PRELIMINARY WORK PLAN
For Runoff and Waterflow Retardation
and Soil Erosion Prevention
BRADY CREEK WATERSHED
Of the Middle Colorado River Watershed
TX-SCD's 98 and 34 MC No. 10
Revised December 1953

DESCRIPTION OF THE WATERSHED

Brady Creek rises approximately ten miles west of Eden, in Concho County, Texas, and flows in an easterly direction through Concho, McCulloch, and San Saba counties for a distance of approximately 93 stream miles, entering the San Saba River approximately ten miles south and slightly west of Richland Springs, Texas. The major tributaries are Little Brady, Onion, and Reubes Creeks; South Fork of Brady; Hardin and Maverick Branches. The watershed varies from 9 to 17 miles in width, averaging 13 miles. Four towns lie within the watershed; Brady, the county seat of McCulloch County, and Rochelle are in the eastern part, Melvin in the central, and Eden in the western part of the watershed. Several small community centers and railroad switches are located throughout the watershed. Ther are 550 miles of roads of which 110 miles are hard surfaced.

The watershed has an area of 846 square miles, or 541,500 acres, of which 534,872 acres are in farms and ranches. The remaining 6,628 acres are in urban areas, roads, and miscellaneous uses. The bottom land areas include 28,353 acres of flood plain and 5,983 acres of stream channels. Al of the flood plain was covered by the July, 1938 flood.

Soils and Land Use

The Brady Creek watershed lies entirely in the Edwards Plateau Problem Area in Soil Conservation. The soils are predominantly fine textured and range from very shallow on the escarpments and hilly areas to deep and medium depth soils in the stream valleys. The bottomlands, especially of Brady Creek proper, are intensively utilized for the production of cultivated crops. Approximately 57 percent of the bottomlands are in cultivation. Of the 534,872 acres of ranch and farm lands 106,629 acres are cultivated and 428,243 acres are in range and pasture.

Geology and Topography

The Brady Creek drainage area lies partly on the Edwards Plateau, and its lower section skirts the north boundary of the Llano Basin. The higher, flatter part of the drainage area in Concho County occupies the upland developed on the Edwards limestone of lower Cretaceous age. In central McCulloch County the margin of the plateau has been deeply notched by erosion along the main valleys. Hence, along the main drainage lines the valleys are characterized by limited bottoms and rugged bluff-like slopes.

A wide variety of rock formations, ranging in age from Cambrian to lower Cretaceous, occur in the Brady Creek drainage area. Most of them are well indurated and relatively resistant. Consequently erosion has produced rugged, bluff-like valley rims, irregular spurs and promontories, and canyons along some main streams. From Eden eastward erosion in Brady Creek valley has carved through the plateau limestones, including the Edwards formation and the underlying Glen Rose limestone. Outcrops in the valley include Permian limestones and red shales, Pennsylvanian sandstones and shales with some interbedded limestones, lower Pennsylvanian and Mississippian shales and marbles and Cambro-Ordovician limestones. The latter formation, the Ellenburger limestone, occurs only in very limited outcrops outside of the Llano Basin area. Most of the formations except the younger Pennsylvanian strata west of Brady have been somewhat affected by faulting, channeling and solution by ground water so that springs occur along the bluff lines and in the canyons. The quality of the ground water is generally good.

The topography ranges from rolling to hilly with narrow bands of gently rolling to nearly level land in the larger stream valleys. The watershed is well drained and has local relief of 50 to 200 feet. Most of the tributary drainage systems are deeply incised, especially near the outer edge of the watershed. The lower stream channel of Brady Creek, from about one mile east of Brady to its confluence with the San Saba River, flows in a gorge section. In the central section the floodplain ranges from one-half to one mile in width.

Climate

The climate is temperate and dry sub-humid. It is characterized by erratic distribution of rainfall, moderate winters with sudden changes in temperature, and long summers. The average minimum temperature for January is 33.4 degrees Fahrenheit, and the average maximum temperature for July is 95.2 degrees. However, temperatures as low as 2 degrees below zero and as high as 109 degrees above zero have been recorded. The average frost-free period of 233 days extends from March 26 to November 14, although frost has occurred as late as April 30 and as early as October 19.

