

**WORK PLAN**  
**MOUNTAIN CREEK WATERSHED**  
Of the Trinity River Watershed  
Johnson, Ellis, Tarrant and Dallas Counties, Texas

( Revised March 1955 )

Prepared By  
SOIL CONSERVATION SERVICE  
U.S. DEPARTMENT OF AGRICULTURE  
Temple, Texas  
March 1955

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**Participating Agencies**

**Dalworth Soil Conservation District**  
**Ellis Prairie Soil Conservation District**  
**Agriculture Stabilization and Conservation Office, USDA**  
**Extension Service, USDA**  
**Soil Conservation Service, USDA**

**Prepared By**  
**Soil Conservation Service**  
**United States Department of Agriculture**  
**March, 1955**

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INTRODUCTION

Authority

The Mountain Creek Watershed Flood Prevention Project will be carried out under the authority of the Soil Conservation Act of 1935 (Public Law No. 46, 74th Congress) and the Flood Control Acts of June 22, 1936 (Public Law No. 738, 74th Congress) and December 22, 1944 (Public Law No. 534, 78th Congress, 2nd Session).

Purpose and Scope of Plan

The Dalworth and Ellis Prairie Soil Conservation Districts provide, through their programs and work plans, for the application of a complete program of soil and water conservation and improved plant management within this watershed. Their objective is to use each acre of agricultural land in accordance with its capabilities for sustained agricultural production and to treat each acre in accordance with its needs for protection and improvement. Such a program, when applied and maintained on all the land within the watershed, will have a limited effect on peak runoff from excessive rains but a major effect in reduction of sediment damage. Additional measures primarily for flood prevention are needed to complete the soil, plant and water conservation program in the watershed and provide effective reductions in flood damage.

The purpose of this plan is (1) to state specifically the land treatment and structural practices and measures which are designed primarily for, or contribute directly to flood prevention, and (2) to specify how, when, and by whom they will be carried out to achieve the maximum practicable reduction of erosion, floodwater and sediment damages. Measures and practices planned herein constitute an integral part of the complete soil, plant and water conservation program in this watershed and have been incorporated in the work plan of each of the soil conservation districts concerned.

Application of this mutually developed plan will provide the protection to and improvement of land and water resources which can be undertaken at this time with the combined facilities of local interests and state and Federal agencies. Upon completion and continued maintenance of the measures set forth in this plan a material contribution will be made toward increasing agricultural production to the maximum level consistent with the capability of the land, thereby promoting the welfare of the landowners and operators, the community, the State and the Nation. The watershed lies in Johnson, Ellis, Tarrant and Dallas Counties, Texas, and contains 194,900 acres.

### SUMMARY OF PLAN

This plan is a combination of land treatment practices and flood prevention measures which contribute directly to soil, plant and water conservation and flood prevention. The works of improvement as listed in Table 1 are planned to be installed at an estimated total cost of \$6,791,906, of which \$4,934,834 is to be borne by State and local interests and \$1,857,072 by the Federal Government. These estimates are inclusive of the current costs of local interests and State agencies under the going National programs pertaining to the objectives of this plan. The Dalworth Soil Conservation District, under provisions of State enabling legislation, has agreed to assume responsibility for over-all periodic inspection and maintenance of the floodwater retarding structures and stream channel improvement at an estimated annual cost of \$2,857.

The landowners and operators will maintain the land treatment measures at an estimated annual cost of \$79,053 in accordance with provisions of the farmer-district cooperative agreements.

#### Comparisons of Benefit and Cost

When the works of improvement are applied and operating at full effectiveness the ratio of the estimated average annual benefit (\$672,702) to the estimated average annual value of the cost (\$379,655) is 1.77 to 1, based on current price levels for costs and long-term prices for benefits.

### DESCRIPTION OF THE WATERSHED

Mountain Creek rises at the town of Alvarado in Johnson County, Texas and flows in a northeasterly direction for approximately 30 miles, entering the Trinity River about four miles east of Grand Prairie. The watershed varies from 4 to 16 miles in width, averaging 10 miles. Cottonwood, Fish, Walnut and Soap Creeks are the major tributaries.

The incorporated towns of Alvarado, Venus, Midlothian, Mansfield and Grand Prairie and several small villages are located in the watershed. There are 1,210 miles of roads, of which 154 miles are hard-surfaced. Of the 312 bridges, 55 are major bridges spanning the larger streams.

The watershed has an area of 194,900 acres (304.5 square miles), of which 179,378 acres are in farms, 390 acres are in stream channels and 3,586 acres are covered by Mountain Creek Lake. The remaining 11,546 acres, about 6 percent, are in urban areas, roads and miscellaneous uses. The bottom land area includes 8,547 acres of flood plain, all of which was covered by the September, 1936 flood.

#### Soils and Land Use

Soils of the area are derived from the Austin chalk, Eagle Ford and Woodbine sand formations. These formations occur in the drainage area from east to

west and have a gentle southeasterly dip. Their belts of outcrop run nearly north and south, parallel to the major drainage pattern. Outcrops of Austin chalk weather to produce very shallow, gravelly, fine textured soils of high lime content. The Eagle Ford formation weathers to produce deep, fine-textured, very slowly to slowly permeable clay soils, typical of the Blackland Prairies. The Terrace soils are generally deep, slowly permeable clays typical of the Blackland Prairies, but some medium- and fine-textured, very slowly permeable soils are found. The Woodbine formation weathers to deep, medium-textured, slowly permeable soils with a small percentage of associated deep, coarse-textured sands, or shallow, medium-textured, slowly permeable soils. Typical deep, black, waxy Blackland Prairie soils are found on approximately 75 percent of the watershed, and sandy loam soils of the Forested Coastal Plain occur on 20 percent of the area. The very shallow, gravelly "white rock" soils constitute the remaining 5 percent of the watershed.

The bottom lands are not intensively utilized, only approximately 29 percent being in cultivation. About 56 percent of the upland is cultivated. Most of the abandoned cropland is covered by some type of vegetation, mainly Johnson-grass and weeds. The major cultivated crop is cotton.

Land use in the watershed at the time of the original plan, March, 1951, was as follows:

<u>Land Use</u>	<u>Acres</u>	<u>Percent of the Watershed</u>
Cultivated	108,415	55.6
Pasture	44,772	23.0
Wooded Pasture	20,077	10.3
Formerly Cultivated	6,114	3.1
Stream Channels	390	0.2
Lake Surface	3,586	1.9
Miscellaneous <u>1/</u>	11,546	5.9
<b>Total</b>	<b>194,900</b>	<b>100.0</b>

1/ Includes roads, highways, railroad rights-of-way and urban areas.

### Geology and Topography

Mountain Creek watershed lies in parts of Ellis, Dallas, Tarrant and Johnson Counties. It occupies small parts of two belts of the Gulf Coastal Plain province. About one-fourth of the drainage west of Mountain Creek lies in the East Cross Timbers Problem Area in Soil Conservation, and the remainder is in the Blackland Prairie. Elevations range from slightly above 800 feet mean sea level in the southeastern headwaters to about 425 feet in the stream channel at the Mountain Creek Lake dam. Drainage of the region is generally nature and has a dendritic pattern.

The Mountain Creek valley lies along the front edge of the White Rock

escarpment. The northeasterly face of the Austin chalk formation is the most prominent local topographic feature in the drainage area. It has a local relief approaching 300 feet about 15 miles upstream from the confluence of Mountain Creek and the West Fork of the Trinity River. The eastern tributaries which drain the face of the escarpment are steep and generally less than 5 miles long; whereas, the western tributaries are 10 to 30 miles in length.

Three rock formations of the Upper Cretaceous series outcrop in the drainage area. Measurements on the Geologic Map of Texas indicate that 26 percent of the area, along the western edge, lies within the outcrop area of the Woodbine sand; 68 percent, including all the central part, is on Eagle Ford marl and shale; and 6 percent, a narrow strip along the eastern edge, is on Austin chalk. All of these formations have low southeasterly dips.

Some faults exist in the Austin chalk which may interfere with reservoir construction. The Eagle Ford shale will generally provide good sites, although precautions must be taken against sliding of the foundation where the shale dips downstream. High permeability in the Woodbine sand may require special measures such as impervious blankets, foundation drains, or relief wells.

Topography of the watershed varies from nearly level to very steeply rolling. The nearly level areas occur as high uplands on formations of Upper Cretaceous age. These flats are found generally on the west side of Mountain Creek, extending from the village of Britton to the West Fork of the Trinity River. Short, steep slopes of 5 to 8 percent are found between these flats and the Mountain Creek valley. The remainder of the watershed in Tarrant and Johnson Counties is gently rolling.

The area east of the main valley of Mountain Creek consists of the Austin chalk escarpment and the rough area of the Eagle Ford prairie. Slopes range from 1 to 40 percent. Approximately 10 percent of the upland is nearly level, 60 percent is gently rolling and 30 percent is steeply rolling to rough, broken land.

#### Climate

The climate of this area is characterized by long summers and short winters. The winters are usually mild but occasional northerly winds 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 84.2 degrees Fahrenheit for the summer months to 45.4 degrees for the winter months. The average temperature for the area is 64.4 degrees. The extreme recorded temperatures are 7 degrees below zero and 112 degrees above zero. The average date of the last killing frost is March 18 and that of the first killing frost is November 14, or a normal frost-free period of 241 days.

