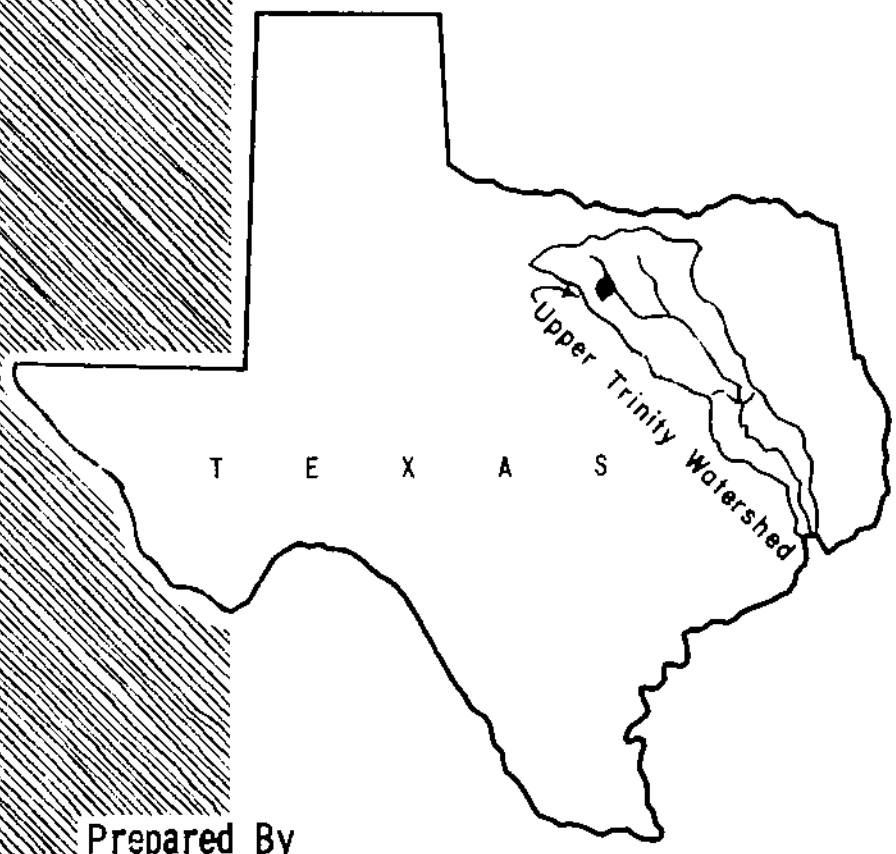
WORK PLAN

SALT CREEK AND LATERALS WATERSHED

OF THE TRINITY RIVER WATERSHED
WISE AND PARKER COUNTIES, TEXAS



Prepared By
SOIL CONSERVATION SERVICE
U. S. DEPARTMENT OF AGRICULTURE
Temple, Texas
APRIL 1964

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WATERSHED WORK PLAN AGREEMENT

between the

Upper West Fork Soil Conservation District
Local Organization

Hood-Parker Soil Conservation District
Local Organization

Wise County Commissioners Court
Local Organization

Wise County Water Control and Improvement District No. 1
Local Organization

State of Texas
(Hereinafter referred to as the Sponsoring Local Organization)

and the

Soil Conservation Service
United States Department of Agriculture
(Hereinafter referred to as the Service)

Whereas, the Soil Conservation Districts have heretofore entered into a Flood Control Supplemental Memorandum of Understanding with the Soil Conservation Service for assistance in constructing works of improvement for prevention of floods in Salt Creek and Laterals Watershed, State of Texas, under the authority of the Flood Control Act of 1944 (58 Stat. 887); and

Whereas, the responsibility for carrying out a portion of the work of the United States Department of Agriculture on the watershed has been assigned by the Secretary of Agriculture to the Service; and

Whereas, there has been developed through the cooperative efforts of the Sponsoring Local Organization and the Service a mutually satisfactory plan for works of improvement for Salt Creek and Laterals Watershed, State of Texas, hereinafter referred to as the Watershed Work Plan, which plan is annexed to and made a part of this agreement; and

Whereas, the Counties will benefit from installation of works of improvement through the reduction of damages to property, including county roads and bridges located in the flood plain of the watershed;

Now, therefore, in view of the foregoing considerations, the Sponsoring Local Organization and the Secretary of Agriculture, through the Service, hereby agree on the Work Plan, and further agree that the works of improvement as set forth in said plan can be installed in about 5 years.

It is mutually agreed that in installing and operating and maintaining the works of improvement substantially in accordance with the terms, conditions, and stipulations provided for in the Watershed Work Plan:

1. The Sponsoring Local Organization will acquire without cost to the Federal Government such lands, easements, or rights-of-way as will be needed in connection with works of improvement. (Estimated cost $142,850).

2. The Sponsoring Local Organization will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to State law as may be needed in the installation and operation of the works of improvement.

3. The Service will provide all construction and installation services costs applicable to structural measures for flood prevention.

4. The Service will award and administer the contracts covering the construction of all works of improvement.

5. The Sponsoring Local Organization will obtain agreements from owners of not less than 50 percent of the land above each floodwater retarding structure that they will carry out conservation farm or ranch plans on their land.

6. The Sponsoring Local Organization will provide assistance to land owners and operators to assure the installation of the land treatment measures shown in the Watershed Work Plan.

7. The Sponsoring Local Organization will encourage land owners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.

8. The Sponsoring Local Organization will be responsible for the operation and maintenance of the structural works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.

9. This agreement does not constitute a financial document to serve as a basis for the obligation of Federal funds, and financial and other assistance to be furnished by the Service in carrying out the Watershed Work Plan are contingent on the appropriation of funds for this purpose.

10. The Watershed Work Plan may be amended or revised, and this agreement may be modified or terminated, only by mutual agreement of the parties hereto.

11. No member of Congress, or resident commissioner, 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.

Upper West Fork Soil Conservation District
Local Organization

By Geo Cunnius
GEO. CUNNIUS

Title Chairman, Board of Supervisers

Date 8/6/64

The signing of this agreement was authorized by a resolution of the governing body of the Upper West Fork Soil Conservation District
Local Organization

adopted at a meeting held on August 6, 1964

J B Bullard
(Secretary, Local Organization)
J. B. BULLARD

Date 8/6/64

Hood-Parker Soil Conservation District
Local Organization

By Doyle Hutcheson
DOYLE HUTCHESON
Title Chairman, Board of Supervisors

Date August 3, 1964

The signing of this agreement was authorized by a resolution of the governing body of the Hood-Parker Soil Conservation District
Local Organization

adopted at a meeting held on August 3, 1964

Albert Porter
(Secretary, Local Organization)
ALBERT PORTER

Date August 3, 1964

Wise County Commissioners Court
Local Organization

By John A. Winder
JOHN A. WINDER
Title Wise Co. Judge

Date August 4, 1964

The signing of this agreement was authorized by a resolution of the governing body of the Wise County Commissioners Court
Local Organization

adopted at a meeting held on Aug 4 - 1964

L. O. Slimp, County Clerk
(Secretary, Local Organization)
L. O. SLIMP

Date 8-3-64 Wise Co. Tex

Wise County Water Control & Improvement District No. 1
Local Organization

By W. W. Ray
W. W. RAY

Title President

Date July 21, 1964

The signing of this agreement was authorized by a resolution of the governing body of the Wise County Water Control & Improvement District No. 1
Local Organization

adopted at a meeting held on July 21, 1964

Dean Padfield
(Secretary, Local Organization)
DEAN PADFIELD

Date July 21, 1964

Local Organization

By

Title

Date

The signing of this agreement was authorized by a resolution of the governing body of the
Local Organization

adopted at a meeting held on

(Secretary, Local Organization)

Date

Soil Conservation Service
United States Department of Agriculture

By

Date

WORK PLAN

SALT CREEK AND LATERALS WATERSHED
Of the Trinity River Watershed
Wise and Parker Counties, Texas

Plan Prepared and Works of Improvement
to be Installed Under the Authority
of the Flood Control Act of 1944
as Amended and Supplemented

Participating Agencies

Upper West Fork Soil Conservation District
Hood-Parker Soil Conservation District
Wise County Commissioners Court
Wise County Water Control and Improvement District No. 1

Prepared By:

Soil Conservation Service
U. S. Department of Agriculture

April 1964

WORK PLAN

SALT CREEK AND LATERALS WATERSHED
Of the Trinity River Watershed
Wise and Parker Counties, Texas
April 1964

INTRODUCTION

Authority

The Salt Creek and Laterals Watershed Flood Prevention Project will be carried out under authority of the Soil Conservation Act of 1935 (Public Law No. 46, 74th Congress) and the Flood Control Act of 1944 (Public Law No. 534, 78th Congress), as amended and supplemented.

Purpose and Scope of Work Plan

The purpose of this work plan is to provide for a flood prevention program consisting of land treatment and structural measures on Salt Creek and Laterals watershed.

SUMMARY OF PLAN

The Salt Creek and Laterals watershed consisting of an area of 118,784 acres (approximately 185.6 square miles) is located in Wise and Parker Counties, Texas. The major land uses are cropland, 13 percent; pastureland, 51 percent; rangeland, 33 percent; and miscellaneous, 3 percent.

Sponsoring local organizations for this watershed project are:

Upper West Fork Soil Conservation District
Hood-Parker Soil Conservation District
Wise County Commissioners Court
Wise County Water Control and Improvement District No. 1

The flood plain of this watershed covers 9,518 acres which includes 5,364 acres on the West Fork of the Trinity, but excludes 400 acres of stream channels. Thirty-seven major floods inundating more than half of the flood plain occurred during the 30-year period covered by the evaluation series.

Needs for rural area development and for agricultural water management are minor in this area and were not given further consideration.

The trend in upland agriculture is toward diversified livestock farming and the conversion of less fertile and more eroded cropland areas to pasture and hay production.

Land treatment measures are being established through the leadership of the two soil conservation districts, and it is estimated that these measures

are approximately 41 percent applied. There is a need for accelerated technical assistance, and it is planned to use flood prevention funds in order to establish the planned measures at a faster rate.

It is estimated that $327,563 is needed to establish land treatment measures during the installation period including reimbursements from going programs. Of this amount, $27,000 is to be borne by Federal funds for accelerated technical assistance and $300,563 from other funds. To date, an estimated $490,347 has been expended for installation of such measures (tables 1 and 1A).

Structural measures to be installed during the 5-year installation period include 19 floodwater retarding structures and 29.31 miles of stream channel improvement (figure 6). It is estimated that the cost for installing these structural measures will be $2,052,798. Federal funds will bear $1,909,948 and other funds $142,850 (table 1).

Prior to the installation of any structural measures, the estimated average annual flood damages on Salt Creek and tributaries amounted to $60,872 (table 5), exclusive of damages occurring on the flood plain along the West Fork of the Trinity River.

Average annual damage reduction benefits are expected to be $51,820 on the 4,154 acres of flood plain land on Salt Creek and its tributaries, benefiting 79 landowners.

The project will result in a 92 percent reduction in average annual area flooded. Annual damages occurring on 5,364 acres of flood plain land along the West Fork of the Trinity, estimated to be $101,988, are reduced $9,591 by the project. Additional benefits from more intensive land use, recreation, and secondary benefits will amount to $46,178.

The average annual benefits from structural measures are expected to be $105,826 as compared to average annual costs of $72,733, giving a benefit-cost ratio of 1.5 to 1 (table 6).

It is expected that a major portion of the easements and rights-of-way will be donated for structural measures. Contributions of services, labor, equipment, materials, and money will be used whenever possible. Local sponsors do not plan to borrow funds for the development of this project.

Land treatment measures will be maintained by the landowners and operators of farms on which the measures are applied. Wise County Commissioners Court has authority and responsibility for the operation and maintenance of the structural measures. Sufficient moneys will be budgeted annually by Wise County Water Control and Improvement District No. 1 for this purpose.

The estimated annual operation and maintenance cost is $7,762, including $1,900 for the floodwater retarding structures and $5,862 for stream channel improvement.

DESCRIPTION OF THE WATERSHED

Physical Data

Salt Creek and Laterals are a series of tributaries discharging into the West Fork of the Trinity River from the west between Lake Bridgeport and Eagle Mountain Lake. West Fork of the Trinity River stream channel is the northeast boundary of the watershed. Salt Creek, a major stream in this watershed, originates in Parker County at Agnes and flows generally in a northeasterly direction through Cottondale approximately 20 miles to its confluence with West Fork of the Trinity River near Boyd. Garrett Creek, a major tributary to Salt Creek, rises approximately 1 mile east of Boonsville and flows in an easterly direction discharging into Salt Creek immediately above its confluence with the West Fork. Salt Creek and Laterals watershed is composed of two major parts. One part consists of Salt Creek, its tributaries, and those laterals draining directly into West Fork of the Trinity River between Eagle Mountain Lake and Lake Bridgeport. The second part is the flood plain area along the west side of the West Fork of the Trinity River. The Salt Creek and Laterals watershed has an area of 118,784 acres (185.6 square miles) nearly all in farms and ranches.

Elevations range from more than 1,248 feet above mean sea level on the southwestern divide to approximately 672 feet at the mouth of Salt Creek. Elevations above mean sea level on the flood plain range from 870 feet in the upper reaches to 690 feet near the confluence of Salt Creek and West Fork.

Cretaceous strata of the Trinity group are exposed over 93 percent of the watershed. The formations are the Travis Peak, Glen Rose, and Paluxy.

The Travis Peak formation occupies 65 percent of the watershed. These conglomerates, unconsolidated sandstones, clays, and siltstones are highly erodible and form a gently rolling topography.

The Glen Rose formation overlies the Travis Peak and consists of three or four thin beds of limestone interstratified with clays, sandy clays, and sands. The hard limestones form prominent escarpments, and in several areas southwest of Bridgeport these beds cap outliers of considerable extent. Because of its unusual thinness (25 feet), the outcrop is never broad and accounts for only 3 percent of the watershed area.

The uppermost exposed formation in the watershed is the Paluxy and represents 25 percent of the watershed area. These highly erodible sands, clays, and siltstones form a gently rolling topography.

Located in the upper 7 percent of the watershed is the Graford formation of Pennsylvanian age. These clay, sandstone, and limestone beds dip to the northwest and because of erosional processes are in sharp topographic contrast with Cretaceous strata which dip to the southeast.

Soils of the West Cross Timbers Land Resource Area occupy approximately 93 percent of the watershed. The principal soil series are the Windthorst, Stephenville, and Nimrod in the upland and the Zavala and Gowen in the flood plain. These soils are predominantly fine sandy loams and loamy fine sands, very shallow to deep. Sandy clay loams and sandy clays form the subsoils and are moderately to slowly permeable. Soils of this area are generally eroded and are low in fertility.

The North Central Prairie Land Resource Area is confined to the northern 7 percent of the watershed. The soils of this area are mostly fine sandy loams, clay loams, and calcareous clays, ranging from rapidly to slowly permeable and very shallow to deep. The Darnell, Chigley, and Vernon soil series occur on the stony, steep slopes and the Truce and Bonti on the wooded slopes. The Lindy, Hensley, Yates, and Tarrant are found on gently sloping, stony ridgetops, and the Brackett on the steep escarpments. Soil series located in the flood plain include the Gowen and Zavala.

The over-all land use in the watershed is as follows:

Land Use	Acres	Percent
Cropland	15,476	13.02
Pastureland	61,051	51.40
Rangeland	38,881	32.74
Miscellaneous 1/	3,376	2.84
	118,784	100.00

1/ Area in roads, railroads, municipalities, oil fields, and stream channels.

Land use in the uplands consists mainly of pasture and rangeland. The highly productive bottomland and flood plain soils are intensively cultivated.

The hydrologic cover on range and pasture lands is fair. Cropland is used for hay crops and small grains which provide a fair to good cover during the growing season. Proper management of crop residues provides a fair cover during other seasons of the year.

The natural vegetation consists of the mixed prairie plant group and the post oak savannah plant group. The eight range sites within the watershed are Sandy Loam, Sandy, Bottomland, Sandy Bottomland, Sandstone Hills, Limestone Prairie, Limestone Hills, and Tightland. The predominant vegetation includes little bluestem, big bluestem, Indiangrass, switchgrass, sand lovegrass, silver bluestem, sideoats gramma, Texas wintergrass, buffalograss, tall dropseed, post oak, and mesquite. Woody type invaders and increasers, such as mesquite and post oak, are the dominant vegetation on the more heavily overgrazed pastures and ranges. The range condition classes of the watershed are as follows: 5 percent excellent; 15 percent good; 50 percent fair; 30 percent poor.