The average annual precipitation in the watershed is approximately 25 inches, but the annual rainfall has varied from 11 to 49 inches. Precipitation is generally greatest during the spring and fall months and least during the winter months. An insignificant portion of the precipitation occurs as snow. The seasonal distribution of rainfall is generally favorable for farming since approximately 78 percent of the rainfall occurs during the frost-free period. Evaporation studies indicate that the mean annual rate of evaporation from free water surface is approximately 60 inches with 65 percent occurring during the growing season.

Water Resources

Surface runoff is the principal source of water for livestock; however, many ranchers and farmers use well water for domestic and livestock uses. Most of the wells range from 100 to 350 feet in depth. The water thus obtained is of good quality. Brady Creek and its main tributaries have intermittent water holes which supply stockwater through the major part of the year. The cities of Brady, Eden and Melvin obtain their water supply from deep wells. Numerous springs that flow continuously are found in the gorge section of Brady Creek below Brady and in the lower portions of its tributaries in that area.

ECONOMY OF THE WATERSHED

Agricultural Economy

The approximate numbers of livestock in the watershed, based on the U. S. Department of Commerce Agricultural Census for 1945, are 27,801 beef cattle, 1,086 dairy cattle, 183,717 sheep, and 30,210 goats.

The major crops grown within the Brady Creek watershed are cotton, grain sorghum, wheat, oats, barley, corn, and hay. There are some clover, austrian winter peas and vetch grown as soil improving crops, as well as some plantings of flax as a cash crop. Nearly all crops increased in acreage during the period 1940 to 1945, with the exception of cotton, where a 35 percent decrease in acreage occurred. The wheat acreage increased almost 400 percent.

The Brady Creek watershed is served by four Soil Conservation Service work units which are assisting the Concho and San Saba-Brady Soil Conservation districts. These work units have assisted farmers and ranchers in preparing 240 conservation plans on 209,756 acres. More than 50 percent of the major planned land treatment measures have been applied. Where recommended land treatment measures have been applied and maintained for several years, crop yields have increased 25 to 30 percent.

Urban and Other Influences

Brady, the county seat of McCulloch County, and Eden in central Concho county are important shipping points for cotton, wool, mohair, cattle, and other commodities. Industries in Brady include two cottonseed mills, a cotton compress, cheese factory, creamery, feed mill and mattress factory. Other markets and shipping points are Rochelle in east McCulloch County and Melvin in the western portion of the county.

The 550 miles of roads provide the rural areas with adequate outlets in dry weather. However, many areas are inaccessible during prolonged periods of precipitation. The Santa Fe Railroad provides ample loading facilities for carload lot shipments with switches at Rochelle, Brady,

Melvin, Whiteland, Marco, Pasche, and Eden. The railroad entering the watershed north of Rochelle is a branch line from Lometa, Texas to Menard with a spur running into Eden from Whiteland. A connecting branch line extends from Brady to Brownwood.

FLOOD PROBLEMS AND DAMAGES

Brady Creek has flooded frequently and caused high annual damage. During the 20-year period 1923 to 1942 inclusive, there were 8 floods which covered more than one-half the 26,330-acre flood plain considered in this report. Four of the larger floods occurred during the spring months, causing great damage to young growing crops. Four floods occurred in the early fall prior to harvest and too late for planting of alternate crops, thus destroying the entire crop for that season. Damages caused by the July, 1938 flood were estimated to be as follows:

Direct Damages		
Crop and Pasture		$ 532,495
Other Agricultural		320,096
Roads, Bridges, and Railroads		45,880
Other Non-agricultural		198,200
	Sub-total	$1,096,671
Indirect Damages		119,577
	Total	$1,216,248

FLOOD CONTROL ACTIVITIES

The Corps of Engineers has made several surveys in and around Brady in the interest of flood damage reduction. However, at the present time no projects are pending approval or adoption. The City of Brady had constructed a flood wall prior to 1938 which was ineffective against the July, 1938 flood. At the present time there is a city-sponsored channel improvement program within the Brady city limits.

