PRELIMINARY WORK PLAN
For Runoff and Waterflow Retardation
and Soil Erosion Prevention
EAST LATERALS OF THE TRINITY WATERSHED
A Subwatershed of the Trinity River
TX-SCD-26 Tr. No. 41

DESCRIPTION OF THE WATERSHED

The East Laterals of the Trinity Watershed is comprised of a series of small drainages along the east side of the Trinity River extending southward approximately 30 miles from Malakoff in Henderson County, Texas, to the confluence of Catfish Creek and the Trinity River. Walnut, Turkey, Prairie, and Wildcat Creeks and Saline Branch are the major streams.

The incorporated towns of Athens and Malakoff and several small villages are located in the watershed.

The watershed has an area of 86,000 acres (134.3 square miles) of which 84,280 acres are in farms. The remaining 1,720 acres, about 2 percent, are in urban areas, roads and miscellaneous uses. Bottom land areas include 2,414 acres of flood plain on Turkey Creek, 7,854 acres of Trinity bottom land which is protected by levees from Trinity River flood water but flooded by Turkey and Prairie Creeks, and 24,732 acres of flood plain in the Trinity River bottom and on Walnut and Wildcat Creeks and Saline Branch. The latter area is almost entirely woodland. Approximately 286 acres are in stream channels.

There are 191 miles of roads, of which 45 miles are hard surfaced. Of the 136 bridges, 20 are major bridges spanning the larger streams.

Soils and Land Use

Approximately 70 percent of the watershed lies within the Forested Coastal Plain Problem Area in Soil Conservation. These soils are deep, medium-textured and are very slowly to slowly permeable. Trinity River bottom land soils comprise approximately 25 percent of the watershed. These deep, fine-textured soils range from very slowly to slowly permeable. The slowly permeable soils predominate. A small area of mixed Blackland Prairie soils, comprising 5 percent of the total watershed, occurs in the southwest part of the watershed. This area is located on both sides of Highway 287, beginning immediately west of Cayuga and extending to the Trinity River flood plain.

Land use in the watershed is as follows:

Land Use	Percent of Watershed
Cropland	18
Open Pasture	41
Woods Pasture	39
Miscellaneous	2

It is estimated that about 50 percent of the open pasture was once cultivated. This area has steep slopes of 4 to 8 percent and has been severely eroded. The majority of the land use changes have occurred in the past 10 years.

Geology and Topography

Geological formations of the Eocene age outcrop in the watershed. The two principal groups are the Wilcox and Claiborne. The Wilcox group occupies the western two-thirds of the watershed and averages about 10 miles in width. It is about 14 miles wide at the extreme north end and 6 miles wide in the south portion of the watershed. This sandy formation weathers to produce medium to coarse-textured soils. A narrow band of the Claiborne group outcrops along the east side of the watershed. This group averages about 3 miles wide and extends from Athens to Yard. The Claiborne group includes the Carrizo, Reklaw and Queen City sand formations. These formations consist of interbedded sand, clay and shale, and weather to produce light brown, sandy soils.

The drainage area consists of gently rolling, mature topography. The upland slopes vary from nearly level to steep along the breaks adjacent to the stream systems. Slopes of 1 to 5 percent are most common in the upland areas. The slopes along the breaks adjacent to the streams range from 5 to 15 percent. Local relief ranges from 25 to 75 feet.

Climate

The climate of the area is characterized by long summers and short winters. The winters are usually mild, but occasional northers cause sudden drops in temperature. As a rule, these cold spells last only a few days. Few winters pass without a light fall of snow, which generally melts as it falls.

Mean temperatures range from 82.2 degrees Fahrenheit in summer to 48.2 degrees in winter. The average temperature for the area is 65.5 degrees. The extreme recorded temperatures are 6 degrees below zero and 108 degrees above zero. The average date of the last killing frost is March 7, and that of the first killing frost is November 23, or a normal frost-free period of 261 days.