The average annual rainfall is 29.32 inches, based on U. S. Weather Bureau records at Bridgeport, Texas. Rainfall is generally highest in the spring months and lowest in the winter months; however, it is well distributed throughout the year.

The mean temperature ranges from about 41 degrees Fahrenheit in January to about 83 degrees in July. The normal frost-free period of 233 days extends from March 28 through November 16.

Wells and farm ponds supply a majority of the farmers and ranchers with adequate water for domestic and livestock use. The towns of Boyd and Paradise obtain water from wells. Bridgeport, although not in the watershed, obtains water from Lake Bridgeport through the Tarrant County Water Control and Improvement District. In an emergency, Boyd and Paradise could possibly make similar arrangements for water.

The watershed is served adequately by 210 miles of State and county roads, of which 50 miles are paved. In addition, there are numerous private farm and ranch roads. The unpaved roads generally are impassable during wet periods. Rail service is provided by the Chicago, Rock Island and Pacific Railroad. Loading facilities are available at Bridgeport, Boyd, and Paradise.

Wise County has not been designated as an area of underemployment under the Area Redevelopment Act.

Economic Data

The economy of the watershed depends to a large extent on agricultural production. Farming operations are primarily in connection with beef cattle production; however, dairying also is found throughout the watershed. The principal crops are small grains, peanuts, alfalfa and other hay crops, grain sorghum, and truck crops.

Agricultural income is supplemented to a large degree from oil and gas drilling activity and employment in nonagricultural enterprises.

The watershed formerly included many small farms on which cotton was a major crop, but the trend has been toward larger operating units with a greater portion devoted to feed crops and pasture. The acreage of peanuts in the watershed is diminishing along with other row crops. Alfalfa production is confined to the alluvial soils. Feed crops are utilized for hay and supplemental grazing in most cases rather than being harvested for grain. Deterioration of upland soils has brought about a more intensive use of flood plain along the tributaries, but the West Fork of the Trinity flood plain is not used intensively due to danger from floodwater and sediment damage. Pasture improvement has been initiated primarily on some of these fertile terrace and bottomland soils. Truck crops consist mainly of cantaloupes and watermelons.

Allotment crops are not important in this watershed and crops in surplus supply have a minor effect on the economy.

Cultivation of flood plain is expected to continue, but an increasing amount of upland is being retired to pasture.

There are estimated to be 510 farms in the watershed, averaging 229 acres in size, and with an appraised value of $27,150 each. There is a wide range in the market value of agricultural land, depending on location and accessibility. Land values are influenced by proximity to the Fort Worth metropolitan area. There has been an increasing number of homes built during the last few years on small acreages adapted for rurban living. The farms are largely owner operated.

The area is well suited for recreational development to supplement farm income. There is plenty of timber and grass cover for wildlife. Quail and small game are prevalent in the countryside and there are ample reservoir sites to furnish fishing and duck shooting for sportsmen.

Land Treatment Data

The Upper West Fork and the Hood-Parker Soil Conservation Districts have been very active in establishing land treatment measures. The districts have obtained a high degree of participation in the soil and water conservation program from farmers, ranchers, and organizations in the watershed.

The watershed is served by the Soil Conservation Service work unit at Bridgeport. The work unit has assisted farmers and ranchers in preparing 274 basic soil and water conservation plans on 63,906 acres (55.14 percent of the total agricultural land) within the watershed. Technical assistance has been furnished in establishing and maintaining planned land treatment measures. About 41 percent of the needed measures have been applied. Where these measures have been applied and maintained as long as 3 years, crop and pasture yields have increased by about one-fifth. Land treatment measures installed before the development of this flood prevention work plan are shown in table 1A.

WATERSHED PROBLEMS

Floodwater Damage

The flood plain is defined as that area inundated by the runoff from the largest storm considered in the 30-year evaluation series. It includes the bottomland along the west side of the West Fork of the Trinity River. A large part of the West Fork flood plain is being damaged by floodwater originating outside the Salt Creek and Laterals watershed, primarily from Big Sandy Creek and Laterals watershed.

There are 9,518 acres of flood plain in the Salt Creek and Laterals watershed. Of this amount, 4,154 acres are located along Salt Creek and its

Damage to County Road below Site 9 resulting from runoff of a 5½ inch rain. April 1964

Damage to highway, fences, crop and pasture on Salt Creek at State Farm Road 2378. April 1964

tributaries above the Chicago, Rock Island and Pacific Railroad. The remainder, 5,364 acres, lies along the west side of the West Fork of the Trinity. When recurrent flooding during a single year is considered, the cumulative area flooded during an average year on Salt Creek and its tributaries is 3,617 acres, or 87 percent of the flood plain. Flooding is so frequent on the West Fork that the average annual cumulative acreage flooded of 10,314 is almost twice the flood plain area.

Downstream from Texas Farm Road 51 to the upper reaches of Eagle Mountain Lake, the flood plain along the west side of West Fork consists of 3,614 acres.

Upstream from Texas Farm Road 51 to Bridgeport Dam, the flood plain consists of 1,750 acres along the west side of the West Fork. Out of this area, 1,522 acres lie between the farm road and the confluence of Big Sandy Creek with West Fork.

Flood plain areas flood frequently and sustain high annual damage. The flood plain is wide and flat. A small rise above bankfull stage will cause large areas to be inundated. Floods develop rapidly and occur most often during the growing season. Livestock are lost unless evacuation can be accomplished promptly.

During the 30-year evaluation period, 1924 through 1953, there were 37 major floods each of which inundated more than half of the entire flood plain in the watershed. Severe flooding was most frequent during this period on the West Fork of the Trinity. Here 62 floods covered more than half of the West Fork portion of the flood plain. In addition there were 49 minor floods. During the same period 17 major floods covered more than half of the flood plain of Salt Creek and its tributaries. Minor floods during the evaluation period on Salt Creek numbered 96. There were 8 major and 39 minor floods on the flood plain of Salt Creek and its tributaries during the months of April, May, and June. During the same months there were 28 major and 19 minor floods on the West Fork portion of the flood plain. This 3-month period is the season when crops and pastures are at a critical stage in growth and are very susceptible to damage from floodwater.

Even though flooding is severe, farmers continue to use the flood plain intensively because of its high productivity. Fences and other improvements are difficult to maintain, restricting diversified farming practices, especially in livestock farming. This results in inefficient use of time and resources of the farmers.

Noxious weeds scattered by floodwater add to the cost of crop and pasture production.

The value of flood plain land is estimated to be $150 to $300 per acre, depending on location and accessibility.

Crop damage on Ratliff farm from storm of April 1964. 15 acres of oats destroyed.

Twenty-acre cropland field and fences on Earl Kelley farm severely damaged by floodwater resulting from a 5½-inch rain in April 1964. Clearing of debris and a major land leveling operation is necessary to restore field to production.

Flooding causes interruption of traffic and damage to roads and bridges.

A recent major flood occurred April 26 and 27, 1957. The entire flood plain was inundated and direct floodwater damage was estimated at $206,800 from this storm. This flood was estimated to equal that of a 25-year frequency.

Based on the floods considered in the 30-year evaluation series, annual direct floodwater damages on Salt Creek and tributaries without the program of land treatment and structural measures in place are estimated to total $35,283 (table 5). These damages, by individual evaluation reaches, are shown in the following table:

Annual Floodwater Damages Without Project

Evaluation Reach (Figure 5)		Floodwater Damages in Dollars (Based on Long-Term Prices)			
Number	Name	Crop and Pasture	Other Agricultural	Road and Bridge	Total
A	Lower Garrett Creek	9,767	1,223	873	11,863
A-1	Lower Salt Creek	2,858	536	351	3,745
B	Upper Salt Creek	5,485	452	386	6,323
C	Upper Garrett Creek	9,949	1,196	633	11,778
D	Rush Creek	1,370	124	80	1,574
Total		29,429	3,531	2,323	35,283

Floodwater damages in the four main stem reaches of the West Fork are estimated to be $89,234 under without project conditions.

Attempts have been made by individual landowners to straighten channels and levee bottomlands along the main stem of Salt, Garrett, and West Fork. These efforts, generally, have not proved to be adequate. The levees are not being effectively maintained and stream channels have inadequate capacities. There has been some improvement in the alignment on the West Fork channel by the Tarrant County Water Control and Improvement District No. 1. In general, this straightening has alleviated some problems, but additional capacity is needed.

Erosion Damage

A high percentage of the upland area of the watershed was formerly in cultivation. Severe sheet and gully erosion occurred in these cropland areas because of the highly erodible West Cross Timbers soils and poor cropping practices. This erosion was critical for a number of years and probably reached its peak during the period 1920 to 1930. Both sheet and gully erosion have been reduced significantly by the conversion of nearly all of the cropland to pasture and hay production and application of sound conservation practices and treatment. Present upland erosion rates range from 1.05

acre-feet to 2.20 acre-feet per square mile annually. Sheet erosion accounts for 75 percent and gully and streambank for 25 percent of the annual gross erosion.

Flood plain scour damage is low. Damaged areas range from broad sheet scour depressions to narrow channels 1 to 4 feet deep. It is estimated that the productive capacity of approximately 121 acres is being reduced 10 to 60 percent annually by scour. Flood plain erosion damage by evaluation reaches is as follows:

	Acres Damaged						
	Percent Damaged						
Evaluation Reach	10	20	30	40	50	60	Total
Salt Creek and Tributaries							
A-1	-	-	1	-	-	-	1
A	5	5	-	2	-	-	12
B	-	-	-	-	-	-	-
C	-	9	5	-	12	3	29
D	-	-	3	3	-	4	10
West Fork							
I-A	-	2	11	-	-	-	13
I-B	16	11	-	3	4	-	34
II	-	2	5	4	2	-	13
III	-	2	7	-	-	-	9
Total	21	31	32	12	18	7	121

Indications are that damage by scour is approximately equal to the rate of recovery. The estimated average annual damage by flood plain scour is $910, of which $695 occurs on the flood plain of Salt Creek and its tributaries.

Channel entrenchment and lateral erosion are generally minor in the lower reaches of the watershed and moderate in the upper reaches, with the exception of Salt Creek channel above Cottondale where entrenchment and bank cutting have been quite active. The estimated land loss by channel erosion is 1 acre per year.

Sediment Damage

Erosion in the upland has resulted in the deposition of predominantly silty sand and lesser amounts of clayey sand and fine sand on the flood plain. The productive capacity of 2,946 acres has been reduced from 10 to 70 percent, as follows:

Evaluation Reach	Acres Damaged: Percent Damaged: 10	20	30	40	50	60	70	Total
Salt Creek and Tributaries								
A-1	34	39	37	28	-	-	-	138
A	127	84	94	16	-	-	-	321
B	149	134	137	34	11	-	-	465
C	300	193	203	67	3	-	-	766
D	83	68	85	43	6	3	-	288
West Fork								
I-A	139	81	69	63	47	6	-	405
I-B	58	50	68	52	13	3	3	247
II	49	78	66	55	12	-	-	260
III	29	14	13	-	-	-	-	56
Total	968	741	772	358	92	12	3	2,946

Annual recovery from sediment deposition is approximately in balance with new damage.

The average annual monetary damage by overbank deposition is estimated to be $15,770. About $12,500 of this occurs on Salt Creek and its tributaries.

Aggradation in the lower reaches of Salt and Garrett Creeks has reduced channel capacities materially resulting in increased frequency and depths of flooding.

An estimated 126 acre-feet of sediment is being deposited annually in Eagle Mountain Lake from Salt Creek and Laterals watershed. The estimated damage annually to this reservoir by depletion of its capacity is $6,858.

Problems Relating to Water Management

The Wise County Water Control and Improvement District No. 1 was organized primarily for the purpose of regulating irrigation activities along the flood plain of the West Fork. Water is available for this purpose in Lake Bridgeport. The potential for irrigation has not been developed due to problems in transporting water. Considerable interest in irrigation development is becoming more evident.

There is only minor need for drainage within the watershed. According to the local sponsoring organizations, there is no known local interest at the present time in providing storage in any of the structures for irrigation, municipal or industrial water supply, fish and wildlife development,

or recreation.

PROJECTS OF OTHER AGENCIES

The works of improvement included in this plan will have significant beneficial effects on Eagle Mountain Lake, an existing downstream Fort Worth water supply reservoir. There are no improvements by Federal agencies in the watershed. Lake Bridgeport and Amon Carter Lake, water supply reservoirs, provide some protection to bottomland from floods on the West Fork of the Trinity in this watershed.

There are no authorized or proposed works of improvement of any Federal agency in this watershed. Tarrant County Water Control and Improvement District No. 1 has indicated an interest in constructing a water supply reservoir in the vicinity of Boyd, and "....requested that the Boyd project be included in the Master Plan," (Master Plan of the Trinity River and Tributaries, Texas).

The Salt Creek and Laterals watershed project will have no known detrimental effect on any downstream projects which might be constructed in the future.

BASIS FOR PROJECT FORMULATION

A reconnaissance of the watershed was made by specialists of the Watershed Work Plan Staff, Area and Work Unit Conservationists, and representatives of the sponsoring local organizations. Agricultural enterprises are the principal sources of income; however, operators of small farm and ranch units supplement their income by off-farm employment. Livestock farming is the major type of operation. Moderate to severe flooding causes extensive damage to flood plain lands, crops, pastures, and other agricultural properties.

Meetings were held to discuss existing problems and to formulate the watershed protection and flood prevention program.

The possibilities and opportunities for including additional storage in floodwater retarding structures for other purposes, such as agricultural and nonagricultural water management, recreational development, and fish and wildlife development, were explained. The sponsors determined that a project for watershed protection and flood prevention most nearly met their needs and that no other group or individual was interested in additional storage for other purposes.

Specific objectives of the local sponsors for the work plan are:

1. Establish land treatment measures during the project installation period which contribute directly to watershed protection and flood prevention.

2. Attain at least a 65 percent reduction in average annual flood damages on Salt Creek and its tributaries to insure sustained

agricultural production on flood plain lands and to maintain the economy of the watershed.

3. To provide capacity in the West Fork channel for release flows from floodwater retarding structures and a reduction in damages contingent to such channel improvement.

The Soil Conservation Service agreed that the desired level of protection was reasonable; and that a combination of land treatment measures, floodwater retarding structures, and stream channel improvement on Salt and Garrett Creeks would be needed to meet these objectives. It was further agreed that minor stream channel improvement on West Fork would give some additional reduction in damages and provide capacity for release flows from floodwater retarding structures.

In selecting the sites for floodwater retarding structures, consideration was given to locations which would provide the desired level of protection to areas subject to flood damage. The size, number, design, and cost of the structures was influenced by the location of the damaged areas, the complex topography, site limitations and obstacles, and the geologic conditions of the watershed. The recommended system of 19 floodwater retarding structures; 11.73 miles of stream channel improvement of Salt and Garrett Creeks; and 17.58 miles of stream channel improvement on West Fork of the Trinity meet project objectives by providing the desired level of protection for agricultural enterprises of the watershed at least cost.

The project for Salt Creek and Laterals watershed complements the comprehensive Trinity River basin plan as indicated in the Report of the U. S. Study Commission of Texas, Part III, page 69 and Table 57.

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment Measures

Land treatment measures are being applied under the leadership of the soil conservation districts. Approximately 37,875 acres of the 118,784 acres in the Salt Creek and Laterals watershed lie above planned floodwater retarding structures. Land treatment is especially important for protection of these watershed lands to support and protect the structural measures. Except for flood plain areas the establishment and maintenance of land treatment constitutes the only planned measures on the remaining 77,533 acres of agricultural lands.

Land treatment measures on the flood plain below floodwater retarding structures are important in reducing scour damage.

Emphasis will be placed on accelerating the establishment of those land treatment measures which will have a measurable effect on reduction of damages from floodwater and sediment and in reducing the cost of providing

sediment storage capacity in the floodwater retarding structures.

The amounts and estimated costs of the measures that will be installed by the landowners and operators during the 5-year installation period are shown in table 1. The local people will continue to install and maintain land treatment measures needed in the watershed after the 5-year installation period.

Land treatment measures will decrease erosion damage and sediment production rates from fields and pastures by improving soil-cover conditions. These measures include conservation cropping systems, cover and green manure crops, and crop residue use for cropland. Severely eroded cropland will be seeded or sodded to adapted grasses and used as pasture. The trend is toward better land use of these areas. Proper use, planting, renovation of pasture, and brush and weed control are included to establish good cover on pastureland and formerly cultivated lands. They also include proper use, deferred grazing, and seeding to improve grass cover on rangeland, and construction of farm ponds to provide adequate watering places for livestock and to encourage uniform distribution of grazing. These measures also effectively bring about soil conditions which allow rainfall to soak into the soil at a more rapid rate.