The mean annual precipitation of 36.16 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 sediment damage and moderate flood damage. The minimum recorded annual rainfall of 18.81 inches occurred in 1909. The maximum annual rainfall of 51.00 inches fell in 1932.

### Water Resources

The principal uses of water in the area are for livestock and domestic purposes and as a cooling agent at the Dallas Power and Light Company generating plant. Water for the urban areas in the watershed is supplied by wells. The principal sources of water for livestock and domestic uses on farms is small reservoirs. The Dallas Power and Light Company's Mountain Creek reservoir has a surface area of 3,586 acres but the capacity of this lake is being reduced rapidly by sediment.

## ECONOMY OF THE WATERSHED

### Agricultural Economy

There are some small dairies within the Mountain Creek watershed which sell milk to Dallas and Fort Worth markets. Sixty-five percent of the cattle are used for beef production. Because of the predominance of livestock enterprises, 67 percent of the cropland is used for the production of feed crops such as corn, oats and hay.

Due to the frequency of flooding and the severe scouring of the flood plain lands, 45 percent of this area formerly used for high-income crops such as cotton or corn is now meadow, pasture or idle land.

The Mountain Creek watershed is served by four Soil Conservation Service work units which are assisting the Dalworth and Ellis Prairie Soil Conservation Districts. These work units have assisted farmers and ranchers in preparing 437 conservation plans on 85,290 acres, which represents 48 percent of the farm land within the watershed. Where land treatment measures have been applied and maintained for as long as two or three years, crop yields have increased 10 to 25 percent.

### Urban and Other Influences

There are several small villages and residential areas occupied by people who commute to and from their work in Dallas or Fort Worth. Also, some people live on small acreages which are not adequate for subsistence and supplement their living by industrial employment. These people contribute very little to agricultural production.

The 1,210 miles of roads are adequate to provide access to all parts of the watershed. However, frequent floods make some roads impassable by washing out bridges. The detours thus occasioned cause delay and extra travel distance to and from work and markets.

Four railroads traverse the watershed and provide ample loading facilities for carload lot shipments.

#### FLOOD PROBLEMS AND DAMAGES

Mountain Creek has flooded frequently and caused moderate annual crop and pasture damage. However, sedimentation damage to Mountain Creek Lake has been high. Large floods have occurred at intervals of three to four years. The September, 1936 flood covered the entire flood plain. During the 20-year period 1923 to 1942 there were 13 floods which covered more than one-half the flood plain, and 76 smaller floods. Half of the larger floods occurred during the spring months, causing damage to growing crops. Occasionally large floods occur in the fall months and completely destroy mature crops.

#### FLOOD CONTROL ACTIVITIES

Efforts to control floods in the Mountain Creek watershed have been minor.

#### LAND TREATMENT ACTIVITIES

During the past nine years 41 neighbor groups of landowners and operators, with membership wholly or partly within the Mountain Creek watershed, have been cooperating with their soil conservation districts in the application and maintenance of land treatment practices on their lands.

#### 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 Mountain Creek watershed.

The storm used for design purposes would produce 5.25 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 to determine minimum floodwater detention storage requirements. From a study of rainfall-runoff relationships for this watershed it was found that a rain of 1.15 inches, 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 7.90 inches which produced 3.08 inches of runoff. Under present conditions 8,547 acres of flood plain would be flooded by the runoff from this storm. If such a rain were to occur after land treatment measures and practices have been applied, it is estimated that the area inundated would be reduced to 8,028 acres. With land treatment measures applied and the proposed detention structures in operation only 4,652 acres would be flooded as a result of such a storm. These figures are based on the area of flood plain below structures. Approximately 49 additional acres of flood plain would lie within the sediment pools of the detention structures, and 14 acres within the detention pools.

The channel capacity of Mountain Creek at section 3 is 875 cubic feet per second. This section is located 0.5 mile upstream from the waterline of Mountain Creek Lake and 4.0 feet vertically above the lake spillway. The peak discharge at this point for a 7.90 inch rain under present conditions was 28,500 cubic feet per second. The discharge would be reduced to 13,000 cubic feet per second by the proposed system of flood prevention structures.

#### SEDIMENTATION CONDITIONS

Soil erosion in the Mountain Creek watershed has caused widespread land damage and excessive sedimentation damage to Mountain Creek Lake.

Sheet erosion continues to be a serious problem in the watershed. Gully erosion has been very severe in the past, but has gradually diminished in severity during the past 15 years. During the early years of settlement (1830-1890), approximately 40 percent of the watershed was put in cultivation. In the later years (1890-1920), an additional 30 percent of the watershed was put under cultivation. Serious active erosion began during this period. Some of these severely eroded croplands have been seeded to permanent grasses, but the bulk of the area is idle and supports only a sparse cover of annuals or Johnsongrass. Erosion is still active on the idle lands that were cultivated prior to 1935.

The principal sedimentation and related flood plain damages in the Mountain Creek and tributary valleys are: (1) reservoir sedimentation, (2) channel filling, (3) overbank deposition and (4) accessory damages. Other related damages encountered within the flood plain are: (1) flood plain scour, (2) impaired drainage on valley lands, and (3) slight channel enlargement in the upper reaches of the watershed.

#### Reservoir Sedimentation

A sedimentation survey of Mountain Creek Lake, made for the Dallas Power and Light Company by the EBASCO Services Incorporated in December, 1946, showed a total sediment accumulation of 9,610 acre-feet. This accumulation occurred during the period March, 1937 (date gates were closed) to December 1946 (date survey was completed). The average annual sedimentation accumulation during this period was approximately 995 acre-feet.

These estimates do not include deposits in the stream channels and valleys in Mountain and Fish Creeks at the head of the reservoir. The Power Company engineers have estimated that the latter deposits would probably exceed 100 acre-feet annually.

It is estimated that the application of land treatment measures, in the past five years (1946 to 1955), have reduced the sediment accumulation to the reservoir about 23 percent, or to an annual accumulation of 769 acre-feet.

For the calculation of benefits of the flood prevention program, it was estimated that after the application of additional land treatment measures

on the watershed lands the sediment accumulations in the reservoir would be reduced to about 461 acre-feet annually, or an additional reduction of 40 percent. With the addition of the proposed floodwater retarding structures it was estimated that the annual sediment accumulations would be reduced to 280 acre-feet, or a 64 percent reduction from the present rate. Thirty-eight percent of the watershed will be controlled by floodwater retarding structures.

At the estimated present sedimentation rate of 769 acre-feet annually, the reservoir will be filled with sediment 45 years after the gates were closed. The total useful life of the reservoir, based on actual water needs plus water losses, is estimated to be 28 years. The main conclusion to be drawn from the above estimates is that, without watershed protection, the useful life of the reservoir will be expended in about 10 years, or by 1965.

### Channel Filling

Channel filling is occurring at an accelerated rate in all the valleys which have a flood plain. The deposits in the channels are similar to the modern deposits on the valley floor. Loss of channel capacity has caused more frequent flooding and increased flood heights in all valleys, especially in Mountain Creek. Mountain Creek has lost 75 to 90 percent of its channel capacity in the area between floodwater retarding structure site 4 and Britton. Between Britton and Mountain Creek Lake the loss of channel capacity of Mountain Creek averages 50 percent. Walnut Creek averages a loss of 50 percent in channel capacity throughout its central section.

### Accelerated Infertile Overwash

It is estimated that the period of accelerated erosion and deposition began in 1900. Long-time residents of the watershed state that the Mountain Creek channel was wide and deep 50 years ago. Fishing was excellent in the many deep holes. The land which produced most of the sediment was put into cultivation during the period 1880 through 1905.

Deposition of clay is occurring over the flood plains of all the drainages in the Blackland Prairie portion of the watershed. The flood plains of the drainages in the Forested Coastal Plain area of the watershed are partially covered by deposition. An estimated 2,700 acres of cultivated and idle land and 350 acres of pasture are damaged 10 percent annually by clay sediment from the Blacklands. On Walnut Creek an estimated 100 acres of cropland and 500 acres of pasture land are damaged 30 percent annually by coarse sand deposits. An additional 300 acres of cropland and 15 acres of pasture annually are damaged 10 percent by sandy loam deposits. These acreages of cultivated land include formerly cultivated areas which are now meadow or idle cropland. The damage is due in part to lower organic matter content and less favorable texture and structure of the modern deposits.

### Accessory Damages

Damage caused by the deposition of fine sediment (silt and clay) on growing plants has occurred in some areas in the flood plain, but the overall damages from this source are of minor consequence. Some damages have accrued in the lower reaches of the watershed from deposition of sediment on county roads

and state highways. These damages were measured in terms of the cost of sediment removal and are included under floodwater damages.

#### Sediment Yield Rates

The annual sediment yield rates under present conditions range from 1.0 to 5.0 acre-feet per square mile of drainage area. The estimated rates are based on the detailed sedimentation survey of Mountain Creek Lake made in 1946 by the Dallas Power and Light Company and data from other similar watersheds in the Blackland Prairie and Forested Coastal Plain. In estimating the present rates for the proposed detention 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 areas of high sediment yield rates with reference to the structure sites.

