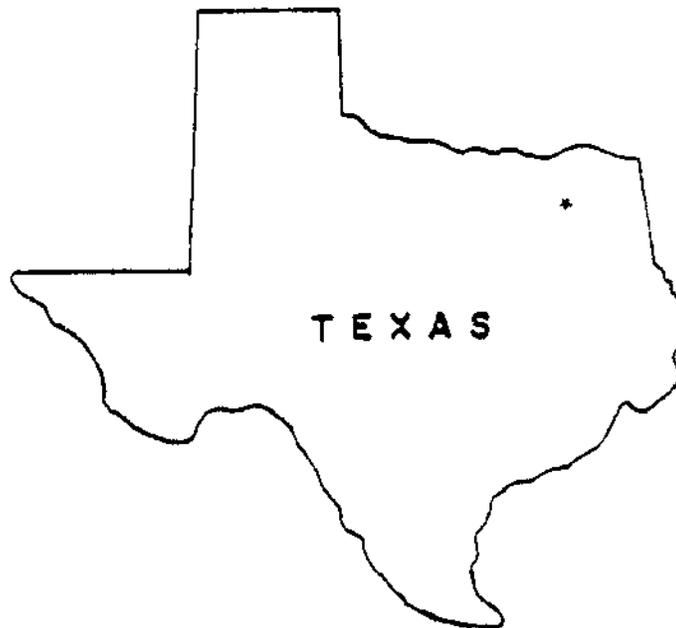


**FINAL
WATERSHED PLAN
and
ENVIRONMENTAL ASSESSMENT**

SOILS

BIG CREEK (DELTA COUNTY) WATERSHED

Delta County, Texas



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

DECEMBER 1980

FINAL

December 1986

WATERSHED PLAN

AND

ENVIRONMENTAL ASSESSMENT

BIG CREEK (DELTA COUNTY) WATERSHED

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WATERSHED PLAN - ENVIRONMENTAL ASSESSMENT

BIG CREEK (DELTA COUNTY) WATERSHED

Delta County, Texas

Abstract

This document describes a plan to assure the capability of sustained long-term agricultural production and to reduce soil erosion in the Big Creek (Delta County) watershed. Two candidate plans were considered. One was the installation of water disposal systems consisting of terraces, waterways, and grade stabilization structures plus management practices and the other was the no action plan. The recommended plan consists of an accelerated land treatment program which includes funds for technical assistance to apply management practices such as crop residue use, contour farming, and conservation cropping systems and technical and financial assistance to apply enduring practices such as terraces, waterways, and grade stabilization structures. Total project costs are \$717,040, of which \$562,040 will be paid from Public Law 566 funds and \$155,000 from other funds. Major impacts will be reduced soil loss from eroding cropland fields and maintenance of the long-term productive capacity of the soil resource base. This document is authorized and prepared under the authority of the Watershed Protection and Flood Prevention Act, Public Law 83-566, as amended, (16 U.S.C. 1001-1008).

Prepared by: Delta County Soil and Water Conservation District
U.S. Department of Agriculture, Soil Conservation Service

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WATERSHED AGREEMENT

Between the

**Delta Soil and Water Conservation District
(Referred to herein as sponsor)**

State of Texas

and the

**Soil Conservation Service
United States Department of Agriculture
(Referred to herein as SCS)**

Whereas, application has heretofore been made to the Secretary of Agriculture by the sponsor for assistance in preparing a plan for works of improvement for the Big Creek (Delta County) Watershed, State of Texas, under the authority of the Watershed Protection and Flood Prevention Act (16 U.S.C. 1001-1008); and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to SCS; and

Whereas, there has been developed through the cooperative efforts of the sponsor and SCS a plan for works of improvement for the Big Creek (Delta County) Watershed, State of Texas, hereinafter referred to as the plan, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Secretary of Agriculture, through SCS, and the sponsor hereby agree on this plan and that the works of improvement for this project will be installed, operated and maintained in accordance with the terms, conditions, and stipulations provided for in this plan and including the following:

1. Cost-sharing rate for the establishment of enduring conservation practices is 65 percent of the average cost or other approved cost-sharing methods of installing the enduring practices in the selected plan for the evaluation unit. The estimated total financial assistance cost for enduring practices is \$287,840.

No practices in the selected plan are approved for an incentive payment.

