PRELIMINARY WORK PLAN
For Runoff and Waterflow Retardation
and Soil Erosion Prevention
ROSSER-TRINIDAD LATERALS WATERSHED
of the Trinity River Watershed
TX-SCD-11-26 Tr. No. 52
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## DESCRIPTION OF THE WATERSHED

The Rosser-Trinidad Laterals watershed is comprised of a series of small drainages along the east side of the Trinity River, extending from Rosser in Kaufman County, Texas, to Trinidad in Henderson County, a distance of 32 miles.

The watershed varies from 1 to 10 miles in width, averaging 7 miles. Bridge, Caney, Bois d'Arc, and Cottonwood Creeks are the major streams that drain directly into the river. A floodwater diversion, extending from Texas State Highway 34 to the Trinity River levee at a point 2 miles South of the Kaufman-Henderson County line, a distance of 11 miles, has been constructed to protect river and tributary bottomlands from hill water in the upper portion of the watershed.

No incorporated towns are located in the watershed. There are 232 miles of roads, of which 36 miles are hard surfaced. Of the 78 bridges, 15 are major bridges spanning the larger streams.

The watershed has an area of 137,500 acres (215 square miles), of which 134,750 acres are in farms. The remaining 2,750 acres, about 2 percent, are in roads and miscellaneous uses. Bottomland areas include 1,173 acres of flood plain on Cottonwood Creek; 12,511 acres of Trinity River bottomland that are protected from river overflows by a levee and from Cottonwood Creek by a floodwater diversion; and an estimated 12,441 acres of unprotected bottomlands which are in woods. Approximately 440 acres are in stream channels.

### Soils and Land Use

The Rosser-Trinidad Laterals lie almost entirely within the Forested Coastal Plains Problem Area in Soil Conservation. Most of the soils are medium textured, having been developed from sandy materials under a forest cover in an area of relatively high rainfall (38 inches). The upland south of Scurry is an area of moderately smooth forested soils with some mixed prairie blackland. Most of the cultivated land is located in the upland areas which have gently rolling slopes and more fertile soils. The sandy soils generally are deficient in organic and mineral elements. Many fields in this area have been severely eroded and abandoned from cultivation and are now used for pasture.

The land use of the watershed, according to conservation survey data, is as follows: cropland, 38 percent; open pasture, 42 percent; woods pasture, 18 percent; and miscellaneous, 2 percent. Field reconnaissance in June, 1951 revealed that approximately one-half of the cropland was idle. Most

of the open and woods pasture is in the Trinity River bottoms and along the small tributary drainages, in the lower two-thirds of the watershed.

Geology and Topography

The watershed is underlain by the Taylor, Navarro, Midway and Wilcox geologic groups. These groups outcrop in bands extending east and west. A small area of Taylor marl lies in the upper portion of the drainage area near Rosser. This formation weathers to produce both fine and medium textured soils. The medium textured soils develop from the interbedded sand in the marl formations. The Navarro group joins the Taylor on the south, and occurs in a band about 15 miles wide across the central part of the watershed. This group consists of formations of sands, marls and clays. The Midway group, consisting of clays and sands, predominates in the lower part of the watershed. A small area of the Wilcox group occurs in the lower section of the watershed near Trinidad. These sandy formations produce medium to coarse textured soils.

Physiographically, the watershed consists of a plain dissected by numerous streams that have cut shallow valleys. The main streams of the watershed drain in a southwesterly direction into the Trinity River. The topography of the drainage area is, for the most part, undulating to gently rolling with some steep slopes (5 - 15 percent) adjacent to the stream channels. The stream valleys are level to gently sloping, with local relief ranging from 50 to 100 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 84.1 degrees Fahrenheit in summer to 45.2 degrees in winter. The average temperature for the area is 65.5 degrees. The extreme recorded temperatures are 3 degrees below zero and 105 degrees above zero. The average date of the last killing frost is March 16 and that of the first killing frost is November 21, or a normal frost-free period of 250 days.

The mean annual precipitation of 38.00 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 moderate erosion and flood damage. The minimum recorded annual rainfall of 18.82 inches occurred in 1917, while the maximum annual precipitation of 53.10 inches fell in 1929.

Water Resources

The principal uses of water in the area are for livestock and domestic purposes and as a cooling agent at the Texas Power and Light Company generating plant at Trinidad. Water for livestock and domestic uses on farms is obtained primarily from shallow wells. The Texas Power and Light Company has a reservoir which is filled by pumping water from the Trinity River.

There are approximately 295 existing farm ponds in the watershed. The increased acreage of pasture and the resultant improved range management to be expected from the land treatment practices and measures will cause a need for approximately 397 additional farm ponds.