LAND TREATMENT ACTIVITIES

During the past four years 19 neighbor groups of farmers, with membership wholly or partially within the watershed, have been planning and applying land treatment measures with the technical assistance made available by the local soil conservation districts.

HYDRAULIC AND HYDROLOGIC INVESTIGATIONS

From a graph showing cumulative departures from normal precipitation, the rainfall series for the period 1923 to 1942 inclusive was selected as most representative for the Brady Creek area. Rainfall information

used in these studies was obtained by applying the Theissen polygon method of weighting to the rainfall data from the Brady, Rochelle, San Saba, and Eden stations. One rain of 15.48 inches, which fell in an 8-day period, was not considered, since its expected frequency of occurrence was much less than once in 20 years. However, much of the historical information of flood damages obtained from landowners was related to this storm.

The design storm would produce 4.62 inches of runoff from the watershed under present conditions. Runoff of this magnitude is expected to occur no more frequently than once in 25 years, and this value was used in determining minimum floodwater detention storage requirements. From a study of the rainfall-runoff relationships of this watershed, it was found that a rain of 1.20 inches, occurring within a two-day period, was the minimum which would cause damage-producing floods at the smallest channel section. Therefore, no rains of less than this amount were considered for flood routing purposes.

The largest rain considered in the 20-year period was one of 7.72 inches, which produced 1.56 inches of runoff. Under present conditions 26,330 acres of the flood plain would be flooded by the runoff from this storm. If such a rain were to occur after land treatment practices and measures had been applied, it is estimated that the area inundated would be reduced to 25,775 acres. These figures are based on the entire flood plain area. With land treatment measures applied and the proposed floodwater retarding structures and floodways in operation, 5,550 acres exclusive of areas within the detention and permanent pools and floodways would be flooded as a result of this storm. Approximately 533 acres of the flood plain would lie within the permanent pools of the proposed floodwater retarding structures, and 1467 acres within the detention pools for a 25-year storm frequency. An additional 1736 acres would lie within the floodways.

The channel capacity of Brady Creek at valley section B-28 is 103,000 cubic feet per second. This section is located approximately 0.43 mile above the confluence of Brady Creek with the San Saba River and has a drainage area of 538,836 acres. This is a gorge section. The peak discharge at this point for a 7.72-inch rain under present conditions would be 82,600 cubic feet per second. The discharge would be reduced to 44,000 cubic feet per second by the proposed system of floodwater retarding structures.

SEDIMENTATION DAMAGES

Soil erosion in the Brady Creek watershed is moderate. Sheet erosion is the dominant process with minor gully erosion occurring on some of the steep cultivated slopes. However, much of the eroded material is being deposited on the gentle slopes at the base of the steeper land.

The principal sedimentation damages in the watershed are as follows: (1) overbank deposition, (2) channel filling, and (3) accessory damage. Other related damages encountered within the flood plain are: (1) flood plain scour, and (2) channel enlargement in the upper reaches of the drainage system.

Overbank Deposition

Overbank deposition has occurred on approximately 300 acres of flood plain lands in the central reaches of the main stem of Brady Creek. The deposits range from a few inches to about one foot in thickness and are generally in the form of uniform valley-wide accumulation. Reconnaissance investigations of the Brady Creek drainage system in 1950 revealed only minor damages resulting from valley deposition.

Channel Filling

The deposition of bed load sediment in the stream channel has been slight. The net reduction in channel capacity is insignificant. Some gravel and sand bars occur in the stream channels and cause flooding and increased flood heights during peak floods.

Accessory Damages

Damages caused by the deposition of fine textured sediment (silt and clay) on field crops and pasture grasses and in urban areas (Brady, Texas) have been of considerable magnitude. These damages were measured in terms of crop damage and the cost of sediment removal, respectively, and are included under floodwater damages. Accessory damages to buildings, machinery, and city streets were especially high for the July, 1938 flood on Brady Creek.

Sediment Output Rates

The present sediment output rates range from 0.1 to 1.0 acre-foot per square mile of drainage area. These rates are based on data from surveys of reservoirs located in similar areas. In estimating the present sedimentation rates for the proposed floodwater retarding structures, adjustments were made for (1) size and shape of the watershed, (2) present erosion rates on the cultivated and pasture lands in the watershed, and (3) the location of the areas of high sediment production with reference to the structure sites.