#### OTHER RELATED FLOOD PLAIN DAMAGES

##### Flood Plain Scour

Damage from flood plain scour in the valleys of the Mountain Creek watershed is moderate. Scour channels occupy approximately 11 percent of the flood plain area. Most of these are wide, flat-bottomed channels which can be crossed with farm implements. During floods they are scoured to plowed depth, resulting in a 10 to 25 percent loss of productive capacity. There is an estimated annual damage of 10 percent to 290 acres of cropland and 10 acres of pasture. In addition, an average of 70 acres of cropland annually are damaged 25 percent by these wide shallow scour channels. Deeply scoured channels each year cause 50 percent damage to 150 acres of cropland and 90 percent damage to an additional 50 acres. These channels are nearly barren of vegetation, and in most places cannot be crossed by tillage implements. It is estimated that scour damage occurs in about a 10-year cycle, from the original damage to recovery, and that the rate of damage is in approximate equilibrium with the rate of recovery.

##### Impaired Drainage on Valley Lands

Poor drainage conditions in the valleys of the Mountain Creek watershed are caused by a combination of overbank deposition and flood plain scour. Partially plugged scour channels damage an estimated 18 acres 40 percent and 4 acres 25 percent annually.

##### Channel Enlargement

Lateral erosion on the stream banks within the flood plain of the Mountain Creek drainage system occurs mainly in the upper reaches. Bank erosion is serious in local sections of the flood plain, but is producing only a small amount, approximately 5 percent, of the total sediment reaching Mountain Creek Lake. This erosion is caused by (1) excessive runoff, (2) the soft composition of the alluvial banks, and (3) the meandering alignment of the stream course.

### FLOOD DAMAGES

Flood damage information for approximately 90 percent of the flood plain area of Mountain Creek and its tributaries was obtained from landowners or operators. Most of the specific information as to the amount and extent of damage related to the June, 1947 flood. Other information obtained included flood plain land uses, 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 land by sediment deposition and scour was determined on the basis of reduced productivity and increased cost of production.

Information concerning flood damage to roads and bridges was obtained from road officials. Damage to railroad property occurred only in 1922, thus no railroad damage is included in this plan.

Damage rates as determined for the June, 1947 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. Adjustments were 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 floodwater and sedimentation damages are estimated to average \$230,920 annually under present conditions, of which \$49,404 is crop and pasture damage. These figures are based on the entire flood plain area. If the areas of flood plain which would be inundated by the proposed detention structures were excluded the average annual direct damage under present conditions would be \$208,408, of which \$49,045 would be 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 the 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, \$20,841, was taken as a conservative evaluation of the annual indirect flood damages. The average annual monetary flood damages are summarized in Table 4.

### THE REMEDIAL PROGRAM AND ITS EVALUATION

#### Land Treatment Measures Needed

The major land treatment measure needed is the seeding of 34,507 acres of the following types of areas: (1) idle land; (2) range land which has been so overgrazed that reseeding is necessary to establish adequate cover; and (3) areas now in cultivation on which a permanent grass cover needs to be established.

Approximately 2,517 miles of terraces need to be constructed to assist in the control of erosion on 58,069 acres of cultivated land. About 2,067 acres of vegetated waterways will be needed to carry the runoff from these systems of terraces.

Other land treatment measures needed include 159 miles of diversion terraces, 903 farm ponds, and 58,979 acres of proper range and pasture use.

The estimated total cost of installing these measures and the 42 grade stabilization structures needed to expedite the application of land treatment is \$4,973,985. The annual cost, including installation and maintenance, is \$307,507.

#### Flood Prevention Structures and Measures

The floodwater retarding structures needed to provide flood protection for flood plain lands and highways, and sediment protection for Mountain Creek Lake are listed in Table 6.

A system of 27 floodwater retarding structures is needed to protect the flood plain lands along Mountain Creek and its tributaries. The proposed structures and their drainage areas are shown on the Work Plan Map.

The system of structures will detain the runoff from 38 percent of the Mountain Creek watershed above the Mountain Creek Lake. Sufficient detention storage capacity can be developed at all sites to permit the use of vegetated emergency spillways.

#### Effect of These Measures on Damages and Benefits

The combined program of land treatment and flood prevention measures described above would prevent damage from 26 of the 89 floods which occurred in the 20-year period 1923 to 1942, inclusive. The remaining storms would flood only in the area immediately above Mountain Creek Lake where much of the original channel capacity has been lost because of sediment. The average annual reduction of acres flooded would be 72 percent.

Most of the expected reduction in annual flood damage 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 \$67,463 out of the total of \$155,129 from all measures, as shown in Table 4.

Flood plain scour will be reduced 72 percent and infertile overwash damage 67 percent by the proposed program.

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 vetch on areas now idle because of frequent flooding. It is estimated that this more intensive use would increase the net income from the land, after all expenses are deducted, by \$42,829 annually.

The total flood prevention benefits, including both the reductions in flood and sediment damages and the benefits from more intensive use of flood plain lands, are estimated to be \$197,958 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 \$474,744 annually. The total expected benefit from the combined program would amount to \$672,702 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 steep and severely eroded areas along with idle cropland 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 acreage 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 \$230,250 from crop land and \$244,494 from pasture land or a total of \$474,744 annually.

#### Comparison of Costs and Benefits

The ratio of the average annual benefit from floodwater retarding structures, \$110,292, to their average annual cost, \$72,148, is 1.53:1.

The ratio of the average annual benefit, \$562,410, from the land treatment measures and practices to their annual cost, \$307,507, is 1.83:1.

The ratio of total average annual benefits, \$672,702, to total average annual costs, \$379,655, is 1.77:1. See Table 5.

#### ANNUAL MAINTENANCE

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

It is expected that the floodwater retarding structures will be maintained by the benefited landowners under an agreement with the soil conservation district which carries the responsibility for maintenance. An organization of farmers, ranchers, business, and professional people has been 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  
 Estimated Installation Cost by Years - Total Needed Program  
 MOUNTAIN CREEK WATERSHED  
 (Trinity River Watershed) March, 1955

Measures	No. Units	Estimated Cost 7/1/50 to 6/30/54			
		Applied to:	Non-Federal:	Private:	Total:
Unit	7/1/50 to 6/30/54	Federal:	Federal:	Public:	Total:
		(dollars)	(dollars)	(dollars)	(dollars)
<b>-Measures Primarily for Flood Prevention (SCS)</b>					
Floodwater Retarding Structures Ea.	-	-	-	-	-
Easements (Land Value)	-	-	-	-	-
Local Assistance & Legal Fees	-	-	-	-	-
Power Line Relocation	-	-	-	-	-
Road Relocation	-	-	-	-	-
Work Plan Development	-	4,219	-	-	4,219
<b>Total A-Measures</b>		<b>4,219</b>	<b>-</b>	<b>-</b>	<b>4,219</b>
<b>-Measures for Conservation of Watershed Lands Which Contribute Directly to Flood Prevention (SCS)</b>					
Contour Farming	Acre 7,371	-	-	3,686	3,686
Cover Cropping	Acre 28,530	-	-	342,360	342,360
Rotation Hay & Pasture	Acre 14,796	-	-	207,144	207,144
Crop-Residue Utilization	Acre 25,326	-	-	12,663	12,663
Proper Use (Range & Pasture)	Acre 14,868	-	-	59,472	59,472
Pasture Planting	Acre 7,866	-	-	196,650	196,650
Brush Control	Acre 2,610	-	-	65,250	65,250
Wildlife Area Improvement	Acre 1,732	-	-	43,300	43,300
Terraces	Mile 301	-	-	60,200	60,200
Diversion Construction	Mile 18	-	-	6,300	6,300
Waterway Development	Acre 102	-	-	6,630	6,630
Pond Construction	Each 369	-	-	129,150	129,150
Stabilization Structures	Each 5	-	-	7,500	7,500
Farm & Ranch Planning Asst. (Accelerated)	Acre 14,110	7,055	-	-	7,055
Farm & Ranch Appli. Asst. (Accelerated)	Acre 10,582	15,873	-	-	15,873
Work Plan Development	-	1,406	-	-	1,406
<b>Total B-Measures</b>		<b>24,334</b>	<b>-</b>	<b>1,140,305</b>	<b>1,164,639</b>
<b>Total A &amp; B Measures</b>		<b>28,553</b>	<b>-</b>	<b>1,140,305</b>	<b>1,168,858</b>
<b>Total Flood Prevention Funds (SCS)</b>		<b>28,553</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>and Total</b>		<b>28,553</b>	<b>-</b>	<b>1,140,305</b>	<b>1,168,858</b>
<b>Facilitating Measures</b>					
Work Plan Development		5,625	-	-	5,625
<b>Planning Program</b>					
Farm & Ranch Planning Asst.	Acre 9,406	4,703	-	-	4,703
Farm & Ranch Appli. Asst.	Acre 7,055	10,583	-	-	10,583
<b>Total</b>		<b>15,286</b>	<b>-</b>	<b>-</b>	<b>15,286</b>

Table 1 - Continued  
 Estimated Installation Cost by Years - Total Needed Program  
 MOUNTAIN CREEK WATERSHED  
 (Trinity River Watershed) March, 1955

