

WORK PLAN
UPPER EAST FORK LATERALS
OF THE TRINITY RIVER WATERSHED
Collin, Rockwall, and Kaufman Counties
Texas

Prepared By
SOIL CONSERVATION SERVICE
U. S. DEPARTMENT OF AGRICULTURE

Temple, Texas
April 1956

Now, therefore, in view of the foregoing considerations, the local organization and the Secretary of Agriculture, through the Service, hereby agree on the watershed work plan, and further agree that the works of improvement as set forth in said plan will be installed, operated, and maintained substantially in accordance with the terms, conditions, and stipulations provided for therein.

It is further understood that this agreement does not constitute a financial document to serve as a basis for the obligation of Federal funds, and that financial and other assistance to be furnished by the Service in carrying out the watershed work plan is contingent on the appropriation of funds for this purpose and on the execution of supplemental agreements setting forth the cost-sharing arrangements and other conditions that are applicable to specific works of improvement.

It is further agreed that the watershed work plan may be amended or revised, and that this agreement may be modified or terminated, only by mutual agreement of the parties hereto.

No member of or Delegate to Congress shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

KAUFMAN-VAN ZANDT-ROCKWALL
SOIL CONSERVATION DISTRICT
(name of local organization)

By James I. Cartwright, Jr.
Title Chairman, Board of Supervisors
Date July 6, 1956

The signing of this agreement was authorized by a resolution of the governing body of the Kaufman-Van Zandt-Rockwall Soil Conservation District
(name of local organization)

adopted at a meeting held on July 6, 1956.

Shady Garland
(Secretary, local organization)

Date 7-6, 1956

COLLIN COUNTY SOIL CONSERVATION DISTRICT
(name of local organization)

By John D. Wells

Title Chairman, Board of Supervisors

Date June 18, 1956

The signing of this agreement was authorized by a resolution of the governing body of the Collin County Soil Conservation District
(name of local organization)

adopted at a meeting held on June 18, 1956

Ben C. Wood
(Secretary, local organization)

Date June 18, 1956

(name of local organization)

By _____

Title _____

Date _____, 195____

The signing of this agreement was authorized by a resolution of the governing body of the _____
(name of local organization)

adopted at a meeting held on _____, 195____.

(Secretary, local organization)

Date _____, 195____

Soil Conservation Service
United States Department of Agriculture

By _____

(State Conservationist)

Date _____, 195____

WATERSHED WORK PLAN
UPPER EAST FORK LATERALS WATERSHED
(Trinity River Watershed)
Collin, Rockwall and Kaufman Counties, Texas

Participating Agencies

Kaufman-Van Zandt County Soil Conservation District
Collin County Soil Conservation District
Agricultural Stabilization and Conservation Office, USDA
Extension Service, USDA
Soil Conservation Service, USDA

Prepared by

Soil Conservation Service
United States Department of Agriculture
April, 1956

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1
Authority	1
Purpose and Scope of Plan	1
SUMMARY OF PLAN	2
DESCRIPTION OF THE WATERSHED	2
Physical Data	2
Economic Data	4
WATERSHED PROBLEMS	5
Floodwater Damage	5
Sediment Damage	6
Erosion Damage	6
Problems Relating to Present Methods	7
WORKS OF IMPROVEMENT TO BE INSTALLED	7
Land Treatment Measures	7
Structural Measures for Flood Prevention	8
Effect of Works of Improvements on Damages and Benefits	10
COMPARISON OF BENEFITS AND COSTS	10
ACCOMPLISHING THE PLAN	11
Land Treatment Measures	11
Structural Measures for Flood Prevention	11
PROVISIONS FOR OPERATION AND MAINTENANCE	12
Land Treatment Measures	12
Structural Measures for Flood Prevention	12

List of Tables and Figures

Table 1 - Estimated Installation Cost	13
Table 2 - Status of Flood Prevention Job Prior to First Year of Work Plan	19
Table 3 - Annual Costs	20
Table 4 - Summary of Benefits	22
Table 5 - Benefit-Cost Analysis	23

TABLE OF CONTENTS - Continued

	<u>Page</u>
Table 6 - Structure Data (Preliminary Estimates for Floodwater Retarding Structures)	25
Table 6A - Structure Data (Preliminary Estimates for Grade Stabilization Structures)	26
Table 6B - Structure Data (Preliminary Estimate for Floodwater Diversions)	26
Table 6C - Structure Data (Preliminary Estimate for Channel Improvement)	26
Table 6D - Structure Data (Estimated Structure Cost Distribution)	27
Table 7 - Summary of Physical Data	29
Table 8 - Summary of Plan Data	30
Figure 1 - Typical Floodwater Retarding Structure	9
Figure 2 - Structure Location Map	31
Figure 3 - Problem Location Map	32

WATERSHED WORK PLAN
Upper East Fork Laterals Watershed
(Trinity River Watershed)
Collin, Rockwall and Kaufman Counties, Texas
April, 1956

INTRODUCTION

Authority

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

Purpose and Scope of Plan

The Kaufman-Van Zandt and the Collin County 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 objectives are 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 be effective in reducing runoff from small rains and will effect some reduction in peak flows from excessive rains. An effective land treatment program will have a major effect in the reduction of upland erosion rates which in turn will reduce sediment damages. Additional structural measures for flood prevention are needed to complete the soil and water conservation and plant management 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 and water conservation and plant management 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 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 a level consistent with the capabilities of the land, thereby promoting the welfare of the landowners and operators, the

community, the State, and the Nation. The area in the watershed includes parts of three counties (Collin, Rockwall and Kaufman), and contains 95,590 acres (150 square miles).

SUMMARY OF PLAN

This plan includes a combination of land treatment measures which contribute directly to soil and water conservation and flood prevention and structural measures primarily for flood prevention. The works of improvement listed in Table 1 are planned to be installed at an estimated cost of \$3,650,666, of which \$2,298,321 is to be borne by State and local interests and \$1,352,345 by the Federal Government. These estimates are inclusive of the current costs of local and State interests under the going National programs pertaining to the objectives of this plan. It is estimated that the Federal contribution under going agricultural programs will be \$22,000.

The Collin County and Kaufman-Van Zandt Soil Conservation Districts, under provisions of State-enabling legislation, have agreed to assume responsibility for over-all periodic inspection and maintenance of the floodwater retarding and land stabilization structures, floodwater diversions and stream channel improvement at an estimated annual cost of \$5,942.

When the works of improvement are applied and operating at full effectiveness, the ratio of the estimated average annual benefit, \$189,827, to the estimated average annual cost, \$59,131, is 3.21 to 1, based on current price levels for costs and long-term prices for benefits. Benefits were evaluated on the flood plains of Bluff, Squabble, Buffalo and Mustang Creeks and the East Fork of the Trinity River where protected by levees from river flooding. Additional benefits that accrue on flood plain of East Fork of the Trinity River and along the Trinity River below its confluence with East Fork are not included in this evaluation.

DESCRIPTION OF THE WATERSHED

Physical Data

The Upper East Fork Laterals watershed is comprised of a series of small drainages along the east side of the East Fork of the Trinity River, extending from the Lavon Reservoir to Crandall, Texas, a distance of approximately 26 miles.

The watershed ranges from 2 to 8 miles in width, averaging 6 miles. Bluff, Squabble, Buffalo, and Mustang Creeks are the major streams that drain directly into the river. The incorporated towns of Rockwall and Forney and several small villages are located in the watershed.

The watershed has an area of 95,590 acres (150 square miles), of which 92,490 acres are in farms and 3,100 acres are in urban areas, roads, and other miscellaneous uses. There are 10,606 acres of bottom land in the

watershed, of which 10,495 acres are flood plain and 111 acres are in stream channels.

The Upper East Fork Laterals watershed lies entirely within the Blackland Prairie Problem Area in Soil Conservation and may be broken down into two different soil areas. These are: (1) bottom land or alluvial soils; and (2) black waxy soils. The alluvial soils make up 10.4 percent of the total watershed. They are mostly fine-textured and dark-colored soils and are very productive. The black waxy soils are dark colored and fine textured and are developed from marl or limy clay formations. These are highly productive soils except where erosion has been rather severe.

Approximately 70 percent of the flood plain area, formerly used for the production of high-income crops, is now pasture, Johnsongrass meadow, or idle land as a result of frequent flooding. Throughout the watershed the cultivated land, about 65 percent of the total area is in rather poor physical condition as a result of long and intensive cultivation. Much of its fertility and organic matter has been lost and erosion is severe on some of the sloping lands.

The watershed is underlain by one principal geologic formation, the Taylor marl. This formation is composed of interbedded shales, calcareous chalk and marl.

Physiographically the watershed consists of a plain dissected by numerous streams which have cut shallow valleys. The main drainage systems drain directly into the East Fork of the Trinity River.

Topography of the drainage area may be classed as nearly level to gently rolling. The surface elevation of the prairie ranges from about 350 feet above mean sea level along the river near Crandall to 620 feet at Nevada. Local relief ranges from 50 to 100 feet.

Stream channels of the East Fork Laterals are irregular in size, with wide and deep sections alternating with sections of shallow, sediment-filled channels. There is no relation between channel size and drainage area.

Mean temperatures range from 85 degrees Fahrenheit in summer to 46 degrees in winter. The extreme recorded temperatures are 3 degrees below zero and 113 degrees above zero. The average date of the last killing frost is March 17 and that of the first killing frost is November 16, a normal frost-free period of 244 days.

The mean annual precipitation of 41.56 inches is fairly evenly distributed, with the greatest amounts of rainfall occurring in April and May. Individual rains of excessive amounts, which may occur at any season, cause serious erosion and flood damage. Although these storms may occur during any season, the majority have occurred in the spring months. The minimum recorded annual rainfall was 18.82 inches, the maximum was 53.10 inches.