## ECONOMY OF THE WATERSHED

### Agricultural Economy

There are estimated to be 822 farms in the Rosser-Trinidad Laterals watershed with an average size of 164 acres. The better uplands scattered throughout the area and the Trinity River bottomlands protected by levees are devoted largely to crops. The more broken lands and the bottomlands not protected by levees are in open and woods pasture. Of the cattle in the watershed, 90 percent are used for beef production and 10 percent are dairy cattle.

The principal crops grown in the watershed are cotton, corn, and vetch, with 62 percent of the cropland being devoted to the production of these crops. The approximate yields per acre are: lint cotton, 175 pounds; corn, 17 bushels; and vetch, 200 pounds. Other crops grown are oats, grain sorghum, hay, and truck crops. Production is 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.

Because of the frequency of flooding 35 percent of the Cottonwood Creek flood plain formerly used for the production of high-income crops is now pasture or idle land.

The Rosser-Trinidad Laterals watershed is served by three Soil Conservation Service Work Units, which are assisting the Kaufman-Van Zandt and Trinity-Neches Soil Conservation Districts. These work units have assisted farmers in preparing 131 conservation plans on 21,469 acres within the watershed boundaries.

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

### Urban and Other Influences

The residents of several small villages in the watershed operate businesses or have farms located nearby on which they depend for livelihood. Industries in Trinidad provide employment for many of the residents of the southern part of the watershed and are a major source of income in that area.

Since much of the area has never been cleared, the 232 miles of roads provide adequate access to all parts of the watershed. Occasionally floods wash out bridges, causing delays in travel and expense for replacements.

Railroad loading and shipping facilities are available at Trinidad and Kaufman and are adequate for the watershed area.

## FLOOD PROBLEMS AND DAMAGES

The streams in the Rosser-Trinidad Laterals watershed have flooded frequently. Moderate annual damage on Cottonwood Creek has resulted. Breaking of the hillside levee has caused some damage in the area between Cottonwood Creek and the main stem of the Trinity. The flood plains of other streams and the Trinity River flood plain below the entrance of Cottonwood Creek into the river are almost entirely in woods. Flood damages in these areas are small and were not evaluated since the land treatment measures here are justified by upland benefits alone without considering flood control benefits.

During the 20 year period, 1923 to 1942, inclusive, there were 21 floods which flooded more than one-half the flood plain, and 84 smaller floods. Four of the larger floods broke the floodwater diversion and caused severe flood damage. One-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.

The types of flood damage encountered in the watershed were (1) damage to crops and pasture, and (2) damage to floodwater diversions, fences and roads.

Other damages include the late planting of crops and the planting of lower income crops of shorter growing season due to spring floods.

## FLOOD CONTROL ACTIVITIES

A levee district was organized and levees constructed to protect 12,511 acres of Trinity River bottomland from Trinity River flood water in 1923. A floodwater diversion was also built to protect this area from Cottonwood Creek floodwater. This floodwater diversion broke four times during the period 1923 to 1942, inclusive. Other efforts at flood control have been minor.

## LAND TREATMENT ACTIVITIES

During the past four years 17 small neighbor groups of landowners and operators, with membership wholly or partially in the Rosser-Trinidad Laterals watershed, have been cooperating with the Kaufman-Van Zandt and Trinity-Neches Soil Conservation Districts in the planning and application of land treatment measures on their lands.

## HYDRAULIC AND HYDROLOGIC INVESTIGATION

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 Rosser-Trinidad Laterals watershed.

The design storm used for determining detention storage capacity would produce 5.10 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 relationship for this watershed it was found that a rain of 1.00 inch, occurring in a one-day period, was the minimum that 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 in the 20-year rainfall series was one of 6.98 inches which produced 3.98 inches of runoff. Under present conditions 1,156 acres of flood plain on Cottonwood Creek would be flooded by the runoff from this storm. 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 1,120 acres. These figures are based on the entire flood plain. With land treatment measures applied and the proposed waterflow retarding structures in operation 605 acres would be flooded as a result of such a storm. In addition to this acreage, approximately 17 acres of flood plain would lie within the permanent pools of the proposed structures and 17 acres within the detention pools.

The channel capacity of Cottonwood Creek at section 5, located approximately one mile above the Peeltown Road, is 122 cubic feet per second, and the peak discharge at this point for a 6.98-inch rain under present conditions was 9,000 cubic feet per second. The discharge would be reduced to 1,088 cubic feet per second by the proposed waterflow retarding structure.