The mean annual precipitation of 35.72 inches is fairly evenly distributed, with the greatest amounts of rainfall occurring in April and May. Individual rains of excessive amounts, which fall at irregular intervals

during the year, cause serious erosion and flood damage. The minimum recorded annual rainfall of 21.93 inches occurred in 1917, while the maximum annual precipitation of 47.19 inches fell in 1926.

Water Resources

The principal use of water in the area is for stockwater and domestic purposes on farms and in the urban areas. The urban areas use water from wells. Most of the water for domestic uses on farms is taken from shallow wells, while stockwater is supplied by small ponds or running streams.

There are approximately 110 farm ponds in the watershed. The increased acreage of pasture and the improved range management to be expected from the land treatment practices and measures will cause a need for approximately 125 additional farm ponds.

ECONOMY OF THE WATERSHED

Agricultural Economy

It is estimated that there are 267 farms in the East Laterals of the Trinity watershed with an average size of 316 acres. The better uplands scattered throughout the area are devoted largely to the production of crops. The more broken lands are used for pasture or woods pasture. Of the cattle in the watershed, 80 percent are used for beef production.

The principal crops grown in the watershed are cotton, peanuts, and corn, with 83 percent of the cropland being devoted to these crops. The approximate yields per acre are: lint cotton, 166 pounds; peanuts, 600 pounds; and corn, 22 bushels. Other crops grown are forage sorghum and truck crops. Production is still fair on the level areas and gentle slopes, but the need for improved rotations on all cropland to increase the organic matter and productivity of the soil is apparent. Areas of steeper slopes should be planted to permanent grasses.

Because of the frequency of flooding by Turkey and Prairie Creeks much of the bottom land area in the levee district has never been cleared.

The East Laterals of the Trinity watershed is served by one Soil Conservation Service Work Unit which is assisting the Trinity-Neches Soil Conservation District. This work unit has assisted farmers in preparing 122 conservation plans on 38,576 acres within the watershed boundaries.

It is expected that when land treatment practices have been applied and maintained for as long as two or three years, the yields in the watershed will be increased approximately 25 percent.

Urban and Other Influences

Industries in the watershed include brick, tile and pottery works, a broom factory, and oil production. These industries provide approximately 50 percent of the income to the residents in the watershed.

The 191 miles of roads provide adequate access to all parts of the watershed. Occasional floods wash out road bridges, thus delaying travel and resulting in expense for replacements. However, this damage is slight and occurs along streams that have no other flood damages. Thus, it is not included in Table 1.

The St. Louis Southwestern Railway and bus and truck lines provide ample transportation and shipping facilities.

FLOOD PROBLEMS AND DAMAGES

The streams in the East Laterals of the Trinity watershed have flooded frequently and caused moderate annual damage. Because of the lack of flood damage in areas other than that protected from the Trinity River floodwater by the river levee, no flood control structures were planned in these areas.

During the 20-year period, 1923 to 1942 inclusive, there were six floods which covered more than one-half the flood plain, and 100 smaller floods. Half of the larger floods occurred during the spring months, causing damage to growing crops. Occasional large floods occurred in the fall months and completely destroyed some mature crops. Since 700 acres of woodland would be flooded before any damage would occur, only 37 of the 106 floods caused damage.

The types of flood damage encountered in the watershed were (1) damage to crops and pasture, and (2) damage to fences and levees. Other damages include late planting of crops and the planting of lower income crops of shorter growing season, due to spring floods.

LAND TREATMENT ACTIVITIES

During the past four years landowners in the 13 small neighbor groups, with membership wholly or partially within the East Laterals of the Trinity watershed, have been cooperating with the Trinity-Neches Soil Conservation District in the planning and application of land treatment measures on their lands.