Water for livestock and domestic uses on farms in the watershed is supplied largely by shallow wells and small farm ponds. These sources yield some water, but generally do not provide a dependable supply. The towns of Rockwall, Forney, and Crandall obtain their water for municipal uses from deep wells. The water from these wells contain considerable minerals.

The Upper East Fork Laterals watershed is served by Soil Conservation Service work units at Kaufman and Rockwall, which are assisting the Kaufman-Van Zandt and the Collin County Soil Conservation Districts. These work units have assisted farmers and ranchers in preparing 386 conservation plans on 58,471 acres within the watershed. Where land treatment measures have been applied and maintained for as long as 3 to 5 years, crop yields have increased 20 to 25 percent.

Economic Data

In farming operations of the watershed, the better or more productive uplands throughout the area are devoted largely to the production of crops. Approximately 70 percent of the cultivated land is used for cotton, corn and small grains. Other crops grown are grain sorghums, clovers, hay and truck crops.

The more broken lands of the Upper East Fork Laterals of the Trinity River are used for livestock production. Beef enterprises predominate, but several small dairies within the watershed sell milk to processors and distributors located elsewhere.

There are 674 farms in the watershed with an average size of approximately 130 acres. Scattered throughout the watershed are small villages and residential areas occupied principally by people who commute to and from their work in Dallas. Also some people live on small acreages which are inadequate for subsistence and supplement their income by employment on farms, in Dallas, or in small industries located in or near the watershed. These people contribute little to agricultural production. Land values are usually high partly because of urban influences due to the proximity of Dallas.

Rockwall, the largest town in the area is located in the north central portion of the watershed. Other towns are Nevada and Lavon on the extreme northern end, Forney in the central portion, and Crandall on the extreme south end of the watershed.

The principal towns and their populations are:

<u>Town</u>	<u>Population</u>
Lavon	200
Nevada	386
Rockwall	1,501
Forney	1,425
Crandall	727

The principal industries in the watershed are associated with agriculture and include clothing and leather goods factories. An aluminum processing industry is located at Rockwall. Also, in 1953, this community authorized a \$5,000,000 bond issue for a freight express airport contingent on its use by new industry.

The watershed is served by approximately 166 miles of roads with 70 miles paved. There are 52 bridges on these roads, 9 of which span the larger streams. Floods occasionally make some of the roads impassable. The detours thus occasioned cause delay and extra travel distance to and from places of employment and markets. The Saint Louis and Southwestern Railroad; the Missouri, Kansas and Texas Railroad; the Texas and Pacific Railroad; and the Texas and New Orleans Railroad provide adequate rail service for carload lot shipments.

WATERSHED PROBLEMS

Floodwater Damage

The streams in the Upper East Fork Laterals watershed have flooded frequently and have caused high annual damage. Of the 10,495 acres of flood plain, 1,733 acres are flooded by Bluff Creek, 345 acres by Squabble Creek, 1,330 acres by the drainage area above the Rockwall County Levee District No. 1, 2,585 acres by Buffalo Creek, 1,077 acres by Mustang Creek, and 3,425 acres by East Fork of the Trinity River. Since the flood control measures proposed on the Upper East Fork Laterals watershed would have an undetermined effect on the area flooded by the East Fork of the Trinity River and the Trinity River below their confluence, no flood damages to the area were included in this plan. To adequately determine and allocate the benefits from the flood prevention measures proposed in the Upper East Fork Laterals watershed on the area flooded by the East Fork of the Trinity River and the Trinity River below their confluence will require a combined study of Upper East Fork Laterals watershed, Rowlett Creek watershed, and Duck and Mesquite Creeks watershed, coordinated with the effects of the Corps of Engineers Lavon reservoir. Therefore, no flood damages or flood prevention benefits on the above main stem flood plain areas were included in this plan.

Of the 1,077 acres flooded by Mustang Creek, 936 acres are river bottom lands located in the Kaufman County Levee District No. 13. The levee in this district has several breaks at present and the East Fork of the Trinity River floods much of the area. Local interests have indicated an intent to reestablish the existing levees since Lavon Reservoir and other floodwater retarding structures have reduced expectant peak flows. Benefits attributed to the works of improvement on Mustang Creek are contingent on the levee improvement by local interests becoming a reality.

During the 20-year period, 1923 to 1942, inclusive, there were 55 storms which inundated more than 50 percent of the flood plain, and 65 smaller floods. Floods occurring during the growing season have caused considerable damage to growing crops. For the floods experienced during the

20-year period studied, the total direct floodwater and sediment damages were estimated to average \$197,427 annually under present conditions. Crop and pasture damage accounts for \$179,659 of this. Excluding the area of flood plain which would be inundated by the proposed floodwater retarding structures, these damages would be \$183,081 and \$166,604, respectively. In addition, there are numerous indirect damages such as the interruption of travel, initial losses sustained by dealers and industries in the area and similar items. The total annual value of these indirect damages is estimated to be \$18,308. The average annual monetary flood damages are summarized in Table 4.

Sediment Damage

Most of the flood plain of the Upper East Fork Laterals has received substantial amounts of sediment deposition. Approximately 3,123 acres have been damaged 5 to 10 percent. The estimated acreages damaged annually under present conditions are 1,711 acres damaged 5 percent, and 1,412 acres damaged 10 percent.

In general these overbank deposits are of the same texture and color as the original material and have been deposited at the rate of a few inches during each major flood. Much of the damage by sediment is the result of impaired drainage caused by deposition of fine silt and clay.

Channel filling by sediment has caused greater frequency of flooding and increased flood heights in numerous valley reaches. Though recognition was made of this effect, no consideration was given to it in estimating future damages.

Benefits based on reduction of sediment damage resulting from installation of floodwater retarding structures were confined to that flood plain area located below proposed structures which was inundated by the largest flood evaluated in the 20-year storm series. Sediment damage resulting from deposition of infertile sediment on flood plain lands will be reduced approximately 80 percent by the watershed project.

Erosion Damage

Erosion rates within the Upper East Fork Laterals range from an almost insignificantly low to very high, but at the present time a decrease can be noticed in the high rates due to applied conservation practices. Some steep areas formerly in cultivation have been retired from such use and established in grass. Many acres of cultivated land have been terraced and put in cover crops. Additional areas have been taken out of cultivation and allowed to remain idle. Natural revegetation is slow but the erosion rates are being reduced. When sufficient additional land treatment has been applied to effect a total of 60 percent of the upland area an additional 25 percent reduction in erosion rates may be expected.

Scour damage to flood plain lands is not extensive. About 1.6 percent

(166 acres) of the total flood plain has been scoured by floodwater resulting in damages ranging from 10 to 75 percent. Acreages affected by scour are estimated to be 34 acres damaged 10 percent; 43 acres damaged 30 percent; 54 acres damaged 50 percent; 25 acres damaged 60 percent; and 10 acres damaged 75 percent.

Problems Relating to Methods Now Used in the Conservation, Development, Utilization and Disposal of Water

During the past 45 years attempts have been made by three organized groups to levee bottom lands along the East Fork of the Trinity River. Two of these, Rockwall County Levee District No. 1 and Kaufman County Levee District No. 15, are in satisfactory condition at the present time. The levees in Kaufman County Levee District No. 13 may be reestablished safely due to the reduction in expected peak flows resulting from the Lavon Reservoir and other floodwater retarding structures.

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment Measures

An effective conservation program based upon the use of each acre of agricultural land within its capabilities and its treatment in accordance with its needs such as is now being carried out by the Collin County and the Kaufman-Van Zandt Soil Conservation Districts is essential to sound and continuing flood prevention in the watershed. Basic to the attainment of this objective is the establishment and maintenance of all applicable soil, water and plant management practices essential to proper land use. Emphasis will be placed on accelerating the establishment of those land treatment practices which have a measurable effect on the reduction of floodwater and sediment damages.

An important phase of work is the seeding or overseeding of 22,555 acres of idle land and pasture which have been so overgrazed that reseeding is necessary to establish cover adequate to reduce erosion and sediment yield. Brush will be controlled on 9,006 acres of pasture land to improve the composition and density of those grasses which will materially improve the hydrologic conditions of the watershed.

Approximately 1,458 miles of terraces will be built. Low-lying fields will be protected by 25 miles of farm diversion terraces. Twenty-eight hundred and twenty-nine acres of protected outlets will be established to carry the runoff from these terraces and diversions. Stabilization structures, including 327 drop inlets and drop structures and 237 sod flumes, are needed to stabilize protected outlets and gullied areas.

Other land treatment measures which have a direct effect on flood prevention and which will be applied include contour cultivation, 33,993 acres; rotation hay and pasture, 14,648 acres; crop residue utilization, 38,919 acres; proper use of pasture, 35,507 acres; and construction of 516 farm ponds.

Under the guidance and with the assistance of the Collin County and the Kaufman-Van Zandt Soil Conservation Districts, landowners and operators will apply other needed land treatment measures, such as farm drainage, land clearing, fish pond management and wildlife area improvement. These practices are needed in a complete soil and water conservation program, but they either do not contribute directly to flood prevention or their contribution is minor due to the characteristics of the practice or small areas affected.

The estimated total cost of planning and installing land treatment measures over and above the going program is \$2,192,246, as shown in Table 1.

