reduced the potential of these areas for marine sport and commercial fish and shellfish. Future upstream demands upon the flows of the Brazos River may result in an increase in salinity levels of the bay areas, thereby threatening further reduction of fish habitat.

Injection of oil well wastes into underground strata, proper treatment of chemical wastes and sewage, and soil management to reduce erosion would assist in reducing pollution of fishery habitat.

Construction of reservoirs on the lower reaches of the Brazos River Subbasin with provision for public access would provide needed fishing facilities for fishermen of the subbasin. Public ownership of marshland habitat which is valuable to larval shrimp, young fish, and waterfowl would protect these areas from encroachment of agriculture and industry.

About 1,240,000 hunter-days annually represent the present hunting pressure by residents of the subbasin. Based on predicted population increases, there will be a demand for over 2,500,000 hunter-days annually by the year 2010. The needs for hunting opportunities are not now being met by wildlife populations with the exception of mourning doves and rabbits. Adequate opportunities for hunting of big game and waterfowl are lacking, and future demands will further aggravate this situation.

Problems associated with recurrent drouths, excessive stock grazing, and timber clearing operations limit the potential of the subbasin to produce adequate deer, antelope, and wild turkey populations. Intensive farming practices, brush eradication, and overhunting are factors which have contributed to the declining populations of bobwhites, scaled quail, squirrels, and other upland game. Industrial and municipal expansion along with drainage for agriculture is rapidly reducing marsh areas of the Coastal Prairie, and the lack of quality marshes will limit any greater waterfowl use of the Gulf Coast area. Inland, the absence of favorable habitat for waterfowl results in a distinct lack of hunting opportunities. Reduced streamflows into estuarine and marsh areas of the subbasin because of upstream demands may upset the balance between fresh and saline waters thereby threatening the destruction of fish and wildlife habitat.

Programs designed to reduce overgrazing of deer and turkey ranges by livestock would contribute toward better management of these species. Elimination of unnecessary timber clearing for agriculture, retiring cultivated lands under the Soil Bank Program, and greater application of soil conservation practices would materially assist upland-game populations. ^{Adequate} ~~adequate~~ grazing of waterfowl habitat on the Coastal Prairie, restoration of drained ponds, and marsh development projects along the coast would benefit waterfowl

populations. A refuge in the lower portion of the subbasin would preserve important waterfowl habitat and create additional hunting opportunities. An assured inflow of fresh water into the estuarine areas of the subbasin would maintain valuable fish and waterfowl habitat.

The assistance given by your staff during the investigation and preparation of this report is kindly appreciated.

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PREFACE

The purpose of this report is to present an overall summary of the fish and wildlife resources in relation to water-development plans for the Brazos River Subbasin of the Texas Gulf Basins. Included in the report is a general inventory of the fish and wildlife resources of the subbasin and an appraisal of present and anticipated future use of these resources. The intrinsic problems associated with optimum development and utilization of the fish and wildlife resources are discussed, and possible solutions to some of these problems are advanced.

An earlier report entitled "Fish and Wildlife Resources of the Texas Gulf Basins" was issued by the Bureau of Sport Fisheries and Wildlife in May 1959. That report contained an account of fish and wildlife considerations relating to land and water-development projects of the entire Gulf Basins region. The present report contains a breakdown of these considerations as they pertain to the Brazos River Subbasin.

Acknowledgment is made of the cooperation and assistance given by the Texas Game and Fish Commission, the Bureau of Reclamation, and the Bureau of Commercial Fisheries during the preparation of the report.

DESCRIPTION OF THE BRAZOS RIVER SUBBASIN

1. The Brazos River Subbasin, which includes the San Bernard River watershed, lies between the subbasins of the Red River on the north, the Trinity River and San Jacinto River on the east, and the Colorado River on the south and west. It is 60 to 100 miles in width and extends from the eastern part of New Mexico in a generally southeasterly direction about 650 miles to the Gulf of Mexico. The subbasin has a drainage area of 45,670 square miles, of which 8,950 square miles in the High Plains are considered as noncontributing drainage area. Plate I shows the relative location of the subbasin.

2. The Brazos River rises in the High Plains section of the Great Plains province at about elevation 4000 1/ and flows generally southeasterly across the State of Texas through the Central Lowland province, the Great Plains province, and the Coastal Plain province. The Central Lowland area has flat-to-undulating lands on the interstream divide; however, the topography is generally rolling and broken with occasional rugged areas near the streams and along the southern limits of the area. The topography of the Central Great Plains area is rugged and has steeply eroded hills. Elevations decrease from 3000 at the Caprock Escarpment to about 1000 near Mineral Wells, Texas. In the Coastal Plain area, the topography varies from hilly relief in the vicinity of the low escarpment to broadly rolling country in its central area.

1/ All elevations are in feet and refer to mean sea level datum.

It is a flat, featureless plain near the coast. Elevations decrease from 500 near Waco to sea level at the Gulf Coast.

3. The San Bernard River rises in Austin County, Texas, at about elevation 300 and flows in a southeasterly direction, gradually falling to sea level. Its watershed lies in the Coastal Plain physiographic province.