FLOOD CONTROL ACTIVITIES

The Henderson County Levee Improvement District No. 3 was organized in 1926 and levees were constructed to protect approximately 17,000 acres of Trinity River bottom land from flooding by the Trinity River

and Cedar Creek. These levees have been kept in a good state of repair. The same levee district constructed floodwater diversions to divert Turkey, Prairie, and several small creeks from the protected area. The diversions have never operated and no attempt has been made to repair them since 1928.

Other efforts to control floods have been minor.

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 East Laterals of the Trinity watershed.

The design storm used for determining detention storage capacity would produce 5.30 inches of runoff from the watershed under present conditions. Runoff of this magnitude is not expected to occur 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 for this watershed, it was found that a rain of 1.00 inch, occurring in a one-day period, was the minimum which would cause flooding at the smallest channel section. Therefore, no rains of less than this amount were considered for flood routing purposes.

The largest rain considered, which occurred during the 20-year period, was one of 8.50 inches which produced 4.50 inches of runoff. Under present conditions 7,393 acres of flood plain would be flooded by the runoff from this storm if the Trinity River was at flood stage and the flood gates were closed. With the flood gates open 6,345 acres would be flooded. This rain occurred in the rainfall series when the flood gates were open, thus 6,345 acres flooded was used to calculate flood damages. If such a rain were to occur after land treatment practices and measures have been applied, it is estimated that the area inundated would be reduced to 5,940 acres. These figures are based on the entire flood plain in the area being considered. With land treatment measures applied, and the proposed detention structures and floodwater diversions in operation, 2,230 acres would be flooded as a result of such a storm. In addition, approximately 160 acres of flood plain would lie within the permanent pools of the proposed structures, and 200 acres within the detention pools.

The channel capacity of Turkey Creek at section 1-A, located approximately 4,000 feet below the floodwater diversion, is 139 cubic feet per second, and the peak discharge at this point for an 8.50 inch rain under present conditions is 7,632 cubic feet per second. The discharge would be reduced to 385 cubic feet per second by the proposed structures.

SEDIMENTATION AND OTHER RELATED FLOOD PLAIN DAMAGES

Recent soil conservation surveys of the watershed indicate that accelerated erosion generally has been only slight to moderate on the present cultivated areas. These areas occupy the more gentle slopes (1 to 3 percent) and are affected by only slight sheet erosion. Most of the steep, severely eroded cultivated land has been retired during the past ten years. The open and wooded pasture lands, with fair cover, are also eroding at a slow rate. Even where more extensive sheet erosion has occurred relatively small volumes of the eroded material reaches the main stream channels. This is due to the coarse texture of the sediment which causes it to deposit at the base of the slopes.

Gully and roadside erosion are the chief sediment sources in parts of the drainage area. The majority of the gullies are located in old cultivated fields. However, at the present time these gullies show definite signs of stabilization.

The principal sedimentation damages in the watershed are: (1) channel filling, (2) modern overbank deposition, and (3) accessory damages. Other related damages encountered within the flood plain are: (1) flood plain scour, (2) channel enlargement, and (3) impaired drainage to valley lands. These damages are so small that no separate monetary evaluation of them has been made.

SEDIMENTATION DAMAGES

Channel Filling

Channel-fill deposits have accumulated at a rapid rate in some of the stream channels. In those sections the velocity of the floodwaters has been insufficient to transport the sand as rapidly as it has been delivered. The channel deposits comprise only a small volume of sediment, but they have been of major importance in causing increased overbank flooding and, consequently, increasing flood plain deposition. Loss in channel capacities ranges from 10 to 40 percent. The majority of the affected areas occur in wooded pasture and are causing only slight monetary damages. Debris consisting of logs, leaves and crop residues have formed partial plugs in some of the channels. These partial plugs act as dams and trap some of the coarse, sandy sediments. Some filling has occurred in the central sections of both the upper (Turkey Creek) and lower (Prairie Creek) diversion levees, but has been of minor consequence.