Measures	Unit	FY 1955		Estimated Cost Fiscal Year 1955			
		No. to be Applied		Federal	Non-Federal: Public	Private	Total
				(dollars)	(dollars)	(dollars)	(dollars)
<b>-Measures Primarily for Flood Prevention (SCS)</b>							
Floodwater Retarding Structures Ea.	None	-	-	-	-	-	-
Easements (Land Value)		-	-	-	-	-	-
Local Assistance & Legal Fees		-	-	1,875	-	-	1,875
Power Line Relocation		-	-	-	-	-	-
Road Relocation		-	-	-	-	-	-
Work Plan Development		6,853	-	-	-	-	6,853
<b>Total A-Measures</b>				<b>6,853</b>	<b>1,875</b>	<b>-</b>	<b>8,728</b>
<b>-Measures for Conservation of Watershed Lands Which Contribute Directly to Flood Prevention (SCS)</b>							
Contour Farming	Acre	4,201	-	-	2,100	-	2,100
Cover Cropping	Acre	9,248	-	-	110,976	-	110,976
Rotation Hay & Pasture	Acre	3,740	-	-	52,360	-	52,360
Crop-Residue Utilization	Acre	3,163	-	-	1,582	-	1,582
Proper Use (Range & Pasture)	Acre	4,538	-	-	18,152	-	18,152
Pasture Planting	Acre	2,603	-	-	65,075	-	65,075
Brush Control	Acre	1,620	-	-	40,500	-	40,500
Wildlife Area Improvement	Acre	286	-	-	7,150	-	7,150
Terraces	Mile	144	-	-	28,800	-	28,800
Diversion Construction	Mile	13	-	-	4,550	-	4,550
Waterway Development	Acre	347	-	-	22,555	-	22,555
Pond Construction	Each	78	-	-	27,300	-	27,300
Stabilization Structures	Each	2	-	-	3,000	-	3,000
Farm & Ranch Planning Asst. (Accelerated)	Acre	9,510	4,755	-	-	-	4,755
Farm & Ranch Application Asst. (Accelerated)	Acre	7,133	10,699	-	-	-	10,699
Work Plan Development		-	2,285	-	-	-	2,285
<b>Total B-Measures</b>			<b>17,739</b>	<b>-</b>	<b>384,100</b>	<b>-</b>	<b>401,839</b>
<b>Total A &amp; B-Measures</b>			<b>24,592</b>	<b>1,875</b>	<b>-</b>	<b>-</b>	<b>410,567</b>
<b>Total Flood Prevention Funds (SCS)</b>			<b>24,592</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>and Total</b>			<b>24,592</b>	<b>1,875</b>	<b>384,100</b>	<b>-</b>	<b>410,567</b>
<b>Facilitating Measures</b>							
Work Plan Development			9,138	-	-	-	9,138
<b>Planning Program</b>							
Farm & Ranch Planning Asst.	Acre	6,340	3,170	-	-	-	3,170
Farm & Ranch Appli. Asst.	Acre	4,755	7,132	-	-	-	7,132
<b>Total</b>			<b>10,302</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>10,302</b>

Table 1 - Continued  
 Estimated Installation Cost by Years - Total Needed Program  
 MOUNTAIN CREEK WATERSHED  
 (Trinity River Watershed) March, 1955

Measures	Unit	FY 1956		Estimated Cost Fiscal Year 1956		
		No. to be Applied	Federal	Non-Federal	Private	Total
		(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
<b>Measures Primarily for Flood Prevention (SCS)</b>						
Floodwater Retarding Structures	ea.	9, 10, 13, 15, 16, 17, 26 & 27	616,631	-	200 <sup>1</sup> / <sub>2</sub>	616,831
Easements (Land Value)			-	-	68,529	68,529
Local Assistance & Legal Fees			-	625	-	625
Power Line Relocation			-	-	1,400	1,400
Road Relocation			-	3,502	-	3,502
Work Plan Development			-	-	-	-
<b>Total A-Measures</b>			<b>616,631</b>	<b>4,127</b>	<b>70,129</b>	<b>690,887</b>
<b>Measures for Conservation of Watershed Lands Which Contribute Directly to Flood Prevention (SCS)</b>						
Contour Farming	Acre	6,541	-	-	3,271	3,271
Cover Cropping	Acres	10,733	-	-	128,796	128,796
Rotation Hay & Pasture	Acre	4,350	-	-	60,900	60,900
Crop-Residue Utilization	Acre	3,694	-	-	1,847	1,847
Proper Use (Range & Pasture)	Acre	6,169	-	-	24,676	24,676
Pasture Planting	Acre	3,840	-	-	96,000	96,000
Brush Control	Acre	2,240	-	-	56,000	56,000
Wildlife Area Improvement	Acre	445	-	-	11,125	11,125
Terraces	Mile	268	-	-	53,600	53,600
Diversion Construction	Mile	21	-	-	7,350	7,350
Waterway Development	Acre	375	-	-	24,375	24,375
Pond Construction	Each	87	-	-	30,450	30,450
Stabilization Structures	Each	6	-	-	9,000	9,000
Farm & Ranch Planning Asst. (Accelerated)	Acre	8,940	4,470	-	-	4,470
Farm & Ranch Application Asst. (Accelerated)	Acre	6,705	10,058	-	-	10,058
Work Plan Development			-	-	-	-
<b>Total B-Measures</b>			<b>14,528</b>	<b>-</b>	<b>507,390</b>	<b>521,918</b>
<b>Total A &amp; B-Measures</b>			<b>631,159</b>	<b>4,127</b>	<b>577,519</b>	<b>1,212,805</b>
<b>Total Flood Prevention Funds (SCS)</b>			<b>631,159</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>and Total</b>			<b>631,159</b>	<b>4,127</b>	<b>577,519</b>	<b>1,212,805</b>
<b>Facilitating Measures</b>						
Work Plan Development			-	-	-	-
<b>Planning Program</b>						
Farm & Ranch Planning Asst.	Acre	5,960	2,980	-	-	2,980
Farm & Ranch Appli. Asst.	Acre	4,470	6,705	-	-	6,705
<b>Total</b>			<b>9,685</b>	<b>-</b>	<b>-</b>	<b>9,685</b>
Levee to protect farm buildings.						

Table 1 - Continued  
 Estimated Installation Cost by Years - Total Needed Program  
 MOUNTAIN CREEK WATERSHED  
 (Trinity River Watershed) March, 1955

Measures	Unit	No. to be Applied	Estimated Cost Fiscal Year 1957			
			Federal	Non-Federal	Private	Total
			(dollars)	(dollars)	(dollars)	(dollars)
<b>-Measures Primarily for Flood Prevention (SCS)</b>						
Floodwater Retarding Structures Ea. 5, 6, 7, 8, 18, 19, & 20			361,969	-	-	361,969
Easements (Land Value)			-	-	55,365	55,365
Local Assistance & Legal Fees			-	-	-	-
Power Line Relocation			-	-	-	-
Road Relocation			-	2,000	-	2,000
<b>Total A-Measures</b>			<b>361,969</b>	<b>2,000</b>	<b>55,365</b>	<b>419,334</b>
<b>-Measures for Conservation of Watershed Lands Which Contribute Directly to Flood Prevention (SCS)</b>						
Contour Farming	Acre	8,073	-	-	4,036	4,036
Cover Cropping	Acre	10,802	-	-	129,624	129,624
Rotation Hay & Pasture	Acre	4,347	-	-	60,858	60,858
Crop-Residue Utilization	Acre	3,733	-	-	1,867	1,867
Proper Use (Range & Pasture)	Acre	6,298	-	-	25,192	25,192
Pasture Planting	Acre	4,154	-	-	103,850	103,850
Brush Control	Acre	2,180	-	-	54,500	54,500
Wildlife Area Improvement	Acre	435	-	-	10,875	10,875
Terraces	Mile	348	-	-	69,600	69,600
Diversion Construction	Mile	22	-	-	7,700	7,700
Waterway Development	Acre	407	-	-	26,455	26,455
Pond Construction	Each	82	-	-	28,700	28,700
Stabilization Structures	Each	6	-	-	9,000	9,000
Farm & Ranch Planning Asst. (Accelerated)	Acre	9,154	4,577	-	-	4,577
Farm & Ranch Application Asst. (Accelerated)	Acre	6,866	10,299	-	-	10,299
Work Plan Development			-	-	-	-
<b>Total B-Measures</b>			<b>14,876</b>	<b>-</b>	<b>532,257</b>	<b>547,133</b>
<b>Total A &amp; B-Measures</b>			<b>376,845</b>	<b>2,000</b>	<b>587,622</b>	<b>966,467</b>
<b>Total Flood Prevention Funds (SCS)</b>			<b>376,845</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>and Total</b>			<b>376,845</b>	<b>2,000</b>	<b>587,622</b>	<b>966,467</b>
<b>Facilitating Measures</b>						
Work Plan Development			-	-	-	-
<b>Planning Program</b>						
Farm & Ranch Planning Asst.	Acre	6,103	3,052	-	-	3,052
Farm & Ranch Appli. Asst.	Acre	4,577	6,865	-	-	6,865
<b>Total</b>			<b>9,917</b>	<b>-</b>	<b>-</b>	<b>9,917</b>

Table 1 - Continued  
 Estimated Installation Cost by Years - Total Needed Program  
 MOUNTAIN CREEK WATERSHED  
 (Trinity River Watershed) March, 1955