4. Outcrops of the Pliocene series consisting of sand, loam, and clay occupy most of the High Plains section of the Great Plains province. The soils are brown, noncalcareous, and friable; the parent material is calcareous clay. In the Central Lowland area, outcrops are composed of sandy clays, sandy shales, conglomerates, shales, sandstones, limestones, gypsum, dolomite, and coal beds. The upland soils are reddish brown to dark brown and generally friable. The parent material consists of sandy clay or sandstone. The central portion of the Great Plains area contains outcrops of limestone and clay. The soils are generally friable, varying from yellow to gray to black and dark brown color. The parent materials are limestone, sandstone, and chalk. The Coastal Plain area has outcrops of chalky marl, clays, shale, sand, shell, gravel, and sandstone. Soils are black, brown, or gray and vary from friable to cohesive soils over limestone and other calcareous parent material. Practically all soils subject to overflow are friable, usually calcareous, and are gray or light brown to black in color.

northerly; during the remainder of the year, southerly winds prevail. The average annual precipitation over the contributing drainage area is about 29 inches, ranging from 50 inches in the coastal region to about 16 inches in the upper portion of the watershed. The entire subbasin is subject to heavy rainstorms. The Gulf area has occasional tropical hurricanes, and the upper portion has frequent sand and dust storms.

7. The Brazos River is formed by the confluence of the Salt Fork and Double Mountain Fork of the Brazos River near the eastern boundary of Stonewall County, Texas, and flows southeasterly about 900 miles to empty into the Gulf of Mexico near Freeport, Texas. The stream has tidal effects for about 30 miles upstream from its mouth. Principal tributaries of the Brazos River, in addition to the Salt Fork and Double Mountain Fork, are Clear Fork, Bosque River, Little River Yegua Creek, and Navasota River.

8. The San Bernard River rises in Austin County and flows in a southeasterly direction for about 105 miles to empty into the Gulf of Mexico. The stream has tidal effects for a distance of 40 miles. The San Bernard River has been dredged 9 feet deep and 100 feet wide from its mouth to river mile 26. The Gulf Intracoastal Waterway intersects both rivers near their mouths.

9. Underground water sources are relied upon to supply the water needs in the semiarid high plains section of the upper portion of the subbasin. At present, about 800,000 acres of farmland are being irrigated from a large underground reservoir in the Brazos and Colorado Rivers Subbasins. This reservoir is estimated to have a capacity of 95,625,000 acre-feet. Impervious rock outcrops in the central portion of the subbasin preclude the occurrence of any large underground water reservoirs, and most of the municipalities and industries in this area depend upon surface water supplies. The lower portion of the subbasin has ample surface and underground water for present use, and completion of the proposed reservoirs will provide for all anticipated future needs.

10. The subbasin is predominantly a farming and ranching area. Farms occupy about 24,000,000 acres, of which croplands constitute about 38 percent; plowable pasture, 12 percent; woodlands, about 11 percent; and other farmland, about 39 percent. Cattle, sheep, goats, and hogs are the important livestock raised here. Principal crops are grain sorghum, rice, oats, corn, truck crops, cotton, and wheat.

11. Principal industries in the subbasin are based on farm and petroleum products, and include oil, gas, cottonseed and peanut processing, meatpacking, sugar refining, canneries, and textile mills.

12. A good network of State, Federal, and County roads crosses the subbasin. In addition, other transportation facilities are railroads, airlines, pipelines, bus lines and water navigation.

13. Recreational assets, in addition to the Gulf Coast, include Abilene State Park in Taylor County, 507 acres; Acton State Park in Hood County; Cleburne State Park in Johnson County, 471 acres; Fort Griffin State Park in Shackelford County, 503 acres; Fort Parker State Park in Limestone County, 1,510 acres; Meridian State Park in Bosque County, 469 acres; Mineral Wells State Park in Palo Pinto County, 56 acres; Mother Neff State Park in Coryell County, 253 acres; Possum Kingdom State Park in Palo Pinto County; Stephen F. Austin State Park in Austin County, 664 acres; Mackenzie State Park in Lubbock County, 550 acres; and Washington State Park in Washington County.

14. Reservoirs of major importance to fish and wildlife in the subbasin are listed in Table 2. Streams, reservoirs, game regions, and the more important cities in the subbasin are shown in Plate II.

Table 2 - Reservoirs of Major Importance to Fish and Wildlife Resources
in the Brazos River Subbasin

Reservoirs	County	Stream	Storage (acre-feet)	Area (surface acres)	Purpose of Reservoir	Species
Trammel Sweetwater	Nolan	Sweetwater Creek	3,183		M & R	F & W
	Nolan	Cottonwood & Bitter Creeks	13,290	752	M & R	F & W
McCarthy (Albany)	Shackelford	Hubbard Creek	4,000	300	M	F & W
Abilene	Taylor	Elm Creek	9,786	580	M	F & W
Kirby	Taylor	Gedar Creek	7,600	740	M & I	F & W
Fort Phantom Hill	Jones	Elm Creek	74,310	3,800	M	F & W
Stamford	Haskell	Paint Creek	60,000	1,415	M & Ind.	F & W
Clisco	Eastland	Big Sandy Creek	49,100	477	M	F
Lytle	Taylor	Lytle Creek	6,500	1,000	H & Ind.	F & W
Daniel	Stephens	Gonzales Creek	10,000	1,000	M & Ind.	F
Eddleman	Young	Flint Creek	5,917	373	M	F
Possum Kingdom	Palo Pinto	Brazos River	698,900*	19,800*	H & I	F & W
Whitney	Bosque & Hill	Brazos River	131,700*	15,800*	FC, H, I & M	F & W
Waco	McLennan	Bosque River	157,700*	7,260*	FC & H	F & W
Lake Creek	McLennan	Nanor Creek	9,500	865	Ind.	F & W
Buffalo Lake	Lubbock	Double Mountain Fork	640		R	F & W
Eames	Comanche				M	F
Comanche	Comanche	Mercer			M	F
Meridian State Park	Bosque	Spring Creek			M	F
Marlin	Falls	Sandy Creek			M	F
Hamilton City	Hamilton	Two-Mile Creek			M	F
Cleburne State Park	Johnson	Camp Creek		80	R	F & W
Anson	Jones	Barrett Creek		300		F & W
College Lake	Jones	--		100		W
T & P	Jones	--		100		W
Don George	Fort Bend	Dry Creek		2,000	R	W
Strawn	Palo Pinto	Palo Pinto		100		W
Mineral Wells	Parker	Rock Creek		125	M	F & W