Modern Overbank Deposition

Overbank deposition is occurring at moderate rates in practically all the tributary valleys in the watershed. These sandy deposits range from 6 to 36 inches in thickness. They are in the form of natural

levees and uniform valley-wide deposits and occur predominantly in the low production, woods pasture flood plain areas. The damage caused by these deposits is slight, because of their similarity in texture and fertility to the original bottom land soils.

Accessory Damages

The deposition of sediment on field crops and pasture grasses is causing moderate damages in the East Laterals drainage system. These damages range from slight to severe. The slight damages are caused by the deposition of fine sediment (silt and clay) on growing plants. This type of damage has occurred in the bottom land areas below the breeched sections of the diversion levees. The severe damage is caused by complete burial of pasture grasses by sandy sediments. These damages are included with floodwater damages.

Sediment Output Rates

Sediment output rates are moderately low in the East Laterals watershed. The present rates are estimated to range from 0.4 to 1.0 acre-foot per square mile of drainage area. The chief sediment source is sheet erosion, with small contributions from gully and stream bank erosion. These estimated rates are based on sedimentation surveys of similar watersheds, stream valleys and reservoirs in the Forested Coastal Plain problem area.

OTHER RELATED FLOOD PLAIN DAMAGES

Flood Plain Scour

Damage by flood plain scour is of minor consequence in the watershed. The scour channels range from 10 to 100 feet in width and 2 inches to 2 feet in depth. They are occurring predominantly in woods pasture areas of low production.

Channel Enlargement

The channels are stable in most of the drainage system. Most of the stream channel banks are well vegetated. However, bank erosion is occurring in some of the sharp meanders but is usually offset by filling.

Impaired Drainage to Valley Lands

Swamping or pondage has caused minor damage in small areas of woods pasture in the flood plains of the drainage system. This pondage is caused by natural levees that retard or obstruct side slope runoff from draining into the main channels.

A large area of Trinity River bottom land between the hillside diversion levee and the Trinity River levee is affected by poor drainage. Poor surface drainage and raised groundwater tables are causing severe damages in this area. The collection of runoff water within the area confined by the levees is believed to be the major cause of this damage. Therefore, no benefits were claimed for reducing these damages.

FLOOD DAMAGES

Flood damage information for approximately 90 percent of the flood plain area of the East Laterals of the Trinity watershed was obtained from landowners or operators. Most of the specific information as to amounts and extent of damages related to the May, 1945 flood. Other information obtained included flood plain land use, yields of major crops, property damages which would result from a major flood, and general flood problems.

Damage rates as determined for the May, 1945 flood were used to indicate damage rates to be expected from floods of various sizes and seasons. These rates were multiplied by acreages covered by each flood, by size and season, in the evaluation series and adjustments made for recurrence of flooding. Flood plain areas lying within the pool limits of proposed detention structures were excluded from all damage calculations.

The total direct floodwater and sedimentation damages are estimated to average $21,077 annually under present conditions, of which $19,971 is crop and pasture damage. These figures are based on the entire flood plain area. After excluding the areas of flood plain which would be inundated by the proposed detention structures, the average direct damage would be $19,878, of which $18,878 is crop and pasture damage. In addition there are indirect damages such as losses sustained by dealers and industries dependent upon agricultural products from or sales to residents of the flooded area, and similar items. Ten percent of the total annual value of the direct damages, $1,988, was taken as a conservative evaluation of the annual indirect flood damages. The average annual monetary flood damages are summarized in Table 1.

THE REMEDIAL PROGRAM AND ITS EVALUATION

Land Treatment Measures Needed

The major land treatment measures needed are the seeding of 11,915 acres (approximately 14 percent of the watershed) of retired land; the sodding of 18 acres of farm waterways; and the construction of 357 miles of terraces.

Other land treatment measures include 21 miles of farm diversions; 125 farm ponds; 62 miles of fencing to enclose newly reseeded and retired areas; conservation rotations on 11,000 acres of cultivated land; and good management practices on 40,000 acres of pasture.