2. The SCS will assist the sponsor in providing technical assistance to landowners or operators to plan and install conservation practices shown in the plan. Percentages of technical assistance costs to be borne by the sponsor and SCS are as follows:

<u>Works of Improvement</u>	<u>Sponsor</u> (percent)	<u>SCS</u> (percent)	<u>Estimated Technical Assistance Cost</u> (dollars)
Conservation Practices	0	100	\$274,200

3. The sponsor will obtain applications from owners of not less than 10 percent of the land in the identified problem areas indicating that they will carry out the planned conservation practices. Applications will be obtained before the first long-term land treatment contract is executed.

4. The sponsor will obtain agreement with landowners or operators to operate and maintain the conservation practices for the protection and improvement of the watershed.

5. The costs shown in this plan are preliminary estimates. Final costs to be borne by the parties hereto will be determined by the average cost method of cost sharing or approved variations.

6. This agreement is not a fund obligating document. Financial and other assistance to be furnished by SCS in carrying out the plan is contingent upon the fulfillment of applicable laws and regulations and the availability of appropriations for this purpose.

7. A separate agreement (long-term contract) will be entered into between SCS and land users before either party initiates work involving funds of the other party. Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

8. This plan may be amended or revised only by mutual agreement of the parties hereto, except that SCS may deauthorize or terminate funding at any time it determines that the sponsor has failed to comply with the conditions of this agreement. In this case, SCS shall promptly notify the sponsor in writing of the determination and the reasons for the deauthorization of project funding, together with the effective date. Payments made to the landowner or operator through long-term contracts or recoveries by SCS shall be in accord with the legal rights and liabilities of the parties when project funding has been deauthorized. An amendment to incorporate changes affecting a specific measure may be made by mutual agreement between SCS and the sponsor having specific responsibilities for the measure involved.

9. No member of or delegate to Congress or resident commissioner shall be admitted to any share or part of this plan, 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.

10. The program conducted will be in compliance with all requirements respecting nondiscrimination, as contained in the Civil Rights Act of 1964, as amended, and the regulations of the Secretary of Agriculture (7 CFR 15), which provide that no person in the United States shall, on the ground of race, color, national origin, sex, age, handicap, or religion, be excluded from participation in, be denied the benefits of, or otherwise be subjected

to discrimination under any program or activity conducted or assisted by the Department of Agriculture.

Delta County Soil and Water Conservation District

By Roy Lee Jackson
Roy Lee Jackson

Route 1, Box 1, Lake Creek, TX 75450
Address Zip Code

Title Chairman

Date 2-11-87

The signing of this agreement was authorized by a resolution of the governing body of the Delta County Soil and Water Conservation District adopted at a meeting held on February 10, 1987.

B. J. Rainey
B. J. Rainey
Secretary

Route 2, Box 23, Cooper, Texas 75432
Address Zip Code

2-11-87
Date

Soil Conservation Service
United States Department of Agriculture

Approved by:

Coy A. Garrett
Coy A. Garrett
State Conservationist

Date FEB 17 1987

CONTENTS

	<u>Page</u>
Abstract	i
Watershed Agreement	ii
Contents	vi
Summary	1
Introduction	5
Project Setting	6
Resource Problems and Opportunities	7
Erosion Damages	9
Sedimentation	20
Financial Problems	20
Inventory and Forecasting	20
Scoping of Concerns	20
Existing Resources	22
Forecasted Conditions	25
Formulation of Alternatives	26
General	26
Formulation Process	26
Evaluation of Alternative Plans	29
Comparison of Plans	42
Summary and Comparison of Plans	43
Project Interaction	45
Risk and Uncertainty	45
Rationale for Plan Selection	45
Recommended Plan	46
General	46
Purpose and Summary	47
Plan Elements	47
Mitigation Features	48
Permits and Compliance	48
Costs	48
Installation and Financing	49
Responsibilities	53
Contracting	53
Cultural Resources	54
Financing	54
Operation and Maintenance	54
Table 1 - Estimated Installation Cost	57
Table 2 - Annualized Adverse NED Effects	59
Table 3 - Comparison of NED Costs and Benefits	61
Effects of Recommended Plan	63
General Effects	63
Land Management	63
Erosion and Sedimentation	67
Prime Farmland Soils	71
Social and Cultural	71
Consultation and Public Participation	71
List of Preparers and Qualifications	73
Index	77
Appendix A - Project Map	

SUMMARY OF WATERSHED PLAN - ENVIRONMENTAL ASSESSMENT

Project Name: Big Creek (Delta County) Watershed

County: Delta

State: Texas

Sponsor: Delta County Soil and Water Conservation District

Description of Recommended Plan:

This plan-EA proposes conservation treatment on 4,400 acres of cropland which are eroding at a rate which will seriously reduce the land's productive capacity during the 25-year evaluation period. Actively eroding perennial gullies which are destroying cropland areas will be treated by installing grade stabilization structures. Current erosion rates on cropland will be reduced by applying enduring practices such as terraces and grassed waterways and management practices such as crop residue use, contour farming, and conservation cropping systems. Approved alternative conservation practices which will control erosion and protect the productive capacity of the soil resource base may be applied provided the practices meet the objectives of the plan-EA.