In addition to the soil-improving and cover measures, land treatment includes contour farming, diversions, grassed waterways, and gradient and parallel terraces, all of which have a measurable effect by slowing runoff water from fields and in reducing erosion damage and sediment production.

Structural Measures

A total of 19 floodwater retarding structures and 11.73 miles of stream channel improvement are required to provide the desired protection to the flood plain of Salt and Garrett Creeks. In addition, 17.58 miles of stream channel of West Fork of the Trinity River will be improved. Improvement of West Fork will provide for release flows from floodwater retarding structures located in the Salt Creek and Laterals watershed without encroaching upon the minimum capacity of the existing channel.

Improvement of West Fork channel will include clearing and snagging from a point approximately 2,800 feet upstream from entry of improved Salt Creek channel to the upper reaches of Eagle Mountain Lake at or near a point approximately 2,000 feet downstream from Valley Section 2. Minor straightening and channel enlargement will be accomplished on the upper portion of the West Fork segment in the vicinity of VS-13 and VS-14 (figure 5).

Figure 1 shows a section of a typical floodwater retarding structure.

The cost of installing these works of improvement is as follows:

Floodwater Retarding Structures	$1,484,260	
Stream Channel Improvement	568,538	
Total	$2,052,798	(table 2)

Runoff will be retarded from 54 percent of the watersheds of Salt and Garrett Creeks. No structural control is planned for any of the laterals draining directly into the West Fork of the Trinity.

The total capacity of the 19 floodwater retarding structures is 18,471 acre-feet. Of this total, 4,331 acre-feet is provided for sediment accumulation over a 100-year period and 14,140 acre-feet for floodwater detention. This detains an average of 4.48 inches from the area upstream from the structures, which is equivalent to 1.43 inches from the entire watershed. The amount of runoff controlled by each structure is shown in table 3.

All applicable State water laws regulating the appropriation of water or the diversion of streamflow will be complied with in the design and construction of structural measures.

The improved stream channels on Salt and Garrett Creeks are designed to carry the flow from an average 2-day storm producing a runoff of 1.5 inches from the uncontrolled area, plus release waters from the floodwater retarding structures. Flood plain lands on Salt and Garrett Creeks will be protected from flood and sediment damages, on an average, approximately equaling those expected from a storm of a 33 percent chance of occurrence.

Passage of design flows for improved stream channels at railroad bridges will be accomplished with minor cleanout of existing structures and within dimensions of existing concrete abutments.

At State Highway 114, clearance for design flows will be provided by deepening the existing Garrett Creek channel by 3 feet and by providing a bottom 70 feet wide. For Salt Creek the existing channel will be deepened 4 feet, with a bottom 70 feet in width.

On Garrett Creek, one county road bridge will be constructed and a second county road bridge will be enlarged to permit passage of design flow.

Excavated materials will be disposed of within the right-of-way of improved channels and may be placed in shaped fills with passageways for side drains or may be placed in contiguous oxbows created by improved alignment. Passageways through spoil fills, for side drains, will be provided at the point where property lines intersect such fills, or more frequently as may be needed. Normally spoil will be placed on both sides of the improved channel but may be placed on one side only as conditions warrant and provided no additional expenditure of Federal funds is involved.

The total cost of structural measures is estimated to be $2,052,798 (table 2).

Details on quantities, costs, and design features of structural measures are shown in tables 1, 1A, 2, 3, and 3A.

EXPLANATION OF INSTALLATION COSTS

The estimated cost of planning and installing land treatment measures during the next 5 years, including expected reimbursement from Agricultural Conservation Program Service funds, is $327,563 based on current program criteria. Accelerated technical assistance will be provided landowners and operators through the soil conservation districts by the Soil Conservation Service at an estimated cost of $27,000 from flood prevention funds. Land treatment costs are based on present prices being paid by landowners and operators to establish the individual measures.

Estimates of the kinds, amounts, and costs of land treatment measures were furnished by the Upper West Fork Soil Conservation District.

Land, easements, and rights-of-way for the floodwater retarding structures and for stream channel improvement will be furnished by local interestes at no cost to the Federal Government.

Reinforcing, underpinning, or reconstructing piers and abutments of highway and public road bridges, necessitated by deepening of channels in connection with stream channel improvement, are considered as construction costs and will be borne by flood prevention funds. Such costs are limited to those required to provide a facility of comparable quality and performance capability to the existing bridge.

Cost of construction or alterations of railroad bridges and approaches, directly associated with structural stability of the structure, is considered project construction cost and will be borne by flood prevention funds. Plans and specifications for needed alterations will be furnished by the railroad for concurrence by the Soil Conservation Service.

All other costs of bridge alterations are considered right-of-way costs and will be borne by local interests.

The local cost for the 19 floodwater retarding structures and 29.31 miles of stream channel improvement, estimated to be $142,850, consists of land, easements, and rights-of-way ($122,350), relocating and clearing obstacles ($12,200), and legal fees ($8,300).

Construction costs for the 19 floodwater retarding structures and 29.31 miles of stream channel improvement, estimated to be $1,543,785, include the engineer's estimate and a 10 percent allowance for contingencies. The engineer's estimates were based on unit costs of structural measures constructed in similar areas and modified by special conditions inherent to each individual site location. The cost of installation services is estimated to be $366,163, including engineering and administrative costs. The

total construction and installation services costs for these measures is $1,909,948 and will be borne by Federal funds.

The total cost of the floodwater retarding structures and stream channel improvement for flood prevention is estimated to be $2,052,798.

The estimated schedule of obligations for the installation period for the work plan, including installation of both land treatment and structural measures, is as follows:

Schedule of Obligations

Fiscal Year	Measures	Flood Prevention Funds	Other Funds 1/	Total
		(dollars)	(dollars)	(dollars)
First	Floodwater Retarding Structures 12, 13, 14, 15, 16, 19, 20, and 22	585,270	64,650	649,920
	Land Treatment	5,400 2/	60,113	65,513
	Subtotal	590,670	124,763	715,433
Second	Floodwater Retarding Structures 1, 2, and 4	248,080	14,750	262,830
	Stream Channel Improvement (Garrett Creek and West Fork of Trinity)	343,682	16,200	359,882
	Land Treatment	5,400 2/	60,113	65,513
	Subtotal	597,162	91,063	688,225
Third	Floodwater Retarding Structures 5, 6, 7, 8, 9, 10, 11, and 21	528,560	42,950	571,510
	Land Treatment	5,400 2/	60,113	65,513
	Subtotal	533,960	103,063	637,023
Fourth	Stream Channel Improvement (Salt Creek)	204,356	4,300	208,656
	Land Treatment	5,400 2/	60,113	65,513
	Subtotal	209,756	64,413	274,169
Fifth	Land Treatment	5,400 2/	60,111	65,511
Total for Installation Period		1,936,948	443,413	2,380,361

1/ Includes reimbursement from ACP funds under going program.

2/ Accelerated technical assistance.

This schedule may be adjusted on the basis of any significant change in the plan found to be mutually desired and in the light of appropriations and actual accomplishments.

EFFECTS OF WORKS OF IMPROVEMENT

Effects of the works of improvement are examined under different conditions for separate parts of the Salt Creek and Laterals watershed. In evaluating the flood plain area along the west side of the West Fork of the Trinity, consideration is given to the effect of the project for Big Sandy Creek and Laterals watershed which is under construction.

Since treatment by structural measures in the small watersheds which make up the laterals portion of the Salt Creek and Laterals watershed cannot be economically justified, the project planned for these areas will be limited to land treatment measures.

With the installation and operation of the project, 16 of the 17 major floods such as those which occurred on Salt Creek and its tributaries during the 30-year evaluation period (1924-1953) would be reduced to minor floods. In addition, flooding would be eliminated from 76 of the 96 minor storms.

With the installation of the project on Salt Creek and Laterals, plus the project for Big Sandy Creek and Laterals watershed, 14 of the 62 major floods, such as those which occurred on West Fork during the evaluation period, would be reduced to minor floods. Flooding would be eliminated on West Fork from 6 of the 49 minor floods. However, monetary benefits claimed in this work plan accrue only to Salt Creek and Laterals watershed project.

The effect on average annual flooding is shown in the tabulation below:

Portion of Watershed	Average Annual Flooding	
	Without Project (acres)	With Project (acres)
Salt Creek and Tributaries	3,617	279
West Fork Flood Plain	10,314	8,244*

* Proposed projects for Big Sandy Creek and Laterals and Salt Creek and Laterals watersheds in place.

The following table illustrates by evaluation reaches the acres flooded by storms of specified frequencies without the project and with the complete project installed:

Agricultural Areas Inundated Below Site Locations

Evaluation Reach (Figure 5)	Average Recurrence Interval: 33 Percent Chance Without Project (acres)	33 Percent Chance With Project (acres)	10 Percent Chance Without Project (acres)	10 Percent Chance With Project (acres)	4 Percent Chance Without Project (acres)	4 Percent Chance With Project (acres)
Salt Creek and Tributaries						
A	642	0	946	182	1,100	500
A-1	322	0	322	52	322	273
B	281	40	567	232	845	316
C	853	12	1,210	467	1,449	1,048
D	131	0	316	148	438	232
Subtotal	2,229	52	3,361	1,081	4,154	2,369
West Fork Flood Plain (Salt Creek Portion)*						
IA	842	784	901	861	996	912
IB	2,312	2,237	2,437	2,366	2,618	2,509
II	1,333	1,280	1,453	1,410	1,522	1,481
III	27	0	114	94	228	191
Subtotal	4,514	4,301	4,905	4,731	5,364	5,093
Total	6,743	4,353	8,266	5,812	9,518	7,462

* "With Project" conditions includes proposed projects for Big Sandy Creek and Laterals and Salt Creek and Laterals watersheds in place.

The following table shows the effects that the project will have on flooding and damages by evaluation reaches. All figures indicate average annual percent reduction.

Evaluation Reach (Figure 5) No.	Name	Percent Reduction: Area Flooded	Damages: Crop and Pasture	Other Agricultural	Non-Agricultural	Flood Plain Scour	Overbank Deposition	Reservoir
Salt Creek and Tributaries								
A	Lower Garrett	96	95	97	98	95	98	-
A-1	Lower Salt	96	95	98	98	100	98	-
B	Upper Salt	79	79	90	98	-	92	38
C	Upper Garrett	93	90	93	93	93	96	38
D	Rush	92	81	87	86	83	96	38
Salt Creek and Tributaries (Total)		92	90	95	96	91	95	38

(Table continued, following page)

Effects project will have on flooding and damages by evaluation reaches - continued:

Evaluation Reach (Figure 5)		Percent Reduction						
			Damages					
No.	Name	Area Flooded	Crop and Pasture	Other Agricultural	Non-Agricultural	Plain Scour	Overbank Deposition	Reservoir
West Fork Flood Plain *								
IA	West Fork	26	22	30	32	25	33	-
IB	West Fork	20	20	28	33	23	31	-
II	West Fork	18	17	24	18	18	53	-
III	West Fork	22	24	22	25	22	32	-
West Fork Flood Plain (Total)		20	19	27	25	21	42	-
Total Watershed		33	40	40	47	74	84	38

* With proposed projects for Big Sandy Creek and Laterals and Salt Creek and Laterals watersheds in place.

The application of the planned land treatment program is expected to reduce the total annual gross erosion from 280 acre-feet to 247 acre-feet, a reduction of 12 percent. The annual flood plain scour damage on 121 acres is expected to be reduced about 74 percent. Six percent will be attributable to land treatment measures and 68 percent to structural measures.

After the complete project is installed, an 84 percent reduction in overbank deposition on 2,946 acres will be effected, with 14 percent resulting from land treatment measures and the remaining 70 percent from structural measures.

It is estimated that 126 acre-feet of sediment from this watershed is deposited annually in Eagle Mountain Lake under present conditions. This damage will be reduced to 78 acre-feet annually with the complete project installed on Salt Creek and Laterals watershed.

Without the project, the largest storm in the evaluation series will produce 5.00 inches of runoff from the watershed. Such a storm occurred in April 1942. This volume of runoff, under without project conditions, on the Salt Creek and tributaries portion of the watershed would produce a peak discharge of 25,200 cubic feet per second at the reference valley section No. 3A, and would inundate 4,154 acres of flood plain land below proposed floodwater retarding structure sites. The accelerated land treatment program will reduce the surface runoff from this storm to 4.88 inches (24,500 c.f.s.) and the area inundated to 4,110 acres. The installation and full functioning of the floodwater retarding structures and stream channel improvement will further reduce the peak discharge to 8,060 c.f.s., and the area inundated to 2,369 acres.

Figure 3 graphically illustrates the reduction at valley section 19A for the storm of June 1928 (3.82 inches of rainfall, 2.95 inches of runoff), representing a storm of approximately 10-year frequency.

The most severe damage is done to roads, bridges, and railroads by floods that cover 75 percent or more of the flood plain. With the project in place, the number of floods that would inundate 75 percent or more of the flood plain would be reduced from 4 to 0.

Percent of Flood Plain Covered	Number of Floods in 30-Year Series	
	Without Project	With Project
Salt Creek and Tributaries		
75+	4	0
West Fork Portion of Watershed		
75+	31	22*

* With proposed projects for Big Sandy Creek and Laterals and Salt Creek and Laterals watersheds in place.

Reduced flooding will make it possible for farmers to increase bottomland productivity and to organize cropping systems which will increase returns. The flood damage from a recurrence of the largest storm in the evaluation series would be eliminated from 2,056 acres. This will permit use of this fertile land to its full potential. An estimated 170 landowners and operators of flood plain land will benefit directly by the project.

It is expected that intensified and changed land use will occur on about 3,980 acres of the flood plain. A large majority of this will be a change from pasture and woods to alfalfa and improved pasture, with some increase in truck crops. No significant change is expected on any crops under allotments or in surplus supply.

With the project installed operators of agricultural lands will be able to carry out a more diversified and profitable agricultural program. Shifts in the overall land use will reduce the acreage of cropland by about 2,200 acres. The acreages in peanuts and grain crops are expected to decrease.

Some loss of wildlife habitat will result from the clearing of sediment pool areas at a limited number of sites, but the sediment pools of all structures will offer opportunities for fish production. Wildlife habitat on the flood plain areas will be improved by reduction of frequency, depth, and duration of flooding.

The sediment pools of the floodwater retarding structures will provide neighborhood recreational opportunities that would not be available from

any other source. Facilities will be available for recreational uses such as fishing, picnicking, camping, and hunting. Peak recreation use is expected to occur from May through September, with fishing and hunting continuing throughout the year. It is estimated that there will be 15,200 visitor days annually with a peak daily use by 300 visitors.

The operation and maintenance of project measures over the life of the project will provide some employment opportunities for the local residents.

Secondary benefits stemming from, and induced by, the project will accrue in the watershed. The increased farm production will provide an outlet for labor and for sale of equipment and materials used in farm production. It will provide added income for farm families to improve their standard of living. Economic activities may be stimulated by sales of boats, motors, fishing and camping equipment, and other items associated with increased recreational opportunities. In addition, there are intangible benefits such as increased sense of security and the opportunity to plan farm operations without consideration of frequent flooding. Local secondary benefits were considered to be equal to 10 percent of the direct primary benefits plus 10 percent of the increased costs that primary producers will incur in connection with increased production.

The project on Salt Creek and tributaries will reduce the annual water yield from this portion of the watershed approximately 2.4 percent and approximately 7.5 percent from the area controlled by floodwater retarding structures.

PROJECT BENEFITS

Total average annual benefits accruing to structural measures after installation of the project are estimated to be $105,826 (table 6), distributed as follows:

Type of Benefits	Dollars
Damage Reduction	54,667
More Intensive and Changed Land Use	24,705
Recreation	11,400
Secondary	10,073
Outside Project	4,981
Total	105,826

Agricultural (crop, pasture, other, erosion, sediment) and nonagricultural (road and bridge) damages on Salt Creek and tributaries, including indirect damages, will be reduced from an estimated $60,872 to $9,052 annually (table 5). Approximately 9 percent of the damage reduction benefits will result from land treatment measures, with the remainder accruing to structural measures.

Annual net income will increase an estimated $23,936 to owners and operators of flood plain land along Salt Creek and tributaries from changed and more intensive land use (table A). An additional $769 increase from this source is expected along the West Fork flood plain.

Local secondary benefits amounting to $10,073 annually will accrue to workers, processors, handlers, and suppliers of additional goods and services that will be needed as a result of the project. Secondary benefits from a national viewpoint were not considered pertinent to the economic evaluation.