Table 2 (continued)

Reservoirs	County	Stream	Storage (acre-feet)	Area (surface acres)	Purpose of Reservoir	Species
Elm Creek Flag Pond	Throckmorton Lee	Elm Creek Off-Channel Yegua Creek		735	M	W
Blue Lake	Brazoria	Oyster Creek		500	R	F & W
Manor Lake	Brazoria	--		1,700		W
Eastland	Eastland	Leon River	4,900	1,200	I	W
Eagle Lake	Colorado	None		150 1/2	M & I	F
Olden	Eastland	Leon River	1,275	2,500	R	F & W
Leon	Eastland	Leon River	28,000	200 1/2	H	F
Belton	Bell & Coryell	Leon River	125,700*	7,400*	M & Ind. FC, M, I, & Ind.	F & W
Alcoa	Milan	Sandy Creek	12,000	800	Ind. & R	F
Springfield	Limestone	Navasota River	4,200	795	R, I, & M	F
Camp Creek	Robertson	Camp Creek	8,400	748	R	F & W
Eagle Nest	Brazoria	Varnor's Creek	18,000	4,300	I	F & W
Brazoria	Brazoria	Off-Channel	21,973	2,000	M	F & W

* Conservation or power pool elevation

M - Municipal

H - Hydroelectric power

I - Irrigation

Ind. - Industrial

FC - Flood Control

R - Recreation

F - Fish

W - Waterfowl

1/2 - Estimated

15. Important stream fishing occurs along the Brazos River from its mouth to Possum Kingdom Dam. Impoundments in the subbasin affect streamflows in the river, but they have not destroyed any important stream fishing. Construction of Possum Kingdom Reservoir has eliminated zero flows at the Palo Pinto Gage, about 20 miles downstream from Possum Kingdom Dam and has increased the average minimum monthly flows. Even during the drought period, 1950-1957, the minimum flow recorded was 8 second-feet. Lesser streamflows have been recorded at the Waco Gage, about 40 miles downstream from Whitney Dam, since impoundment of Whitney Reservoir began in December 1951; however, most of the flows recorded after Whitney Dam was completed were made during the drought. Minimum flow recorded during the drought was 31 second-feet.

16. Table 3 lists the average monthly minimum flows in the Brazos River at the Palo Pinto Gage before and after the construction of Possum Kingdom Dam and during the drought period.

Table 3 - Average Monthly Minimum Flows (second-feet),
Brazos River, Palo Pinto Gage, Before and
After Possum Kingdom Dam Construction
and During the Drought Period

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.
Before	47	40	59	28	41	23	37	166	328	86	31	56
After	120	70	66	82	113	116	96	398	344	119	128	73
Drought	48	39	40	40	33	41	24	210	76	57	64	22

17. Table 4 lists the average monthly minimum flows in the Brazos River at the Waco Gage following the construction of Possum Kingdom and Whitney Dams and during the drought period.

Table 4 - Average Monthly Minimum Flows (second-feet)
Brazos River at Waco Gage Following Closure of Possum
Kingdom and Whitney Dams and During
the Drought Period

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.
Possum												
Kingdom	451	373	346	410	579	625	727	818	735	408	408	338
Whitney	70	57	69	54	80	57	79	2595	4508	213	128	71
Drought	119	87	100	76	108	77	67	287	473	213	294	75

18. The Brazos and San Bernard Rivers empty directly into the Gulf of Mexico, thereby supporting little estuarine habitat. The brackish-water marshland within the subbasin is almost entirely dependent upon local runoff.

FISHERY SECTION

Inventory

19. Fish habitat in the Brazos River Subbasin supports fresh-water and marine fish. Principal species of fresh-water fish in streams, lakes, reservoirs, and farm ponds are largemouth bass, Texas spotted bass, white and black crappie, bluegill, white bass, channel and flathead catfishes, freshwater drum, buffalofishes, carp, river carpsucker, and minnows. Redfish, gafftopsail, speckled trout, sheepshead, flounders, croakers, menhaden, mullet, shrimp, and blue crabs are the principal marine fish and shellfish.

20. Stream fisheries of importance occur in the Brazos River from its mouth upstream to Possum Kingdom Dam. Stream fisheries of local importance occur in the Navasota, Paluxy, Leon, San

Gabriel, Nolands, Little, and San Bernard Rivers; and Chocolate, Dickerson, Austin, and Bastrop Bayous. Streams that provide intermittent sources of fishing are the Bosque and Lampasas Rivers; and Cowhorse, Sulphur, Big Sandy, Brushy, Meridian, Steel, Neal, Palo Pinto, Keachi, and Oyster Creeks.