The capacity of the floodwater diversion at section 16 is 3,678 cubic feet per second, and the peak discharge at this point for a 6.98-inch rain under present conditions was 12,000 cubic feet per second. The discharge would be reduced to 3,500 cubic feet per second by the proposed waterflow retarding structures. Since the extent of flooding on the 12,511 acres of flood plain protected by this floodwater diversion would depend on the point at which the floodwater diversion failed and the flood stage of the Trinity River at time of failure, the amount and depth of flooding in this area cannot be accurately determined. Flood routing showed four rains in the series causing failure under present conditions. With land treatment measures applied and the proposed detention structures in operation, it would carry the runoff from the largest rain considered in the series.

## SEDIMENTATION DAMAGES

Soil erosion in the Rosser-Trinidad Laterals has been of varying degrees, ranging from slight on the more nearly level wooded land to moderately severe on the steep cultivated land. Sheet erosion is the dominant process on the gently sloping pasture and wooded areas, and both sheet and gully erosion are active on the steeper slopes.

The principal sedimentation damages in the watershed are: (1) channel filling, (2) accessory damages, and (3) overbank deposition. Other related damages encountered within the flood plain are: (1) flood plain scour,

and (2) impaired drainage to valley lands. As described below these damages are minor. Therefore no monetary evaluation of them has been made in Table 1.

Channel Filling

Channel filling is the most serious sedimentation damage found in the watershed. The deposition of sandy sediment in the stream bed and on the stream banks has reduced channel capacities from 10 to 50 percent in the main drainage systems. Most of the streams have low gradients and well vegegated banks that retard stream flow. These conditions cause the coarse, sandy sediments to settle out and be deposited. In addition, debris consisting of logs, tree limbs and leaves has clogged the channels in some places. Channel filling has caused a slight increase in the frequency of flooding and in flood heights. Sedimentation in the diversion channels has been of little consequence because the bulk of the sandy sediments has been deposited in the upstream valleys.

Accessory Damage

Damages resulting from the deposition of sandy sediment on pasture grasses have been minor in the flood plains of the drainage system. These damages were measured in terms of reduced yields and are included with flood water damages.

Overbank Deposition

Modern overbank deposition is of minor consequence in the rather narrow (200 - 800 feet) valleys. The deposits range from 1 to 3 feet thick, and usually are of a medium to coarse sandy texture. These deposits, in general, are occurring on wooded pasture lands of low production. The modern deposits also are similar to the original bottomland soils in texture and fertility.

Sediment Output Rates

The present sediment output rates range from 0.4 to 0.6 acre-foot per square mile of drainage area. These rates are based on surveys of similar watersheds, valleys and reservoirs, with adjustments for: (1) size and shape of watershed; (2) present land use, erosion rates and vegetative cover conditions of the watershed; and (3) the location of high sediment source areas with reference to the waterflow retarding structure sites.

The present output rates are moderately low and indicate an average of slight erosion for the watershed and low delivery rates. It is estimated that after land treatment practices have been applied the sediment output rates will be reduced 20 to 30 percent.

## OTHER RELATED FLOOD PLAIN DAMAGES

### Flood Plain Scour

Scour damage has been slight on the flood plains of the watershed. The majority of the scour channels are less than 100 feet wide and 2 feet deep. Most of the scour has occurred in the area of woods pasture.

### Impaired Drainage to Valley Lands

Swamping has caused minor damages to small areas of woods pasture in the tributary valleys and the area protected by upland diversion levee. The swamping is caused by sand bars and debris dams (logs, tree limbs and leaves).

Poor drainage is causing severe damage to the Trinity River bottomland between the confines of the levees. The major portion of these damages is caused by local accumulations of run-off water in low, level areas that do not have adequate outlets. These areas will require land treatment consisting of land leveling, drainage, and the planting of deep-rooted legumes to increase the water intake capacity of the tight bottomland soils. No drainage benefits were claimed in this area due to the rebuilding of the hillside levee or the construction of the flood control detention structures.

## FLOOD DAMAGES

Flood damage information for approximately 80 percent of the flood plain area of Cottonwood Creek was obtained from landowners or operators. Most of the specific information as to amounts and extent of damages related to the May, 1948 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. The monetary value of the percentage of damage to flood plain lands by sediment deposition and scour was determined on the basis of present prices and costs.

Information concerning flood damage to roads and bridges was obtained from county road commissioners.

Damage rates as determined for the May, 1948 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 waterflow retarding structures were excluded from all damage calculations.

The total direct floodwater and sedimentation damages are estimated to average $20,668 annually under present conditions, of which $18,336 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 waterflow retarding structures, the average direct damage would be $20,188 of which $17,938 is crop and pasture damage. In addition there are indirect damages such as the interruption of travel, losses sustained by dealers and industries dependent upon agricultural products from or sales to residents of the flooded areas, depreciation in property values in the flooded areas, and similar items. Ten percent of the total annual value of the direct damages, $2,019, 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 24,775 acres (approximately 18 percent of the watershed) of retired land; the sodding of 340 acres of farm waterways and the construction of 1,018 miles of terraces.