Incidental recreation benefits (picnicking, fishing, boating, and hunting) based on an estimated net value of 75 cents per visitor-day will amount to $11,400 annually at structures open for public recreational use. Facilities will be moderately developed. Allowance has been made for associated costs of about 25 cents per user day for repairs, maintenance and operation of facilities and liability insurance.

COMPARISON OF BENEFITS AND COSTS

Primary benefits accruing to structural measures consist of reduction in damages, increase in income from more intensive and changed land use, and incidental recreation. These average $95,753 annually as compared to their annual cost of $72,733, giving a benefit-cost ratio of 1.32 to 1.

Total benefits, including secondary benefits, accruing to structural measures annually amount to $105,826, giving a benefit-cost ratio of 1.5 to 1 (table 6).

PROJECT INSTALLATION

Land treatment measures itemized in table 1 will be established by farmers and ranchers over a 5-year period in cooperation with the Upper West Fork and the Hood-Parker Soil Conservation Districts which are providing technical assistance in planning and application of these measures under their going programs. These programs will be accelerated with flood prevention funds to assure application of the planned measures within the 5-year installation period.

The governing bodies of the soil conservation districts will arrange for meetings in accordance with definite schedules. By this means, and by individual contacts, they will encourage the landowners and operators within the watershed to adopt and carry out the 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 district.

The Soil Conservation Service work unit will assist landowners and operators cooperating with the district in accelerating the preparation of soil

and water conservation plans and in the application of conservation practices.

The Extension Service will assist with the educational phase of the program by conducting general information and local farm meetings, prepare radio, television and press releases, and using other methods of getting information to landowners and operators in the watershed. This activity will help get the land treatment practices and structural measures for flood prevention established.

The Soil Conservation Service will contract for the construction of the 19 floodwater retarding structures and 29.31 miles of channel improvement. It also will provide technical specialists to prepare plans and specifications, supervise construction, prepare contract payment estimates, make contract payments, make final inspections, certify completion, and perform related duties for the installation of the structural measures.

Stream channel improvement planned for Salt and Garrett Creeks and the main stem of West Fork will be coordinated with construction of floodwater retarding structures to insure that release rate requirements are met. The various features of cooperation between the parties involved have been covered in appropriate memoranda of understanding and working agreements.

The Wise County Water Control and Improvement District No. 1 and the Wise County Commissioners Court have the right to eminent domain under applicable State law and will obtain the necessary land, easements, and rights-of-way, including utility, pipeline, road and improvement changes. The Wise County Water Control and Improvement District No. 1 will determine the legal adequacy of easements, permits, etc. for the construction of the planned structural measures. They will install culverts or make other needed improvements to keep crossings on county roads passable during periods of floodwater release. Local interest will be responsible for the improvement of individually owned crossings.

The 19 floodwater retarding structures will be constructed during the first 3 years of the 5-year installation period in a general order which will permit installation of stream channel improvement on Garrett Creek and the West Fork of the Trinity River during the second fiscal year and on Salt Creek during the fourth fiscal year.

Since sites 11 and 19 are in series with other sites, the upper structures will be constructed before or concurrently with the lower structures (figure 6).

The structural measures will be constructed pursuant to the following conditions:

1. The requirements for land treatment in the drainage area above structures have been satisfied.

2. Land, easements, and rights-of-way have been secured for all structural measures or for a group of structures in a hydrologic unit, or written statements are furnished by the appropriate sponsoring local organization(s) that their rights of eminent domain will be used, if needed, to secure any remaining easements within the project installation period, and that sufficient funds are available and will be used to pay for these easements, permits, and rights-of-way.

3. Court orders have been obtained from the Wise County Commissioners Court showing that the county roads affected by floodwater retarding structures will be relocated, raised 2 feet above emergency spillway crest elevation, closed, or permission granted to temporarily inundate the road and provide equal alternate routes as needed.

4. Project and operation and maintenance agreements have been executed.

5. Flood prevention funds are available.

FINANCING PROJECT INSTALLATION

Federal assistance for carrying out the works of improvement as described in this work plan will be provided under the authority of the Flood Control Act of 1944, as amended and supplemented.

Provision of Federal funds is contingent upon the local organizations meeting their obligations and upon appropriation of Federal funds for these purposes.

The Wise County Water Control and Improvement District No. 1 is authorized by law "to levy, assess and collect taxes for the construction of dams and other flood control measures". Qualified voters of the district approved a tax rate of 6 cents on each $100 valuation within the district. The current district valuation is in excess of $4,599,360. The tax is to be levied and collected annually. Revenue from the tax can be used for acquiring rights-of-way and construction of works of improvement.

The Wise County Commissioners Court has entered into an agreement with the Wise County Water Control and Improvement District No. 1 whereby the county agreed to assume and guarantee the costs of land, easements, and rights-of-way, and to use its power of eminent domain, if necessary, in securing land rights for all works of improvement in the Salt Creek and Laterals watershed. In consideration of the guarantee of the necessary advancements and expenditures to be made by the county, the Wise County Water Control and Improvement District No. 1 will reimburse the county for funds expended in its behalf.

The costs of applying land treatment measures will be borne by the owners and operators of the land. Flood prevention funds will be used for technical assistance in accelerating the application of land treatment measures.

Contributions of land, easements or rights-of-way, materials, labor, equipment, services, and money will be used whenever possible. Wise County Water Control and Improvement District No. 1 funds also will be used where necessary. Landowners were contacted by the local sponsors during development of the work plan, and it is expected that the major portion of the easements and rights-of-way will be donated.

The sponsoring local organizations do not plan to apply for a Farmers Home Administration loan for this project.

The soil and water conservation loan program of the Farmers Home Administration is available to all eligible farmers in the area. Educational meetings will be held in cooperation with other agencies to outline the services available and eligibility requirements. Present clients will be encouraged to cooperate in the project.

The County Agricultural Stabilization Conservation Committee will cooperate with the sponsoring organizations by selecting and providing financial assistance for those land treatment measures which will meet the conservation objectives in the shortest possible time.

PROVISIONS FOR OPERATION AND MAINTENANCE

Land Treatment Measures

Land treatment measures will be maintained by the landowners or operators of the farms on which the measures are installed. Representatives of the soil conservation district will make periodic inspections of the land treatment measures to determine maintenance needs. Landowners and operators will be encouraged to perform the management practices and needed maintenance. District-owned equipment is available for this purpose.

Structural Measures

The estimated annual operation and maintenance cost is $7,762 for the floodwater retarding structures and stream channel improvement.

Specific operation and maintenance agreements will be executed prior to the issuance of invitation to bid on construction of any of the structural works of improvement included in this work plan.

Each year the County Commissioners Court will budget sufficient funds for operation and maintenance of the 19 floodwater retarding structures and 29.31 miles of stream channel improvement. Maintenance will be accomplished through the use of contributed labor and equipment, by contract, by force

account, or by a combination of these methods. The court will establish a permanent reserve fund to be used for operation and maintenance of the structural measures from tax revenue being collected by the county.

The structural measures will be inspected jointly by representatives of the appropriate soil conservation district, water control and improvement district, and county commissioners court after each heavy streamflow. The Soil Conservation Service representative will participate in these inspections at least annually. For the floodwater retarding structures, items of inspection will include, but will not be limited to, the condition of the principal spillway and its appurtenances, the earth fill, the emergency spillway, the vegetative cover, and the fences and gates installed as a part of the structure. For the stream channel improvement, items of inspection will include, but will not be limited to, the degree of scour, silting, and bank erosion; obstructions to flow caused by debris lodged against bridges, fences, and watergates; excessive brush and tree growth within the channel; and the condition of side inlets and drains. The items of inspection listed are those most likely to require maintenance.

The Soil Conservation Service, through the Wise County Water Control and Improvement District No. 1, the Wise County Commissioners Court, and the Upper West Fork Soil Conservation District, will participate in operation and maintenance only to the extent of furnishing technical assistance to aid in inspections and technical guidance necessary.

Provisions will be made for free access of representatives of sponsoring local organizations and Federal representatives to inspect and provide maintenance for all structural measures and their appurtenances at any time.

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST
Salt Creek and Laterals Watershed, Texas
(Trinity River Watershed)

Price Base: 1962

Installation Cost Item	Unit	Number	Estimated Cost (Dollars) Federal 1/	Other 2/	Total
LAND TREATMENT					
Soil Conservation Service					
Cropland	Acre	3,625	-	59,388	59,388
Pastureland	Acre	9,900	-	228,780	228,780
Rangeland	Acre	6,200	-	12,395	12,395
Technical Assistance (Accelerated)			27,000	-	27,000
Subtotal		19,725	27,000	300,563	327,563
TOTAL LAND TREATMENT		19,725	27,000	300,563	327,563
STRUCTURAL MEASURES					
Soil Conservation Service					
Floodwater Retarding Structures	No.	19	1,086,030	-	1,086,030
Stream Channel Improvement	Foot	154,750	457,755	-	457,755
Subtotal			1,543,785	-	1,543,785
Subtotal - Construction			1,543,785	-	1,543,785
Installation Services					
Soil Conservation Service					
Engineering Services			230,927	-	230,927
Other			135,236	-	135,236
Subtotal			366,163	-	366,163
Subtotal - Installation Services			366,163	-	366,163
Other Costs					
Land, Easements, and Rights-of-Way			-	134,550	134,550
Legal Fees			-	8,300	8,300
Subtotal - Other Costs			-	142,850	142,850
TOTAL STRUCTURAL MEASURES			1,909,948	142,850	2,052,798
Work Plan Preparation Cost			22,000	-	22,000
TOTAL PROJECT			1,958,948	443,413	2,402,361
SUMMARY					
Subtotal - SCS			1,958,948	443,413	2,402,361
TOTAL PROJECT			1,958,948	443,413	2,402,361

1/ Flood prevention funds.
2/ Includes reimbursement from ACP funds under going programs.

April 1964

TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT
(At time of Work Plan Preparation)
Salt Creek and Laterals Watershed, Texas
(Trinity River Watershed)

Price Base: 1962

Measures	Unit	Applied to Date 1/	Total Cost (dollars) 2/
LAND TREATMENT			
Brush and Weed Control	Acre	6,929	173,225
Conservation Cropping System	Acre	3,310	-
Contour Farming	Acre	1,542	1,542
Cover and Green Manure Crop	Acre	6,280	75,988
Crop Residue Use	Acre	6,230	6,230
Diversion	Foot	113,000	9,266
Farm Pond	No.	300	108,000
Grade Stabilization Structure	No.	13	13,000
Grasses and Legumes in Rotation	Acre	1,376	20,640
Grassed Waterway	Acre	26	679
Pasture and Hayland Renovation	Acre	263	2,104
Pasture Planting	Acre	3,410	6,479
Pasture Proper Use	Acre	11,380	39,830
Range Deferred Grazing	Acre	11,680	11,680
Range Proper Use	Acre	13,750	6,875
Range Seeding	Acre	556	6,261
Terrace, Gradient	Foot	207,750	8,310
Terrace, Parallel	Foot	4,750	238
TOTAL	xxx	xxx	490,347

1/ As of June 30, 1963.
2/ Includes reimbursement from ACP funds under going programs.

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TABLE 2 - ESTIMATED STRUCTURAL COST DISTRIBUTION 1/
Salt Creek and Laterals Watershed, Texas
(Trinity River Watershed)
(Dollars) 2/

Structure Site Number or Name	Installation Cost - Federal Funds				Total Non-Federal Installation Cost 3/	Total Installation Cost
	Construction	Installation Services: Engineering	Installation Services: Other	Total Federal		
Floodwater Retarding Structures						
1	53,140	9,670	4,780	67,590	4,400	71,990
2	55,490	10,100	4,990	70,580	2,900	73,480
4	88,810	13,320	7,780	109,910	7,450	117,360
5	61,150	9,170	5,360	75,680	4,250	79,930
6	73,970	11,100	6,490	91,560	9,200	100,760
7	42,680	7,770	3,840	54,290	3,700	57,990
8	67,550	10,130	5,920	83,600	8,250	91,850
9	40,810	7,430	3,670	51,910	3,750	55,660
10	46,250	8,420	4,160	58,830	2,950	61,780
11	49,770	9,060	4,480	63,310	7,500	70,810
12	65,590	9,840	5,750	81,180	5,600	86,780
13	57,060	8,560	5,000	70,620	6,250	76,870
14	49,370	8,990	4,440	62,800	5,400	68,200
15	105,080	13,660	9,050	127,790	13,350	141,140
16	65,120	9,770	5,710	80,600	13,150	93,750
19	51,860	9,440	4,670	65,970	14,250	80,220
20	43,790	7,970	3,940	55,700	4,400	60,100
21	30,930	6,800	2,880	40,610	2,250	42,860
22	37,610	8,270	3,500	49,380	3,350	52,730
Subtotal	1,086,030	179,470	96,410	1,361,910	122,350	1,484,260
Stream Channel Improvement						
Salt Creek and Side Inlets	171,061	18,817	14,478	204,356	4,300	208,656
Garrett Creek and Side Inlets	207,284	20,728	17,385	245,397	13,700	259,097
West Fork of Trinity River	79,410	11,912	6,963	98,285	2,500	100,785
Subtotal	457,755	51,457	38,826	548,038	20,500	568,538
GRAND TOTAL	1,543,785	230,927	135,236	1,909,948	142,850	2,052,798

1/ Does not include work plan preparation cost.
2/ Price Base: 1962.
3/ Includes land, easements, rights-of-way, legal fees, and removing obstacles.

TABLE 3 - STRUCTURE DATA - FLOODWATER RETARDING STRUCTURES
Salt Creek and Laterals Watershed, Texas
(Trinity River Watershed)

Item	Unit	STRUCTURE NUMBER 1	2	4	5	6	7	8	9	10	11
Drainage Area	Sq.Mi.	2.74	1.86	5.42	2.55	6.53	1.95	3.93	1.50	1.30	3.12 1/
Storage Capacity											
Sediment Pool (50-year)	Ac.Ft.	85	81	145	90	146	69	136	42	47	88
Sediment Reserve Below Riser	Ac.Ft.	90	85	153	96	153	74	147	45	50	93
Sediment in Detention Pool	Ac.Ft.	48	45	81	49	80	39	77	23	26	48
Floodwater Retention	Ac.Ft.	623	426	1,240	575	1,557	469	939	356	328	747
Total	Ac.Ft.	846	637	1,619	810	1,936	651	1,299	466	451	976
Surface Area											
Sediment Pool (50-year or 200 acre-feet limit)	Acre	12	9	24	10	22	13	32	9	7	26
Sediment Reserve Pool (Top of Riser)	Acre	22	13	39	21	37	21	48	17	13	40
Floodwater Pool	Acre	62	43	106	61	142	50	112	53	41	106
Volume of Fill	Cu.Yd.	80,800	95,360	161,050	97,490	127,400	66,200	117,990	62,230	74,880	69,990
Elevation Top of Dam	Foot	989.5	990.7	926.4	871.5	850.5	844.8	800.5	817.6	829.5	779.9
Maximum Height of Dam 2/	Foot	53	59	60	51	53	37	32	39	45	38
Emergency Spillway											
Crest Elevation	Foot	985.5	987.0	922.0	868.0	846.0	841.0	797.0	814.0	826.0	776.0
Bottom Width	Foot	130	100	200	130	200	80	180	60	70	180
Type		Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.
Percent Chance of Use 3/		3.0	3.0	3.0	3.1	2.8	2.9	2.9	2.9	2.9	3.0
Average Curve No. - Condition II		74	74	78	74	75	75	74	74	76	76
Emergency Spillway Hydrograph											
Storm Rainfall (6-hour) 4/	Inch	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70
Storm Runoff	Inch	3.79	3.79	3.88	3.79	3.88	3.88	3.80	3.80	3.99	3.99
Velocity of Flow (V_c) 5/	Ft./Sec.	0	0	0	0	0	0	0	0	0	0
Discharge Rate 5/	C.F.S.	0	0	0	0	0	0	0	0	0	0
Maximum Water Surface Elevation 5/	Foot	-	-	-	-	-	-	-	-	-	-
Freeboard Hydrograph											
Storm Rainfall (6-hour) 6/	Inch	13.70	13.70	13.70	13.70	13.70	13.70	13.70	13.70	13.70	13.70
Storm Runoff	Inch	10.24	10.24	10.38	10.24	10.38	10.38	10.24	10.24	10.52	10.52
Velocity of Flow (V_c) 5/	Ft./Sec.	8.5	9.5	8.9	8.0	9.0	8.3	8.0	8.1	8.0	8.7
Discharge Rate 5/	C.F.S.	2,491	1,650	4,442	2,043	4,520	1,426	2,860	981	1,120	3,005
Maximum Water Surface Elevation 5/	Foot	989.5	990.7	926.4	871.5	850.5	844.8	800.5	817.6	829.5	779.9
Principal Spillway Capacity (Maximum)	C.F.S.	34	23	68	32	81	24	49	19	16	55
Capacity Equivalents											
Sediment Volume	Inch	1.53	2.13	1.31	1.72	1.09	1.75	1.72	1.37	1.77	1.38
Detention Volume	Inch	4.26	4.30	4.29	4.23	4.47	4.51	4.48	4.45	4.73	4.49
Spillway Storage 7/	Inch	1.83	1.82	1.86	1.86	2.04	1.84	2.05	2.73	2.35	2.73
Class of Structure		A	A	A	A	A	A	A	A	A	A

(See footnotes on last page of table 3.)