Measures	Unit	FY 1958		Estimated Cost Fiscal Year 1958		
		No. to be Applied		Non-Federal	Federal	Private
			(dollars)	(dollars)	(dollars)	(dollars)
<b>-Measures Primarily for Flood Prevention (SCS)</b>						
Floodwater Retarding Structures Ea. 1, 2, 3, 21 & 22			262,184	-	-	262,184
Easements (Land Value)			-	-	32,333	32,333
Local Assistance & Legal Fees			-	-	-	-
Power Line Relocation			-	-	370	370
Road Relocation			-	3,957	-	3,957
Work Plan Development			-	-	-	-
<b>Total A-Measures</b>			<b>262,184</b>	<b>3,957</b>	<b>32,703</b>	<b>298,844</b>
<b>-Measures for Conservation of Watershed Lands Which Contribute Directly to Flood Prevention (SCS)</b>						
Contour Farming	Acre	9,432	-	-	4,716	4,716
Cover Cropping	Acre	13,229	-	-	158,748	158,748
Rotation Hay & Pasture	Acre	4,520	-	-	63,280	63,280
Crop-Residue Utilization	Acre	4,031	-	-	2,016	2,016
Proper Use (Range & Pasture)	Acre	6,814	-	-	27,256	27,256
Pasture Planting	Acre	4,625	-	-	115,625	115,625
Brush Control	Acre	2,825	-	-	70,625	70,625
Wildlife Area Improvement	Acre	523	-	-	13,075	13,075
Terraces	Mile	397	-	-	79,400	79,400
Diversion Construction	Mile	31	-	-	10,850	10,850
Waterway Development	Acre	259	-	-	16,835	16,835
Pond Construction	Each	84	-	-	29,400	29,400
Stabilization Structures	Each	7	-	-	10,500	10,500
Farm & Ranch Planning Asst. (Accelerated)	Acre	8,565	4,282	-	-	4,282
Farm & Ranch Application Asst. (Accelerated)	Acre	6,424	9,636	-	-	9,636
Work Plan Development		-	-	-	-	-
<b>Total B-Measures</b>			<b>13,918</b>	<b>-</b>	<b>602,326</b>	<b>616,244</b>
<b>Total A &amp; B-Measures</b>			<b>276,102</b>	<b>3,957</b>	<b>635,029</b>	<b>915,088</b>
<b>Total Flood Prevention Funds (SCS)</b>			<b>276,102</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>and Total</b>			<b>276,102</b>	<b>3,957</b>	<b>635,029</b>	<b>915,088</b>
<b>Facilitating Measures</b>						
Work Plan Development			-	-	-	-
<b>Planning Program</b>						
Farm & Ranch Planning Asst.	Acre	5,710	2,855	-	-	2,855
Farm & Ranch Application Asst.	Acre	4,282	6,423	-	-	6,423
<b>Total</b>			<b>9,278</b>	<b>-</b>	<b>-</b>	<b>9,278</b>

Table 1 - Continued  
 Estimated Installation Cost by Years - Total Needed Program  
 MOUNTAIN CREEK WATERSHED  
 (Trinity River Watershed) March, 1955

Measures	Unit	Applied	Estimated Cost Balance to Complete			
			Federal	Non-Federal Public	Private	Total
			(dollars)	(dollars)	(dollars)	(dollars)
<u>Measures Primarily for Flood Prevention (SCS)</u>						
Floodwater Retarding Structures	Each	4, 11, 12, 14, 23, 24, 25	410,743	-	-	410,743
Easements (Land Value)			-	-	56,086	56,086
Local Assistance & Legal Fees			-	-	-	-
Power Line Relocation			-	-	-	-
Road Relocation			-	7,800	-	7,800
Work Plan Development			-	-	-	-
<b>Total A-Measures</b>			<b>410,743</b>	<b>7,800</b>	<b>56,086</b>	<b>474,629</b>
<u>Measures for Conservation of Watershed Lands Which Contribute Directly to Flood Prevention (SCS)</u>						
Contour Farming	Acre	22,451	-	-	11,226	11,226
Cover Cropping	Acre	33,825	-	-	405,900	405,900
Rotation Hay & Pasture	Acre	14,459	-	-	202,426	202,426
Crop-Residue Utilization	Acre	12,231	-	-	6,114	6,114
Proper Use (Range & Pasture)	Acre	20,292	-	-	81,168	81,168
Pasture Planting	Acre	11,419	-	-	285,475	285,475
Brush Control	Acre	6,348	-	-	158,700	158,700
Wildlife Area Improvement	Acre	806	-	-	20,150	20,150
Terraces	Mile	1,059	-	-	211,800	211,800
Diversion Construction	Mile	54	-	-	18,900	18,900
Waterway Development	Acre	577	-	-	37,505	37,505
Pond Construction	Each	203	-	-	71,050	71,050
Stabilization Structures	Each	16	-	-	24,000	24,000
Farm & Ranch Planning Asst. (Accelerated)	Acre	9,475	4,738	-	-	4,738
Farm & Ranch Application Asst. (Accelerated)	Acre	69,560	104,340	-	-	104,340
Work Plan Development		-	-	-	-	-
<b>Total B-Measures</b>			<b>109,078</b>	<b>-</b>	<b>1,534,414</b>	<b>1,643,492</b>
<b>Total A &amp; B-Measures</b>			<b>519,821</b>	<b>7,800</b>	<b>1,590,500</b>	<b>2,118,121</b>
<b>Total Flood Prevention Funds (SCS)</b>			<b>519,821</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Grand Total</b>			<b>519,821</b>	<b>7,800</b>	<b>1,590,500</b>	<b>2,118,121</b>
<u>Facilitating Measures</u>						
Work Plan Development			-	-	-	-
<u>Planning Program</u>						
Farm & Ranch Planning Asst.	Acre	14,924	7,462	-	-	7,462
Farm & Ranch Appli. Asst.	Acre	11,193	16,790	-	-	16,790
<b>Total</b>			<b>24,252</b>	<b>-</b>	<b>-</b>	<b>24,252</b>

Table 1 - Continued  
 Estimated Installation Cost by Years - Total Needed Program  
 MOUNTAIN CREEK WATERSHED  
 (Trinity River Watershed) March, 1955

Measures	No. of Units to be Applied	Estimated Total Cost			
		Federal	Non- Federal Public	Private	Total
		(dollars)	(dollars)	(dollars)	(dollars)
<b>-Measures Primarily for Flood Prevention (SCS)</b>					
Floodwater Retarding Structures Ea.	27	1,651,527	-	200 <sup>2</sup> / <sub>2</sub>	1,651,727
Easements (Land Value)		-	-	212,313	212,313
Local Assistance & Legal Fees		-	2,500	-	2,500
Power Line Relocation		-	-	1,770	1,770
Road Relocation		-	17,259	-	17,259
Work Plan Development		11,072	-	-	11,072
<b>Total A-Measures</b>		<b>1,662,599</b>	<b>19,759</b>	<b>214,283</b>	<b>1,896,641</b>
<b>-Measures for Conservation of Watershed Lands Which Contribute Directly to Flood Prevention (SCS)</b>					
Contour Farming	Acre 58,069	-	-	29,035	29,035
Cover Cropping	Acre 106,367	-	-	1,276,404	1,276,404
Rotation Hay & Pasture	Acre 46,212	-	-	646,968	646,968
Crop-Residue Utilization	Acre 52,178	-	-	26,089	26,089
Proper Use (Range & Pasture)	Acre 58,979	-	-	235,916	235,916
Pasture Planting	Acre 34,507	-	-	862,675	862,675
Brush Control	Acre 17,823	-	-	445,575	445,575
Wildlife Area Improvement	Acre 4,227	-	-	105,675	105,675
Terraces	Mile 2,517	-	-	503,400	503,400
Diversion Construction	Mils 159	-	-	55,650	55,650
Waterway Development	Acres 2,067	-	-	134,355	134,355
Pond Construction	Each 903	-	-	316,050	316,050
Stabilization Structures	Each 42	-	-	63,000	63,000
Farm & Ranch Planning Asst. (Accelerated)	Acre 59,754	29,877	-	-	29,877
Farm & Ranch Application Asst. (Accelerated)	Acre 107,270	160,905	-	-	160,905
Work Plan Development		3,691	-	-	3,691
<b>Total B-Measures</b>		<b>194,473</b>	<b>-</b>	<b>4,700,792<sup>1</sup>/<sub>2</sub></b>	<b>4,895,265</b>
<b>Total A &amp; B-Measures</b>		<b>1,857,072</b>	<b>19,759</b>	<b>4,915,075</b>	<b>6,791,906</b>
<b>Total Flood Prevention Funds (SCS)</b>		<b>1,857,072</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>and Total</b>		<b>1,857,072</b>	<b>19,759</b>	<b>4,915,075</b>	<b>6,791,906</b>
<b>Facilitating Measures</b>					
Work Plan Development		14,763	-	-	14,763
<b>Financing Program</b>					
Farm & Ranch Planning Asst.	Acre 48,444	24,222	-	-	24,222
Farm & Ranch Appli. Asst.	Acre 36,332	54,498	-	-	54,498
<b>Total</b>		<b>78,720</b>	<b>-</b>	<b>-</b>	<b>78,720</b>

Includes \$1,270,762 that may be available from other federal funds (ACPS) to reimburse private interests.

Levee to protect farm buildings.