Other land treatment measures include 8 miles of farm diversions; 397 farm ponds; 250 miles of fencing to enclose newly reseeded and retired areas; conservation rotations on 20,000 acres of cultivated land; and good management practices on 40,000 acres of pasture.

The estimated cost of installing these measures is $1,064,400, and the annual cost, including installation and maintenance, is $60,639.

### Structures and Measures for Waterflow Retardation

The waterflow retarding structures and measures needed to provide protection for flood plain lands, roads and floodwater diversions are listed in Table 2, items 1 and 2.

A system of 2 waterflow retarding structures is needed to protect the flood plain lands along Cottonwood Creek and the bottomland area below the floodwater diversion. The proposed structures and their drainage areas are shown on the Work Plan Map. Descriptive information concerning the waterflow retarding structures is summarized in Table 5.

The system of structures will detain the runoff from 43% of the Cottonwood Creek drainage area. Sufficient detention storage capacity can be developed at all proposed sites to permit the use of vegetated emergency spillways.

The estimated cost of installing these detention structures is $143,095, and the annual cost, including installation and maintenance, is $4,912.

Effect of These Measures on Damages and Benefits

The combined program of land treatment and flood control measures described above would prevent damage from 41 of the 105 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 355 acres annually and causing an estimated average annual damage of only $2,653.

Most of the expected reduction in annual flood damage would be effected by the system of waterflow retarding structures. The annual value of the reduction in flood damages attributable to these structures is estimated to be $15,882 out of the total of $19,554 from all measures, as shown in Table 1.

Owners and operators of flood plain lands say that if flood protection is provided they will intensify their use of these lands by growing high-value crops such as cotton, corn, and alfalfa on areas now used for pasture, woods pasture or meadow 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 $12,386 annually.

The total benefits, including both the reductions in flood damages and the benefits from more intensive use of flood plain lands, are estimated to be $31,940 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 $414,571 annually. The total expected benefit from the combined program would amount to $446,511 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 $343,069 from crops and $71,502 from pasture, or a total of $414,571 annually.

Comparison of Costs and Benefits

The ratio of the average annual benefit from waterflow retarding structures, $28,268, to their average annual cost, $4,912, is 5.75:1.

The ratio of the average annual benefit, $418,243, from land treatment measures and practices to their average annual cost, $60,639, is 6.90:1.

The ratio of total average annual benefits, $446,511, to total average annual costs, $65,551 is 6.81:1. See Table 4.

## ANNUAL MAINTENANCE

Estimated annual maintenance costs after the land treatment measures and waterflow retarding structures have been installed are shown in Table 3.

It is expected that the waterflow retarding structures will be maintained by the benefited farmers under an agreement with the Soil Conservation Districts which carry the responsibility for maintenance. Group organizations of farmers 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/
ROSSER-TRINIDAD LATERALS WATERSHED
(1950 Prices)

| Damages | Average Annual Damage | | | Average Annual Benefit | | |
|---|---|---|---|---|---|---|
| | Under Present Conditions | With Land Treatment Only | With Land Treatment and Detention Storage | From Land Treatment Only | From Detention Storage Only | Total Waterflow Retardation Benefits |
| | (Dollars) | (Dollars) | (Dollars) | (Dollars) | (Dollars) | (Dollars) |
| Floodwater Damage | | | | | | |
| Crop and Pasture | 17,938 | 14,830 | 2,403 | 3,108 | 12,427 | 15,535 |
| Other Agricultural | 2,200 | 1,980 | 0 | 220 | 1,980 | 2,200 |
| Roads and Bridges | 50 | 40 | 9 | 10 | 31 | 41 |
| Sub-Total | 20,188 | 16,850 | 2,412 | 3,338 | 14,438 | 17,776 |
| Indirect Damage | 2,019 | 1,685 | 241 | 334 | 1,444 | 1,778 |
| Total Damage | 22,207 | 18,535 | 2,653 | xxx | xxx | xxx |
| Benefit from Reduction of Damage | xxx | xxx | xxx | 3,672 | 15,882 | 19,554 |
| Benefit From More Intensive Use of Flood Plain | xxx | xxx | xxx | xxx | 12,386 | 12,386 |
| Total Runoff and Waterflow Retardation Benefit | xxx | xxx | xxx | 3,672 | 28,268 | 31,940 |

1/ Areas to be inundated by proposed detention structures are excluded.