21. In addition to the reservoirs of major importance for fishing listed in Table 2, small lakes and reservoirs and 94,000 farm ponds, totalling about 64,000 acres collectively, provide considerable fishing opportunities.

22. Important sources of marine sport fishing occur in the lower reaches of the Brazos and San Bernard Rivers, Oyster Creek, the Gulf Intracoastal Waterway, and the Gulf of Mexico.

23. Fresh-water commercial fishing of importance occurs in the Brazos, San Bernard, Leon, Lampasas, and Navasota Rivers; Belton, Whitney, Possum Kingdom, Fort Phantom Hill, and Camp Creek Reservoirs; and Springfield Lake. Marine commercial fishing of importance occurs in the lower reach of the Brazos and San Bernard Rivers and the Gulf of Mexico.

Use

24. About 1,200,000 people reside in the Brazos River Subbasin. By the year 2010, the population is expected to be about 3,000,000 people. According to the Crossley and Belden Surveys in

the State of Texas, about 2,675,000 man-days of fishing are expended annually by people of the subbasin, of which 2,666,000 man-days are by fresh-water fishermen and 875,000 man-days by marine fishermen. By the year 2010, should future use follow the present trends, almost 8,000,000 man-days of fresh-water fishing and 3,600,000 man-days of marine fishing will be expended by people of the subbasin. Table 5 presents data regarding present and future fresh-water and marine sport fishing use in the subbasin.

Table 5 - Fresh-Water and Marine Sport Fishing
In the Brazos River Subbasin

	Fisherman-Days		
	<u>1955</u>	<u>2010</u>	<u>1955 to 2010 Average</u>
Fresh-Water	2,666,000	7,981,000	5,323,000
Marine	875,000	3,600,000	2,238,000
Total	3,541,000	11,581,000	7,561,000

25. With the exception of the lower portion of the subbasin which lacks reservoir-type fishing, streams and reservoirs in the subbasin provide adequate fishing opportunities for residents of the Brazos River Subbasin. Residents from other areas of the State also use these facilities. Whitney, Belton, and Possum Kingdom Reservoirs in themselves receive an annual estimated fishing pressure of about 2,000,000 man-days. The anticipated increase in population

and fishing pressure, however, will require additional facilities to meet the future needs for fishing opportunities.

26. Demands for marine sport fishing in the subbasin are far greater than the habitat can support, and fishermen must rely on fisheries associated with other subbasins. It is doubtful that the waters of the subbasin can accommodate any increase in fishing pressure.

27. Demands for fresh-water and marine commercial fish species are great but are adequately met by fish from streams and reservoirs in the subbasin and the fishery in the Gulf of Mexico associated with the subbasin. About 10,500,000 pounds of shrimp and 120,000 pounds of fish caught in the Gulf of Mexico in 1956 were landed in the subbasin. For the same period, over 350,000 pounds of buffalofishes, carp, and catfishes were taken from streams and reservoirs in the subbasin. Anticipated population increases will result in greater demands for both fresh-water and marine commercial fishes. The demands for fresh-water commercial species can be met through more intensive use of existing waters.

Problems

28. Pollution is one of the greatest factors affecting the fishery resources in the Brazos River Subbasin. Soil erosion

results in about 35 million tons of silt being carried annually by the Brazos River. Oil wells, municipalities, refineries, petroleum-processing plants, chemical plants, dairy product plants, cheese plants, rendering and soap plants, canneries, and textile mills are sources of pollution. In the headwaters, severe mineral pollution from natural sources also is a problem.

29. Access to most streams and reservoirs in the sub-basin is a problem as it is on many streams and reservoirs in the State. On some reservoirs and reaches of streams, payment of a fee or landowner permission is required to fish. In other instances, use of the streams or reservoirs is restricted to membership groups.

30. Demands for reservoir-type fishing are great in the lower portion of the subbasin where public fishing facilities are lacking. People of the area must travel long distances to fish reservoirs or to participate in marine or stream fishing.

31. Drainage of brackish-water marshlands for agriculture and industrial and municipal expansion has reduced the larval shrimp and young fish habitat which is required in the life cycle of these animals. These areas are abundantly rich in food organisms, provide protection against many predatory animals, and serve as nurseery grounds for fish and shellfish.

32. Maintaining a balanced population of sport and rough fishes in reservoirs, lakes, and ponds is the most difficult

management problem affecting the fresh-water fisheries.

33. Construction of reservoirs on the mainstem of the Brazos River would destroy valuable stream fishing habitat and create a hardship on stream fishermen who prefer float fishing.

34. Future upstream demands upon the flows of the Brazos River may result in an increase in salinity levels near the coast to the extent that a valuable marine fishery could be destroyed.

Solutions

35. Through education and more stringent pollution legislation, industrial and municipal wastes can be prevented from entering streams. Sewage plant construction and renovation of existing sewage disposal units would reduce stream pollution from this source. Oil well wastes can be injected into underground strata, and other industrial wastes can be processed free of toxic materials before releasing wastes into streams. Adequate soil conservation measures to keep the topsoil on the land and out of streams would reduce the amount of silt carried by streams and result in better fish habitat. This would also reduce the amount of silt which is carried into the Gulf of Mexico, some of which is redistributed into the bay areas.