Table 1A  
MOUNTAIN CREEK WATERSHED  
(Trinity River Watershed)

C-Measures for Conservation of Watershed Lands which do not Contribute Directly to Flood Prevention

<u>Measure</u>	<u>Unit</u>	<u>Number</u>
Fish-Pond Improvement	Each	620

Table 2  
 Status of Flood Prevention Job Prior to First Year of the Work Plan  
 MOUNTAIN CREEK WATERSHED  
 (Trinity River Watershed) March, 1955

Measures	Unit	Number	Federal Cost 1/	Non- Federal Construo- tion 2/	Total Cost
			(dollars)	(dollars)	(dollars)
<b><u>A-Measures</u></b>					
Floodwater Retarding Structures	Each	0			
<b>Subtotal</b>			-	-	-
<b><u>B-Measures</u></b>					
Contour Farming	Acre	4,598			
Cover Cropping	Acre	9,472			
Rotation Hay & Pasture	Acre	-			
Crop-Residue Utilization	Acre	9,449			
Proper Use Pasture	Acre	3,743			
Pasture Planting	Acre	1,626			
Brush Control	Acre	-			
Wildlife Area Improvement	Acre	5			
Terraces	Mile	91			
Diversion Construction	Mile	5			
Waterway Development	Acre	142			
Pond Construction	Each	26			
Stabilization Structures	Each	-			
Farm & Ranch Planning Assistance (Accelerated)	Acre	30,887			
Farm & Ranch Application Assistance (Accelerated)	Acre	23,165			
<b>Subtotal</b>			50,193	214,014	264,207
<b>Total A and B-Measures</b>			50,193	214,014	264,207

1/ Flood prevention funds including accelerated funds.

2/ Includes an estimated \$50,190 of other Federal funds (ACPS) by which private interests were reimbursed.

Table 2A  
 Status of Conservation Job in the Watershed  
 MOUNTAIN CREEK WATERSHED  
 (Trinity River Watershed)  
 (Revised March, 1955)

Measures	Unit	Number	Total Conservation Job	Applied to	Estimated Cost to Date	Non-Federal		Private	Applied to be	Remaining
						Federal	Public			
			Cost	6/30/50	1/			2/	(See Table 1)	
			(dollars)		(dollars)	(dollars)	(dollars)	(dollars)		
<b>A-Measures</b>										
<b>Floodwater Retarding Structures</b>										
	Each	27	1,896,611	0	-	-	-	-	-	27
			<u>1,896,611</u>							<u>27</u>
<b>Subtotal A-Measures</b>										
<b>B-Measures</b>										
<b>Contour Farming</b>										
Cover Cropping	Acre	67,265	33,633	9,196	-	-	-	-	4,598	58,069
Rotation Hay & Pasture	Acre	125,311	1,503,732	18,944	42,813	-	-	-	184,515	106,367
Crop-Residue Utilization	Acre	46,212	646,968	-	-	-	-	-	-	46,212
Proper Use (Range & Pasture)	Acre	71,075	35,538	18,897	-	-	-	-	9,449	52,178
Pasture Planting	Acre	66,466	265,864	7,487	-	-	-	-	29,948	58,979
Brush Control	Acre	37,758	943,950	3,251	8,128	-	-	-	73,147	34,507
Wildlife Area Improvement	Acre	17,823	445,575	-	-	-	-	-	-	17,823
Terraces	Acre	4,237	105,925	10	-	-	-	-	250	4,227
Diversions Construction	Mile	2,699	539,800	182	15,495	-	-	-	20,905	2,517
Waterway Development	Mile	168	58,800	9	1,212	-	-	-	1,938	159
Pond Construction	Acre	2,350	152,750	283	1,752	-	-	-	16,643	2,067
Stabilization Structures	Each	955	334,250	52	7,704	-	-	-	10,496	903
Farm & Ranch Planning	Acres	42	63,000	-	-	-	-	-	-	42
Assistance (Accl.)	Acres	179,378	89,689	71,180	35,590	-	-	-	-	108,198
Work Plan Development	Acres	179,378	269,067	35,776	53,664	-	-	-	-	143,602
			<u>3,691</u>							
<b>Subtotal B-Measures</b>										
			5,492,232	-	166,358	-	-	-	351,889	-
<b>Total A and B-Measures</b>										
			<u>7,388,873</u>	-	<u>166,358</u>	-	-	-	<u>351,889</u>	-

Annual Costs  
MOUNTAIN CREEK WATERSHED  
(Trinity River Watershed)

Measures	Amortization of Installation Costs <u>3/</u>		Operation & Maintenance <u>4/</u>		Other Economic Costs	Grand Total
	Federal	Non-Federal	Federal	Non-Federal		
	1/	2/	1/	2/	3/	4/
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
<u>A-Measures</u>						
Floodwater Retarding Structures 1 thru 27	58,620	697	9,974	69,291	-	72,148
	9,632 <u>7/</u>	-	218,822	228,454	-	307,507
<u>B-Measures</u>						
Total A & B-Measures	68,252	697	228,796	297,745	-	379,655

1/ 3.5258 percent of Federal and Non-Federal Public Installation Costs for A and B Measures (50-year period) including interest at 2.5 percent on investment.

2/ 4.6550 percent of Private Installation Costs for A and B Measures, including interest at 4 percent on investment.

3/ 1954 prices, the last complete year for which information is available.

4/ Long-term prices (B.A.E.)

5/ Based on estimated average annual maintenance cost of \$77 for structures under 100,000 yards and \$116 for structures 100,000-200,000 cubic yards and \$154 for structures over 200,000 cubic yards.

6/ Based on estimated average annual maintenance cost of individual land treatment measures during the 50-year period following application.

7/ Includes \$2,776 for Going Program (SCS).

Table 4  
 Summary of Average Annual Monetary Floodwater and Sediment Damage  
 and Flood Prevention Benefit from the Plan  
 MOUNTAIN CREEK WATERSHED  
 (Trinity River Watershed)  
 (Long-Term Prices)

Damages	Average Annual Damage			Average Annual Benefit		
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
	Under	B-Measures	From	From	Total	
	Present	Only	Land	Detention	Flood	
	Conditions	Retarding	Treatment	Storage	Prevention	
		Structures	Only	Only	Benefit	
<b>Floodwater Damage</b>						
Crop and Pasture	49,045	32,888	14,554	16,157	18,334	34,491
Other Agricultural	7,157	4,267	371	2,890	3,896	6,786
Flood Plain Soor	9,750	6,143	2,705	3,607	3,438	7,045
Roads and Bridges	4,015	2,060	85	1,975	1,975	3,930
Impaired Drainage	447	282	125	165	157	322
<b>Subtotal</b>	<b>70,414</b>	<b>45,640</b>	<b>17,840</b>	<b>24,774</b>	<b>27,800</b>	<b>52,574</b>
<b>Sediment Damage</b>						
Overbank Deposition	27,049	16,229	8,927	10,820	7,302	18,122
Reservoirs	110,945	66,843	40,615	44,102	26,228	70,330
<b>Subtotal</b>	<b>137,994</b>	<b>83,072</b>	<b>49,542</b>	<b>54,922</b>	<b>33,530</b>	<b>88,452</b>
<b>Indirect Damage</b>						
Total Damage	20,841	12,871	6,738	7,970	6,133	14,103
Benefit from Reduction of Damage	229,249	141,583	74,120	xxx	xxx	xxx
Benefit from More Intensive Use of Flood Plain	xxx	xxx	xxx	87,666	67,463	155,129
<b>Total Flood Control Benefit</b>	xxx	xxx	xxx	xxx	42,829	42,829
				87,666	110,292	197,958

Table 5  
 Distribution of Costs and Benefits by Measures and Groups of Measures  
 MOUNTAIN CREEK WATERSHED  
 (Trinity River Watershed)

Item	Average Annual Benefit		Conservation		Benefit-Cost Ratio
	(dollars)	(dollars)	(dollars)	(dollars)	
	Total Cost	Average Annual Cost	More Intensive Use of Land	Conservation	Total Benefit
A-Measures					
Floodwater Retarding Structures Nos. 1 thru 27	1,896,641	72,148	67,463	42,829	110,292
B-Measures	4,973,985	307,507	87,666	474,744	562,410
Total All Measures	6,870,626	379,655	155,129	474,744	672,702
					1.77:1

Table 6  
Floodwater Retarding Structure Data  
MOUNTAIN CREEK WATERSHED  
(Trinity River Watershed)