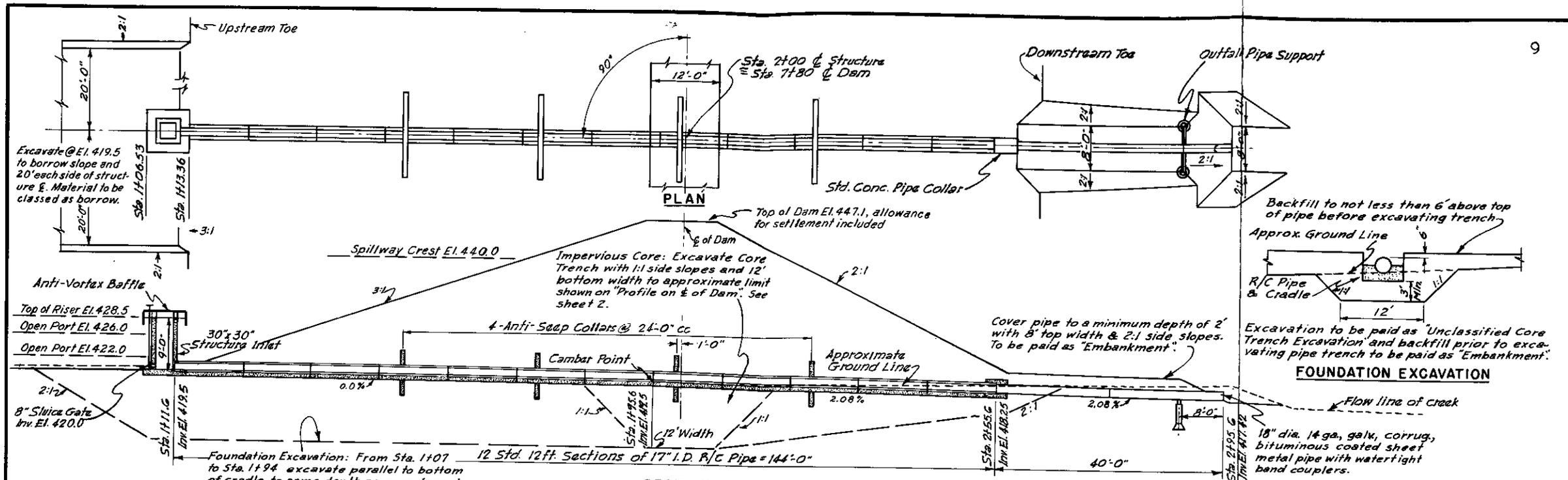
Structural Measures for Flood Prevention

The floodwater retarding structures needed to provide flood protection for flood plain lands, highways, and rural improvements are listed, with their costs in Table 1. A schematic drawing of a cross section of a typical floodwater retarding structure is shown by Figure 1. The provision for sediment reserve is in compliance with the State laws which permit storage of only 200 acre-feet of water without a permit. The sediment pool is designed to store all expected sediment produced in a 50-year period. Any storage requirements in excess of 200 acre-feet are provided for in the sediment reserve.

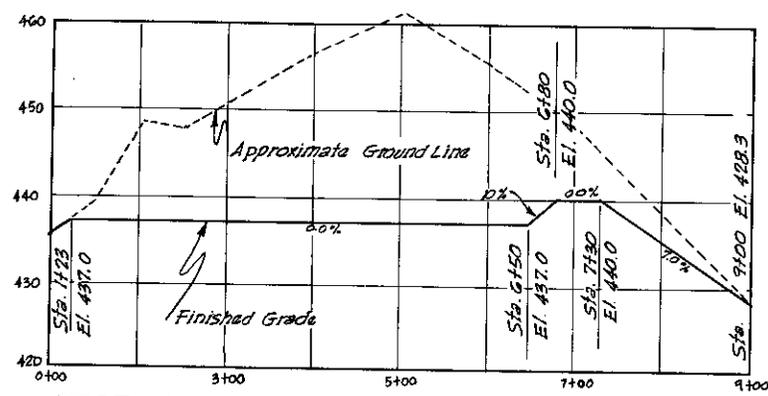
A system of 30 floodwater retarding structure, 1 grade stabilization structure, 9.15 miles of stream channel improvement and 4.78 miles of floodwater diversions are to be installed to protect the flood plain lands in the watershed. The works of improvement will be constructed at or near the locations shown on the Structure Location Map, Figure 2. Data concerning the floodwater retarding structures are summarized in Table 6, 6A, 6B, and 6C.

The system of floodwater retarding structures will temporarily detain runoff from 43 percent of Bluff Creek, 60 percent of Squabble Creek, 88 percent of Mustang Creek and 58 percent of Buffalo Creek, and will divert water from 44 percent of the Rockwall County Levee District No. 1. Sufficient detention storage can be developed at all structure sites to make possible the use of vegetated spillways, thereby effecting a substantial reduction in cost over concrete or similar spillways.

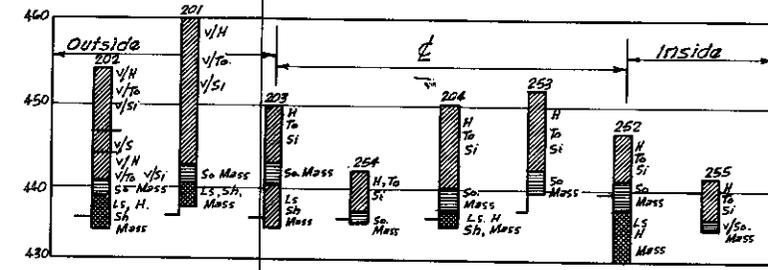
Sites for the floodwater retarding structures will be provided by local interests. The value of these sites is estimated to be \$184,200. Site costs were determined by adding the full value of the land in the sediment pool and one-half of the value of the land in the detention pool, since the latter will remain in productive use as pasture. The amortized current value of land in the structure sites, \$8,575, exceeds the average annual value of the loss of production within the sites at long-term price levels. Therefore, in accordance with sound procedures, the higher figure was used in evaluating the economic justification of the project.



SECTION
STRUCTURE AND EMBANKMENT
DETAILS ON SHEET 4

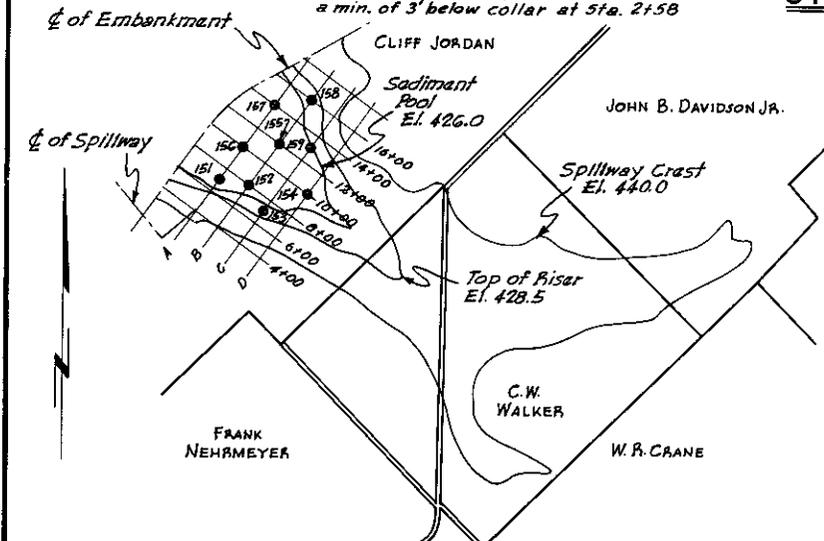


PROFILE ON REFERENCE AND C OF SPILLWAY



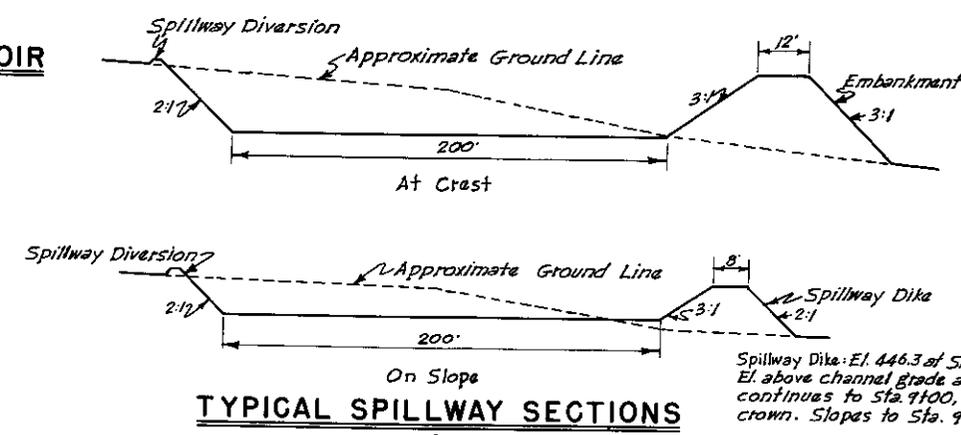
Note: Bar at left of boring is at spillway grade.
LOG OF SPILLWAY BORINGS
SEE PLAN OF EMBANKMENT AND SPILLWAY

- LEGEND OF BORINGS**
- S. Sand- Sandy
 - Si. Silt- Silty
 - Sh. Shale - Shaley
 - Ls. Limestone
 - Fri. Friable
 - Pl. Plastic
 - Cl. Clay
 - Com. Compact
 - Con. Concretions
 - V. Very
 - W. With
 - So. Soft
 - H. Hard
 - To. Tough
 - Fi. Firm



GENERAL PLAN OF RESERVOIR

ELEVATION	SURFACE		STORAGE	
	ACRES	ACRE FT.	ACRE FT.	INCHES
422.0	18.3	36.6	0.26	
426.0	27.9	127.0	0.91	
428.5	33.5	205.7	1.45	
430.0	37.5	260.0	1.84	
434.0	61.6	458.4	3.24	
438.0	84.1	749.8	5.30	
440.0	95.5	929.1	6.57	
442.0	107.2	1132.4	8.01	
446.0	136.0	1618.8	11.45	
Top of Dam (Effective) Elev. 446.1				
Spillway Crest Elev. 440.0				
Top of Riser Elev. 428.5				
Sediment Pool Elev. 426.0				
Drainage Area, Acres 1697.0				
Sediment Storage, Ac. Ft. 206.0				
Floodwater Storage, Ac. Ft. 723.0				



TYPICAL SPILLWAY SECTIONS

Figure 1

STRUCTURE — PLAN AND SECTION
FLOODWATER RETARDING STRUCTURE SITE No. 10
UPPER EAST FORK LATERALS
OF THE
TRINITY RIVER WATERSHED - TEXAS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	L.A.W.	date	11/8/55	Approved by	J.M.
Drawn	L.A.W. & D.S.	date	11/23/55	HEAD, ENGINEERING & WATER RESOURCES DIVISION, FT. WORTH, TEXAS.	
Traced	D.S.	date	11/23/55	STATE CONSERVATION ENGINEER, TEXAS.	
Checked	L.A.W.	date	12-1-55	Dwg. No.	4-E-10,159
				Sheet No.	3 of 6

The total estimated cost of installing the structures, the stream channel improvement and the floodwater diversions is \$1,447,270. The annual equivalent cost, including installation and maintenance, is \$59,131.