36. Providing facilities for public use of streams and construction of Federally authorized reservoirs would provide adequate fishing opportunities and solve fishing access problems in the subbasin.

37. A good fishing reservoir in the general vicinity of Allen's Creek in Austin County with adequate free, public access facilities would go far in solving the existing and future fresh-water fishing demands in the lower subbasin.

38. An adequate inflow of fresh water into estuarine areas must be maintained in order to preserve the valuable marine fishery of the lower Brazos River and the Gulf Coast.

39. Public ownership of marshland habitat which is valuable for larval shrimp and young fish would preserve the nursery and feeding grounds of these animals and also provide habitat for waterfowl.

40. A solution to an overpopulation of fresh-water fishes would be the use of surplus populations in processing animal foods, fertilizers, and utilization as food for human consumption. However, a more effective solution to reservoir overpopulation would be to determine methods of controlling overpopulations and maintaining a population balance favoring desirable species.

WILDLIFE SECTION

Inventory

41. Big-game animals in the subbasin are white-tailed deer, mule deer, antelopes, and javelinas. Approximately 80 percent

of the 3,800,000 acres of deer habitat are occupied by about 60,000 white-tailed deer. Their greatest population density occurs in the Coastal Prairie game region where there is ~~an~~ *an average of .033 deer per acre*. The lowest population density is on the Blackland Prairie game region where there is ~~about~~ *.005 deer per acre*. About 250 mule deer range in the southern parts of Garza and Kent Counties. The small antelope population of about 650 animals is more prominent in the Rolling Plains game region; however, small groups occur on the A. P. George Ranch in Fort Bend County and in the Erath-Somervell-Bosque area. Javelinas have not increased sufficiently to be significant. About 25 javelinas were stocked in Garza County, and their population has not increased. They have increased in numbers on the A. P. George Ranch where hunting is not permitted.

42. About 50 percent of the 3,800,000 acres of turkey habitat are occupied by about 13,000 wild turkeys. The greatest concentration is in Shackelford, Throckmorton, and Haskell Counties where about 60 percent of the turkeys occur. Most of the other turkeys are in the Rolling Plains, West Cross Timbers, and Grand Prairie game regions.

43. Approximately 1,250 Attwater's prairie chickens are in Austin, Colorado, Wharton, Waller, and Brazoria Counties. Most of the prairie chickens are in an area near the Colorado-Wharton

County line. Only 250,000 acres of habitat still remain, of which 65 percent is occupied by prairie chickens.

44. Bobwhites, mourning doves, fox squirrels, raccoons, opossums, gray foxes, and snipes occur throughout the subbasin. Bobwhites are most abundant in the Grand Prairie, Rolling Plains, and Coastal Prairie game regions and on small farms in the East Texas Timber Country game region. Their population is estimated to be 800,000 birds, or about one-third of the Gulf Basin total. Scaled quail occur in the upper part of the subbasin, and their population is estimated to be 79,000. The most abundant game species are mourning doves which occur throughout the subbasin.

45. There are 3,800,000 acres of squirrel habitat of which 3,450,000 acres are upland habitat with a population of 860,000 squirrels. Bottom-land habitat amounts to 350,000 acres, and it has a population of 117,000 squirrels. The greatest populations of fox and gray squirrel occur in the lower portion of the subbasin. There are 19,800,000 acres of habitat for cottontails, 12,700,000 acres for jackrabbits, and 86,000 acres for swamp rabbits. Jackrabbits are more common in the northern part of the subbasin and cottontails and swamp rabbits in the southern part.

46. Raccoons and opossum are abundant and occupy about 10,850,000 acres of habitat. Gray foxes are abundant in the lower

half of the watershed. Red wolves are scarce and are found in the southern and central portions of the watershed. Coyotes are found in the northern and western portions of ~~the watershed~~ *the subbasin.*

~~Bobcats are abundant in the extreme upper and lower portions of the subbasin. Snipes and woodcocks occur only in the southern and eastern portions of the subbasin. Pelicans, herons, ibises, cranes, terns, and gulls are the principal birds along the coast.~~

47. Minks are the most important fur animals, and except in Wharton County where their population is estimated to be about 2 minks per mile of rice-irrigation canals, their population is low and estimated at ~~one mink per mile~~ *.20 mink per mile* of stream habitat. Raccoons, opossums, and skunks are the most abundant fur animals and occur throughout the subbasin. Ring-tailed cats are scarce and are found in the lower portion of the watershed. Badgers, beavers, and muskrats are scarce and of insignificant importance. Nutrias have become so abundant on Eagle Lake in Colorado County that they have destroyed waterfowl habitat and are now considered pests.

48. There are 575,000 acres of waterfowl habitat in the Brazos River Subbasin consisting of rice fields, shallow fresh marshes, farm ponds, reservoirs, lakes, streams, bays, coastal fresh and salt marshes, and coastal meadows. Approximately 264,000 acres are of high value, 222,000 acres of moderate

value, and 89,000 acres of low value to waterfowl. The most important areas are rice fields and shallow fresh marshes.