The estimated cost of installing these measures is $462,180, and the annual cost, including installation and maintenance, is $22,631.

Structures and Measures for Runoff and Waterflow Retardation

The runoff and waterflow retardation structures and measures needed to provide protection for flood plain lands are listed in Table 2, items 1 to 4 inclusive.

A system of 5 detention structures and the repair of 12.2 miles of floodwater diversions are needed to protect the flood plain lands along Turkey and Prairie Creeks and in the leveed Trinity River bottom lands. The proposed detention structures and their drainage areas, and the floodwater diversions are shown on the Work Plan Map. Descriptive information concerning the detention structures is summarized in Table 5.

The system of detention structures will detain the runoff from 88 percent of the Turkey Creek floodwater diversion drainage area and 54 percent of the Prairie and Wildcat Creeks floodwater diversion drainage area. The floodwater diversions will divert the runoff from 57 percent of the drainage area which contributes water to the flood gates located in the southwest corner of the leveed area. Sufficient detention storage capacity can be developed at all proposed sites to permit the use of vegetated emergency spillways.

It will be necessary to raise or relocate a portion of the county road which crosses the pool area of proposed detention structure Number 5.

The estimated cost of installing these measures is $363,483, and the annual cost, including installation and maintenance, is $13,581.

Effect of These Measures on Damages and Benefits

The combined program of land treatment and runoff and waterflow retardation measures described above would prevent damage from 27 of the 37 damaging floods which occurred in the 20-year period, 1923 to 1942, inclusive. The remaining floods would be reduced to minor floods covering an average of 624 acres annually, of which 274 acres is damageable land, causing an estimated average annual damage of only $1,901.

Most of the reduction in annual flood damage would be effected by the system of detention structures and floodwater diversions. The annual value of the reduction in flood damages attributable to these structures is estimated to be $14,404, out of the total of $19,965 from all measures, as shown in Table 1.

Owners and operators of flood plain lands say that if protection is provided, they will intensify their use of these lands by growing high value crops such as cotton and alfalfa on land now being used for pasture or woods because of the frequency of flooding. It is estimated that this more intensive use would increase the net income from the land, after all expenses are deducted, by $50,093 annually.

The total flood control benefits, including both the reduction in flood damages and the benefits from more intensive use of flood plain lands, are estimated to be $70,058 annually. In addition, it is estimated that the benefits to landowners and operators in upland areas of the watershed, from application of land treatment measures, would be $59,744 annually.

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 practices and measures. It was assumed that the proportion of the cropland used for each crop would not be changed, although the total area used for cropland would be decreased by the retirement of idle cropland and steep and severely eroded areas to pasture and meadow. Likewise, it was assumed that there would be no change in the percentages of cattle used for dairying and beef production, although the total number of cattle would be increased materially because of the increased acreages of meadow and pasture and the greater per acre hay production and pasture carrying capacity to be expected from the application of land treatment measures.

The estimated increase in annual net income is $37,745 from crops and $21,999 from pasture, or a total of $59,744.

Comparison of Costs and Benefits

The ratio of the average annual benefit, $64,497, from detention structures and their appurtenant structures, including floodwater diversions, to their average annual cost of $13,581 is 4.75:1.

The ratio of the average annual benefit, $65,305, from land treatment measures and practices to their annual cost, $22,631, is 2.89:1.

The ratio of total average annual benefits, $129,802, to total average annual cost, $36,212, is 3.58:1.

ANNUAL MAINTENANCE

Estimated annual maintenance costs after the conservation measures and runoff and waterflow retardation structures have been installed are shown in Table 3.