Site No.	Drainage Area : Sq.Mi.	Storage			Inches of Runoff			Surface Area			Flood Plain Area			Estimated Total Cost : (dollars)				
		Acres-Feet : Sed. : Det. : Pool : Re-serve : 1/2 : 1/4	Acres : Sed. : Det. : Pool : Re-serve : 1/2 : 1/4	Top of : Sed. : Det. : Pool : Re-serve : 1/2 : 1/4	Top of : Sed. : Det. : Pool : Re-serve : 1/2 : 1/4	Top of : Sed. : Det. : Pool : Re-serve : 1/2 : 1/4	Max. : Ht. : Under : Det. : Pool : Re-serve : 1/2 : 1/4	Imundated - Acre : Under : Det. : Pool : Re-serve : 1/2 : 1/4	Volume : of : Fill : Cu.Yds : cfs	Drawn : down : Total								
1	2.38	200	42	660	902	1.6	0.3	5.20	7.10	38	44	100	29	1	1	118,559	12	63,974
2	4.65	200	245	1,291	1,736	0.8	1.0	5.20	7.00	60	90	197	26	3	1	125,181	23	73,291
3	3.80	200	185	1,055	1,440	1.0	0.9	5.20	7.10	43	70	152	40	1	1	139,790	19	81,470
4	8.24	200	655	2,745	3,580	0.5	1.4	6.25	8.15	38	110	296	40	4	1	205,469	41	116,127
5	3.59	200	145	947	1,292	1.1	0.8	5.25	7.15	42	63	195	30	4	1	91,092	17	57,100
6	9.94	200	648	2,784	3,628	0.4	1.2	5.25	6.85	51	135	353	34	4	1	142,318	50	89,507
7	1.06	200	108	294	402	1.9	-	5.20	7.10	27	-	60	30	1	1	48,511	5	26,485
8	3.68	200	310	1,030	1,540	1.0	1.6	5.25	7.85	75	125	228	25	3	1	70,110	18	46,825
9	4.38	200	128	1,227	1,555	0.9	0.5	5.25	6.65	37	48	117	34	2	2	116,566	22	64,648
10	8.19	200	710	3,345	4,255	0.4	1.6	7.40	9.40	44	118	312	38	4	2	196,257	42	116,211
11	1.29	96	-	357	453	1.4	-	5.20	6.60	15	-	42	24	-	-	54,907	6	28,805
12	6.25	200	433	1,734	2,367	0.6	1.3	5.20	7.10	34	72	206	39	3	1	198,965	31	111,962
13	6.39	200	380	1,765	2,345	0.6	1.1	5.20	6.90	32	65	173	45	-	-	198,334	32	106,358
14	1.80	183	-	507	690	1.9	-	5.20	7.10	21	48	65	35	-	-	80,508	9	45,510
15	4.28	200	210	1,198	1,608	0.9	0.9	5.25	7.05	36	48	99	44	-	-	207,100	21	107,116
16	4.82	200	212	1,351	1,763	0.8	0.8	5.25	6.85	37	80	193	34	-	-	153,758	24	82,231
17	4.42	200	107	1,250	1,557	0.8	0.5	5.30	6.60	35	48	177	34	-	-	147,170	22	78,535
18	2.07	66	-	580	646	0.6	-	5.25	5.85	15	-	85	30	-	-	84,639	10	44,116
19	2.90	200	110	805	1,115	1.3	0.7	5.20	7.20	35	50	108	35	2	1	141,005	15	74,043
20	4.64	124	-	1,288	1,412	0.5	-	5.20	5.70	25	-	141	35	-	-	160,283	23	82,038
21	3.25	86	-	910	996	0.5	-	5.25	5.75	18	-	107	32	2	2	98,585	16	51,934
22	1.89	60	-	529	589	0.6	-	5.25	5.85	15	-	59	31	-	-	52,406	9	28,535
23	3.27	105	-	916	1,021	0.6	-	5.25	5.85	42	-	125	28	5	1	89,148	10	51,693
24	3.98	200	182	1,102	1,484	0.9	0.9	5.20	7.00	30	57	168	37	2	2	106,788	20	63,543
25	4.30	200	213	1,191	1,604	0.9	0.9	5.20	7.00	40	52	128	41	-	-	101,526	22	57,589
26	4.51	200	233	1,250	1,683	0.8	1.0	5.20	7.00	40	74	188	35	2	1	108,775	23	64,119
27	5.10	200	290	1,415	1,905	0.7	1.1	5.20	7.00	29	58	143	42	3	1	129,186	26	71,804
Total	115.17	4,628	5,418	33,526	43,572	-	-	954	1,407	4,247	-	19	14	63	3,366,936	-	1,885,569	

1/ May be adjusted in final design.

2/ Construction Cost \$1,212,130  
 Technical Services 181,819  
 Contingencies 121,213

Land Easements Rights-of-way, \$214,813  
 Power line & Road Relocation, etc. 19,229  
 Foundation Investigations, Design,  
 Cartographic, Administration, etc. 136,365  
 Total \$1,885,569

Note: Vegetative emergency spillway provided for all structures.

- LEGEND**
- Sediment Pool
  - Flood Pool
  - Floodwater Retarding Structure
  - Drainage Area Boundary - Special Structures
  - Acres Drainage Area
  - Outline of Floodwater and Sediment Damage Area
  - Watershed Boundary
  - Paved Road
  - Improved Road
  - County Road
  - County Line
  - Railroad
  - Pipe Line
  - Streams
  - Lakes
  - River
  - Cities
  - Towns

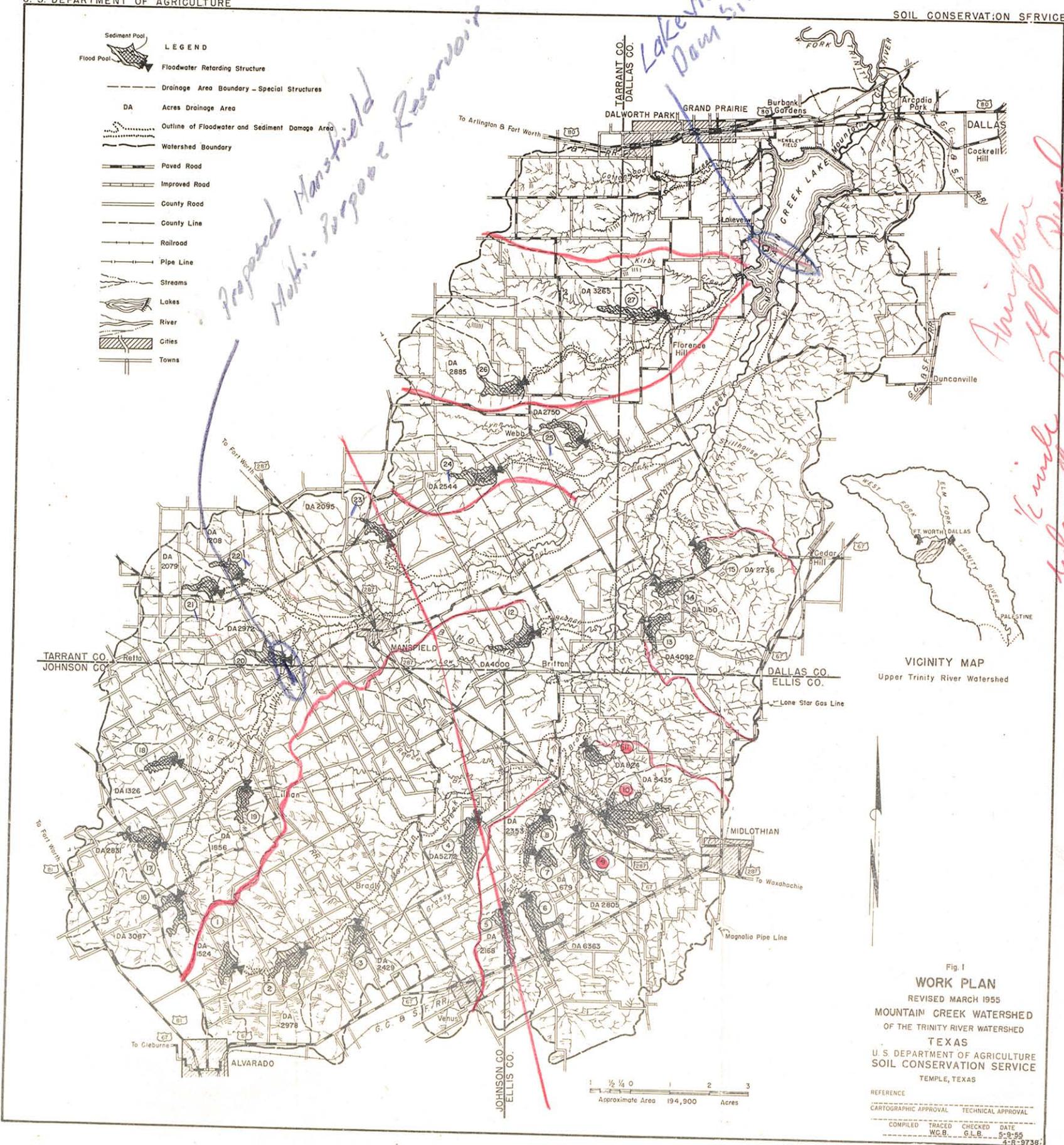


Fig. 1  
**WORK PLAN**  
REVISED MARCH 1955  
MOUNTAIN CREEK WATERSHED  
OF THE TRINITY RIVER WATERSHED  
TEXAS  
U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
TEMPLE, TEXAS

Approximate Area 194,900 Acres

REFERENCE

CARTOGRAPHIC APPROVAL	TECHNICAL APPROVAL
COMPILED	TRACED
WC.B.	S.L.B.
CHECKED	DATE
5-2-55	4-R-9738

*Proposed Mansfield Multi-Purpose Reservoir*

*Lakeview Dam Site*

*Approx. 1/2 mile down str from below Mansfield city limit*

## A P P E N D I X

Table 1a - Increase in Income Through More Intensive Use of Flood Plain Lands.

Table 1b - Increase in Income Through More Intensive Use of Flood Plain Lands.

Table 1c - Increase in Income Through More Intensive Use of Flood Plain Lands.

Table 2 - Individual Justification - Floodwater Retarding Structures.

Table 3a - Summary of Average Annual Monetary Floodwater and Sediment Damage and Flood Prevention Benefit from the Plan.

Table 3b - Summary of Average Annual Monetary Floodwater and Sediment Damage and Flood Prevention Benefit from the Plan.