TABLE 3 - STRUCTURE DATA - FLOODWATER RETARDING STRUCTURES - Continued
Salt Creek and Laterals Watershed, Texas
(Trinity River Watershed)

Item	Unit	STRUCTURE NUMBER 12	13	14	15	16	19	20	21	22	Total
Drainage Area	Sq.Mi.	2.86	2.65	1.64	7.57	5.52	4.83 1/	1.71	0.70	0.80	59.18
Storage Capacity											
Sediment Pool (50-year)	Ac.Ft.	90	73	48	162	132	129	48	24	32	1,667
Sediment Reserve Below Riser	Ac.Ft.	94	78	52	162	142	134	51	25	33	1,757
Sediment in Detention Pool	Ac.Ft.	50	41	26	73	71	72	26	14	18	907
Floodwater Detention	Ac.Ft.	737	656	450	1,845	1,295	1,118	401	183	195	14,140
Total	Ac.Ft.	971	848	576	2,242	1,640	1,453	526	246	278	18,471
Surface Area											
Sediment Pool (50-year or 200 acre-feet limit)	Acre	17	18	14	35	37	43	12	9	9	358
Sediment Reserve Pool (Top of Riser)	Acre	28	29	22	58	52	72	18	12	12	574
Floodwater Pool	Acre	80	91	70	206	151	206	62	31	31	1,704
Volume of Fill	Cu.Yd.	124,500	98,550	87,180	191,900	114,340	69,220	77,800	57,780	73,400	1,848,060
Elevation Top of Dam	Foot	976.0	948.5	846.9	862.5	834.0	788.7	770.6	765.6	904.5	xxx
Maximum Height of Dam 2/	Foot	44	33	32	43	35	32	28	26	34	xxx
Emergency Spillway											
Crest Elevation	Foot	972.5	945.0	844.0	858.0	830.0	783.5	767.0	763.0	901.5	xxx
Bottom Width	Foot	130	120	80	200	200	250	70	50	50	xxx
Type		Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	xxx
Percent Chance of Use 3/		2.7	2.7	2.4	2.7	3.0	3.1	3.1	2.6	3.0	xxx
Average Curve No. - Condition II		76	75	75	76	76	75	75	75	75	xxx
Emergency Spillway Hydrograph											
Storm Rainfall (6-hour) 4/	Inch	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	xxx
Storm Runoff	Inch	3.99	3.88	3.88	3.99	3.99	3.88	3.88	3.88	3.88	xxx
Velocity of Flow (V_c) 5/	Ft./Sec.	0	0	0	0	0	0	0	0	0	xxx
Discharge Rate 5/	C.F.S.	0	0	0	0	0	0	0	0	0	xxx
Maximum Water Surface Elevation 5/	Foot	-	-	-	-	-	-	-	-	-	xxx
Freeboard Hydrograph											
Storm Rainfall (6-hour) 6/	Inch	13.70	13.70	13.70	13.70	13.70	13.12	13.70	13.70	13.70	xxx
Storm Runoff	Inch	10.52	10.38	10.38	10.52	10.52	9.82	10.38	10.38	10.38	xxx
Velocity of Flow (V_c) 5/	Ft./Sec.	7.9	7.9	7.2	9.0	8.4	9.8	7.9	6.6	7.2	xxx
Discharge Rate 5/	C.F.S.	2,040	1,867	900	4,505	3,750	7,676	1,110	451	580	xxx
Maximum Water Surface Elevation 5/	Foot	976.0	948.5	846.9	862.5	834.0	788.7	770.6	765.6	904.5	xxx
Principal Spillway Capacity (Maximum)	C.F.S.	36	33	21	95	69	224	21	9	10	xxx
Capacity Equivalents											
Sediment Volume	Inch	1.54	1.36	1.44	0.98	1.17	1.30	1.37	1.68	1.94	xxx
Detention Volume	Inch	4.83	4.64	5.15	4.57	4.40	4.34	4.40	4.91	4.58	xxx
Spillway Storage 7/	Inch	2.02	2.60	2.61	2.60	2.26	5.00	2.93	2.41	2.38	xxx
Class of Structure		A	A	A	A	A	A	A	A	A	xxx

1/ Exclusive of area controlled by other floodwater retarding structures.
2/ Measured from centerline of stream channel to effective top of dam.
3/ Based on regional stream gage analysis and soil-cover complex characteristics of the watershed of the individual structure.
4/ Value of P taken from Plate 2-a1, Spillway Design Storm, ENGINEERING-HYDROLOGY MEMORANDUM EWP-1 (Revised) (Fort Worth).
5/ Maximum during passage of hydrograph.
6/ Value of P taken from Plate 2-a2, Freeborad Storm, ENGINEERING-HYDROLOGY MEMORANDUM EWP-1 (Revised) (Port Worth).
7/ Storage from emergency spillway crest to top of dam.

TABLE 3A - STRUCTURE DATA - STREAM CHANNEL IMPROVEMENT

Salt Creek and Laterals Watershed, Texas
(Trinity River Watershed)

Channel Designation	Station Numbering for Reach: Station	Station	Watershed Area 1/	Required Channel Capacity	Planned Channel Capacity	Average Bottom Width	Average Side Slope	Average Depth	Average Grade	Average Velocity in Channel	Volume of Excavation
	(100 Ft.)	(100 Ft.)	(sq. mi.)	(c.f.s.)	(c.f.s.)	(ft.)		(ft.)	(pct.)	(ft./sec.)	(1000 cu. yds.)
Salt Creek	(Begin Project at Channel Section 2S)										
14WF	0+00	83+60	23.40	2,380	2,396	62	2:1	8.0	0.09	3.84	
1B	83+60	90+20	23.40	2,380	2,464	90	2:1	5.2	0.21	4.72	
Railroad	90+20	189+20	21.11	2,380	2,464	90	2:1	5.2	0.21	4.72	
Highway 114 to End Project	189+20	273+80	19.00	2,380	2,416	70	2:1	6.4	0.16	4.56	
										Subtotal	718.11
Garrett Creek	(Begin Project 220 Feet Below Channel Section 4G)										
1B	0+00	31+80	27.22	2,270	2,275	62	2:1	8.0	0.08	3.63	
Railroad	31+80	91+50	26+15	2,270	2,317	70	2:1	6.8	0.12	4.08	
Highway 114	91+50	121+10	24+69	2,270	2,317	70	2:1	6.8	0.12	4.08	
5D	121+10	214+40	19+60	2,270	2,282	70	2:1	6.3	0.15	4.38	
18	214+40	295+70	14+63	2,270	1,988	70	2:1	5.1	0.24	4.86	
19-A to 38-G End Project	295+70	345+10	13.32	1,490	1,500	60	2:1	4.7	0.24	4.60	
										Subtotal	835.86
West Pork Trinity River	(Begin Project at Valley Section 2WF)										
12 2/	0+00	814+00	590.55	1,215	1,340	-	-	-	-	2.78	
14	814+00	928+00	580.92	1,215	1,274	30	1.5:1	10.0	0.045	2.83	137.31
										Subtotal	137.31
										GRAND TOTAL	1,691.28

1/ Does not include area controlled by floodwater retarding structures.
2/ Clearing and snagging only on 374 acres.

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TABLE 4 - ANNUAL COST

Salt Creek and Laterals Watershed, Texas
(Trinity River Watershed)

(Dollars)

Evaluation Unit	Amortization of Installation Cost 1/	Operation and Maintenance Cost 2/	Total
Salt Creek and Tributaries			
Floodwater Retarding Structures 1, 2, 4 through 16, and 19 through 22	46,977	1,900	48,877
11.73 Miles of Stream Channel Improvement	14,804	2,346	17,150
West Fork Flood Plain			
17.58 Miles of Stream Channel Improvement	3,190	3,516	6,706
TOTAL	64,971	7,762	72,733

1/ Installation costs based on 1962 prices amortized for 100 years at 3.0 percent.

2/ Long-term prices as projected by ARS, September 1957.

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TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

Salt Creek and Laterals Watershed, Texas
(Trinity River Watershed)

(Dollars) 1/

Item	Estimated Average Annual Damage		Damage Reduction Benefits
	Without Project	With Project	
Floodwater			
Crop and Pasture	29,429	3,023	26,406
Other Agricultural	3,531	190	3,341
Nonagricultural (Road and Bridge)	2,323	84	2,239
Subtotal	35,283	3,297	31,986
Sediment			
Overbank Deposition	12,502	622	11,880
Reservoir 2/	6,858	4,246	2,612
Subtotal	19,360	4,868	14,492
Erosion			
Flood Plain Scour	695	64	631
Indirect	5,534	823	4,711
TOTAL	60,872	9,052	51,820 3/

1/ Price Base: Long-Term as projected by ARS, September 1957.
2/ Sediment damage to Eagle Mountain Lake at lower end of watershed.
3/ An additional $9,591 benefits from damage reduction will accrue along West Fork of Trinity flood plain.

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TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Salt Creek and Laterals Watershed, Texas
(Trinity River Watershed)

(Dollars)

Evaluation Unit	AVERAGE ANNUAL BENEFITS 1/						Average Annual Cost 2/	Benefit-Cost Ratio
	Damage Reduction	More Intensive and Changed Land Use	Recreation	Secondary	Outside Project	Total		
Salt Creek and Tributaries								
Floodwater Retarding Structures 1, 2, 4 through 16, and 19 through 22; and 11.73 Miles of Stream Channel Improvement	49,124	24,578	11,400	9,549	2,134	96,785	66,027	1.5:1
West Fork of Flood Plain								
17.58 Miles of Stream Channel Improvement on West Fork of Trinity River	5,543	127	-	524	2,847	9,041	6,706	1.4:1
GRAND TOTAL	54,667 3/	24,705	11,400	10,073	4,981	105,826	72,733	1.5:1

1/ Price Base: Long-term as projected by ARS, September 1957.

2/ From table 4.

3/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of $6,744 annually.

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TABLE 7 - CONSTRUCTION UNITS

Salt Creek and Laterals Watershed, Texas
(Trinity River Watershed)
(Dollars)

Unit No.	Measures in Construction Unit	Annual Benefit	Annual Cost
	Salt Creek		
1	Floodwater Retarding Structures 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, and 21	33,379	27,194
	Garrett Creek		
2	Floodwater Retarding Structures 12, 13, 14, 20, and 22	19,532	11,410
	Rush Creek		
3	Floodwater Retarding Structures 15, 16, and 19	15,931	10,273
	Salt Creek and Tributaries		
4	Units 1, 2, and 3 plus 11.73 Miles of Stream Channel Improvement on Salt Creek and Garrett Creek	96,785	66,027
	Salt Creek and Tributaries and West Fork Flood Plain		
5	Unit 4 plus 17.58 Miles of Stream Channel Improvement on West Fork of Trinity River	105,826	72,733

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INVESTIGATIONS AND ANALYSES

Land Use and Treatment Investigations

At a meeting held at Bridgeport in January 1963, the measures for land treatment required to establish a sound soil, water, and plant conservation program for the watershed were determined.

The status of land treatment measures for the watershed was developed by the Upper West Fork Soil Conservation District, with assistance from the Soil Conservation Service work unit personnel at Bridgeport.

Conservation needs data and conservation plans previously developed were examined. The kinds and amounts of land treatment practices to be applied on farms under conservation plans were obtained from records maintained by the Soil Conservation Service and expanded to represent the watershed area.

Trends in farming operations, expected changes in land use, soil condition, land tenure, and other pertinent data were used. From these data, land treatment measures expected to be applied during the 5-year installation period were selected. Past rates of application were examined, and the need for funds to be used for accelerated technical assistance was determined.

Land treatment practices that have been applied on farms under conservation plans, obtained from accomplishment records maintained by the Soil Conservation Service, were expanded to represent the applied to date within the watershed.

An estimate was made of the measures that could be applied in the 5-year installation period. The acres to be treated and cost of treatment measures by land use are shown in table 1.

Table 1A reflects the cost of land treatment measures applied prior to development of the work plan.

Engineering Investigations

The following steps were taken in making the engineering investigations:

1. A base map of the watershed was prepared showing the watershed boundary, drainage pattern. system of roads, and other pertinent information. Probable sites for floodwater retarding structures were located by a study of U. S. Geological Survey maps, stereoscopic study of photographs, and field examinations. Tentative locations of the structure sites and valley cross sections were placed on the watershed base map for use in field surveys. Cross sections of the flood plain were surveyed at the selected locations (figure 5).

2. A field examination was made of all possible floodwater retarding structure sites thus located. Sites in which obstacles such as pipelines or roads were encountered were relocated to avoid the obstacles.

   Sites 17 and 18 were dropped from further consideration when it was determined that below-site benefits were not available in sufficient quantity to justify the structures. Site No. 3 was omitted after an economic analysis of Sites 3 and 4 indicated that Site No. 4 was less costly than a system of the two sites in series. With these omissions, 19 sites remained, forming a system of floodwater retarding structures which was determined to be feasible. Plans of a floodwater retarding structure typical of those planned for the watershed are illustrated by figures 2 and 2A.

3. Topographic maps of Sites 1 through 16, with 4-foot contour intervals, were developed by use of the Kelsh Plotter and printed on aerial photographs to a scale of 1 inch = 660 feet. Topography was also developed for the dam site and emergency spillway areas. Topographic maps of Sites 17 through 22 with 4-foot contour intervals were developed on aerial photographs (1 inch = 660 feet) from engineering field surveys of the flood pool, dam, and emergency spillway areas of each site. Cross section and profile data were obtained at all dam centerlines, pipelines, utility lines, roads, and property lines involved in each site.

   These surveys provided the necessary information to determine whether the required sediment and floodwater detention storage could be obtained, the limit of the pool areas, estimate of installation cost, and the most economical design for each structure. The sediment and floodwater storage requirements, structure classification, and emergency spillway layout and design meet or exceed criteria outlined in Engineering Memorandum SCS-27 and Texas State Manual Supplement 2441.

   Additional cross sections and profile data were obtained to supplement valley section data needed for design and cost estimates for proposed stream channel improvement on Salt and Garrett Creeks and West Fork of the Trinity River.

4. Structure data tables were developed to show for each proposed floodwater retarding structure the drainage area, storage capacity planned for floodwater detention and sediment, release rate of the principal spillway, emergency spillway capacity, area inundated by the pools, volume of

fill in the dam, estimated cost, and other pertinent data (tables 2 and 3).

Tables were developed for stream channel improvement to show watershed area, planned capacity, design data, volume of excavation, estimated cost, and other pertinent data (tables 2 and 3A).

5. Because of highly erodible soils encountered in the emergency spillway areas, additional capacity was planned in all sites to detain in excess of the expected runoff from a 25-year storm event. The detention requirement for a 25-year storm event was determined from a regional analysis of stream gage records. The percent chance of use of the emergency spillway, based on regional analysis of gaged runoff is shown in table 3.

6. Appropriate emergency spillway design and freeboard storms were selected from Plates 2-a1 and 2-a2 of ENGINEERING-HYDROLOGY MEMORANDUM EWP-1 (Fort Worth).

   Spillway design and freeboard inflow hydrographs were developed for each of the floodwater retarding structures by the distribution graph method. Various combinations of spillway widths and depths were computed in order to determine the most economical structure. All floodwater retarding structures were graphically routed using the Goodrich flood routing method described on page 5.8-12 of the National Engineering Handbook, Section 5, to determine the effective top of dam.

7. Estimates were made of the volume of fill in the dams and the costs of the structures. Total costs were determined from a preliminary design and cost estimate of significant individual items such as embankment, principal spillway, clearing, and fencing. Unit prices were determined from recent contracts of structures in sites with similar characteristics. Conditions peculiar to an individual site such as wet excavation and need for foundation drainage were considered.