Six of the proposed floodwater retarding structures and the grade stabilization structure have been constructed since the original watershed plan was developed. The costs of these structures are summarized in Table 1.

Effect of Works of Improvements on Damages and Benefits

The combined program of land treatment and structural measures for flood prevention would eliminate damages from 54 of the 120 floods that occurred in the 20-year period of study. The remaining 66 floods would be reduced to minor floods. Average annual flooding throughout the watershed would be reduced from 16,419 acres to approximately 2,515 acres.

The estimated annual floodwater, sediment and erosion damage, based on floods experienced in the 20-year period of study, would be reduced from \$201,389 to \$28,129, or a reduction of 86 percent. Approximately 85 percent of the expected reduction in average annual damages caused by the storms in the 20-year period studied would result from the system of floodwater retarding and grade stabilization structures, floodwater diversions and channel improvement. The annual value of this reduction is estimated to be \$148,763 out of the total of \$173,260 from all measures as shown in Table 4.

Owners and operators of flood plain lands say that if adequate flood protection is provided, they will restore land now in pasture to the production of high-value crops such as cotton, corn and alfalfa. Much of this pastureland was in cultivation at one time, but was removed because of the flood hazard. It is estimated that increased net income from changes in land use will amount to \$41,064 (long-term prices) annually.

The proposed flood prevention program on Upper East Fork Laterals watershed will have no known detrimental effect on any downstream projects that might be constructed in the future.

COMPARISON OF BENEFITS AND COSTS

When the structural measures for flood prevention are installed and operating at full effectiveness, the ratio of the average annual benefit, \$189,827, to the average annual cost of the measures, \$59,131, is about 3.21 to 1, based on current price levels for costs and long-term price levels for benefits. In addition to the monetary benefits, there are other substantial values which will accrue from the program, such as increased opportunities for recreation, better living conditions and sense of security, which have not been evaluated.

ACCOMPLISHING THE PLAN

The Agricultural Extension Service will carry out the educational phase of the program by conducting general information and farm meetings, the preparation of radio and press releases and the use of other forms of disseminating information to reach the landowners and operators in the Upper East Fork Laterals watershed to help achieve understanding and stimulate participation in the entire plan to be carried out, including the land treatment practices and the structural measures for flood prevention.

Land Treatment Measures

The Soil Conservation Service has accelerated the planning and application of land treatment measures by assigning additional technicians and aids to the Soil Conservation Districts concerned. Agricultural Conservation Program Service payments will assist the farmers in carrying out the land treatment practices and measures needed in the watershed.

The governing bodies of the Soil Conservation Districts concerned will arrange for meetings according to a definite schedule, and by individual contacts encourage the landowners and operators within the Upper East Fork Laterals watershed to adopt and carry out soil and water conservation plans on their farms. District-owned equipment will be made available to the landowners in accordance with existing arrangements for equipment usage in the districts. The district governing bodies will make periodic inspections of the completed conservation measures within their districts and follow through to see that needed maintenance is performed.

Structural Measures for Flood Prevention

The Collin County and the Kaufman-Van Zandt Soil Conservation Districts will furnish the land easements and rights-of-way for all structural measures at no cost to the Federal Government. These easements and rights-of-way will be obtained by private donation.

Technicians will be provided by the Soil Conservation Service to assist in the planning, design, supervision of construction, certification of payments and related duties for the structural measures for flood prevention. Since most of this work on private lands will be done by contract, the Soil Conservation Service will be responsible for preparing specifications and discharging the various steps involved in the letting of contracts in accordance with customary Federal procedures.

Table 1 indicates the planned schedule of operations for each phase of the project. Sites located on Mustang Creek will not be constructed until the Kaufman County Levee District No. 13 has reestablished its existing levees. The cooperating parties have agreed that this schedule should be followed to achieve the most efficient prosecution of the work. This schedule will be adjusted year by year on the basis of any significant

changes in the plan found to be mutually desired and in light of current applications and accomplishments. The various features of cooperation between the cooperating parties have been covered in appropriate memoranda of understanding and working agreements.

PROVISIONS FOR OPERATION AND MAINTENANCE

Land Treatment Measures

Applied land treatment measures will be operated and maintained by the landowners or operators of the farms on which measures are located under agreement with the appropriate soil conservation district. Representatives of the district concerned will make periodic inspections of the land treatment measures to determine maintenance needs, will encourage landowners and operators to perform maintenance and will make district-owned equipment available for this purpose.

Structural Measures for Flood Prevention

The 30 floodwater retarding structures, 1 grade stabilization structure, 4.78 miles of floodwater diversion and 9.15 miles of improved channel will be maintained by the soil conservation district in which they are located.

All floodwater retarding structures will be inspected at least once annually and following each heavy rain or streamflow. Items of inspection will include, but not be limited to, the conditions of the principal spillway and its appurtenances, the emergency spillway, the earth fill, the vegetative cover of the earth fill and emergency spillway, and fences and gates installed as a part of the floodwater retarding structures. The improved stream channel will be inspected at least once each year to determine the need for control of vegetation to prevent reduction of channel capacity and accumulation of sediment. Floodwater diversions will be inspected at least annually and following each heavy or localized rainfall. This inspection will include condition of the diversions, maintenance needs and determination of vegetative control measures to prevent sediment accumulation and/or a reduction in waterflow capacity. A record of all maintenance inspections will be maintained by the responsible organization.

Provisions will be made by the soil conservation districts for free access of district and Federal representatives to inspect the works of improvement.

The estimated annual operation and maintenance cost is \$5,942. The necessary maintenance work will be accomplished through the use of contributed labor and equipment, by contract, or by force account, or a combination of these methods.

TABLE 1. ESTIMATED INSTALLATION COST
(Based on 1954 Price Levels)
Upper East Fork Laterals Watershed, Texas
(Trinity River Watershed)

For: Period 7-1-50 to 6-30-55

Items	Unit	Number to be Applied	Estimated Cost		Total
			Federal	Non-Federal ^{1/}	
			(dollars)	(dollars)	(dollars)
LAND TREATMENT					
Soil Conservation Service					
Land Treatment Measures					
Contour Farming	Acre	4,870	-	4,870	4,870
Cover Cropping	Acre	26,919	-	258,422	258,422
Rotation Hay and Pasture	Acre	8,846	-	95,537	95,537
Crop Residue Utilization	Acre	13,271	-	13,271	13,271
Proper Use Pasture	Acre	21,198	-	42,396	42,396
Rotation Grazing	Acre	20,959	-	-	-
Pasture Planting	Acre	9,799	-	122,488	122,488
Brush Control	Acre	1,976	-	39,520	39,520
Terracing	Mile	185	-	23,125	23,125
Diversion Construction	Mile	10	-	2,100	2,100
Waterway Development	Acre	464	-	25,520	25,520
Pond Construction	No.	223	-	56,776	56,776
Drop Inlets and Drop Structures	No.	5	-	7,500	7,500
Sod Flumes	No.	10	-	5,000	5,000
Planning Assistance (Accl.)	Acre	31,720	12,688	-	12,688
Application Assistance (Accl.)	Acre	32,727	36,000	-	36,000
SCS Subtotal			48,688	696,525	745,213
TOTAL LAND TREATMENT			48,688	696,525	745,213
STRUCTURAL MEASURES					
Soil Conservation Service					
Land Stabilization					
Drop Inlet Construction	No.	-	-	-	-
Diversion Construction	Mile	-	-	-	-
Waterflow Control					
Floodwater Retarding Structures	Nos.	4,4A,4B, 5A,5B,5C	163,375	-	163,375
Channel Improvement	Mile	-	-	-	-
TOTAL CONSTRUCTION COSTS			163,375	-	163,375
TOTAL INSTALLATION SERVICES			50,027	-	50,027
TOTAL OTHER COST			-	37,020	37,020
TOTAL STRUCTURAL MEASURES			213,402	37,020	250,422
Work Plan Preparation			8,150	-	8,150
GRAND TOTAL			270,240	733,545	1,003,785
SUMMARY					
Total SCS			270,240	733,545	1,003,785
GRAND TOTAL			270,240	733,545	1,003,785

^{1/} Excludes \$212,332 that was reimbursed from other Federal Funds (ACPS) to private interests.