Candidate Plans Considered

1. No action plan.
2. Enduring practices of terraces, waterways, and grade stabilization structures plus management practices of contour farming, conservation cropping systems, and crop residue use to protect 4,400 acres of cropland.

Resource Information

Size of watershed: Watershed area - 22,140 acres
Total problem area - 8,000 acres
Project treatment area - 4,400 acres (Based on 55 percent participation rate)

<u>Land Use</u>	<u>Present</u> (acres)	<u>Future</u> <u>Without Project</u> (acres)	<u>Future</u> <u>With Project</u> (acres)
Cropland	10,300	8,500	9,000
Pastureland	9,120	9,500	9,840
Native Grassland	1,970	3,340	2,500
Other	750	800	800

Land Ownership: Private, 98 percent; state-local, 2 percent; federal, 0 percent.

Number of Farms: 160 wholly or partially in watershed

Average Size: 150 acres

Prime Farmland: 19,000 acres

Endangered Species: Several bird species may occur in the area. These include the endangered American peregrine falcon (Falco peregrinus anatum), threatened arctic peregrine falcon (Falco peregrinus tundrius), the endangered bald eagle (Haliaeetus leucocephalus), endangered Interior least tern (Sterna antillarum athalassos), threatened piping plover (Charadrius melodus), and endangered whooping crane (Grus americana). Data indicate none of these species would be impacted by the proposed project.

Cultural Resources: It is expected that no cultural resources will be disturbed. Significant resources will be avoided whenever practical and

feasible, or significant data will be recovered prior to construction disturbance.

Visual Resources: This watershed is located in a rural area where the primary activity is the production of agricultural crops. Application of conservation practices will add to the esthetic value of the landscape by removing unsightly gullies and eroded areas. Landscape architecture rating elements establishes the watershed as a low priority area.

Problem Identification

The problem which will be addressed in this plan is the permanent loss of soil productive capacity on 8,000 acres of cropland which is caused by excessive erosion.

Project Purpose

The project purpose is the protection of the resource base to sustain its capability for long-term agricultural production.

Principal Project Measures

Principal project measures are: enduring practices consisting of 929,280 feet of terraces, 88 acres of grassed waterways, 13 grade stabilization structures; and management practices consisting of 4,312 acres of contour farming, conservation cropping systems, and crop residue use.

Total Project Costs

	<u>PL 566</u>		<u>Other</u>		<u>Total</u>	
	<u>Funds</u>		<u>Funds</u>		<u>Costs</u>	
	Dollars	Percent	Dollars	Percent	Dollars	Percent
Land Treatment Practices	287,840	65	155,000	35	442,840	100
Technical Assistance	274,200	100	0	0	274,200	100
Total	562,040		155,000		717,040	

Project Benefits

Erosion damage reduction: \$66,150

Acres benefited: 4,400 acres

Impacts

Land use changes resulting from project action (relationship of future without project and future with project):

Cropland maintained as cropland - 500 acres
Pastureland increase - 340 acres
Native grassland decrease - 840 acres
Other - No effect

Natural Resources Changed or Lost

Prime farmland - Protect an estimated 4,000 acres of prime farmland from excessive erosion.

INTROOUCTION

The watershed plan and environmental assessment for this project have been combined into a single document, plan-EA. The plan-EA will hereinafter be referred to as the plan. This document of plan formulation discloses the expected impacts and provides the basis for authorizing federal assistance for implementation. The purpose of the plan is watershed protection to sustain the long-term productive capacity of the soil resources.

The U.S. Department of Agriculture, Soil Conservation Service (SCS), provided assistance to the Delta County Soil and Water Conservation District (sponsor) in the development of the plan.

The plan was prepared under the authority of the Watershed Protection and Flood Prevention Act, Public Law 83-566, as amended (16 U.S.C. 1001-1008) and in accordance with Section 102(2)(C) of the National Environmental Policy Act of 1969, Public Law 91-190, as amended (42 U.S.C. 4321 et seq). Responsibility for compliance with the National Environmental Policy Act rests with the SCS.