   Estimate of the volume of excavation for stream channel improvement was made using the additional cross sections surveyed. Where feasible, the natural channel was used and considered in the estimate of excavation. Amount of clearing was estimated from recent aerial photographs. Unit prices were determined from recent contracts.

   Cost distribution tables were developed (table 2).

Hydraulic and Hydrologic Investigations

The following steps were taken as part of the hydrologic and hydraulic investigations:

1. Basic meteorologic and hydrologic data were tabulated from Climatological Bulletins, U. S. Weather Bureau, U. S. Geological Survey Water Supply Papers, and local records. These data were analyzed to determine average precipitation depth-duration relationships, seasonal distribution of precipitation, frequency of occurrence of meteorological events, historical flood series, rainfall-runoff-peak discharge relationships, and the relationship of geology, soils, and climate to runoff depth for single storm events.

2. Engineering surveys were made of valley cross sections, high water marks, bridges, and other data pertinent to determining flood and sediment damages. The cross sections were selected to represent the stream hydraulics and flood plain area. Evaluation reaches were delineated after joint study with the economist and geologist.

   Partial valley cross sections for planning stream channel improvement were surveyed at approximately 1,000-foot intervals on the main stem of Salt and Garrett Creeks and West Fork of the Trinity River in the reaches where channel improvement was studied and planned.

3. The before-project hydrologic conditions of the watershed were determined on the basis of cover conditions, land treatment, soil groups, and crop distribution. The II-Curve number of 76 for the hydrologic soil-cover complex was determined from a 54 percent sample of the watershed of Salt Creek and its tributaries.

   The after-project conditions were determined by analyzing the results of the land treatment that would be applied during the installation period. This study revealed that a II Condition Curve number of 75 is applicable.

4. Cross section rating curves were computed from field survey data by the use of Manning's formula.

5. Runoff-peak discharge relationships were determined by flood routing the runoff from the 24-hour rainfall, 10-year frequency, as selected from Technical Paper No. 40, U. S. Weather Bureau. The storage-indication method of

routing, modified by the use of a variable routing interval, was used. Initial hydrographs for routing were developed by means of Common's distribution graph. The peak discharge for each subwatershed was determined from the volume of runoff produced by a storm of duration equal to the time of concentration. The peak discharges agree favorably with gaged data on similar watersheds.

Peak discharges under project conditions were determined in a similar manner by flood routing the runoff from the uncontrolled areas and adding the outflow from the floodwater retarding structures. A maximum release rate of 12.5 c.s.m. was used for all structures.

6. Stage-area inundated curves were developed from field survey data for each portion of the valley represented by a cross section. Stage runoff-area inundated curves were developed for each evaluation reach for existing watershed conditions. Similar curves were developed to show the effect of the system of floodwater retarding structures and the additional benefits of an improved channel in selected reaches.

7. The rainfall records from the Bridgeport gage were studied for the period 1923 through 1961. From a tabulation of cumulative departure from normal precipitation, the 30-year period 1924 through 1953 was determined to be representative of normal precipitation on the watershed. The historical evaluation series was developed from that period, with individual events limited to a period of 2 days.

8. Determinations were made of the area that would have been inundated by each storm of the evaluation series under each of the following conditions:

   a. The without-project condition using the before-project soil-cover complex number.

   b. The installation of land treatment measures for watershed protection.

   c. The installation of land treatment measures and floodwater retarding structures.

   d. The installation of land treatment measures, floodwater retarding structures, and stream channel improvement.

9. The evaluation series contained 113 storms that would cause flood damage at the smallest cross section, an average of approximately four floods per year.

10. The runoff from the largest storm in the historical evaluation flood series was routed to determine the maximum flood plain area that would be used in the computations of damages and benefits.

11. Proportioning of stream channel improvement for Salt and Garrett Creeks is based on stability, bedload, and tractive force studies. The selected design was planned to protect the flood plain from damage by a storm which would produce a 1.5-inch depth of runoff from the watershed. The average cross section of the improved channel will carry the runoff from 103 of the 113 storms plus release flows from floodwater retarding structures without causing damage.

    Existing stream channel capacity on West Fork of the Trinity below the point of confluence of the improved Garrett Creek stream channel was examined. It was determined that clearing and snagging with minor straightening and enlargement are needed to provide capacity for release flows from the proposed floodwater retarding structures of the Salt Creek and Laterals watershed.

12. A reservoir operation study for the period 1941 through 1957 was made for the proposed floodwater retarding structures in the watershed. The surface areas and capacities of the 19 structure sites were related to inches of runoff and combined for developing the composite area-capacity curve. Gross lake surface evaporation rates were taken from Texas Water Commission data (Texas Board of Water Engineers' Bulletin 6006). This material was adjusted for pan coefficient to conform with data in U. S. Department of Commerce, Weather Bureau, Technical Paper No. 37.

Sedimentation Investigations

Sedimentation investigations for the work plan were made in accordance with procedures as outlined in Technical Release No. 17, "Geologic Investigations for Watershed Planning," March 1961, and Technical Release No. 12, "Procedures for Computing Sediment Requirements for Retarding Reservoirs," September 1959, U. S. Department of Agriculture, Soil Conservation Service.

Sediment Source Studies

Sediment source studies to determine the 100-year sediment storage requirements were made in the drainage areas of the 19 planned floodwater retarding

structures according to the following procedures:

1. Detailed investigations were made in the drainage areas above 7 of the planned floodwater retarding structures. Semidetailed studies of sediment sources were made for the remaining 12 planned floodwater retarding structures.

2. Detailed field surveys to determine gross sheet erosion included: mapping soil units by slope in percent, slope length in feet, land treatment on cropland, and cover conditions on rangeland and pastureland. Gully and streambank channel investigations included mapping lengths, depths, and estimated annual lateral erosion by stream channels and gullies. Representative soil samples were obtained for volume weight determinations and mechanical analyses.

3. The annual gross erosion was computed in tons by sediment sources (sheet, gully and streambank erosion). The soil loss equation by Musgrave was used in sheet erosion calculations.

4. Semidetailed field surveys to determine the gross erosion rates consisted of mapping land use and studying soils, topography, and erosion. Annual gross erosion computations were based on erosion rates determined by detailed studies of similar areas.

5. The gross erosion rates were then adjusted to reflect the effect of land treatment above the planned structures. The computed sediment storage requirements for each structure are based on a gradual improvement of watershed conditions as a result of the expected application of needed land treatment measures during the installation period and the maintenance of these measures at 75 percent effectiveness for the remainder of the project period.

6. Sediment storage requirements for structures were determined by adjusting annual gross erosion for expected delivery ratios and trap efficiency.

7. The ratio of sediment storage volume in the pools to soils in place was based on volume weights ranging from 90 to 95 pounds per cubic foot (soil in place) and 69 to 75 pounds per cubic foot (sediment).

8. The allocation of sediment to structure pools averaged 25 percent in the detention pool and 75 percent in the sediment pool.

Flood Plain Sedimentation and Scour Damages

The following sedimentation and scour damage investigations were made to determine the nature and extent of physical damage to the flood plain:

1. Hand auger borings were made along each of the valley cross sections (figure 5), making note of the depth and texture of the deposit, soil conditions, scour channels, stream channel aggradation or degradation, and other pertinent factors contributing to flood plain damage.

2. Estimates of past physical flood plain damage were obtained through interviews with landowners and operators and by comparing crops on undamaged and damaged lands.

3. A table was developed to show percentage of damage by texture and depth increments for deposition and percent of damage by depth and width for scour channels.

4. The depth and area of damaging sediment deposits and scour channels were measured and tabulated.

5. The damage to the productive capacity of the flood plain was assessed by percent for each type damage.

6. The sedimentation and scour damages were summarized by evaluation reaches for the entire flood plain. Estimates of recoverability of productive capability were developed as a result of field studies and interviews with farmers.

7. Using the average annual erosion rates as a basis, the average annual sediment yields to the flood plain reaches were estimated for present conditions, with land treatment, and with land treatment and structural measures installed. The results were compared to show the average annual reduction of overbank deposition. The reduction of scour damage is based on reductions in depth and area inundated.

Sedimentation in Eagle Mountain Lake

The estimate of the present sediment yield to Eagle Mountain Lake is based on a detailed study of sediment sources and the use of delivery ratio curves developed by the Soil Conservation Service. The estimated present annual sediment yield to Eagle Mountain Lake from Salt Creek and Laterals watershed is 0.68 acre-foot per square mile. The estimated annual contribution from

the watershed with the watershed project installed will be 0.42 acre-foot per square mile.

Channel Stability Investigations

A preliminary investigation was made on the proposed channel improvement on Salt and Garrett Creeks. Borings were made on representative cross sections of the proposed channels from their points of confluence with the West Fork of the Trinity River to the upper limits of the proposed channel improvements. Most of the alluvium encountered on Salt Creek was noncohesive and is classified as a silty sand (SM). Silty and sandy clays (CL) occur below valley cross section 3-A on Garrett Creek. Above this section, silty sands overlie sandy clays at depths ranging from 2 to 15 feet.

Twenty-one representative samples were selected for laboratory analysis. The tests included Atterberg limits, mechanical analysis, percent of dispersion, soluble salts, and unconfined compressive strength.

Tractive force analyses indicate that the proposed channels of Salt and Garrett Creeks will degrade under design conditions; however, the tractive force theory does not consider incoming bedload. The Schoklitch bedload equation was then applied to relate the estimated incoming bed material with the bedload transport capacity of each proposed channel under the design flow duration. These studies indicate an annual accumulation of approximately 3.5 acre-feet in the Salt Creek channel and approximately 1.5 acre-feet in Garrett Creek channel below Section 5-D. Slight degradation is probable above Valley Section 5-D on Garrett Creek.

Geologic Investigations

Preliminary geologic investigations were made at each of the proposed structure sites. These included studies of valley slopes, alluvium, channel banks, and exposed geologic formations. Borings with a hand auger were made to obtain preliminary information on the nature and extent of embankment materials, foundation conditions, and emergency spillway excavation that might be encountered in construction.

Description of Problems

All sites for planned floodwater retarding structures, except Site 10, are located within the outcrop of the Travis Peak formation. Site 10 is on the outcrop of the Paluxy formation. The Travis Peak formation is characterized by conglomerates, poorly cemented sandstones, soft siltstones, and clays. The Paluxy is very similar to the Travis Peak but is composed of a higher percentage of highly erodible, poorly cemented sandstones.

Soils overlying the geologic strata are classified as SM, SC, and CL soils. Adequate quantities of embankment materials are available within sediment pool areas. The high embankments of Sites 2, 4, and 6 may require berms

on the downstream slopes, as well as upstream, for erosion control purposes. Permeable foundation conditions will probably necessitate foundation drainage measures at all site locations.

Materials in emergency spillway areas are primarily unconsolidated sands, clayey sands, silty sands, and sandy clays and are suitable for embankment purposes. Small volumes of rock excavation are expected on some sites in removal of thin sandstone ledges and boulders from emergency spillway areas. Preliminary estimates of rock excavation in the emergency spillways are:

Sites	Percent Rock
1, 2, 4, 8, and 10	5
19	10

The Travis Peak and Paluxy formations are highly erodible, and emergency spillway cuts will be vegetated as soon as possible after construction.

All these geologic factors were considered in arriving at construction costs. Previous construction experience in these formations has been obtained in the nearby Clear Fork, Big Sandy, Denton, and Clear Creek watersheds.

Detailed investigations, including exploration with core drilling equipment and field permeability tests, will be made at all sites prior to construction. Laboratory tests will be performed to determine the suitability and handling of embankment and foundation materials.

Economic Investigations

Evaluation of Damages

For evaluation purposes, the flood plain was divided into reaches based on significant differences in land use, drainage pattern, and characteristics of flooding. Owners and operators of flood plain land in each reach were interviewed concerning flooding and flood damage, land use in flood plain, yield data, and expected changes in land use with structural measures installed. This information was recorded on 35 damage schedules covering approximately 53 percent of the flood plain. Data from these schedules, as well as information from local agricultural technicians, were used as a basis for making the necessary estimates used in the economic evaluations.

Flood plain land use was mapped in the field, and each reach was evaluated separately on the basis of its own composite damageable value and characteristics of flooding. Crop and pasture damages were calculated from the combined effects of area and depth of flooding and season of occurrence, using factors from data compiled in WATERSHEDS-ECONOMICS MEMORANDUM EWP-5

(Fort Worth). The "Historical Series" method of calculation of damages was used, and the occurrence of more than one flood in a growing season was considered in determining crop and pasture damage. The computed damages were discounted for the recurrence with allowance for partial recovery of crops between floods.

Other agricultural damage to fences, levees, and farm roads, livestock losses, and the cost of removing debris from fields were estimated from information collected in the field. Damage was associated with area and depth of flooding for each storm in the series by reaches.

Road and bridge damages were based on information from the County Commissioner and residents of the watershed.

Monetary damages to the flood plain from scour and overbank deposition of sediment were based on the value of production losses. Scour damage reductions were related to the area of flooding, and influenced by the increased scouring effect from deeper flows. Reduction in monetary damages from sediment deposition is based on the effectiveness of land treatment measures, trap efficiency of planned floodwater retarding structures, and the average annual area flooded.

Evaluation of damage from sediment accumulation in Eagle Mountain Lake was made by straight-line depreciation of the construction cost adjusted to long-term price level. The value per acre-foot was obtained by dividing the reservoir cost by the acre-feet of original storage. The benefits were allocated to the various reaches in the watershed according to the amount of sediment storage in floodwater retarding structures.

Indirect damages involve such items as additional travel time for farmers in transporting products and farm equipment, delay of school buses and mail deliveries, cost of extra feed for livestock, loss of benefits from grazing, and other related items. Based upon information obtained and data from other watersheds previously analyzed, it was decided that 10 percent of the direct damage be used for this estimate.

Floodwater, scour, sediment, and indirect damages were calculated under the following conditions: without project; with land treatment; with land treatment and floodwater retarding structures (including those on Big Sandy Creek and Laterals watershed); and with land treatment, floodwater retarding structures, and channel improvement. Evaluations of reaches along the West Fork of the Trinity River were made under the same conditions, but included effects of floodwater retarding structures proposed in Big Sandy Creek and Laterals watershed. The difference between the average annual damages for each progressive increment of protection constitutes the benefits assigned to that increment.

Benefits Outside Project Area

Damages were determined for the reaches along the West Fork for the entire flood plain but adjusted to proportion of area located on the southwest or Salt Creek side of the river. Benefits accruing to structural measures located in Big Sandy Creek and Laterals watershed were excluded from this plan. The benefits accruing to Salt Creek and Laterals structural measures from the northeast or Big Sandy Creek side of the river were considered as outside of project area benefits. The entire cost of West Fork channel improvement and all benefits accruing to it, including those outside the project, are included in this work plan.

Evaluation of More Intensive and Changed Land Use

During field investigations, farmers were asked what changes had been made in their flood plain land use as a result of past flooding. It was found that some cropland has been returned to pasture as a result of flooding and crops less susceptible to damage are planted. They were also asked what changes they would make in their use of the flood plain if flooding were reduced by 50 percent or more. Farmers indicated that when flooding is reduced, timberland will be cleared and this land, plus some of the open pastureland, will be planted to alfalfa and Coastal Bermudagrass. Some increase in truck crop acreage was also anticipated.

Estimates of benefits from more intensive and changed land use of the flood plain were based on changes indicated by farmers, land capabilities, and the general agricultural economy. Consideration was given for added damage expected to the higher value production from the remaining flooding. Additional costs of production, harvesting, and associated costs were deducted from the expected increase in production. Benefits were discounted to allow for a 5-year lag in accrual. Production costs were based on "Economic Evaluation Data of Blackland Prairie" by Engineering and Watershed Planning Unit, dated June 1958. Prices were adjusted to long-term levels. All reaches of Salt Creek and its tributaries share in intensification benefits, and the average annual net benefits are estimated to be $23,936 (Table A). This estimate reflects a very moderate degree of intensification, and one which would be exceeded during the life of the project.

A small amount of intensification was calculated for the two reaches along the West Fork of the Trinity affected by Salt Creek and its tributaries. Such benefits accruing to this project amount to $769 annually. No intensification benefits were calculated for the upper two reaches along the West Fork.

Recreation Benefits

Incidental recreation benefits are expected to occur at the floodwater retarding structures open for public use. Field studies indicated a need

for additional recreational facilities in the area. All sites are within one hour driving distance from metropolitan Fort Worth. The proposed structures are well suited for recreational activities as they are readily accessible from public roads and have available shade trees near the sediment pools.