It is expected that the runoff and waterflow retardation 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 will be developed for this purpose. The conservation 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
EAST LATERALS OF THE TRINITY RIVER
(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)	From Land Treatment Only (dollars)	From Detention Storage Only (dollars)	Total Waterflow Retardation Benefits (dollars)
Floodwater Damage						
Crop and Pasture	18,878	14,003	1,548	4,875	12,455	17,330
Other Agricultural	1,000	820	180	180	640	820
Sub-Total	19,878	14,823	1,728	5,055	13,095	18,150
Indirect Damage	1,988	1,482	173	506	1,309	1,815
Total Damage	21,866	16,305	1,901	xxx	xxx	xxx
Benefit from Reduction of Damage	xxx	xxx	xxx	5,561	14,404	19,965
Benefit from More Intensive Use of Flood Plain	xxx	xxx	xxx	xxx	50,093	50,093
Total Waterflow Retardation Benefit	xxx	xxx	xxx	5,561	64,497	70,058

Table 2
Cost Estimate Table
EAST LATERALS OF THE TRINITY WATERSHED

Structure or Measure	Unit	No.	Cost			
			To Farmer	To Federal Funds	To State, County or Other	Total
Detention Structure	Each	5	$	$278,450	$ 7,500	$285,950
Site Acquisition	Total			44,608		44,608
Relocating Roads	Mile	0.8			2,500	2,500
Floodwater Diversion	Mile	12.2		30,425		30,425
Sub-total				353,483	10,000	363,483
Farm Waterways	Acre	18	1,350	450		1,800
Seeding Retired Areas	Acre	11,915	121,533	81,022		202,555
Terracing	Mile	357	44,625			44,625
Farm Diversions	Mile	21	3,150			3,150
Farm Ponds	Each	125	56,250			56,250
Farm Fencing	Mile	62	24,800			24,800
Farm and Ranch Planning and Application	Acre	86,000		129,000		129,000
Sub-total			251,708	210,472		462,180
Total			$251,708	$563,955	$10,000	$825,663
Estimated Amount to be Expended during 1952 Fiscal Year			$ 80,502	$ 43,348		$123,850

Table 3
Annual Costs
EAST LATERALS OF THE TRINITY WATERSHED

Structure or Measure	Unit	No.	Annual Cost		
			Installation	Maintenance	Total
Detention Structure	Each	5	$ 9,621	$ 500	$10,121
Site Acquisition	Total		1,115		1,115
Relocating Roads	Mile	0.8	63		63
Floodwater Diversion	Mile	12.2	761	1,521	2,282
Sub-Total			11,560	2,021	13,581
Farm Waterways	Acre	18	66	72	138
Seeding Retired Areas	Acre	11,915	6,887		6,887
Terracing	Mile	357	1,785	3,570	5,355
Farm Diversions	Mile	21	126	168	294
Farm Ponds	Each	125	2,250	2,250	4,500
Farm Fencing	Mile	62	992	1,240	2,232
Farm and Ranch Planning and Application	Acre	86,000	3,225		3,225
Sub-Total			$15,331	$7,300	$22,631
Total			$26,891	$9,321	$36,212
Annual Maintenance - Farmer				$9,321	

Table 4
Comparison of Average Annual Benefit and Cost of the Recommended Program
EAST LATERALS OF THE TRINITY WATERSHED
(1950 Prices)

Source of Benefit	Annual Cost	Annual Benefit	Benefit per Dollar of Cost
	(dollars)	(dollars)	(dollars)
Detention Storage	13,581	64,497	4.75
Land Treatment			
Decrease in Flood Damages	xxx	5,561	xxx
Land Treatment	xxx	59,744	xxx
Total	22,631	65,305	2.89
All Sources	36,212	129,802	3.58