OTHER RELATED FLOOD PLAIN DAMAGES

Flood Plain Scour

Damage by sheet scouring to the flood plains of the Brady Creek watershed has affected 3,843 acres 15 to 40 percent. Scour channels generally are not continuous, but affected areas are found throughout the

stream valleys. The channels average 1 to 3 feet deep and usually have gently sloping sides. These scour channels remain wet longer after rains than the uneroded bottomland. A total of 280 acres has been damaged 25 to 50 percent by scouring. Of the total area affected, about 80 percent is cropland.

Channel Enlargement

Lateral bank erosion on the channels within the flood plains of Brady Creek drainage system is very slight. However, some minor bank erosion is occurring in the small headwater tributaries.

The average annual monetary sedimentation and flood plain scour damages are summarized in Table 1.

FLOOD DAMAGES

Flood damage information on the flood plain of Brady Creek was obtained from landowners and operators on 40 percent of the flood plain lands. Most of the information as to amount and extent of damage referred to the July, 1938 flood. Other information obtained included land use, crop yields, property damage which would result from a major flood, and general flood problems. All damages were computed on the basis of present values and prices.

Information concerning flood damages to roads and bridges was obtained from county highway officials and landowners living adjacent to areas where the damage occurred. Information concerning railroad damages was obtained from officials at the division headquarters. Basic information concerning non-agricultural damage other than to roads, bridges, and railroads was taken from Table 6B of the appendix of the original survey report on the Middle Colorado River watershed, and adjusted to present conditions.

Damage rates obtained from the July, 1938 flood and others were adjusted on the basis of relationships found from surveys of other watersheds of similar characteristics to indicate damage rates to be expected from floods of various depths and seasons. These rates were multiplied by acres flooded by each flood, by depth and season in the evaluation series. Damage figures were then adjusted for the recurrence of flooding. Flood plain areas lying within pool limits of proposed floodwater retarding structures and floodways were excluded from all benefit calculations.

The total direct floodwater and sediment damages are estimated to average $216,213 annually under present conditions, of which $117,998 is crop and pasture damage. These figures are based on the entire 26,330-acre flood plain area. After excluding the area of flood plain inundated by the proposed floodwater retarding structures, the average annual direct damage would be $201,613, of which $109,896 is crop and pasture damage.

In addition to the above, there are numerous indirect damages such as loss of travel time waiting for low water bridges to clear, depreciation in property values within the flooded area, and similar items including indirect damage to urban areas. Ten percent of the total annual value of the direct damages, or $20,161, was taken as a conservative evaluation of the annual indirect flood damages. The average annual monetary floodwater damages are summarized in Table 1.

THE REMEDIAL PROGRAM AND ITS EVALUATION

Land Treatment Measures Needed

Land treatment measures needed include seeding approximately 3,300 acres of retired cropland with perennial grasses. Range improvement is needed on approximately 284,826 acres.

Approximately 3,460 miles of terraces need to be constructed on all upland cultivated areas to assist in the control of sheet and gully erosion and to reduce the sediment load of the streams. About 600 acres of vegetated farm waterways are needed to carry concentrated runoff from these terrace systems.

Other land treatment measures needed include approximately 150 miles of farm diversion terraces, 600 farm ponds, 400 miles of fencing to enclose newly seeded and retired cropland areas, and conservation crop rotations on 60,171 acres of cropland.

The estimated cost of installing these measures is $1,803,408, and the annual cost, including installation and maintenance, is $117,102. These estimates are based on the entire watershed area. Approximately 20 percent of the needed land treatment practices have been applied through the soil conservation district program.

Structures and Measures for Runoff and Waterflow Retardation

The runoff and waterflow retarding structures and measures needed to provide flood protection for flood plain lands and highways traversing the flood plains are listed in Table 2, items 1 to 6, inclusive. A system of 46 floodwater retarding structures is needed to protect the flood plain lands along Brady Creek and its tributaries. The proposed system of structures and their drainage areas are shown on the Work Plan Map. Descriptive information concerning the proposed structures is summarized in Table 5.