Recreation benefits for floodwater retarding structures were estimated based on experience data from structures installed on the adjacent Clear Fork Watershed. Information relative to recreational use of eight Clear Fork structures, together with landowner costs associated with recreation were considered in determination of the value of recreation. The net value for incidental recreation was estimated at 75 cents per visitor-day of expected use after deduction of 25 cents for associated costs such as repairs to facilities, clean-up of grounds, insurance and an allowance for replacements.

The expected public recreational use for the floodwater retarding structures was estimated to average 15,200 visitor-days annually, based on use at the Clear Fork Watershed structures and similar installations in the general area. Consideration was given for depletion of sediment pool areas by sediment accumulation toward the end of useful life of structures. This is reflected in the estimated average annual visitor days over the project life as shown above rather than by monetary discounting. Consideration also was given to the effect of evaporation during seasons of below normal precipitation on the surface area of the sediment pools.

Negative Project Benefits

Areas that will be used for project construction and areas to be inundated by pools of reservoirs were excluded from damage calculations. Net income from production to be lost in these areas after installation of the project was compared with the appraised value of the land amortized over the period of project life. No production in sediment pools was considered and the land covered by detention pools and spoil from channel improvement was assumed to be grassland under project conditions. The annual value of the loss of net income from these areas was less than the amortized value of the land; therefore, the easement value was used in economic justification.

Secondary Benefits

Secondary benefits stemming from the project were estimated to equal 10 percent of direct primary benefits, including those from reduction of damages (except indirect), more intensive and changed land use, and incidental recreation. Secondary benefits induced by the project were considered as 10 percent of the increased cost of production with intensification of the flood plain after installation of the project.

TABLE A - Summary of More Intensive and Changed Land Use of Flood Plain Land

Salt Creek and Laterals Watershed, Texas
(Trinity River Watershed)

Flood Plain Land Use	Unit of Production	Acres	Yield Per Acre	Gross Income	Production Cost	Net Return
				(dollars)	(dollars)	(dollars)
Without Project						
Alfalfa	Ton	345	4.2	41,742	13,121	28,621
Corn	Bu.	88	50.0	5,456	2,660	2,796
Grain Sorghum	Cwt.	153	30.0	7,752	2,668	5,084
Oat Hay	Ton	495	1.7	19,758	16,091	3,667
Oat Grazing	AUM	(495)	3.0	5,928	-	5,928
Sorghum Hay	Ton	810	2.6	47,788	26,911	20,877
Truck Crop	Cwt.	283	100.0	28,200	9,176	19,024
Pasture	AUM	1,253	5.6	18,322	6,134	12,188
Wooded Pasture	AUM	516	2.0	2,693	129	2,564
Miscellaneous	-	37	-	-	-	-
Total		3,980		177,639	76,890	100,749
With Project						
Alfalfa	Ton	685	4.2	82,059	25,838	56,221
Corn	Bu.	88	50.0	5,456	2,660	2,796
Grain Sorghum	Cwt.	124	30.0	6,273	2,161	4,112
Oat Hay	Ton	474	1.7	16,271	13,424	2,847
Oat Grazing	AUM	(474)	3.0	5,676	-	5,676
Sorghum Hay	Ton	874	2.6	53,993	30,948	23,045
Truck Crop	Cwt.	309	100.0	30,800	10,023	20,777
Pasture	AUM	1,299	5.6	19,225	6,360	12,865
Wooded Pasture	AUM	90	2.0	469	22	447
Miscellaneous	-	37	-	-	-	-
Total		3,980		220,222	91,436	128,786
Increased Net Return With Project - 1962 Prices						$ 28,037
Less Added Damages						435
Less Associated Costs 1/						926
						$ 26,676
Discounted Increased Net Return (5 Years at 4 Percent)						24,676
Increased Net Return - Long-Term Prices						$ 23,936

1/ Includes cost of clearing, pasture plantings, and added fencing.

April 1964

ESTIMATES OF SHIFTS IN ACREAGE AND USE OF CROPLAND

Salt Creek and Laterals Watershed, Texas
(Trinity River Watershed)

Crop	Acreage and Use of Cropland					
	Area Benefited By Structural Measures: Without Project	Area Benefited By Structural Measures: With Project	Remaining Areas: Without Project	Remaining Areas: With Project	Total Watershed: Without Project	Total Watershed: With Project
	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)
Grain Sorghum	514	482	761	550	1,275	1,032
Sorghum Hay	1,370	1,430	4,487	3,850	5,857	5,280
Alfalfa	397	761	54	30	451	791
Truck Crops	310	339	937	800	1,247	1,139
Oats, Barley and Rye	999	971	2,458	1,800	3,457	2,771
Wheat	322	320	-	-	322	320
Corn	92	92	350	125	442	217
Peanuts	-	-	1,500	1,050	1,500	1,050
Legumes	-	-	925	700	925	700
TOTAL	4,004	4,395	11,472	8,905	15,476	13,300

April 1964

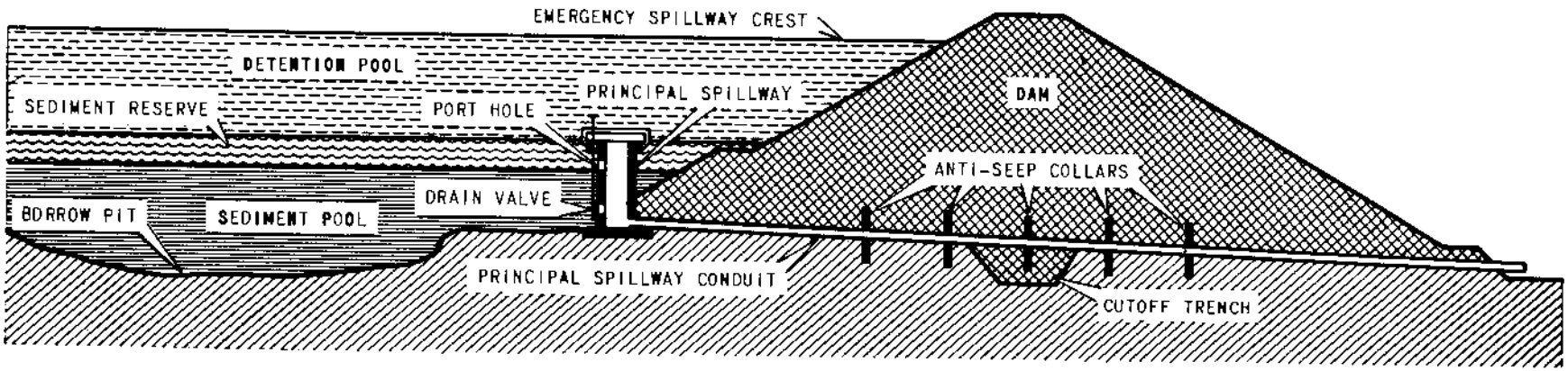


Figure 1

SECTION OF A TYPICAL FLOODWATER RETARDING STRUCTURE

U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE

Revised 10-31-60 S-L-10,071

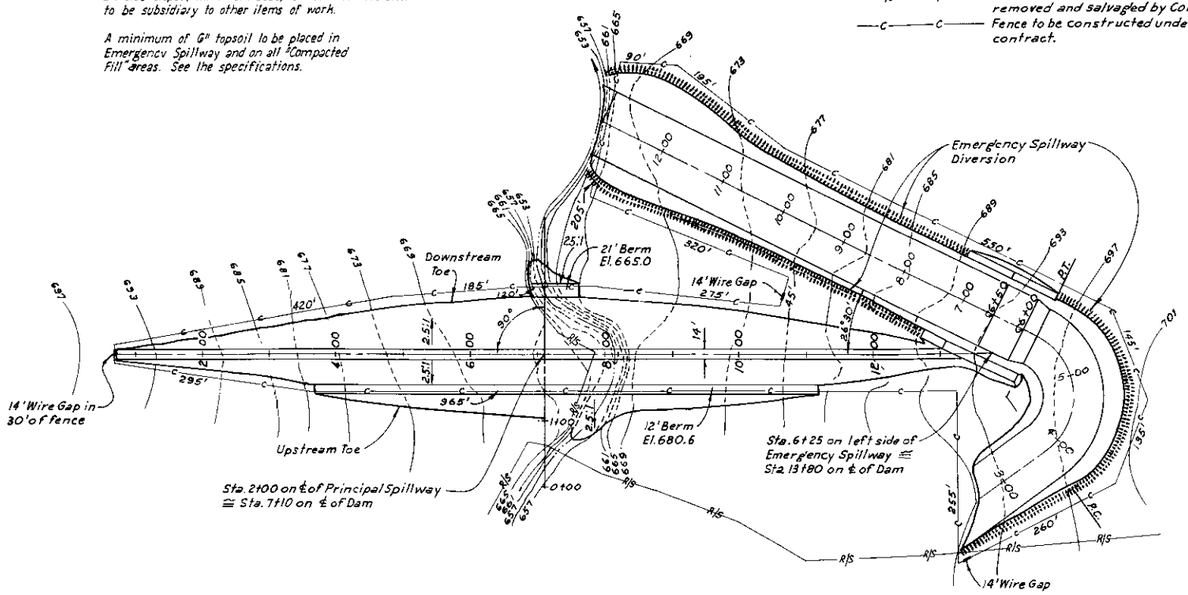
Emergency Spillway Diversion: 18' effective height, 3:1 side slopes, minimum base, 13' Cost of diversion to be subsidiary to other items of work.

A minimum of 6" topsoil to be placed in Emergency Spillway and on all Compacted Fill areas. See the specifications.

FENCE LEGEND

R/s — R/s — Fence in construction area to be removed and salvaged by Contractor.

C — C — Fence to be constructed under this contract.



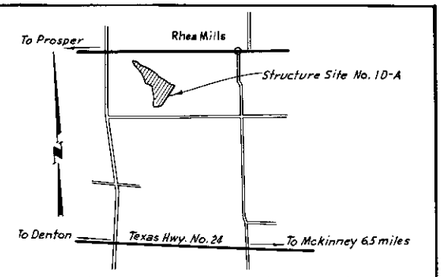
PLAN OF EMBANKMENT AND SPILLWAYS

0 100 200 300 400 500

SCALE IN FEET

EMERGENCY SPILLWAY CURVE DATA

Δ = 114°48'
D = 56°00'
R = 102.31'
L = 205.0'
P.C. = Sta 3+75
P.T. = Sta 5+80

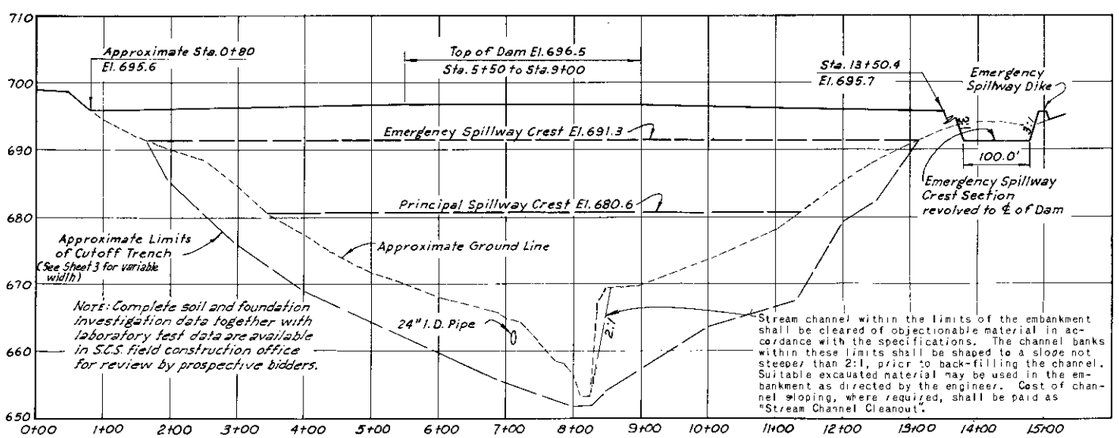


Structure Site No. 10-A, located 7 miles west and 2 miles north of McKinney, Collin County, Texas.

VICINITY MAP

0 1 2 3 4

SCALE IN MILES



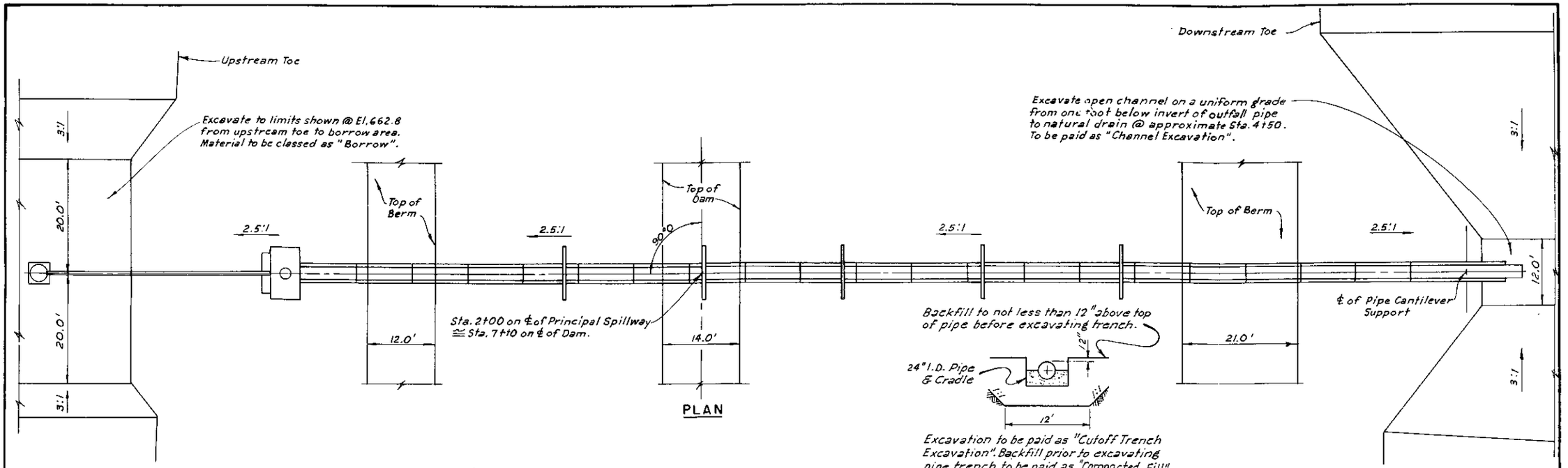
PROFILE ON ℄ OF DAM

Figure 2

EMBANKMENT PLAN AND PROFILE
FLOODWATER RETARDING STRUCTURE SITE No. 10-A
EAST FORK ABOVE LAVON WATERSHED
OF THE
TRINITY RIVER WATERSHED - TEXAS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

		Date	
Designed	S.M.B.	3-63	Approved by: HEAD, ENGINEERING & WATERSHED PLANNING UNIT, FORT WORTH, TEXAS
Drawn	D.L.F. & S.M.B.	3-63	STATE CONSERVATION ENGINEER, S. C. S., TEMPLE, TEXAS
Traced	M.G.C.	4-63	Sheet No. 2 of 8 — Drawing No. 4-E-17,783
Checked	S.M.B. & G.W.T.	4-63	