PROJECT SETTING¹

Big Creek (Delta County) comprises an area of 22,140 acres (34.6 square miles) in the west-central portion of Delta County, Texas. This area is about 70 miles northeast of Dallas, Texas. Big Creek originates north of the city of Cooper and merges with the South Sulphur River about 4 miles southeast of Cooper. The watershed encompasses all but the extreme southwestern portion of the city of Cooper. No other towns are in the watershed. The 1980 population of Cooper was 2,338 (Bureau of the Census, U.S. Department of Commerce).

The climate is warm, temperate, and humid with an average rainfall of 44 inches. The mean maximum July temperature is 94^o F. The mean minimum temperature in January is 34^o F. The normal frost-free growing season is 233 days (Texas Almanac, The Dallas Morning News).

Land use in the watershed is about 10,300 acres (47 percent) cropland, 9,120 acres (41 percent) pastureland, 1,970 acres (9 percent) native grassland, and 750 acres (3 percent) other land (urban, built-up areas, water, roads, highways, etc.).

There are 160 operating farm units in the watershed. The average size farm unit is 150 acres.

Big Creek watershed is in the Texas Blackland Prairie Major Land Resource Area. Soils are mainly dark-colored, clayey, and calcareous. The predominant soil types are Houston Black clay, Leson clay, Heiden clay, and Wilson clay loam. Characteristically, these soils swell as they become wet and shrink when they dry. When dry, large cracks form in the soil surface, allowing water to enter rapidly. These soils are highly erodible.

The Pecan Gap (Cretaceous) geologic formation occurs along the extreme northern edge of the watershed. It is about 120 feet thick and is

¹ All information and data, except as otherwise noted by reference to source, were collected during watershed planning investigations by the Soil Conservation Service, U.S. Department of Agriculture.

comprised primarily of chalk which is locally argillaceous, sandy, slightly bituminous, and glauconitic. Local rock outcroppings in dissected patterns are characteristic of this unit. Soils formed from this formation are Houston Black and Leson.

Marlbrook Marl (Cretaceous) occurs south of the Pecan Gap Chalk to a line which approximately parallels Highway 154 east of Cooper. This unit is a strikingly uniform clay marl except for the upper part, which is slightly glauconitic. It is about 400 feet thick. Soils formed from this formation are Heiden, Houston Black, and Leson.

A small area of Neylandville Formation (Cretaceous) occurs just east of Cooper. This unit consists of calcareous sandy clay and forms an irregular topography. It is only a few feet thick. Wilson soils are formed in this formation.

The flood plain of Big Creek consists of alluvial deposits of Recent age. Materials consist of gravel, sand, silt, and clays in varying amounts.

RESOURCE PROBLEMS AND OPPORTUNITIES

The major problem is the loss of productive capacity of the soil resource base on 8,000 acres, which has caused a reduction of food and fiber output. The problem is the result of severe soil erosion. The opportunity for project action is to protect the resource base for long-term, sustained agricultural production.

Areas of cropland in the watershed are expected to be converted to a less intensive land use in the future. The following table shows the present and expected future without project land use:

LAND USE

<u>Land Use</u>	<u>Present</u> (acres)	<u>Future</u> <u>Without Project</u> (acres)
Cropland	10,300	8,500
Pastureland	9,120	9,500
Native Grassland	1,970	3,340
Other	750	800

The monetary loss and the reduction of food and fiber production is detrimental to local, regional, and national economies. These problems are interrelated and adversely affect other resources such as visual quality and the social well-being of the watershed residents. These problems are expected to continue and increase at an accelerating rate.

The following table shows the estimated present and future yields of the major crops grown in the problem area. The table also shows the dollar damages due to the loss of production.

YIELD AND DOLLAR DAMAGES PER ACRE¹

<u>Crop</u>	<u>Unit</u>	<u>Present</u>	<u>Future</u> <u>Without</u> <u>Project</u>	<u>Annual</u> <u>Dollar Damages</u> <u>Due to Loss of</u> <u>Productive</u> <u>Capacity</u>
Cotton	lb	281	265	8.64
Grain Sorghum	cwt	32	29	13.35
Wheat	bu	33	30	10.47

¹All estimated average yields and dollar damages reflect the production from a typical acre identified as having an erosion problem.