The system of floodwater retarding structures will retard the runoff from 57 percent of the watershed lying above valley section B-14. The area below section B-14 is in rough and rolling range land, and the channel is a rocky gorge from this point to the San Saba River. Sufficient storage can be provided at all structure sites to make possible

the use of vegetated emergency spillways. As indicated it will be neoessary to raise or relocate portions of county roads which cross the pool areas of the proposed floodwater retarding structures.

Floodways are needed to protect additional areas of the flood plain where the stream ohannels are too small to carry the release rate from the floodwater retarding structures plus runoff from uncontrolled areas. The existing floodway through the city of Brady should be adequate to carry runoff from the watershed if properly maintained and the proposed system of structures and floodways are constructed.

Effect of These Measures on Damages and Benefits

The combined program described above would eliminate flooding from 10 of the 76 damage-producing storms such as occurred in the 20-year period 1923 to 1942 inclusive. The remaining floods would be reduced to the extent that total flooding would be reduced from an average of 15, 391 acres to 2,530 acres annually and cause an estimated average annual damage of only $30,659. An average of only 528 acres annually would be flooded to a depth of more than three feet, exclusive of the area within the floodways. Most of the expected reduction in annual flood damages would be effected by the system of floodwater retarding structures. The annual value of the reduction in flood damages attributable to these structures is estimated to be $139,507 out of a total of $191,115 from all measures, while the annual value of the reduction of flood damages attributable to floodways is estimated to be $34,195. (See Table 1.)

Farmers and ranchers who own flood plain land indicate that if flooding were reduced materially, about 20 percent of the bottomland now in pasture would be used to grow field crops. It is estimated that this more intensive use would increase the net income from the land by $55,320 annually.

The total flood plain benefits, including both the reduction in flood damages and benefits from more intensive use of the flood plain lands, are estimated to be $246,435 annually. In addition it is estimated that the benefits to the landowners and operators in upland areas of the watershed from the application of land treatment measures would be $564,007 annually. The expected benefits from the combined program would amount to $810,442 annually, as shown in Table 4.

The expected land treatment benefits were determined by estimating the increased net income to the land which would result from the application of the needed land treatment measures and practices. It was assumed that the proportion of the cropland used for each crop would not change. The total area used for cropland would be decreased by the retirement of steep and severely eroded areas to pasture. It was assumed that there would be no change in the percentages of the various types of livestock,

although the total number would change because of the increased acreage of pasture and the greater per-acre pasture carrying capacity to be expected from the application of land treatment measures. The estimated increase in annual net income is $469,371 from cropland and $94,636 from pasture, or a total of $564,007 annually.

Comparison of Costs and Benefits

The ratio of the average annual benefits from detention storage, $183,163, to the average annual cost of the structures and the appurtenant structures for their protection, $124,334, is 1.47:1.

The ratio of the average annual benefit from floodways, $45,859, to their average annual cost, $24,343, is 1.88:1.

The ratio of the average annual benefit from land treatment measures, $581,420, to their average annual cost, $117,102, is 4.96:1.

The ratio of the total average annual benefit, $810,442, to the total average annual cost, $265,789, is 3.05:1.

ANNUAL MAINTENANCE

The estimated annual maintenance costs after the recommended program has been installed are shown in Table 3.

It is expected that the runoff and waterflow retarding structures will be maintained by the benefited farmers under an agreement with the soil conservation district which carries the responsibility for maintenance. Group organizations of farmers and ranchers will be developed for this purpose. The land treatment measures will be maintained by the landowners or operators of the farms on which the measures are installed.