49. Based on censuses, about 855,000 waterfowl use the Brazos River Subbasin chiefly during fall and winter months. Principal waterfowl are pintails, mallards, lesser scaups, baldpates, shovelers, blue-winged and green-winged teal, gadwalls, redheads, canvasbacks, mottled ducks, fulvous tree ducks, snow geese, blue geese, wood ducks, and coots. Mottled ducks and fulvous tree ducks nest in tall grass close to ponds and sloughs in the coastal prairie counties. Wood ducks nest in the timbered bottoms of the Brazos River downstream from Whitney Reservoir and the Navasota River.

Use

50. About 15 percent of the subbasin is deer habitat, and about ⁸⁰ percent of that habitat is occupied by deer. The human population density of the subbasin is 25 persons per square mile; moreover, the cities of Houston, Dallas, and Fort Worth lie within 80 miles. Based on the Crossley Survey report and the estimated subbasin population, the existing demands for big-game hunting of 228,300 man-days annually far exceed the estimated 61,000 man-days expended in the subbasin. As a result many hunters in the subbasin apply for permits to deer hunt on State management areas

near Kerrville, Marathon, and Palestine, Texas. Others go outside the subbasin to hunt. As is the case with deer hunting, the demands for turkey hunting far exceed the hunting opportunities. At present, there is no open season on pronghorn antelopes because of their limited distribution and sparse population. The increased demand for big-game hunting and rapidly increasing human population will result in a demand for 725,000 man-days of big-game hunting in the year 2010.

51. The demand for hunting upland-game species such as quail, doves, squirrels, and rabbits is great. Based on the Crossley Survey there is a demand for about 862,000 man-days of hunting in the Brazos River Subbasin. With a rapidly expanding human population and increasing interest in this type of hunting, this demand will increase to over 2,600,000 man-days in 2010.

52. Although bobwhites are widely distributed, their population is so low that hunting opportunities do not meet the demands in all but a few counties. Hunting opportunities are presently adequate for scaled quails but are not expected to be adequate in the future.

53. Interest in mourning dove hunting is high, and there are usually enough birds to adequately meet the demands. In the future, the demands generally will be met.

54. Squirrel populations in the upper half of the subbasin are insufficient to meet hunters' demands. On the lower portion of the subbasin squirrels provide good hunting. Increasing human populations will result in a need for additional squirrel hunting opportunities.

55. Rabbit hunting has not been as popular with sportsmen as deer, squirrel, or quail hunting. Owing to declining populations of other game species, an increase in rabbit hunting is occurring. The rabbit population is considered adequate to take care of present and future demands.

56. Opossums and raccoons are sufficiently common to more than meet the demands of the relatively few hunters, most of whom hunt raccoons at night with dogs. Fox, coyote, wolf, and bobcats are frequently hunted for sport and bounties are paid on one or more of these species in several counties. In a few localities, ring-tailed cats are hunted for sport. The amount of sport hunting provided by these species varies from place to place, but these animals are numerous enough to meet the demands of those who pursue them.

57. Minks and muskrats are the most sought fur animals wherever they occur, although they are far less numerous than some of the others whose pelt value is much lower. Inasmuch as fur trapping provides only supplemental incomes and is not of economic

importance to any community in the subbasin, it is not considered to be of major importance.

58. The Coastal Prairie Region of the subbasin comes the nearest to filling the demands of duck and goose hunters, although waterfowl hunting is occasionally good on inland reservoirs and farm ponds. Despite some fair-to-good hunting, the demands for waterfowl hunting far surpass the available opportunities. The Crossley Survey showed a demand for 154,200 man-days of waterfowl hunting annually in the Brazos River Subbasin. As is the case with other types of hunting in the basin, the demand for waterfowl hunting will greatly increase as a result of an increasing human population, increased leisure time, and increased interest in hunting. The demand for waterfowl hunting is expected to be 459,000 man-days in 2010.

59. Table 7 contains data showing present and future big-game, upland-game, and waterfowl hunting use in the Brazos River Subbasin.

Table 7 - Big-Game, Upland-Game, and Waterfowl Hunting
in the Brazos River Subbasin

	Man-Days		
	<u>1955</u>	<u>2010</u>	<u>1955 to 2010 Average</u>
Big-Game	228,300	725,000	477,000
Upland-Game	862,100	2,603,000	1,733,000
Waterfowl	154,200	459,000	307,000
Total	1,244,600	3,787,000	2,517,000

Problems

60. The quality of deer habitat in the subbasin is generally considered fair to poor due principally to excessive stock grazing. The drought of 1950 to 1957 further deteriorated the range. The future prospects for deer rehabilitation is dismal because habitat is continually being destroyed through timber clearing for additional grazing lands. The West Cross Timbers game region supports the greatest deer populations, but this herd frequently causes depredations on peanut, melon, and truck crops. Bosque, Stephens, and Jack Counties have overpopulations of deer for the quality of range. Much of the deer range is closed to hunting and those areas that are open receive so much gun pressure that hunter success is low. Many landowners do not permit hunting or limit hunting to their families and friends. This results in an underharvest of deer thereby perpetuating overpopulations and poor growth and reproduction.

61. There is little likelihood that antelope hunting will become a reality in the subbasin unless the herds are increased in numbers. Antelopes do not do as well on sheep range as on cattle range, and it is problematical if their population can be increased to huntable numbers.