Table 5
Detention Structure Data
EAST LATERALS OF THE TRINITY WATERSHED

Site No.	Drainage Area Sq. Mile	Storage Capacity Acre Feet Perm. Pool	Det. Pool	Total	Inches of Runoff Perm. Pool	Det. Pool	Total	Surface Area Acres Top of Perm. Pool	Top of Det. Pool	Flood Plain Inundated Perm. Pool Ac.	Det. Pool Ac.	Total Acres	Max. Ht. of Dam Ft.	Volume of Fill Cu. Yds.	Draw-down Rate cfs	Type of Spill way	Estimated Total Cost
1	3.19	118	1006	1124	0.69	5.91	6.60	28	101	0	0	0	32	52,623	16	Veg.	$ 23,680
2	19.80	1098	8646	9744	1.04	8.19	9.23	180	727	160	200	360	40	268,769	99	Veg.	120,946
3	1.50	89	376	465	1.11	4.70	5.81	15	53	0	0	0	32	72,873	10	Veg.	32,793
4	6.97	402	1842	2244	1.08	4.95	6.03	85	232	0	0	0	36	116,864	35	Veg.	52,589
5	9.06	238	3210	3448	0.49	6.64	7.13	48	281	0	0	0	44	107,649	46	Veg.	48,442
Total	40.52	1945	15080	17025				356	1394	160	200	360		618,778			$278,450 1/

1/ Construction Cost - $242,251
Technical Services - 36,199

APPENDIX
Table 2-A
Cost Estimate Table
EAST LATERALS OF THE TRINITY WATERSHED
(Levee Drainage Area)

Structure or Measure	Unit	No.	Cost			
			To Farmer	To Federal Funds	To State, County or Other	Total
Detention Structure	Each	5	$	$278,450	$ 7,500	$285,950
Site Acquisition	Total			44,608		44,608
Relocating Roads	Mile	0.8			2,500	2,500
Floodwater Diversion	Mile	12.2		30,425		30,425
Sub-total				353,483	10,000	363,483
Farm Waterways	Acre	9	675	225		900
Seeding Retired Areas	Acre	6110	62,322	41,548		103,870
Terracing	Mile	183	22,875			22,875
Farm Diversions	Mile	11	1,650			1,650
Farm Ponds	Each	64	28,800			28,800
Farm Fencing	Mile	32	12,800			12,800
Farm and Ranch Planning and application	Acre	41,152		61,728		61,728
Sub-total			$129,122	$103,501		$232,623
Total			$129,122	$456,984	$10,000	$596,106
Estimated Amount to be Expended During 1952 Fiscal Year			$58,120	$31,296		$89,416

APPENDIX
Table 2-B
Cost Estimate Table
EAST LATERALS OF THE TRINITY WATERSHED
(Direct Drains, Walnut Creek and Saline Branch)

Structure or Measure	Unit	No.	Cost			
			To Farmer	To Federal Funds	To State, County or Other	Total
Farm Waterways	Acre	9	$ 675	$ 225		$ 900
Seeding Retired Areas	Acre	5,805	59,211	39,474		98,685
Terracing	Mile	174	21,750			21,750
Farm Diversions	Mile	10	1,500			1,500
Farm Ponds	Each	61	27,450			27,450
Farm Fencing	Mile	30	12,000			12,000
Farm & Ranch Planning and Application	Acre	44,848		67,272		67,272
Total			$122,586	$106,971		$229,557
Estimated amount to be Expended During 1952 Fiscal Year			$22,382	$12,052		$34,434

APPENDIX
Table 3-A
Annual Costs
EAST LATERALS OF THE TRINITY WATERSHED
(Levee Drainage Area)

Structure or Measure	Unit	No.	Annual Cost		
			Installation	Maintenance	Total
Detention Structure	Each	5	$ 9,621	$ 500	$ 10,121
Site Acquisition	Total		1,115		1,115
Relocating Roads	Mile	0.8	63		63
Floodwater Diversion	Mile	12.2	761	1,521	2,282
Sub-total			11,560	2,021	13,581
Farm Waterways	Acre	9	33	36	69
Seeding Retired Areas	Acre	6,110	3,532		3,532
Terracing	Mile	183	915	1,830	2,745
Farm Diversions	Mile	11	66	88	154
Farm Ponds	Each	64	1,152	1,152	2,304
Farm Fencing	Mile	32	512	640	1,152
Farm and Ranch Planning and Application	Acre	41,152	1,543		1,543
Sub-Total			7,753	3,746	11,499
Total			$19,313	$ 5,767	$25,080
Annual Maintenance - Farmer				$ 5,767	