Date: April 1956

TABLE 1. ESTIMATED INSTALLATION COST
 (Based on 1954 Price Levels)
 Upper East Fork Laterals Watershed, Texas
 (Trinity River Watershed)

For: Fiscal Year 1956

Items	Unit	Number to be Applied	Estimated Cost		Total
			Federal	Non-Federal ^{1/}	
			(dollars)	(dollars)	(dollars)
LAND TREATMENT					
Soil Conservation Service					
Land Treatment Measures					
Contour Farming	Acre	1,200	-	1,200	1,200
Cover Cropping	Acre	2,200	-	25,080	25,080
Rotation Hay and Pasture	Acre	950	-	9,519	9,519
Crop Residue Utilization	Acre	4,200	-	4,200	4,200
Proper Use Pasture	Acre	2,500	-	5,000	5,000
Rotation Grazing	Acre	2,000	-	-	-
Pasture Planting	Acre	1,600	-	24,000	24,000
Brush Control	Acre	450	-	9,000	9,000
Terracing	Mile	65	-	7,150	7,150
Diversion Construction	Mile	1	-	188	188
Waterway Development	Acre	120	-	6,600	6,600
Pond Construction	No.	45	-	10,687	10,687
Drop Inlets and Drop Structures	No.	9	-	7,425	7,425
Sod Plumes	No.	20	-	5,500	5,500
Planning Assistance (Accl.)	Acre	4,000	1,600	-	1,600
Application Assistance (Accl.)	Acre	5,091	5,600	-	5,600
SCS Subtotal			7,200	115,549	122,749
TOTAL LAND TREATMENT			7,200	115,549	122,749
STRUCTURAL MEASURES					
Soil Conservation Service					
Land Stabilization					
Drop Inlet Construction	No.	1	15,237	-	15,237
Diversion Construction	Mile	-	-	-	-
Waterflow Control					
Floodwater Retarding Structures	Nos.	6,8,& 9	100,664	-	100,664
Channel Improvement	Mile	-	-	-	-
TOTAL CONSTRUCTION COSTS			115,901	-	115,901
TOTAL INSTALLATION SERVICES			36,136	-	36,136
TOTAL OTHER COST			-	25,070	25,070
TOTAL STRUCTURAL MEASURES			152,037	25,070	177,107
Work Plan Preparation			3,000	-	3,000
GRAND TOTAL			162,237	140,619	302,856
SUMMARY					
Total SCS			162,237	140,619	302,856
GRAND TOTAL			162,237	140,619	302,856

^{1/} Excludes \$39,551 that may be available from other Federal Funds (ACPS) to reimburse private interests.

Date: April 1956

TABLE 1. ESTIMATED INSTALLATION COST
 (Based on 1954 Price Levels)
 Upper East Fork Laterals Watershed, Texas
 (Trinity River Watershed)

For: Fiscal Year 1957

Items	Unit	Number to be Applied:	Estimated Cost		Total
			Federal	Non-Federal ^{1/}	
			(dollars)	(dollars)	(dollars)
LAND TREATMENT					
Soil Conservation Service					
Land Treatment Measures					
Contour Farming	Acre	1,400	-	1,400	1,400
Cover Cropping	Acre	2,200	-	25,080	25,080
Rotation Hay and Pasture	Acre	1,050	-	10,521	10,521
Crop Residue Utilization	Acre	4,400	-	4,400	4,400
Proper Use Pasture	Acre	2,750	-	5,500	5,500
Rotation Grazing	Acre	2,250	-	-	-
Pasture Planting	Acre	1,700	-	25,500	25,500
Brush Control	Acre	450	-	9,000	9,000
Terracing	Mile	65	-	7,150	7,150
Diversion Construction	Mile	2	-	375	375
Waterway Development	Acre	135	-	7,425	7,425
Pond Construction	No.	50	-	11,875	11,875
Drop Inlets and Drop Structures	No.	13	-	10,725	10,725
Sod Flumes	No.	25	-	6,875	6,875
Planning Assistance (Accl.)	Acre	4,000	1,600	-	1,600
Application Assistance (Accl.)	Acre	5,091	5,600	-	5,600
SCS Subtotal		-	7,200	125,826	133,026
TOTAL LAND TREATMENT			7,200	125,826	133,026
STRUCTURAL MEASURES					
Soil Conservation Service					
Land Stabilization					
Drop Inlet Construction	No.	-	-	-	-
Diversion Construction #4	Mile	0.41	2,581	-	2,581
Waterflow Control					
Floodwater Retarding Structures	Nos.	9A & 10	68,323	-	68,323
Channel Improvement	-	-	-	-	-
TOTAL CONSTRUCTION COSTS			70,904	-	70,904
TOTAL INSTALLATION SERVICES			21,323	-	21,323
TOTAL OTHER COST			-	8,260	8,260
TOTAL STRUCTURAL MEASURES			92,227	8,260	100,487
Work Plan Preparation	-	-	-	-	-
GRAND TOTAL			99,427	134,086	233,513
SUMMARY					
Total SCS			99,427	134,086	233,513
GRAND TOTAL			99,427	134,086	233,513

1/ Excludes \$45,574 that may be available from other Federal Funds (ACPS) to reimburse private interests.

Date: April 1956

TABLE 1. ESTIMATED INSTALLATION COST
 (Based on 1954 Price Levels)
 Upper East Fork Laterals Watershed, Texas
 (Trinity River Watershed)

For: Fiscal Year 1958

Items	Unit	Number to be Applied	Estimated Cost		Total
			Federal	Non-Federal ^{1/}	
			(dollars)	(dollars)	(dollars)
LAND TREATMENT					
Soil Conservation Service					
Land Treatment Measures					
Contour Farming	Acre	1,600	-	1,600	1,600
Cover Cropping	Acre	2,200	-	25,080	25,080
Rotation Hay and Pasture	Acre	1,150	-	11,523	11,523
Crop Residue Utilization	Acre	4,600	-	4,600	4,600
Proper Use Pasture	Acre	3,000	-	6,000	6,000
Rotation Grazing	Acre	2,500	-	-	-
Pasture Planting	Acre	1,800	-	27,000	27,000
Brush Control	Acre	450	-	9,000	9,000
Terracing	Mile	65	-	7,150	7,150
Diversion Construction	Mile	1	-	187	187
Waterway Development	Acre	160	-	8,800	8,800
Pond Construction	No.	55	-	13,062	13,062
Drop Inlets and Drop Structures	No.	17	-	14,025	14,025
Sod Flumes	No.	25	-	6,875	6,875
Planning Assistance (Accl.)	Acre	4,000	1,600	-	1,600
Application Assistance (Accl.)	Acre	5,091	5,600	-	5,600
SCS Subtotal			7,200	134,902	142,102
TOTAL LAND TREATMENT			7,200	134,902	142,102
STRUCTURAL MEASURES					
Soil Conservation Service					
Land Stabilization					
Drop Inlet Construction	-	-	-	-	-
Diversion Construction, Nos. 1, 2, and 3	Mile	4.37	21,214	-	21,214
Waterflow Control					
Floodwater Retarding Structures	Nos.	4C & 7	45,800	-	45,800
Channel Improvement-Buffalo	Mile	6.70	124,079	-	124,079
TOTAL CONSTRUCTION COSTS			191,093	-	191,093
TOTAL INSTALLATION SERVICES			45,942	-	45,942
TOTAL OTHER COST			-	7,580	7,580
TOTAL STRUCTURAL MEASURES			237,035	7,580	244,615
Work Plan Preparation			-	-	-
GRAND TOTAL			244,235	142,482	386,717
SUMMARY					
Total SCS			244,235	142,482	386,717
GRAND TOTAL			244,235	142,482	386,717

^{1/} Excludes \$50,698 that may be available from other Federal Funds (ACPS) to reimburse private interests.

Date: April 1956

TABLE 1. ESTIMATED INSTALLATION COST
 (Based on 1954 Price Levels)
 Upper East Fork Laterals Watershed, Texas
 (Trinity River Watershed)

For: Remaining to be done

Items	Unit	Number to be Applied	Estimated Cost		Total
			Federal	Non-Federal ^{1/}	
			(dollars)	(dollars)	(dollars)
LAND TREATMENT					
Soil Conservation Service					
Land Treatment Measures					
Contour Farming	Acre	24,923	-	24,923	24,923
Cover Cropping	Acre	16,494	-	188,032	188,032
Rotation Hay and Pasture	Acre	2,652	-	26,573	26,573
Crop Residue Utilization	Acre	12,448	-	12,448	12,448
Proper Use Pasture	Acre	6,059	-	12,118	12,118
Rotation Grazing	Acre	7,642	-	-	-
Pasture Planting	Acre	7,656	-	114,840	114,840
Brush Control	Acre	5,680	-	113,600	113,600
Terracing	Mile	1,078	-	118,580	118,580
Diversion Construction	Mile	11	-	2,062	2,062
Waterway Development	Acre	1,950	-	107,250	107,250
Pond Construction	No.	143	-	33,963	33,963
Drop Inlets and Drop Structures	No.	283	-	233,475	233,475
Sod Flumes	No.	157	-	43,175	43,175
Planning Assistance (Accl.)	Acre	17,532	2,013	-	2,013
Application Assistance (Accl.)	Acre	30,094	16,104	-	16,104
SCS Subtotal			18,117	1,031,039	1,049,156
TOTAL LAND TREATMENT			18,117	1,031,039	1,049,156
STRUCTURAL MEASURES					
Soil Conservation Service					
Land Stabilization					
Drop Inlet Construction	-	-	-	-	-
Diversion Construction	-	-	-	-	-
Waterflow Control					
Floodwater Retarding					
Structures	No.	17	388,587	-	388,587
Channel Improvement	Mile	2.45	43,929	-	43,929
TOTAL CONSTRUCTION COSTS			432,516	-	432,516
TOTAL INSTALLATION SERVICES			125,573	-	125,573
TOTAL OTHER COST			-	116,550	116,550
TOTAL STRUCTURAL MEASURES			558,089	116,550	674,639
Work Plan Preparation			-	-	-
GRAND TOTAL			576,206	1,147,589	1,723,795
SUMMARY					
Total SCS			576,206	1,147,589	1,723,795
GRAND TOTAL			576,206	1,147,589	1,723,795

1/ Excludes \$486,162 that may be available from other Federal Funds (ACPS) to reimburse private interests.