62. Problems associated with wild turkeys are similar to those encountered by white-tailed deer. The expansion of rice,

cotton, corn, and grain sorghum acreages has eliminated most of the Attwater's prairie chicken coastal habitat of native prairie grasses. Excessive grazing on drought-stricken pastures has added to the acreage from which these birds have been forced. Bobwhites and scaled quails also have suffered from drought and excessive livestock grazing. Bobwhites also have lost habitat as a result of clean, intensive farming practices and brush removal on pastures and ranges.

63. Although the squirrel population in the lower portion of the subbasin is adequate to meet the hunters' demands, it is likely the day will soon arrive when the demand will exceed the supply. Bottom-land clearing, upland brush eradication, and over-hunting are factors contributing to the decline of the squirrel population. Squirrels are sometimes serious pests in pecan groves, and many farmers wage a constant war on these animals.

64. Ricelands and marshes in Brazoria and Fort Bend Counties winter the greatest concentration of waterfowl and furnish considerable amounts of hunting opportunities. But here, as elsewhere, the opportunities do not meet the demand, due to restrictions on hunting imposed by landowners. Ricelands provide ample waste grain for waterfowl when the fields are not dry, but the lack of quality marshes may be an important obstacle to greater waterfowl use of the Coastal Prairie portion of the subbasin. Inland, absence of favorable habitat on and around reservoirs and lakes results in

the inability of most of these waters to hold ducks during migration more than a few days. Industrial and municipal expansion and drainage for crops and pastures are rapidly reducing the marsh areas of the Coastal Prairie.

Solutions

65. Formulating better sportsmen-landowner relationships to permit more hunting and harvest will for the most part resolve problems created by overpopulations of deer. Where deer populations are being reduced by livestock competition or destruction of habitat, an educational program should be designed to show landowners' benefits which could be realized by reducing livestock competition and by selective timber clearing. Where depredation is a problem it may be profitable for some large peanut and truck-crop growers to convert their less valuable lands into deer hunting preserves.

66. Better grazing management on timbered and brushy ranges and leaving a good distribution of mast-producing trees will contribute materially toward increasing wild turkey populations, but at best the demand for turkey hunting will continue to exceed the hunting opportunities.

67. Improving present native pastures and restoring additional grasslands would increase the Attwater's prairie chicken population but not to the extent of providing a huntable population. Landowners can receive assistance through the Soil Bank Program in returning cultivated lands to grasses. Existing

native pastures, when used in accordance with soil conservation practices, have resulted in an increase in numbers of this native grouse.

68. Although the intensively farmed Blackland Prairie may never support more than a small bobwhite population as compared to other less intensively farmed lands or good rangelands, there are many waste spots on many farms which, if properly developed, would contribute materially to local quail populations. Grassland management and quail management practices on ranges and native pastures, such as creating properly spaced islands of food and cover, would increase quail populations. This is needed particularly on mesquite ranges where even partial clearing reduces bobwhite populations. On ranges heavily covered with post oaks, quail populations will benefit from a limited amount of clearing. Besides encouraging landowners to retain some of their squirrel habitat, there appears to be no feasible solution to prevent habitat destruction.

69. Undertaking marsh development projects on the Coastal Prairie would make that area more attractive to waterfowl. Coastal rangelands could also be improved for waterfowl, especially for mottled ducks, by eliminating or reducing grazing around natural ponds and by restoring drained ponds. Provisions for adequate

fresh-water flows into estuarine areas should be made to preserve valuable waterfowl habitat in bay areas of the Gulf Coast.

70. Were it possible to control water levels for waterfowl food production in public reservoirs, use of the areas by waterfowl would be greatly increased. Since this may be impossible to accomplish, an alternative plan would be to explore the feasibility of creating subimpoundments on tributary streams immediately upstream from large reservoirs. The water level of the subimpoundments would be controlled to provide a maximum duck-food production. A refuge in the lower Coastal Prairie region would preserve some important waterfowl areas and possibly create a public hunting area.

71. With the high demand for places to hunt waterfowl, it should be profitable for rice farmers to shallow flood all or portions of rice-stubble fields for seasonal hunting leases or for day-hunting leases. Hunter control should be exercised or the birds will be overhunted or forced out of the area. Farmers who wish to do a little private shooting or who merely want to assist waterfowl without the expense of pumping water can plug rice-field drains so as to impound rainwater. If they do not want to drown out grazing land, drains can be partially closed so that rainwater does not remain on the field long enough to destroy its value for grazing.

SUMMARY

72. Fresh-water and marine fisheries of importance occur in the Brazos River Subbasin. There is high-quality stream fishing in the Brazos River downstream from Possum Kingdom Dam. Except for the lower portion of the subbasin, reservoir-type fishing is well distributed and meets present demands. Future reservoir demands can be met by construction of reservoirs in the upper and lower portions of the subbasin. Marine fishing demands are not fulfilled by the estuarine and Gulf waters in the subbasin. Pollution and lack of adequate access facilities are major factors affecting proper production and use of the fishery resources.

73. Limited and poor-quality habitat, unduly restricted hunting on many private lands, poor access, overgrazing, and elimination of habitat by clearing or drainage have been detrimental to wildlife populations and prevented hunters' interests from being fully satisfied. Acquisition and management of lands for waterfowl and for mitigation of other wildlife losses created by reservoir construction, and improved land use on private lands will partially solve the problems associated with wildlife.