Table 2
Cost Estimate Table
ROSSER-TRINIDAD LATERALS WATERSHED

| Structure or Measure | Unit | No. | Cost | | | |
|---|---|---|---|---|---|---|
| | | | To Farmer | To Federal Funds | To State, County or Other | Total |
| Waterflow Retarding structures | Each | 2 | $ | $110,515 | $ | $110,515 |
| Site Acquisition | Total | | | 32,580 | | 32,580 |
| Sub-Total | | | | 143,095 | | 143,095 |
| Farm Waterways | Acre | 340 | $ 25,500 | $ 8,500 | $ | $ 34,000 |
| Seeding Retired Areas | Acre | 24,775 | 252,705 | 168,470 | | 421,175 |
| Terracing | Mile | 1,018 | 127,250 | | | 127,250 |
| Farm Diversion | Mile | 8 | 1,200 | | | 1,200 |
| Farm Ponds | Each | 397 | 178,650 | | | 178,650 |
| Farm Fencing | Mile | 250 | 100,000 | | | 100,000 |
| Farm and Ranch Planning and Application | Acre | 134,750 | | 202,125 | | 202,125 |
| Sub-Total | | | 685,305 | 379,095 | | 1,064,400 |
| Total | | | 685,305 | 522,190 | | 1,207,495 |
| Estimated Amount to be Expended During 1952 Fiscal Year | | | $117,730 | $ 63,394 | | $ 181,124 |

Table 3
Annual Costs
ROSSER-TRINIDAD LATERALS WATERSHED

| Structure or Measure | Unit | No. | Annual Cost | | |
|---|---|---|---|---|---|
| | | | Installation | Maintenance | Total |
| Waterflow Retarding Structures | Each | 2 | $ 3,897 | $ 200 | $ 4,097 |
| Site Acquisition | Total | | 815 | | 815 |
| Sub-Total | | | 4,712 | 200 | 4,912 |
| Farm Waterways | Acre | 340 | $ 1,232 | $ 1,360 | $ 2,592 |
| Seeding Retired Areas | Acre | 24,775 | 14,320 | | 14,320 |
| Terracing | Mile | 1,018 | 5,090 | 10,180 | 15,270 |
| Farm Diversion | Mile | 8 | 48 | 64 | 112 |
| Farm Ponds | Each | 397 | 7,146 | 7,146 | 14,292 |
| Farm Fencing | Mile | 250 | 4,000 | 5,000 | 9,000 |
| Farm and Ranch Planning and Application | Acre | 134,750 | 5,053 | | 5,053 |
| Sub-Total | | | 36,889 | 23,750 | 60,639 |
| Total | | | 41,601 | 23,950 | 65,551 |
| Annual Maintenance - Farmer | | | | 23,950 | |

Table 4

Comparison of Average Annual Benefit and Cost of the Recommended Program
ROSSER-TRINIDAD LATERALS WATERSHED

| Source of Benefit | Annual Cost | Annual Benefit | Benefit per Dollar of Cost |
|---|---|---|---|
| | (Dollars) | (Dollars) | (Dollars) |
| Detention Storage | 4,912 | 28,268 | 5.75 |
| Land Treatment | | | |
| Reduction in Floodwater and Sediment Damages | xxx | 3,672 | xxx |
| Land Treatment | xxx | 414,571 | xxx |
| Total | 60,639 | 418,243 | 6.90 |
| All Sources | 65,551 | 446,511 | 6.81 |

Table 5
Waterflow Retarding Structure Data
ROSSER-TRINIDAD LATERALS WATERSHED

| Site No. | Drainage Area Sq.Mi. | Storage Volume: Det. Pool In. | Storage Volume: Det. Pool Ac.Ft. | Storage Volume: Perm. Pool Ac. | Storage Volume: Res-erve 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: Spill-way Crest Ac. | Max. Ht. of Fill Ft. | Volume of Fill Cu.Yd. | Draw-down Rate cfs | Type of Spill-way | Esti-mated Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 14.80 | 8.9 | 6,218 | 898 | 624 | 7,740 | 133 | 460 | 15 | 30 | 45 | 178,698 | 74 | Veg. | $80,414 |
| 2 | 2.70 | 6.1 | 728 | 128 | 137 | 993 | 21 | 83 | 2 | 4 | 37 | 66,890 | 14 | Veg. | 30,101 |
| Total | 17.50 | | 6,946 | 1026 | 761 | 8,733 | 154 | 543 | 17 | 34 | | 245,588 | | | $110,515 |