Date: April, 1956

TABLE 1. ESTIMATED INSTALLATION COST
 (Based on 1954 Price Levels)
 Upper East Fork Laterals Watershed, Texas
 (Trinity River Watershed)

For: Total Project

Items	Unit	Total to be Applied	Estimated Cost		Total
			Federal	Non-Federal ^{1/}	
			(dollars)	(dollars)	(dollars)
LAND TREATMENT					
Soil Conservation Service					
Land Treatment Measures					
Contour Farming	Acre	33,993	-	33,993	33,993
Cover Cropping	Acre	50,013	-	521,694	521,694
Rotation Hay and Pasture	Acre	14,648	-	153,673	153,673
Crop Residue Utilization	Acre	38,919	-	38,919	38,919
Proper Use Pasture	Acre	35,507	-	71,014	71,014
Rotation Grazing	Acre	35,351	-	-	-
Pasture Planting	Acre	22,555	-	313,828	313,828
Brush Control	Acre	9,006	-	180,120	180,120
Terracing	Mile	1,458	-	163,155	163,155
Diversion Construction	Mile	25	-	4,912	4,912
Waterway Development	Acre	2,829	-	155,595	155,595
Pond Construction	No.	516	-	126,363	126,363
Drop Inlets and Drop Structures	No.	327	-	273,150	273,150
Sod Flumes	No.	237	-	67,425	67,425
Planning Assistance (Accl.)	Acre	61,252	19,501	-	19,501
Application Assistance (Accl.)	Acre	78,094	68,904	-	68,904
SCS Subtotal			88,405	2,103,841	2,192,246
TOTAL LAND TREATMENT			88,405	2,103,841	2,192,246
STRUCTURAL MEASURES					
Soil Conservation Service					
Land Stabilization					
Drop Inlet Construction	No.	1	15,237	-	15,237
Diversion Construction	Mile	4.78	23,795	-	23,795
Waterflow Control					
Floodwater Retarding Structures	No.	30	766,749	-	766,749
Channel Improvement	Mile	9.15	168,008	-	168,008
TOTAL CONSTRUCTION COSTS			973,789	-	973,789
TOTAL INSTALLATION SERVICES			279,001	-	279,001
TOTAL OTHER COST			-	194,480	194,480
TOTAL STRUCTURAL MEASURES			1,252,790	194,480	1,447,270
Work Plan Preparation			11,150	-	11,150
GRAND TOTAL			1,352,345	2,298,321	3,650,666
SUMMARY					
Total SCS			1,352,345	2,298,321	3,650,666
GRAND TOTAL			1,352,345	2,298,321	3,650,666

^{1/} Excludes \$834,317 that may be available from other Federal Funds (ACPS) to reimburse private interests.

Date: April 1956

TABLE 2
 STATUS OF FLOOD PREVENTION JOB PRIOR TO FIRST YEAR OF WORK PLAN
 (Based on 1954 Price Levels)
 Upper East Fork Laterals Watershed, Texas
 (Trinity River Watershed)

Measures	Unit	Number	Federal	Non-Federal	Total
			Cost	Construction	Cost
			1/	2/	
			(dollars)	(dollars)	(dollars)
<u>LAND TREATMENT MEASURES</u>					
Contour Farming	Acre	2,815			
Cover Cropping	Acre	4,302			
Rotation Hay and Pasture	Acre	0			
Crop Residue Utilization	Acre	5,788			
Proper Use Pasture	Acre	2,316			
Rotation Grazing	Acre	2,316			
Pasture Planting	Acre	5,732			
Brush Control	Acre	0			
Terracing	Mile	103			
Diversion Construction	Mile	1			
Waterway Development	Acre	190			
Pond Construction	No.	64			
Stabilizing Measures					
Drop Inlet or Structure	No.	0			
Sod Flume	No.	0			
Planning Assistance	Acre	18,726			
Application Assistance	Acre	6,936			
Subtotal			15,120	135,112	150,232
<u>STRUCTURAL MEASURES</u>					
Subtotal			-	-	-
TOTAL			15,120	135,112	150,232

1/ Flood Prevention funds, including acceleration funds.

2/ Excludes an estimated \$108,550 from other Federal funds (ACPS) by which private interests were reimbursed.

Date: April, 1956

TABLE 3. ANNUAL COSTS
Upper East Fork Laterals Watershed, Texas
(Trinity River Watershed)

Measures	AMORTIZATION OF INSTALLATION COSTS 1/			OPERATION AND MAINTENANCE COSTS 2/			Total
	Federal	Non-Federal	Total	Federal	Non-Federal	Total	
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
STRUCTURAL MEASURES FOR FLOOD PREVENTION							
Waterflow Control							
1. Floodwater Retarding Structure No. 2	1,522	612	2,134	-	76	76	2,210
2. Floodwater Retarding Structure No. 3A	1,339	303	1,642	-	76	76	1,718
3. Floodwater Retarding Structure No. 3B	897	169	1,066	-	76	76	1,142
4. Floodwater Retarding Structure No. 3C ^{2014/1/27}	727	134	861	-	76	76	937
5. Floodwater Retarding Structure No. 3D ^{2014/1/27}	1,374	543	1,917	-	76	76	1,993
6. Floodwater Retarding Structure No. 3E	664	131	795	-	76	76	871
7. Floodwater Retarding Structures No. 3F ^{2014/1/27} 4, 4A and 4B	3,503	729	4,232	-	228	228	4,460
8. Floodwater Retarding Structure No. 4C in combination with Floodwater Diversions No. 1, 2 and 3	1,937	130	2,067	-	388	388	2,455
9. Floodwater Retarding Structure No. 5A	1,543	178	1,721	-	76	76	1,797
10. Floodwater Retarding Structure No. 5B	1,558	565	2,123	-	114	114	2,237
11. Floodwater Retarding Structure No. 5C	921	250	1,171	-	76	76	1,247
12. Floodwater Retarding Structure No. 6 in combination with Grade Stabilization Structure No. 6A	3,143	866	4,009	-	190	190	4,199
13. Floodwater Retarding Structure No. 7	1,150	191	1,341	-	76	76	1,417
14. Floodwater Retarding Structure No. 8	991	188	1,179	-	76	76	1,255
15. Floodwater Retarding Structure No. 9	1,226	114	1,340	-	76	76	1,416
16. Floodwater Retarding Structure No. 9A in combination with Floodwater Diversion No. 4	839	76	915	-	121	121	1,036
17. Floodwater Retarding Structure No. 10	2,413	308	2,721	-	114	114	2,835
18. Floodwater Retarding Structures No. 11, 11A, 11B, 11C, 11D, 11E, 11F, 11G, 11H, and 11K	10,618	3,379	13,997	-	798	798	14,795

TABLE 3. ANNUAL COSTS (Continued)
Upper East Fork Laterals Watershed, Texas
(Trinity River Watershed)

Measures	AMORTIZATION OF INSTALLATION:		OPERATION AND MAINTENANCE		Total
	Federal	Non-Federal	Federal	Non-Federal	
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
19. Floodwater Retarding Structure No. 12	669	110	779	76	855
20. Stream Channel Improvement, Bluff Creek	1,866	11	1,877	805	2,682
21. Stream Channel Improvement, Buffalo Creek	5,271	31	5,302	2,272	7,574
Subtotal	44,171	9,018	53,189	5,942	59,131
TOTAL STRUCTURAL MEASURES FOR FLOOD PREVENTION	44,171	9,018	53,189	5,942	59,131
GRAND TOTAL	44,171	9,018	53,189	5,942	59,131

1/ Based on 1954 price levels.

2/ Based on long-term price levels.

Date: April, 1956

TABLE 4. SUMMARY OF BENEFITS
 (Based on Long-Term Price Levels)
 Upper East Fork Laterals Watershed, Texas
 (Trinity River Watershed)

Item	Estimated Average :		Estimated Average :		Benefits From Structural Measures (dollars)
	Without Project : (dollars)	Measures : (dollars)	Without Structural : (dollars)	Annual Damage : (dollars)	
Floodwater	172,665	153,814	23,833	129,981	
Sediment	7,702	4,851	1,510	3,341	
Erosion	2,714	2,146	229	1,917	
Indirect	18,308	16,081	2,557	13,524	
Subtotal	201,389	176,892	28,129	148,763	
Benefits from Changed Use of Land					41,064
TOTAL FLOOD PREVENTION BENEFITS					189,827

Date: April, 1956

TABLE 5. BENEFIT-COST ANALYSIS
Upper East Fork Laterals Watershed, Texas
(Trinity River Watershed)

Measures	AVERAGE ANNUAL BENEFITS							Average Annual Cost (dollars)	Benefit-Cost Ratio
	Floodwater (dollars)	Sediment (dollars)	Erosion (dollars)	Indirect (dollars)	Use of Land (dollars)	Changed (dollars)	Total (dollars)		
STRUCTURAL MEASURES FOR FLOOD PREVENTION									
Waterflow Control									
1. Floodwater Retarding Structure No. 2	4,411	254	277	493	2,032	7,467	2,210	3.38:1	
2. Floodwater Retarding Structure No. 3A	2,046	118	129	230	942	3,465	1,718	2.02:1	
3. Floodwater Retarding Structure No. 3B	1,212	70	76	136	558	2,052	1,142	1.80:1	
4. Floodwater Retarding Structure No. 3C <i>Del. 875</i>	875	50	54	98	403	1,480	937	1.58:1	
5. Floodwater Retarding Structure No. 3D <i>Del. 3,388</i>	3,388	196	213	379	1,560	5,736	1,993	2.88:1	
6. Floodwater Retarding Structure No. 3E <i>Del. 755</i>	755	43	48	85	348	1,279	871	1.47:1	
7. Floodwater Retarding Structures No. 4, 4A and 4B <i>Del. 5,752</i>	5,752	115	123	598	2,149	8,737	4,460	1.96:1	
8. Floodwater Retarding Structure No. 4C <i>Del. 15,500</i> in combination with Floodwater Diversion No. 1, 2, and 3	15,500	591	394	1,649	-	18,134	2,455	7.39:1	
9. Floodwater Retarding Structure No. 5A	2,266	28	20	231	348	2,893	1,797	1.61:1	
10. Floodwater Retarding Structure No. 5B	8,196	103	68	836	1,258	10,461	2,237	4.68:1	
11. Floodwater Retarding Structure No. 5C	2,675	34	22	273	411	3,415	1,247	2.74:1	
12. Floodwater Retarding Structure No. 6 in combination with Grade Stabilization Structure No. 6A	10,411	130	86	1,063	1,598	13,288	4,199	3.16:1	
13. Floodwater Retarding Structure No. 7	2,454	31	20	250	377	3,132	1,417	2.21:1	
14. Floodwater Retarding Structure No. 8	2,079	26	17	212	319	2,653	1,255	2.11:1	
15. Floodwater Retarding Structure No. 9	1,414	55	12	148	217	1,846	1,416	1.30:1	
16. Floodwater Retarding Structure No. 9A in combination with Floodwater Diversion No. 4	886	34	7	93	136	1,156	1,036	1.12:1	
17. Floodwater Retarding Structure No. 10	4,515	56	37	462	693	5,763	2,835	2.03:1	
18. Floodwater Retarding Structures No. 11, 11A, 11B, 11C, 11D, 11E, 11F, 11G, 11H, and 11K <i>Del. 34,544</i>	34,544	852	189	3,559	8,762	47,906	14,795	3.24:1	