Table 1
Summary of Average Annual Monetary Floodwater and Sediment Damage and Waterflow Retardation Benefit from the Recommended Program 1/
BRADY CREEK WATERSHED
(1950 Prices)

Damages	Average Annual Damage				Average Annual Benefit			
	Under Present Conditions (dollars)	With Land Treatment Only (dollars)	With Land Treatment and Detention Storage (dollars)	With Land Treatment Detention Storage and Floodways (dollars)	From Land Treatment Only (dollars)	From Detention Storage Only (dollars)	From Floodways Only (dollars)	Total Waterflow Retardation Benefits (dollars)
Floodwater Damage								
Crop and Pasture	109,896	101,263	42,592	25,495	8,633	58,671	17,097	84,401
Flood Plain Scour	2,936	2,728	1,064	477	208	1,664	587	2,459
Other Agricultural	77,311	71,377	13,129	1,815	5,934	58,248	11,314	75,496
Roads, Railroads & Bridges	7,645	6,862	787	85	783	6,075	702	7,560
Other	3,768	3,500	1,365	0	268	2,135	1,365	3,768
Sub-Total	201,556	185,730	58,937	27,872	15,826	126,793	31,065	173,684
Sediment Damage								
Overbank Deposition	57	53	21	0	4	32	21	57
Indirect Damage	20,161	18,578	5,896	2,787	1,583	12,682	3,109	17,374
Total Damage	221,774	204,361	64,854	30,659	xxx	xxx	xxx	xxx
Benefit from Reduction of Damage	xxx	xxx	xxx	xxx	17,413	139,507	34,195	191,115
Benefit from More Intensive Use of Flood Plain	xxx	xxx	xxx	xxx	xxx	43,656 2/	11,664 2/	55,320

Table 2
Cost Estimate Table
BRADY CREEK WATERSHED

Structure	Unit	No.	Cost To Farmer	Cost To Federal Funds	Cost To State, County or Other	Cost To
Floodwater Retarding Structures	Each	46	$	$3,644,290	$	$3,644,2
Site Acquisition	Total		439,190			439,1
Earth Gully Plugs	Each	6		3,000		3,0
Relocating Roads	Mile	1.5		300	2,250	2,5
Floodwater Diversion	Mile	4.7		11,760		11,7
Floodways	Mile	44.6	91,860	275,580		367,1
Sub-Total			531,050	3,934,930	2,250	4,468,2
Seeding Retired Areas	Acre	3,300	56,100			56,1
Farm Waterways	Acre	600	60,000			60,0
Terracing	Mile	3,460	432,500			432,5
Farm Diversions	Mile	150	22,500			22,5
Farm Ponds	Each	600	270,000			270,0
Farm Fencing	Mile	400	160,000			160,0
Farm and Ranch Planning and Application	Acre	534,872		802,308		802,3
Sub-Total			$1,001,100	$802,308		$1,803,4
Total			$1,532,150	$4,737,238	$2,250	$6,271,6

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Table 3
Annual Costs
BRADY CREEK WATERSHED

Structure or Measure	Unit	No.	Annual Cost		
			Installation	Maintenance	Total
Floodwater Retarding Structures	Each	46	$108,053	$4,600	$112,65
Site Acquisition	Total		10,980		10,98
Earth Gully Plugs	Each	6	75	90	16
Relocating Roads	Mile	1.5	64		6
Floodwater Diversion	Mile	4.7	294	188	48
Floodways	Mile	44.6	10,564	13,779	24,34
Sub-Total			$130,030	$18,657	$148,68
Seeding Retired Areas	Acre	3,300	2,244		2,24
Farm Waterways	Acre	600	2,400	2,400	4,80
Terracing	Mile	3,460	17,300	34,600	51,90
Farm Diversions	Mile	150	900	1,200	2,10
Farm Ponds	Each	600	10,800	10,800	21,60
Farm Fencing	Mile	400	6,400	8,000	14,40
Farm and Ranch Planning and Application	Acre	534,872	20,058		20,05
Sub-Total			$60,102	$57,000	$117,10
Total			$190,132	$75,657	$265,78

Annual Maintenance - Farmer	$75,657
Annual Maintenance - State, County or Other	0

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Table 4
Comparison of Average Annual Benefit and Cost of the Recommended Program
BRADY CREEK WATERSHED
(1950 Prices)