APPENDIX
Table 1A
Summary of Average Annual Monetary Floodwater and Sediment Damage and Waterflow Retardation Benefit from the Recommended Program 1/
ROSSER-TRINIDAD LATERALS WATERSHED
(Cottonwood Creek)

| 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 | 13,642 | 10,964 | 2,403 | 2,678 | 8,561 | 11,239 |
| Other Agricultural | 2,200 | 1,980 | 0 | 220 | 1,980 | 2,200 |
| Road and Bridges | 50 | 40 | 9 | 10 | 31 | 41 |
| Sub-total | 15,892 | 12,984 | 2,412 | 2,908 | 10,572 | 13,480 |
| Indirect Damage | 1,589 | 1,298 | 241 | 291 | 1,057 | 1,348 |
| Total Damage | 17,481 | 14,282 | 2,653 | xxx | xxx | xxx |
| Benefit from Reduction of Damage | xxx | xxx | xxx | 3,199 | 11,629 | 14,828 |
| Benefit from More Intensive Use of Flood Plain | xxx | xxx | xxx | xxx | 9,748 | 9,748 |
| Total Runoff and Waterflow Retardation Benefit | xxx | xxx | xxx | 3,199 | 21,377 | 24,576 |

1/ Areas to be inundated by proposed detention structures are excluded.

APPENDIX
Table 1B
Summary of Average Annual Monetary Floodwater and Sediment Damage and Waterflow Retardation Benefit from the Recommended Program 1/
ROSSER-TRINIDAD LATERALS WATERSHED
(Area protected by Hillside Diversion)

| 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 | 4,296 | 3,866 | 0 | 430 | 3,866 | 4,296 |
| Sub-total | 4,296 | 3,866 | 0 | 430 | 3,866 | 4,296 |
| Indirect Damage | 430 | 387 | | 43 | 387 | 430 |
| Total Damage | 4,726 | 4,253 | 0 | xxx | xxx | xxx |
| Benefit from Reduction of Damage | xxx | xxx | xxx | 473 | 4,253 | 4,726 |
| Benefit from More Intensive Use of Flood Plain | xxx | xxx | xxx | xxx | 2,638 | 2,638 |
| Total Runoff and Waterflow Retardation Benefit | xxx | xxx | xxx | 473 | 6,891 | 7,364 |

1/ Areas to be inundated by proposed detention structures are excluded.

APPENDIX
Table 2A - Cost Estimate Tables

ROSSER-TRINIDAD LATERALS WATERSHED
COTTONWOOD CREEK

| Structure or Measure | Unit | No. | Cost | | |
|---|---|---|---|---|---|
| | | | To Farmer | To Federal Funds | To State County or Other | Total |
| | | | $ | $ | $ | $ |
| Waterflow Retarding Structures | Each | 2 | | 110,515 | | 110,515 |
| Site Acquisition | Total | | | 32,580 | | 32,580 |
| Sub-Total | | | | 143,095 | | 143,095 |
| Farm Waterways | Acre | 82 | 6,150 | 2,050 | | 8,200 |
| Seeding Retired Areas | Acre | 6,172 | 62,954 | 41,970 | | 104,924 |
| Terracing | Mile | 247 | 30,875 | | | 30,875 |
| Farm Diversions | Mile | 4 | 600 | | | 600 |
| Farm Ponds | Each | 98 | 44,100 | | | 44,100 |
| Farm Fencing | Mile | 60 | 24,000 | | | 24,000 |
| Farm and Ranch Planning and Application | Acre | 26,662 | | 39,993 | | 39,993 |
| Sub-Total | | | $168,679 | $ 84,013 | | $252,692 |
| Total | | | $168,679 | $227,108 | | $395,787 |
| Estimated Amount to be Expended During 1952 Fiscal Year | | | $ 38,589 | $ 20,779 | | $ 59,368 |

APPENDIX
Table 2B - Cost Estimate Table

ROSSER-TRINIDAD LATERALS WATERSHED
Direct Drains

| Structure or Measure | Unit | No. | Cost | | | |
|---|---|---|---|---|---|---|
| | | | To Farmer | To Federal Funds | To State County or Other | Total |
| | | | $ | $ | $ | $ |
| Farm Waterways | Acre | 258 | 19,350 | 6,450 | | 25,800 |
| Seeding Retired Areas | Acre | 18,603 | 189,751 | 126,500 | | 316,251 |
| Terracing | Mile | 771 | 96,375 | | | 96,375 |
| Farm Diversions | Mile | 4 | 600 | | | 600 |
| Farm Ponds | Each | 299 | 134,550 | | | 134,550 |
| Farm Fencing | Mile | 190 | 76,000 | | | 76,000 |
| Farm and Ranch Planning and Application | Acre | 108,088 | | 162,132 | | 162,132 |
| Total | | | $516,626 | $295,082 | | $811,708 |
| Estimated Amount to be Expended During 1952 Fiscal Year | | | $ 79,141 | $ 42,615 | | $121,756 |