APPENDIX

Table 1b  
 Increase in Income Through More Intensive Use of Flood Plain Lands  
 MOUNTAIN CREEK WATERSHED  
 Walnut Creek

Land Use	Acres	Yield	Production	Gross Income	Cost	Net Income
				(dollars)	(dollars)	(dollars)
<b>Present Conditions:</b>						
Cotton	129	290 Lb.	37,410	12,383	6,347	6,036
Corn	102	35 Bu.	3,570	4,570	1,729	2,841
Oats	104	40 Bu.	4,160	3,203	1,159	2,044
Grain Sorghum	46	20 CWT	920	1,785	552	1,233
Forage Sorghum	86	3 T.	258	5,908	1,911	3,997
Alfalfa	13	3 T.	39	1,001	399	602
Sudan	236	6 AUM	1,416	3,342	1,841	1,501
Truck	16	\$250	4,000	4,000	1,600	2,400
Meadow	544	2.5 T.	1,360	23,800	9,520	14,280
Pean Trees		20 Lb.	25,000	5,000	2,500	2,500
Idle	246	-	-	-	-	-
Waste	3	-	-	-	-	-
Pasture	1,074	3.6 AUM	3,866	9,124	-	9,124
Miscellaneous	80	-	-	-	-	-
<b>Total</b>	<b>2,679</b>	<b>-</b>	<b>-</b>	<b>74,116</b>	<b>27,558</b>	<b>46,558</b>
<b>After Land Treatment and Detention Storage:</b>						
Cotton	349	290 Lb.	101,210	33,501	17,171	16,330
Corn	102	35 Bu.	3,570	4,570	1,729	2,841
Oats	104	40 Bu.	4,160	3,203	1,159	2,044
Grain Sorghum	46	20 CWT.	920	1,785	552	1,233
Forage Sorghum	306	3 T.	918	21,022	6,799	14,223
Alfalfa	233	3 T.	699	17,943	7,164	10,779
Sudan	236	6 AUM	1,416	3,342	1,841	1,501
Truck	16	\$250	4,000	4,000	1,600	2,400
Meadow	244	2.5 T.	610	10,675	4,270	6,405
Pean Trees		20 Lb.	25,000	5,000	2,500	2,500
Pasture	963	3.6 AUM	3,467	8,182	-	8,182
Miscellaneous	80	-	-	-	-	-
<b>Total</b>	<b>2,679</b>	<b>-</b>	<b>-</b>	<b>113,223</b>	<b>44,785</b>	<b>68,438</b>
Flooded too Often to Intensity	650					
	<u>3,329</u>			Gross Increase	39,107	
				Net Increase		21,880
				Less Added Damage		249
				Less Increased Overhead 660 Ac. @ \$1.80		1,188
				Less Cost of Clearing Pasture 111 Ac. @ \$25.00 = 2,775 @ 4%		111
						<u>20,332</u>
				Discounting for 5-year lag.		.926
						<u>18,827</u>
				Long-term Price Factor		0.86
				Net Benefit		<u>16,191</u>



(Trinity River Watershed)

Total Benefits from Floodwater Retarding Structures - \$110,292  
 Drainage Area Controlled (Table 6) - 115.17 square miles.  
 Benefit per Square Mile Controlled - Main Stem \$992.68; Fish Creek \$572.84

Site No.	Drainage Area (Sq. Mi.)	Total Installation Cost (dollars)	Federal Installation Cost 1/2 (dollars)	Non-Federal Installation Cost 2/2 (dollars)	Easement Value 3/2 (dollars)	Annual Installation Cost (dollars)	Annual Maintenance Cost (dollars)	Total Annual Cost (dollars)	Annual Benefit (dollars)	Benefit-Cost Ratio
1	2.38	64,203	58,383	60	5,760	2,328	116	2,444	2,363	1.32:1
2 1/2	4.65	73,738	61,848	410	11,480	2,733	116	2,849	4,616	1.21:1
3	3.80	81,835	68,933	3,467	9,435	2,992	116	3,108	6,979	1.84:1
4	8.24	116,919	101,574	120	15,225	4,294	154	4,448	8,180	
5	3.39	57,426	45,006	2,100	10,320	2,141	77	2,218	3,365	
6	9.94	90,463	70,763	180	19,520	3,410	116	3,526	9,867	
7	1.06	26,587	23,897	80	2,610	968	77	1,045	1,052	
8 5/8	3.68	47,179	34,744	80	12,355	1,802	77	1,879	3,653	
9	4.38	65,069	57,597	160	7,312	2,377	116	2,493	4,348	2.07:1
10	8.49	117,027	97,080	1,672	18,275	4,340	116	4,456	8,428	1.74:1
11	1.29	28,929	27,056	20	1,853	1,041	77	1,118	1,281	1.89:1
12	6.25	112,563	98,193	1,860	12,510	4,109	116	4,225	6,204	1.15:1
13	6.39	106,972	97,897	1,340	7,735	3,861	116	3,977	6,343	1.47:1
14	1.80	45,683	39,703	2,540	3,440	1,649	77	1,726	1,788	1.59:1
15	4.28	107,528	101,995	20	5,513	3,855	154	4,009	4,249	1.04:1
16	4.82	82,694	75,881	670	6,143	2,991	116	3,107	4,785	1.06:1
17	4.42	78,960	72,612	160	6,188	2,854	116	2,970	4,388	1.54:1
18	2.07	44,315	41,715	100	2,500	1,591	77	1,668	2,055	1.18:1
19	2.90	74,322	69,442	140	4,740	2,674	116	2,790	2,055	1.23:1
20	4.64	82,484	79,064	100	3,320	2,947	116	3,063	2,879	1.03:1
21	3.25	52,246	48,568	140	3,438	1,881	77	1,958	4,606	1.50:1
22 6/8	1.89	28,717	25,887	610	2,220	1,036	77	1,113	3,225	1.06:1
23	3.27	52,007	44,042	2,120	5,845	1,900	77	3,071	1,876	1.66:1
24	3.98	63,926	52,763	1,600	9,563	2,362	116	2,478	3,246	1.64:1
25	4.30	58,002	50,212	140	7,650	2,132	116	2,248	3,951	1.59:1
26	4.51	64,553	53,788	940	9,825	2,388	116	2,504	4,267	1.90:1
27	5.10	72,294	63,856	900	7,538	2,635	116	2,751	2,584	1.03:1
Total	115.17	1,896,641	1,662,599	21,729	212,313	69,291	2,857	72,148	110,292	1.53:1

Includes:  
 1/ Cost of fill plus nine percent.  
 2/ \$17,259 for road relocations, \$200 for building relocation and \$1,770 for power line relocation.  
 3/ Only cost of easements.  
 4/ Sites 1 and 2 in series.  
 5/ Sites 5, 6, 7, and 8 in series.  
 6/ Sites 21 and 22 in series due to planned spillway arrangement.

APPENDIX

Table 3a  
 Summary of Average Annual Monetary Floodwater and  
 Sediment Damage and Flood Prevention Benefit from the Plan  
 MOUNTAIN CREEK WATERSHED  
 Main Stem & Walnut  
 Long-Term Prices

Damages	Average Annual Damage			Average Annual Benefit		
	Under Present Conditions	B-Measures Only	B-Measures Floodwater Retarding Structures	From Land Treatment Only	From Detention Storage Only	Total Flood Prevention Benefit
<u>Floodwater Damage</u>						
Crop and Pasture	48,281	32,382	14,302	15,899	18,080	33,979
Other Agricultural	6,163	3,705	172	2,458	3,533	5,991
Flood Plain Scour	9,285	5,850	2,600	3,435	3,250	6,685
Roads and Bridges	3,611	1,839	60	1,772	1,779	3,551
Impaired Drainage	447	282	125	165	157	322
Subtotal	67,787	44,058	17,259	23,729	26,799	50,528
<u>Sediment Damage</u>						
Overbank Deposition	25,718	15,431	8,487	10,287	6,944	17,231
Reservoirs	101,233	60,891	36,856	40,342	24,035	64,377
Subtotal	126,951	76,322	45,343	50,629	30,979	81,608
<u>Indirect Damage</u>						
Total Damage	19,474	12,038	6,260	7,436	5,778	13,214
Benefit from Reduction of Damage	214,212	132,418	68,862	-	-	-
Benefit from More Intensive Use of Flood Plain	-	-	-	81,794	63,556	145,350
Total Flood Control Benefit	-	-	-	41,231	104,787	146,018

APPENDIX

Table 3b  
 Summary of Average Annual Monetary Floodwater and  
 Sediment Damage and Flood Prevention Benefit from the Plan  
 MOUNTAIN CREEK WATERSHED  
 Fish  
 Long-Term Prices

Damages	Average Annual Damage			Average Annual Benefit		
	Under Present Conditions	B-Measures Only	B-Measures: Floodwater Retarding Structures	From Land Treatment Only	Detention Storage Only	Total Flood Prevention Benefit
<u>Floodwater Damage</u>						
Crop and Pasture	764	506	252	258	254	512
Other Agricultural	994	562	199	432	363	795
Flood Plain Scour	465	293	105	172	188	360
Roads and Bridges	404	221	25	183	196	379
Subtotal	2,627	1,582	581	1,045	1,001	2,046
<u>Sediment Damage</u>						
Overbank Deposition	1,331	798	440	533	358	891
Reservoirs	9,712	5,952	3,759	3,760	2,193	5,953
Subtotal	11,043	6,750	4,199	4,293	2,551	6,844
<u>Indirect Damage</u>						
Total Damage	1,367	833	478	534	355	889
Benefit from Reduction Damage	15,037	9,165	5,258	-	-	-
Benefit from More Intensive Use of Flood Plain	-	-	-	5,872	3,907	9,779
Total Flood Control Benefit	-	-	-	-	1,598	1,598
					5,505	11,377



# SECTION OF A TYPICAL FLOODWATER RETARDING STRUCTURE