Source of Benefit	Annual Cost (dollars)	Annual Benefit (dollars)	Benefit per Dollar of Cost (dollars)
Detention Storage	124,344	183,163	1.47
Floodways	24,343	45,859	1.88
Total	148,687	229,022	1.54
Land Treatment			
Reduction in Flood Damage	xxx	17,413	xxx
Land Treatment	xxx	564,007	xxx
Total	117,102	581,420	4.96
All Sources	265,789	810,442	3.05

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Table 5
Floodwater Retarding Structure Data
BRADY CREEK WATERSHED

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Site No.	Drainage Area: Acres	Drainage Area: Square Miles	Storage Volume: Det. Pool: In.	Storage Volume: Det. Pool: Ac. Ft.	Storage Volume: Perm. Pool: Ac. Ft.	Storage Volume: Total: Ac. Ft.	Surface Area Acres: Top Perm. Pool	Surface Area Acres: Top Det. Pool	Flood Plain Inundated: Perm. Pool: Ac.	Flood Plain Inundated: Spillway Crest: Ac.	Max. Ht. of Fill: Ft.	Volume of Fill Cu.Yd.	Drawdown Rate: cfs	Estimated Total Cost
1	4,200	6.56	4.60	1,932	50	1,982	13	198	6	40	36	168,000	33	$ 75,600
2	11,550	18.05	7.30	6,996	360	7,356	50	350	5	55	65	261,270	166	117,570
3	2,600	4.06	7.30	1,582	41	1,623	10	142	4	10	47	175,670	20	79,050
4	2,100	3.28	7.30	1,278	34	1,312	12	120	3	7	28	144,590	16	65,060
5	2,600	4.06	7.30	1,582	41	1,623	15	175	4	9	33	188,640	20	84,890
6	2,550	3.98	7.30	1,551	40	1,591	10	160	3	6	27	77,780	20	35,000
7	2,100	3.28	4.65	816	106	922	16	85	6	23	45	106,700	16	48,015
8	3,100	4.84	4.48	1,159	30	1,189	13	83	10	31	36	90,600	24	40,770
9	10,930	17.08	7.30	6,649	427	7,076	65	470	25	200	55	365,485	222	164,465
10	1,000	1.56	7.30	608	40	648	8	60	1	3	33	91,090	11	41,000
11	1,900	2.97	7.30	1,155	45	1,200	14	120	3	8	33	133,920	15	60,260
12	1,700	2.66	7.35	1,083	67	1,150	16	120	1	2	29	116,040	13	52,220
13	2,200	3.44	7.30	1,338	34	1,372	12	145	2	6	34	140,000	17	63,000
14	7,370	11.52	7.30	4,484	116	4,600	25	380	16	42	40	265,700	58	119,570
15	2,900	4.53	7.35	1,765	23	1,788	10	177	8	80	34	162,600	23	73,170
16	2,900	4.53	4.62	1,117	25	1,142	9	118	1	2	36	103,400	23	46,530
17	18,000	28.13	8.28	12,419	309	12,728	75	727	75	306	55	618,700	235	278,415
18	11,000	17.19	7.30	6,692	86	6,778	30	700	24	50	40	295,150	86	132,820
19	5,700	8.91	6.84	3,244	62	3,306	25	291	11	37	40	284,400	45	127,980
20	12,100	18.91	7.30	7,300	94	7,394	25	560	43	106	44	392,770	94	176,750
21	6,100	9.53	6.53	3,319	143	3,462	45	380	12	110	33	162,100	48	72,945
22	1,800	2.81	7.30	1,095	42	1,137	12	118	2	4	28	87,800	14	39,510
23	3,400	5.31	4.78	1,355	135	1,490	37	196	7	7	28	151,200	27	68,040
24	2,200	3.44	4.80	882	189	1,071	43	242	13	30	32	70,700	17	31,815
25	6,400	10.00	7.30	3,626	50	3,676	20	380	16	260	33	140,900	50	63,400