TABLE 5. BENEFIT-COST ANALYSIS (Continued)
 Upper East Fork Laterals Watershed, Texas
 (Trinity River Watershed)

Measures	AVERAGE ANNUAL BENEFITS						
	Flood- water (dollars)	Sediment (dollars)	Erosion (dollars)	Indirect (dollars)	Changed: Use of: Land (dollars)	Average Annual Cost (dollars)	Benefit- Cost Ratio
19. Floodwater Retarding Structure No. 12-10-71	1,563	38	8	161	385	2,155	855 : 2.52:1
20. Stream Channel Improvement (Bluff Creek)	8,551	347	95	900	3,726	13,619	2,682 : 5.08:1
21. Stream Channel Improvement (Buffalo Creek)	16,488	170	22	1,668	14,842	33,190	7,574 : 4.38:1
Subtotal	129,981	3,341	1,917	13,524	41,064	189,827	59,131 : 3.21:1
TOTAL STRUCTURAL MEASURES FOR FLOOD PREVENTION	129,981	3,341	1,917	13,524	41,064	189,827	59,131 : 3.21:1
GRAND TOTAL	129,981	3,341	1,917	13,524	41,064	189,827	59,131 : 3.21:1

Date: April, 1956

TABLE G. STRUCTURE DATA
 Preliminary Estimates for Floodwater Retarding Structures
 Upper East Fork Laterals Watershed, Texas
 (Trinity River Watershed)

Site No.	Drainage Area : sq. mi.	STORAGE CAPACITY				SURFACE AREA				FLOOD PLAIN AREA				PRINCIPAL SPILLWAY : Maximum Discharge : Capacity : c. f. s.
		Sediment : Reserve : Above : Riser : Pool : acre-feet	Detention : Total : Sediment : Stor. : inches	Total : Sediment : Stor. : inches	Detention : Total : Sediment : Stor. : inches	Top : of : Riser : Pool : acres	Top : of : Det. : Dam : Riser : Pool : acres	Max. : Ht. : of : Top : of : Det. : Dam : Riser : Pool : ft.	Max. : Ht. : of : Top : of : Det. : Dam : Riser : Pool : ft.	Below : Under : Total : of : Det. : Dam : Riser : Pool : acres	Volume : of : Fill : cu. yd.			
2	4.44	200	1,232	2.00	5.20	7.20	87	174	29	25	17	42	86,253	23
3A	2.06	139	572	1.40	5.20	6.60	35	93	30	10	5	15	75,888	11
3B	1.22	99	337	1.70	5.20	6.90	20	50	29	4	2	6	50,853	8
3C	0.88	64	244	1.50	5.20	6.70	15	41	25	4	2	6	41,174	8
3D	3.41	200	946	1.50	5.20	6.70	59	138	26	21	10	31	77,836	17
3E	0.76	69	211	1.90	5.20	7.10	16	38	24	2	1	3	37,643	8
4	2.83	178	991	1.01	5.56	6.57	40	121	33	20	10	30	72,047	32
* 4A	1.01	104	291	1.93	5.40	7.33	19	44	33	0	0	0	60,115	9
* 4B	1.17	132	423	2.11	4.66	6.77	18	45	33	0	0	0	76,437	9
* 4C	0.60	92	268	3.20	5.20	8.40	12	25	40	0	0	0	53,814	10
* 5A	1.33	131	492	1.80	5.10	6.90	21	54	32	5	3	8	98,715	9
* 5B	4.81	199	1,386	1.20	5.35	6.55	61	179	30	16	8	24	102,049	24
* 5C	1.57	132	590	1.60	5.46	7.06	26	80	28	6	3	9	66,034	8
* 6	6.11	197	1,666	1.13	5.11	6.24	85	248	29	33	16	49	153,379	31
7	1.44	138	407	2.00	5.30	7.30	26	55	28	2	1	3	65,149	8
* 8	1.22	85	338	1.57	5.39	6.96	23	57	33	3	1	4	65,634	9
* 9	0.83	60	232	1.60	5.24	6.84	14	34	26	1	1	2	69,583	8
* 9A	0.52	50	202	2.03	5.30	7.33	11	23	27	0	0	0	40,719	8
10	2.65	185	724	1.45	5.12	6.57	34	96	30	8	4	12	136,742	13
11	10.91	200	4,232	1.32	7.27	8.59	128	383	33	120	173	293	181,349	129
Deleted 11A	0.53	75	229	2.84	5.20	8.04	11	26	33	0	0	0	44,164	9
Deleted 11B	0.65	70	256	2.19	5.20	7.39	10	26	30	2	1	3	70,017	8
Deleted 11C	0.84	78	318	1.86	5.20	7.06	13	32	33	1	1	2	58,093	9
Deleted 11D	0.69	59	254	1.73	5.20	6.93	13	35	26	1	1	2	34,401	8
Deleted 11E	0.92	95	359	2.10	5.20	7.30	25	58	22	4	2	6	39,242	7
11F	0.37	47	103	2.55	5.20	7.75	10	21	30	1	1	2	45,831	8
11G	0.44	54	121	180	2.52	5.20	11	19	25	1	1	2	35,723	8
Deleted 11H	0.32	46	87	137	2.95	5.20	10	15	25	0	0	0	43,743	8
Deleted 11K	0.50	69	139	213	2.80	5.20	13	24	31	0	0	0	49,186	9
Deleted 11L	0.74	90	204	302	2.48	5.20	14	32	30	0	0	0	37,922	8
TOTAL	55.77	3,337	1,061	306	16,715	21,419	880	2,286	290	264	554	2,069,735		

* Constructed prior to March, 1956.

1/ Excluding the area from which runoff is controlled by other floodwater retarding structures in series.

Note: Vegetative emergency spillways provided for all structures.

741

See revised notes p. 7, 10, 11

Date: April, 1956

TABLE 6A. STRUCTURE DATA
 Preliminary Estimates for Grade Stabilization Structures
 Upper East Fork Laterals Watershed, Texas
 (Trinity River Watershed)

Site No.	Drainage Area : acres	Drop : feet	Earth Fill : cu. yd.	Type Structure
6A	890	10.7	28,686	Drop Inlet
TOTAL	890		28,686	

TABLE 6B. STRUCTURE DATA
 Preliminary Estimate for Floodwater Diversions

Diversion Number	Drainage Area : acres	Length : miles	Volume of Fill : cubic yards
1		2.48	91,700
2		1.02	17,700
3		0.87	18,400
4		0.41	15,560
TOTAL		4.78	143,360

TABLE 6C. STRUCTURE DATA
 Preliminary Estimate for Channel Improvement

Location	Length : miles	Volume of Excavation : cubic yards
Bluff Creek	2.45	264,630
Buffalo Creek	6.70	747,467
TOTAL	9.15	1,012,097

Date: April, 1956

TABLE 6D. STRUCTURE DATA
 Estimated Structure Cost Distribution
 (Based on 1954 Price Levels)
 Upper East Fork Laterals Watershed, Texas
 (Trinity River Watershed)

Structure Number or Name	FEDERAL INSTALLATION COST					NON-FEDERAL INSTALLATION COST					Total Estimated	
	Contract	Installation	Administration	Contingencies	Total	Easements	Legal	Removing	Obstacles	Total		
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	
FLOODWATER RETARDING STRUCTURES												
2	30,188	6,038	3,019	3,924	43,169	13,050	100	-	-	13,150	56,319	
3A	26,561	5,312	2,656	3,453	37,982	6,400	100	-	-	6,500	44,482	
3B	17,798	3,560	1,780	2,314	25,452	3,500	120	-	-	3,620	29,072	
3C	14,411	2,882	1,441	1,873	20,607	2,800	80	-	-	2,880	23,487	
3D	27,243	5,448	2,724	3,542	38,957	9,850	180	1,950	-	11,980	50,937	
3E	13,175	2,635	1,318	1,713	18,841	2,700	120	-	-	2,820	21,661	
4	31,485	6,070	-	3,755	41,310	8,050	100	1,000	-	9,150	50,460	
4A	19,437	5,050	-	2,449	26,936	3,150	120	-	-	3,270	30,206	
4B	23,799	4,451	-	2,825	31,075	3,150	100	-	-	3,250	34,325	
4C	18,835	3,767	1,883	2,448	26,933	2,300	60	-	-	2,360	29,293	
5A	33,789	5,987	-	3,978	43,754	3,750	80	-	-	3,830	47,584	
5B	35,116	5,063	-	4,018	44,197	12,000	140	-	-	12,140	56,337	
5C	19,749	4,006	-	2,375	26,130	5,300	80	-	-	5,380	31,510	
6	53,035	7,980	-	6,102	67,117	16,650	120	-	-	16,770	83,887	
7	22,802	4,560	2,280	2,964	32,606	4,050	60	-	-	4,110	36,716	
8	21,299	4,260	-	2,556	28,115	4,000	40	-	-	4,040	32,155	
9	26,330	5,266	-	3,160	34,756	2,400	40	-	-	2,440	37,196	
9A	14,252	2,850	1,425	1,853	20,380	1,600	40	-	-	1,640	22,020	
10	47,860	9,572	4,786	6,222	68,440	6,500	120	-	-	6,620	75,060	
11	63,472	12,695	6,347	8,252	90,766	51,100	200	1,700	-	53,000	143,766	
11A	15,457	3,092	1,546	2,010	22,105	1,850	20	-	-	1,870	23,975	
11B	24,506	4,901	2,451	3,186	35,044	1,800	40	-	-	1,840	36,884	
11C	20,333	4,066	2,033	2,643	29,075	2,750	80	-	-	2,830	31,905	
11D	12,040	2,409	1,204	1,565	17,218	2,400	60	-	-	2,460	19,678	
11E	13,735	2,746	1,374	1,786	19,641	4,150	20	-	-	4,170	23,811	
11F	16,041	3,208	1,604	2,085	22,938	1,550	20	-	-	1,570	24,508	
11G	12,503	2,501	1,250	1,625	17,879	1,800	80	-	-	1,880	19,759	