APPENDIX
Table 3A - Annual Costs

ROSSER-TRINIDAD LATERALS WATERSHED
COTTONWOOD CREEK

| Structure or Measure | Unit | No. | Cost | | |
|---|---|---|---|---|---|
| | | | Installation | Maintenance | Total |
| | | | $ | $ | $ |
| Waterflow Retarding Structures | Each | 2 | 3,897 | 200 | 4,097 |
| Site Acquisition | Total | | 815 | | 815 |
| Sub-Total | | | $ 4,712 | $ 200 | $ 4,912 |
| Farm Waterways | Acre | 82 | 297 | 328 | 625 |
| Seeding Retired Areas | Acre | 6,172 | 3,567 | | 3,567 |
| Terracing | Mile | 247 | 1,235 | 2,470 | 3,705 |
| Farm Diversions | Mile | 4 | 24 | 32 | 56 |
| Farm Ponds | Each | 98 | 1,764 | 1,764 | 3,528 |
| Farm Fencing | Mile | 60 | 960 | 1,200 | 2,160 |
| Farm and Ranch Planning and Application | Acre | 26,662 | 1,000 | | 1,000 |
| Sub-Total | | | 8,847 | 5,794 | 14,641 |
| Total | | | 13,559 | 5,994 | 19,553 |
| Annual Maintenance - Farmer | | | | 5,994 | |

APPENDIX
Table 3B - Annual Costs

ROSSER-TRINIDAD LATERALS WATERSHED
Direct Drains

| Structure or Measure | Unit | No. | Annual Cost | | |
|---|---|---|---|---|---|
| | | | Installation | Maintenance | Total |
| | | | $ | $ | $ |
| Farm Waterways | Acre | 258 | 935 | 1,032 | 1,967 |
| Seeding Retired Areas | Acre | 18,603 | 10,753 | | 10,753 |
| Terracing | Mile | 771 | 3,855 | 7,710 | 11,565 |
| Farm Diversions | Mile | 4 | 24 | 32 | 56 |
| Farm Ponds | Each | 299 | 5,382 | 5,382 | 10,764 |
| Farm Fencing | Mile | 190 | 3,040 | 3,600 | 6,840 |
| Farm and Ranch Planning and Application | Acre | 108,088 | 4,053 | | 4,053 |
| Total | | | $ 28,042 | $ 17,956 | $ 45,998 |
| Annual Maintenance - Farmer | | | | $ 17,956 | |

APPENDIX
Table 4A

Comparison of Average Annual Benefit and Cost of the Recommended Program

ROSSER-TRINIDAD LATERALS WATERSHED
(Cottonwood Creek)

| Source of Benefit | Annual Cost | Annual Benefit | Benefit Per Dollar of Cost |
|---|---|---|---|
| | (Dollars) | (Dollars) | (Dollars) |
| Detention Storage | 4,912 | 28,268 | 5.75 |
| Land Treatment | | | |
| Reduction in Floodwater and Sediment Damages | xxxx | 3,672 | xxxx |
| Land Treatment | xxxx | 36,170 | xxxx |
| Total | 14,641 | 39,842 | 2.72 |
| All Sources | 19,553 | 68,110 | 3.48 |

# APPENDIX

Table 4B

Comparison of Average Annual Benefit and Cost of the Recommended Program

ROSSER-TRINIDAD LATERALS WATERSHED
(Direct Trinity Drainages)

| Source of Benefit | Annual Cost | Annual Benefit | Benefit per Dollar of Cost |
|---|---|---|---|
| | (Dollars) | (Dollars) | (Dollars) |
| Land Treatment | 45,998 | 378,401 | 8.23 |
| All Sources | 45,998 | 378,401 | 8.23 |