Erosion Damages

Soil erosion is evident throughout the watershed. Erosion reduces crop yields and farming efficiency. Long-term damages to the soil resource base are manifested by reduced fertility and water-holding capacity, diminished rooting depths, decreased organic matter and biological activity, and degraded soil structure.

The present annual erosion rate for the problem area (8,000 acres) for all erosion types is 16.9 tons per acre. The present annual erosion rate for the remaining 14,140 acres is 3.6 tons per acre. The problem area is comprised of 146 treatment areas. Treatment areas are fields which are being severely damaged by erosion. This severe erosion will deteriorate the productive capability of the soil resource base and cause abandonment of cropland fields. These abandoned fields will become low producing grassland.

The four types of upland erosion to be addressed by the plan are perennial gully erosion, ephemeral gully erosion, cultural erosion, and sheet-rill erosion.

Perennial gully erosion is a permanent damage caused by concentrated runoff dislodging and moving soil and rock material. A perennial gully creates a "voided area" and an associated "depreciated area." The "voided area" results in a total loss of the land resource base. The "depreciated area" results in a less intensive cropping pattern or land use on physically undamaged land adjacent to, or influenced by, the perennial gully.

Deeply incised and actively eroding perennial gullies are common in the watershed above State Highway 24. These gullies are eroding upstream into adjacent area, destroying cropland and existing conservation measures. The unstable outlets created by these gullies have hindered or prevented the construction of adequate water disposal systems. Gully depths extend to 15 feet and widths are as much as 50 feet. Lengths range from a few

feet to about 900 feet. Presently an estimated 35 acres are voided and an additional 160 acres are depreciated.

Ephemeral gully erosion occurs only on cropland. When rainfall rates exceed the infiltration rate of the soil, water drains downslope and forms areas of concentrated flow. These concentrated flows moving over loose or cultivated soil develop shallow and broad gullies (see illustration on page 14). These gullies can be traversed by tillage and harvesting equipment and are erased by subsequent tillage operations. They reappear after each runoff producing event, and may occur five or six times each year.

The concentrated flows within this ephemeral gully system cause erosion so severe that the 4- to 6-inch plow layer is removed and the growing crop is destroyed. This area is referred to as the "depleted area."

Tillage operations move soil material from the adjacent "depreciated area" into the depleted area where it is readily available for transport by the next runoff event. This mechanical displacement of soil is called "cultural erosion."

Crop yields in the depreciated area are reduced because of the cultural erosion. Crop yields range from production levels that occur on soils that are damaged by sheet-rill erosion only to no production in the depleted area. The damage to the depreciated area was calculated to be a yield reduction of 50 percent when compared to the yield on the area damaged by sheet-rill erosion only.

Sheet-rill erosion is the process in which thin layers of surface soil are removed more or less evenly from an extensive area by broad continuous sheets of moving water. All cropland is subjected to sheet-rill erosion except areas affected by perennial gullies and the depleted areas of ephemeral gullies.

The productive capability of the soils in the identified problem area is being reduced by sheet-rill erosion. Approximately 10 to 15 inches of soil

have been removed by erosion. It is anticipated that an additional 2 inches will be removed in the next 25 years without treatment. An example of this process is illustrated on page 15. This adversely affects the root zone by lowering the organic matter content, lowering the available plant nutrient content, and deteriorating the soil structure. These root zone characteristics reduce the productive capacity of the soil by lowering the available water-holding capacity, which subjects the crops to more frequent and severe water stress. Additional fertilizer can partially compensate for the reduced crop yields from the eroded soil, but production cost is increased. The poor soil structure condition increases the soil erodibility, surface sealing and crusting, and results in poor quality seedbeds. Surface sealing and crusting decrease seedling emergence, infiltration rates, and water storage.

Now-time damage is the annual damage associated with sheet-rill erosion. This damage consists of the loss in growing crops and pesticides from the dislocation of soil material.

Some fields previously used as cropland have been removed from crop production because of excessive erosion. Severe sheet-rill erosion is occurring on 8,000 acres of cropland, averaging 11.7 tons per acre annually.

Detailed assessment of the watershed revealed that two groups of treatment areas occur in the watershed. These groups are called evaluation units because the treatment areas in each have similar problems, soil characteristics, and treatment needs. The evaluation units are described as follows:

Evaluation Unit A - Deep, clayey soils with high potential for crop production. Present condition is eroding cropland. Long-term productive capacity is decreasing because of a high rate of erosion that is occurring. Typical soils are Houston Black and Leson with slopes of 1 to 3 percent. There are 124 treatment areas comprising 5,500 acres in this evaluation unit.