SECTION
PRINCIPAL SPILLWAY

Figure 2A

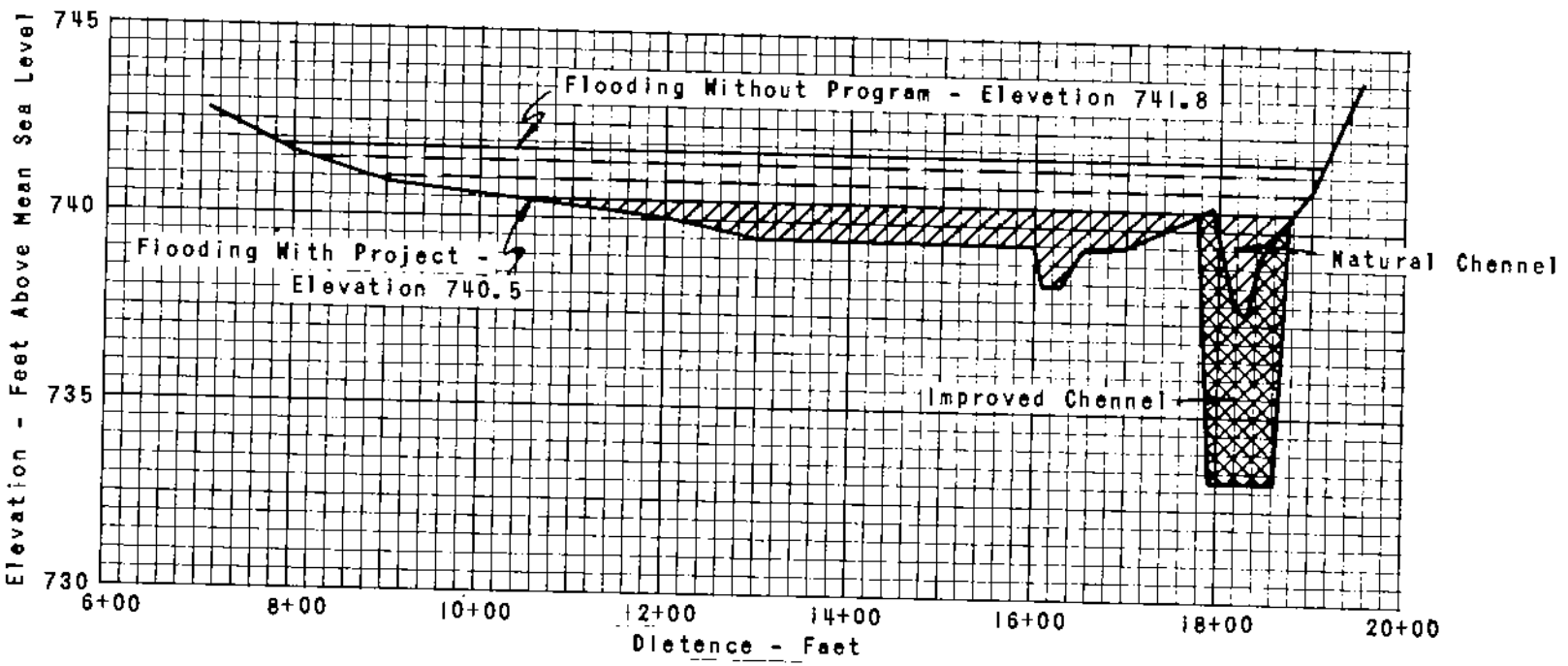
PRINCIPAL SPILLWAY—PLAN AND SECTION
FLOODWATER RETARDING STRUCTURE SITE No. 1D-A
EAST FORK ABOVE LAVON WATERSHED
OF THE
TRINITY RIVER WATERSHED - TEXAS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

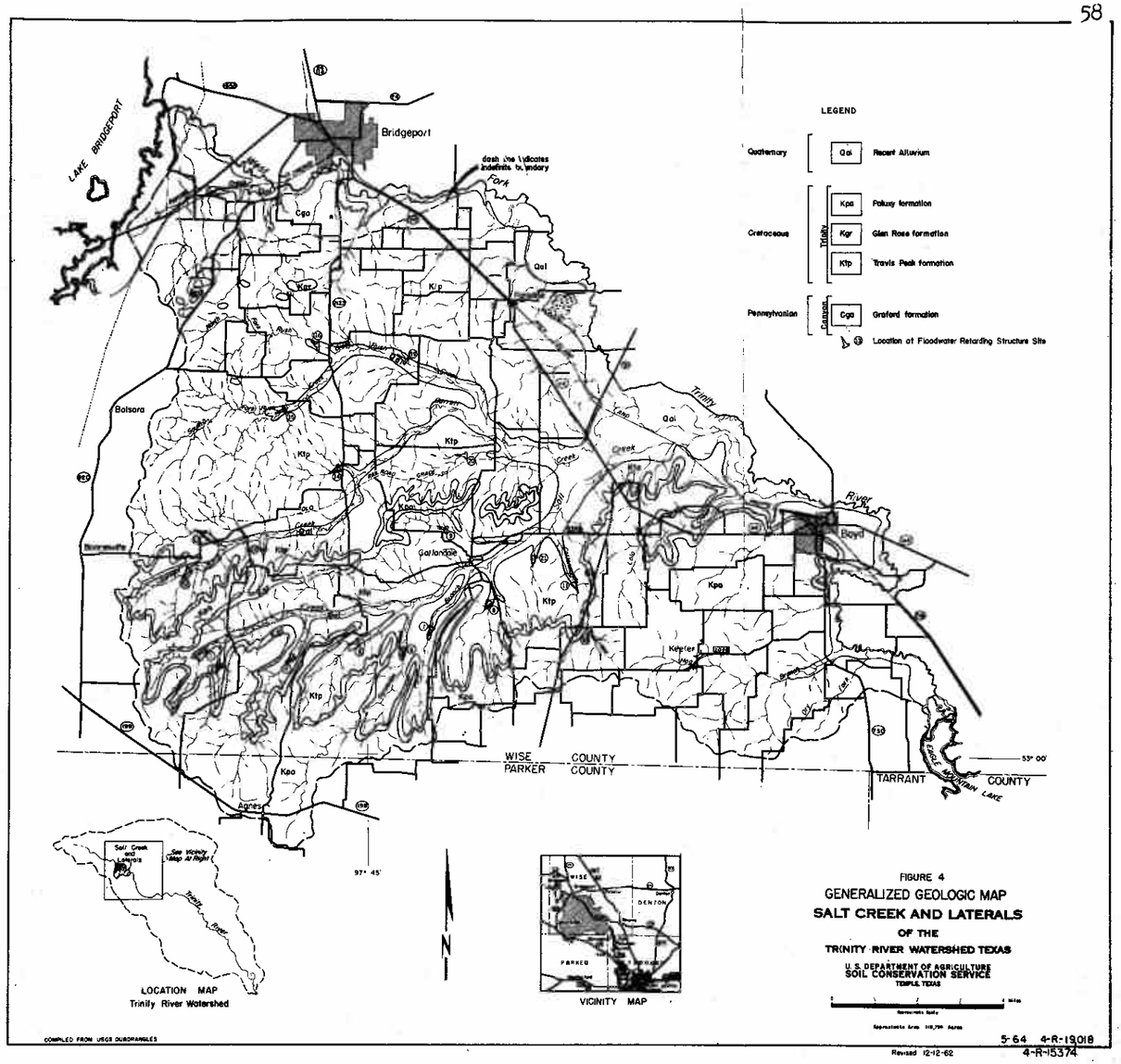
	Date	
Designed S.M.B.	3-63	Approved by: HEAD, ENGINEERING & WATERSHED PLANNING UNIT, FORT WORTH, TEXAS
Drawn S.M.B.	3-63	STATE CONSERVATION ENGINEER, S. C. S., TEMPLE, TEXAS
Traced M.G.C.	4-63	Sheet No 4 of 8
Checked S.M.B. & G.W.T.	4-63	Drawing No 4-E-17,783

Figure 3

DEGREE OF FLOOD PROTECTION
Storm of June 3-4, 1928
SALT CREEK AND LATERALS WATERSHED
of the
TRINITY RIVER WATERSHED, TEXAS
3.82" Rainfall with 2.95" Runoff
Approximately 10-Year Frequency



VALLEY CROSS SECTION NO. 19A


LEGEND
Quaternary
Qal Recent Alluvium
Cretaceous
Trinity
Kpa Paluxy formation
Kgr Glen Rose formation
Ktp Travis Peak formation
Pennsylvanian
Canyon
Cgp Graford formation
Location of Floodwater Retarding Structure Site
LAKE BRIDGEPORT
Bridgeport
dash line indicates indefinite boundary
Cgp
Kgr
Ktp
Qal
Kpa
Boisora
Garlandale
Boyd
Keller
WISE COUNTY
PARKER COUNTY
TARRANT COUNTY
Agnes
97° 45'
32° 00'
LOCATION MAP
Trinity River Watershed
VICINITY MAP
N
FIGURE 4
GENERALIZED GEOLOGIC MAP
SALT CREEK AND LATERALS
OF THE
TRINITY RIVER WATERSHED TEXAS
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEMPLE, TEXAS
COMPILED FROM USGS QUADRANGLES
Revised 12-12-62
5-64 4-R-19018
4-R-15374

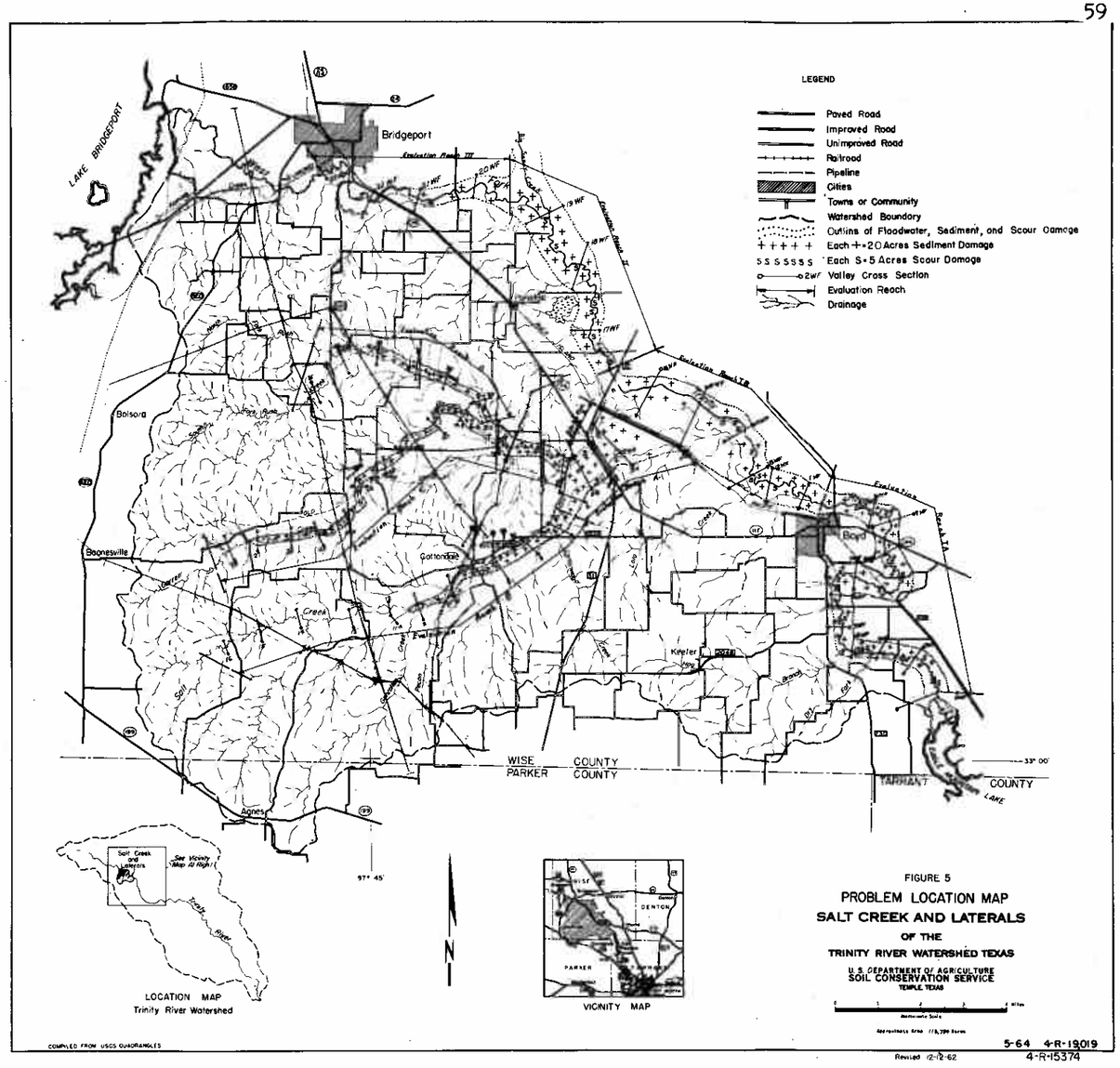


FIGURE 5

PROBLEM LOCATION MAP

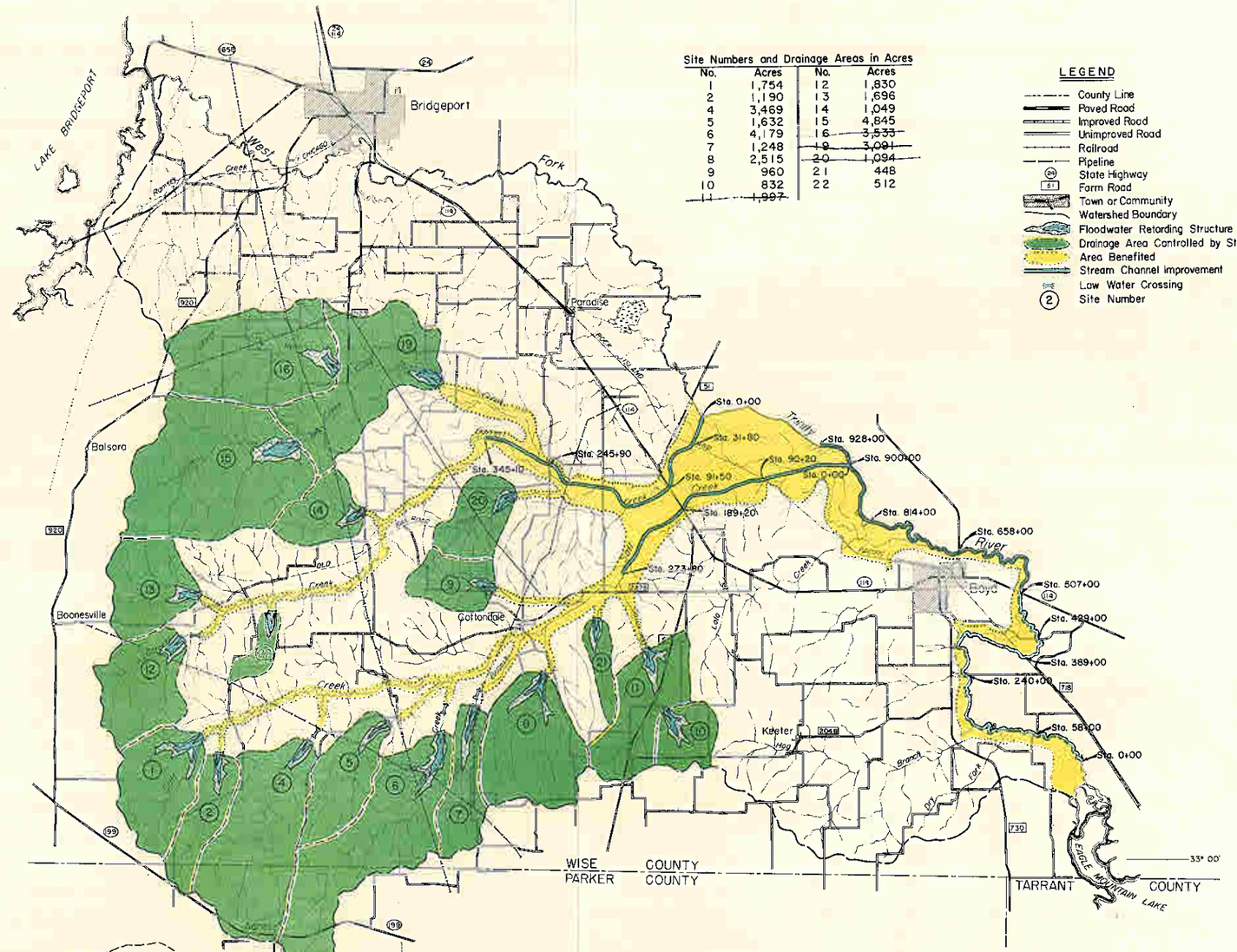
SALT CREEK AND LATERALS

OF THE

TRINITY RIVER WATERSHED TEXAS

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEMPLE, TEXAS

5-64 4-R-19019
Revised 12-12-62 4-R-15374



Site Numbers and Drainage Areas in Acres			
No.	Acres	No.	Acres
1	1,754	12	1,830
2	1,190	13	1,696
4	3,469	14	1,049
5	1,632	15	4,845
6	4,179	16	3,533
7	1,248	19	3,091
8	2,515	20	1,094
9	960	21	448
10	832	22	512
11	1,997		

LEGEND

- County Line
- Paved Road
- Improved Road
- Unimproved Road
- Railroad
- Pipeline
- State Highway
- Farm Road
- Town or Community
- Watershed Boundary
- Floodwater Retarding Structure
- Drainage Area Controlled by Structure
- Area Benefited
- Stream Channel Improvement
- Low Water Crossing
- Site Number

LOCATION MAP
Trinity River Watershed

VICINITY MAP

Figure 6

PROJECT MAP

SALT CREEK AND LATERALS

OF THE

TRINITY RIVER WATERSHED TEXAS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEMPLE, TEXAS

0 1 2 3 4 Miles
Reconnaissance Scale

Approximate Area 118,784 Acres

COMPILED FROM USGS QUADRANGLES

8-64 4-R-19020
4-R-15374

Revised 8-64 Revised 12-12-62