# APPENDIX

## Increase in Income Through More Intensive Use of Flood Plain Lands

### ROSSER-TRINIDAD LATERALS WATERSHED
### (Cottonwood Creek)

| Land Use | Acres | Yield | Production | Gross Income | Cost | Net Income |
|---|---|---|---|---|---|---|
| **Present Condition** | | | | | | |
| Cotton | 150 | 350 lbs. | 52,500 | $20,265 | $11,472 | $ 8,793 |
| Corn | 60 | 38 bu. | 2,280 | 2,827 | 930 | 1,897 |
| Alfalfa | 40 | 2.5 tons | 100 | 2,602 | 480 | 2,122 |
| Grain Sorghum | 50 | 18 cwt | 900 | 1,629 | 764 | 865 |
| Temporary Pasture | 50 | 5 AUM | 250 | 625 | 300 | 325 |
| Pasture | 150 | 3 AUM | 450 | 1,125 | 150 | 975 |
| Woods Pasture | 150 | 1 AUM | 150 | 375 | | 375 |
| Idle | 151 | -- | -- | -- | -- | -- |
| Miscellaneous | 11 | -- | -- | -- | -- | -- |
| Total | 812 | | | $29,448 | $14,096 | $15,352 |
| Flooded too often to intensify | 310 | | | | | |
| Total | 1,122 | | | | | |
| **After Land Treatment and Detention Storage** | | | | | | |
| Cotton | 200 | 350 lbs. | 70,000 | $27,020 | $15,296 | $11,724 |
| Corn | 60 | 38 bu. | 2,280 | 2,827 | 930 | 1,897 |
| Alfalfa | 200 | 2.5 tons | 500 | 13,010 | 2,400 | 10,610 |
| Grain Sorghum | 50 | 18 cwt | 900 | 1,629 | 764 | 865 |
| Temporary Pasture | 50 | 5 AUM | 250 | 625 | 300 | 325 |
| Pasture | 252 | 3 AUM | 756 | 1,890 | 252 | 1,638 |
| Miscellaneous | 11 | | | | | |
| Total | 812 | | | $47,001 | $19,942 | $27,059 |

| | |
|---|---|
| Net Increase | $11,707 |
| Less Added Damage | 139 |
| Less Cost of Clearing | 1,200 |
| Less Increase in Overhead Expense | 620 |
| Net Benefit | $ 9,748 |

# APPENDIX

## Increase in Income Through More Intensive Use of Flood Plain Lands

### ROSSER-TRINIDAD LATERALS WATERSHED
### (Bottom Land)

| Land Use | Acres | Yield | Production | Gross Income | Cost | Net Income |
|---|---|---|---|---|---|---|
| **Present Condition** | | | | | | |
| Cotton | 3,398 | 375 lbs. | 1,274,250 | $491,861 | $270,073 | $221,788 |
| Corn | 1,100 | 45 bu. | 49,500 | 61,380 | 17,050 | 44,330 |
| Grain Sorghum | 1,700 | 20 cwt. | 34,000 | 61,540 | 25,959 | 35,581 |
| Alfalfa | 1,150 | 4 tons | 4,600 | 119,692 | 36,800 | 82,892 |
| Johnsongrass Meadow | 1,390 | 1.5 tons | 2,085 | 33,819 | 9,758 | 24,061 |
| Hubam Clover | 100 | 4 cwt | 400 | 4,000 | 1,600 | 2,400 |
| Temporary Pasture | 1,200 | 5 AUM | 6,000 | 15,000 | 7,200 | 7,800 |
| Woods Pasture | 1,800 | 2 AUM | 3,600 | 9,000 | | 9,000 |
| Pasture | 200 | 4 AUM | 800 | 2,000 | 200 | 1,800 |
| Idle | 348 | -- | -- | -- | -- | -- |
| Miscellaneous | 125 | -- | -- | -- | -- | -- |
| Total | 12,511 | | | $798,292 | $368,640 | $429,652 |
| **After Land Treatment and Detention Storage** | | | | | | |
| Cotton | 3,398 | 375 lbs. | 1,274,250 | $491,861 | $270,073 | $221,788 |
| Corn | 1,100 | 45 bu. | 49,500 | 61,380 | 17,050 | 44,330 |
| Grain Sorghum | 1,700 | 20 cwt | 34,000 | 61,540 | 25,959 | 35,581 |
| Alfalfa | 1,150 | 4 tons | 4,600 | 119,692 | 36,800 | 82,892 |
| Johnsongrass Meadow | 690 | 1.5 tons | 1,035 | 16,788 | 4,844 | 11,944 |
| Hubam Clover | 800 | 4 cwt | 3,200 | 32,000 | 12,800 | 19,200 |
| Temporary Pasture | 1,200 | 5 AUM | 6,000 | 15,000 | 7,200 | 7,800 |
| Woods Pasture | 1,500 | 2 AUM | 3,000 | 7,500 | | 7,500 |
| Pasture | 848 | 4 AUM | 3,392 | 8,480 | 848 | 7,632 |
| Miscellaneous | 125 | -- | -- | -- | -- | -- |
| Total | 12,511 | | | $814,241 | $375,574 | $438,667 |
| | | | | Net Increase | | $ 9,015 |
| | | | | Less Cost of Clearing | | 2,400 |
| | | | | Less Increase in overhead expense | | 3,977 |
| | | | | Net Benefit | | $ 2,638 |