Legend

1. Sabine Sub-Basin
2. Neches Sub-Basin
3. Trinity Sub-Basin
4. San Jacinto Sub-Basin
5. Brazos Sub-Basin
6. Colorado Sub-Basin
7. Lavaca-Navidad Sub-Basin
8. Guadalupe-San Antonio Sub-Basin
9. Mission Sub-Basin
10. Nueces Sub-Basin
11. Los Olmos Sub-Basin

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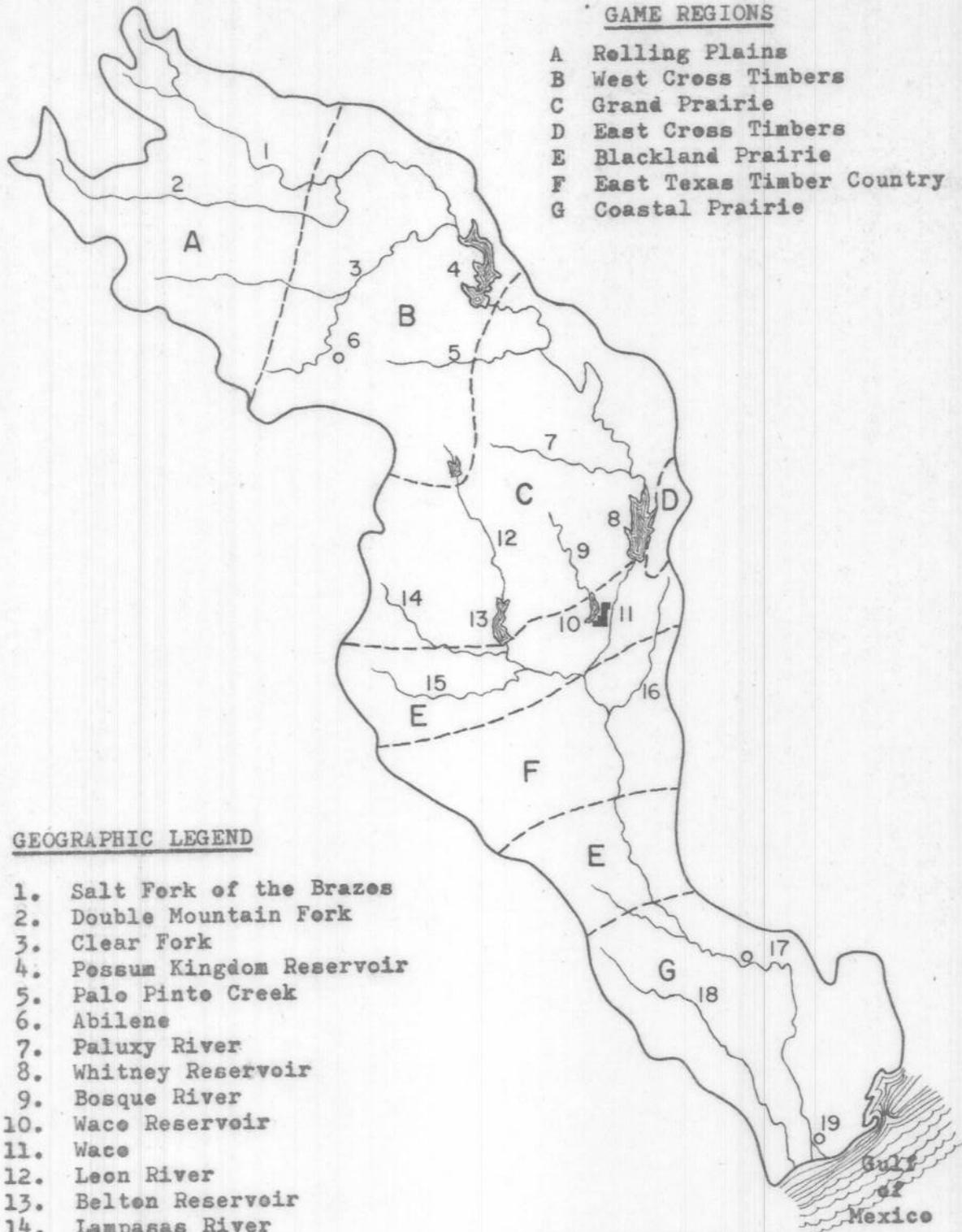
GULF BASINS OF TEXAS

ALBUQUERQUE, NEW MEXICO REGION 2

DATE: March 15, 1960 PLATE I

GAME REGIONS

- A Relling Plains
- B West Cross Timbers
- C Grand Prairie
- D East Cross Timbers
- E Blackland Prairie
- F East Texas Timber Country
- G Coastal Prairie



GEOGRAPHIC LEGEND

- 1. Salt Fork of the Brazos
- 2. Double Mountain Fork
- 3. Clear Fork
- 4. Pessum Kingdom Reservoir
- 5. Pale Pinte Creek
- 6. Abilene
- 7. Paluxy River
- 8. Whitney Reservoir
- 9. Bosque River
- 10. Waco Reservoir
- 11. Waco
- 12. Leon River
- 13. Belten Reservoir
- 14. Lampasas River
- 15. San Gabriel River
- 16. Navasota River
- 17. Richmond
- 18. San Bernard River
- 19. Freeport

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BRAZOS RIVER SUB-BASIN

ALBUQUERQUE, NEW MEXICO

REGION 2

DATE: July, 1960

PLATE II