APPENDIX
Table 3-B
Annual Costs
EAST LATERALS OF THE TRINITY WATERSHED
(Direct Drains, Walnut Creek and Saline Branch)

Structure or Measure	Unit	No.	Annual Cost		
			Installation	Maintenance	Total
Farm Waterways	Acre	9	$ 33	$ 36	$ 69
Seeding Retired Areas	Acre	5,805	3,355		3,355
Terracing	Mile	174	870	1,740	2,610
Farm Diversions	Mile	10	60	80	140
Farm Ponds	Each	61	1,098	1,098	2,196
Farm Fencing	Mile	30	480	600	1,080
Farm and Ranch Planning and Application	Acre	44,848	1,682		1,682
Total			$7,578	$3,554	$11,132
Annual Maintenance - Farmer				$3,554	

APPENDIX
Table 4-A
Comparison of Average Annual Benefit and Cost of the Recommended Program
EAST LATERALS OF THE TRINITY WATERSHED
(Levee Drainage Area)

Source of Benefit	Annual Cost (dollars)	Annual Benefit (dollars)	Benefit per Dollar of Cost (dollars)
Detention Storage	13,581	64,497	4.75
Land Treatment			
Reduction in Flood Damages	xxx	5,561	xxx
Land Treatment	xxx	25,427	xxx
Total	11,499	30,988	2.69
All Sources	25,080	95,485	3.81

APPENDIX
Table 4-B
Comparison of Average Annual Benefit and Cost of the Recommended Program
EAST LATERALS OF THE TRINITY WATERSHED
(Direct Drains, Walnut Creek and Saline Branch)

Source of Benefit	Annual Cost (dollars)	Annual Benefit (dollars)	Benefit per Dollar of Cost (dollars)
and Treatment			
Reduction in Flood Damages	xxx	xxx	xxx
Land Treatment	xxx	34,317	xxx
Total	11,132	34,317	3.08

APPENDIX
Table 5
Increase in Income Through More Intensive Use of Flood Plain Lands
EAST LATERALS OF THE TRINITY WATERSHED
(Levee Drainage Area)

Land Use	Acres	Yield	Production	Gross Income	Cost	Net Income
Present Condition						
Cotton	600	375 lb.	225,000	$ 86,850	$ 47,688	$ 39,162
Corn	1000	50 Bu.	50,000	62,000	15,500	46,500
Forage Sorghum	500	3 Tons	1,500	30,465	22,015	8,450
Alfalfa	35	3 Tons	105	2,732	1,140	1,592
Improved Pasture	400	5 AUM	2,000	5,000	400	4,600
Abandoned Cropland	210	2 AUM	420	1,050		1,050
Woods Pasture	1,265	1 AUM	1,265	3,163		3,163
Woods	960					
Miscellaneous	120					
Total	5,090			$191,260	$86,743	$104,517
Flooded too often to intensify	895					
	5,985					
After Land Treatment and Detention Storage						
Cotton	1,000	375 lb.	375,000	$144,750	$ 79,480	$ 65,270
Corn	1,000	50 bu.	50,000	62,000	15,500	46,500
Forage Sorghum	800	3 tons	2,400	48,744	35,224	13,520
Grain Sorghum	500	20 cwt.	10,000	18,100	7,635	10,465
Alfalfa	705	3 tons	2,115	55,032	22,962	32,070
Improved Pasture	400	5 AUM	2,000	5,000	400	4,600
Woods Pasture	565	1 AUM	565	1,412		1,412
Miscellaneous	120					
Total	5,090			$335,038	$161,201	$173,837

Net Increase	69,320
Less Added Damage	431
Less Cost of Clearing	13,280
Less Increase in Overhead Expense	5,516
Net Benefit	$50,093