TABLE 6D. STRUCTURE DATA (Continued)
 Estimated Structure Cost Distribution
 (Based on 1954 Price Levels)
 Upper East Fork Laterals Watershed, Texas
 (Trinity River Watershed)

Structure Number or Name	FEDERAL INSTALLATION COST				NON-FEDERAL INSTALLATION COST				Estimated Total Cost (dollars)
	Contract	Installation	Continuation	Administration	Easements	Legal	Removing Obstacles	Total	
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
FLOODWATER RETARDING STRUCTURES									
11H	15,310	3,062	1,531	1,990	1,450	40	-	1,490	23,383
11K	17,215	3,443	1,721	2,238	1,850	40	-	1,890	26,507
12	13,273	2,654	1,327	1,725	2,300	60	-	2,360	21,339
TOTAL	721,049	139,534	45,700	90,629	184,200	2,460	4,650	191,310	1,188,222
LAND STABILIZATION									
Drop Inlet #6A	15,237	4,808	-	2,004	1,800	20	-	1,820	23,869
Diversion #1	15,222	3,044	-	1,827	220	-	-	220	20,313
Diversion #2	2,938	588	-	353	120	-	-	120	3,999
Diversion #3	3,054	611	-	366	100	-	-	100	4,131
Diversion #4	2,581	516	-	310	-	-	-	-	3,407
Total	39,032	9,567	-	4,860	2,240	20	-	2,260	55,719
OTHER									
Channel Improvement (Bluff)	43,929	4,499	-	4,498	-	240	-	240	53,166
Channel Improvement (Buffalo)	124,079	12,707	-	12,707	-	670	-	670	150,163
Total	168,008	17,206	-	17,205	-	910	-	910	203,329
GRAND TOTAL	928,089	166,307	45,700	112,694	1,252,790	3,390	4,650	194,480	1,447,270

TABLE 7. SUMMARY OF PHYSICAL DATA
 Upper East Fork Laterals Watershed, Texas
 (Trinity River Watershed)

Item	Unit	Quantity Without Program	Quantity With Program
Watershed Area	Sq. Mi.	149.36	149.36
Watershed Area	Acre	95,590	95,590
Area of Cropland	Acre	60,499	57,484
Area of Grassland	Acre	31,445	34,491
Area of Woodland	Acre	546	515
Area of Miscellaneous	Acre	3,100	3,100
Overflow Area Subject to Damage by Design Storm	Acre	7,070	3,117
Area Damaged Annually by Sediment	Acre	3,123	843
Flood Plain Scour	Acre	166	14
Sheet Erosion	Acre	34,394	7,556
Average Annual Rainfall	Inches	41.56	41.56

Date: April, 1956

TABLE 8. SUMMARY OF PLAN DATA
 Upper East Fork Laterals Watershed, Texas
 (Trinity River Watershed)

Item	Unit	Quantity
Years to Complete Program	Year	10
Total Installation Cost		
Federal	Dollar	1,352,345
Non-Federal	Dollar	2,298,321
Annual Operation & Maintenance Cost		
Federal	Dollar	0
Non-Federal	Dollar	5,942
Annual Benefits	Dollar	189,827
Structural Measures		
Floodwater Retarding Structures	Each	30
Grade Stabilization Structure(Drop Inlet)	Each	1
Floodwater Diversions	Mile	4.78
Channel Improvement	Mile	9.15
Area Inundated by Structures		
Flood Plain		
Detention Pool	Acre	264
Sediment Pool	Acre	290
Upland		
Detention Pool	Acre	1,142
Sediment Pool	Acre	590
Watershed Area above Structures	Acre	35,693
Reduction of Floodwater Damage		
Land Treatment Measures	Percent	11
Structural Measures	Percent	75
Reduction of Sediment Damage		
Land Treatment Measures	Percent	37
Structural Measures	Percent	43
Reduction of Erosion Damage (Flood Plain Scour)		
Land Treatment Measures	Percent	21
Structural Measures	Percent	71
Benefit from More Intensive Use of Land Resulting from Reduction of Flood Hazard	Dollar	41,064

Date: April, 1956

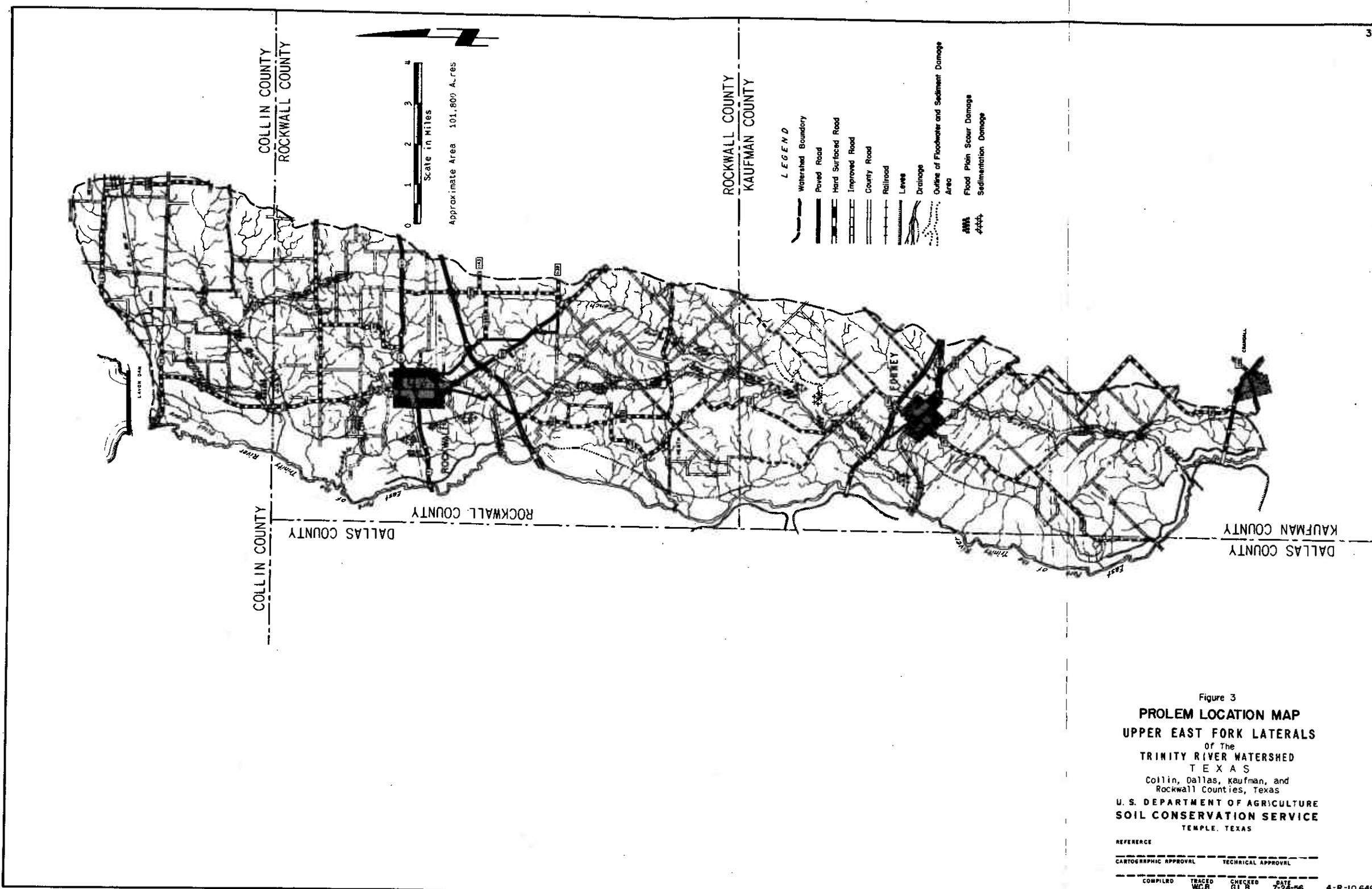


Figure 3
PROLEM LOCATION MAP
 UPPER EAST FORK LATERALS
 of The
 TRINITY RIVER WATERSHED
 TEXAS
 Collin, Dallas, Kaufman, and
 Rockwall Counties, Texas
 U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
 TEMPLE, TEXAS

REFERENCE

CARTOGRAPHIC APPROVAL _____ TECHNICAL APPROVAL _____

COMPILED _____ TRACED W.C.B. _____ CHECKED G.L.B. _____ DATE 7-24-56