Table 5 (Continued)
Floodwater Retarding Structure Data
BRADY CREEK WATERSHED

Revised 9-18-53

Site No.	Drainage Area		Storage Volume				Surface Area Acres		Flood Plain Inundated		Max. Ht. of Fill	Volume of Fill	Drawdown Rate	Estimated Total Cost
	Acres	Square Miles	Det. Pool		Perm. Pool	Total	Top Perm. Pool	Top Det. Pool	Perm. Pool	Spillway Crest				
			In.	Ac. Ft.	Ac. Ft.	Ac. Ft.			Ac.	Ac.	Ft.	Cu.Yd.	cfs	
27	4,500	7.03	7.30	2,738	35	2,773	10	270	2	2	39	223,300	35	$100,485
28	14,000	21.88	7.37	8,614	285	8,899	105	646	56	206	38	488,100	109	219,645
29	2,200	3.44	4.43	814	25	839	12	90	1	1	28	96,300	17	43,335
30	2,400	3.75	4.54	908	38	946	12	130	8	60	30	107,000	19	48,150
31	12,800	20.00	7.36	7,859	110	7,969	33	740	30	150	44	505,900	100	227,655
32	7,900	12.34	6.93	3,900	100	4,000	26	450	26	197	37	287,500	62	129,375
33	3,980	6.22	4.66	1,548	62	1,610	23	243	17	19	27	91,800	31	41,310
34	2,875	4.49	4.53	1,086	48	1,134	9	182	9	14	28	80,200	22	36,090
35	2,800	4.37	4.85	1,134	34	1,168	11	156	4	12	31	83,300	22	37,485
36	5,550	8.67	6.00	2,783	45	2,828	15	288	13	107	36	127,400	43	57,330
37	1,600	2.50	4.40	588	37	625	14	92	3	23	25	61,900	13	27,855
38	2,800	4.37	4.53	1,059	86	1,145	25	152	7	18	27	95,000	22	42,750
39	2,950	4.61	4.55	912	50	962	18	118	3	16	28	115,700	19	52,065
40	1,100	1.72	4.82	442	26	468	7	70	1	1	27	66,500	9	29,925
41	5,970	9.33	6.61	3,290	50	3,340	12	310	1	1	39	233,100	30	104,890
(42)	3,000	4.69	4.33	1,082	38	1,120	10	105	2	53	41	60,000	23	27,000
(43)	18,500	28.91	7.11	10,980	907	11,887	40	810	20	225	67	273,500	145	123,070
44	1,440	2.19	4.50	540	90	630	23	105	6	10	24	41,380	11	18,620
45	2,100	3.28	4.50	945	131	1,076	50	120	10	30	21	83,840	16	37,730
46	1,880	2.94	4.50	705	100	805	37	157	10	30	18	57,800	15	26,010
Total	230,745	360.48		128,171	4,906	133,077	1,107	11,871	533	2,613		8,098,425		$3,644,290

APPENDIX

Increase in Income Through More Intensive Use of Flood Plain Lands
BRADY CREEK WATERSHED

Land Use	Acres	Yield	Production	Gross Income	Cost	Net Income
Present Conditions						
Cotton	4,903	220 lb.	1,078,660	$416,363	$212,496	$ 203,867
Grain Sorghum	1,611	1670 lb.	2,690,370	26,904	15,788	11,116
Wheat	4,834	14.4 bu.	69,610	139,220	51,966	87,254
Oats	898	40 bu.	35,920	29,095	8,980	20,115
Corn	322	29 bu.	9,338	11,579	5,152	6,427
Hay	552	1.7 ton	938	19,041	4,604	14,437
Pasture	9,900	1.5 AUM	14,850	54,796	33,858	20,938
Total	23,020			$696,998	$332.844	$ 364,154
After Land Treatment and Detention Storage						
Cotton	5,985		1,316,700	508;246	259,390	248,856
Grain Sorghum	1,680	Same as	2,805,600	28,056	16,464	11,592
Wheat	5,064	above	72,921	145,842	54,438	91,404
Oats	1,381		55,240	44,744	13,810	30,934
Corn	668		19,372	24,021	10,688	13,333
Hay	552		938	19,041	4,604	14,437
Pasture	7,690		11,534	42,560	26,296	16,264
Total	23,020			$812,510	$385,690	$426,820

	Brady Creek
Gross Increase	$62,666
Less Clearing	1,769
Less Added Damages	849
Less Overhead	4,422
Less Added Taxes	306
Net Increase	$55,320