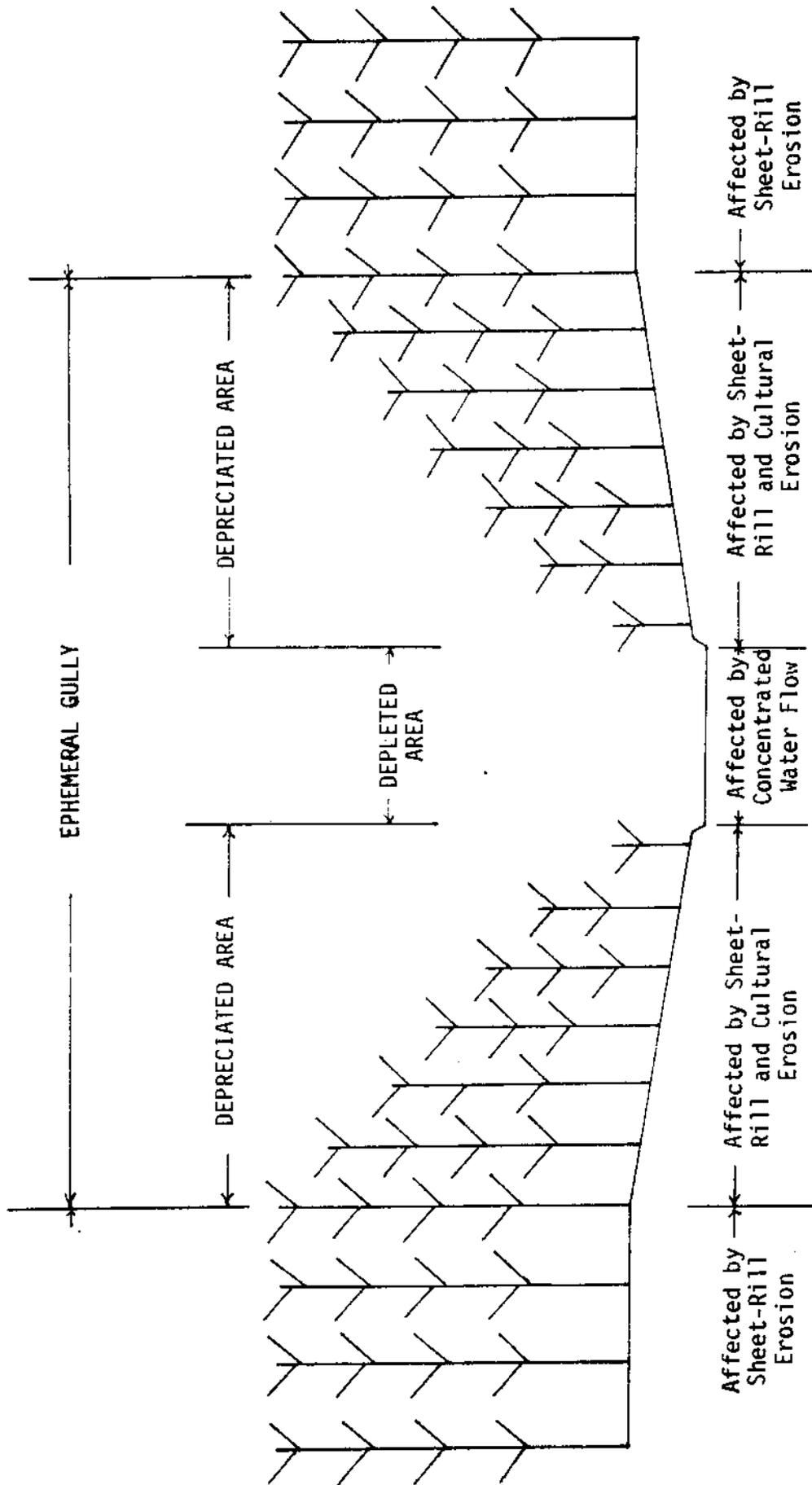
Evaluation Unit B - Deep, clayey soils with high potential for crop production. Present condition is eroding cropland. Long-term productive capacity is decreasing because of a high rate of erosion that is occurring. In addition, crop production and installed conservation practices are threatened by one or more perennial gullies with active overfalls. These gullies are increasing in size each year. Typical soils in this evaluation unit are Houston Black and Leson with slopes of 1 to 3 percent. There are 22 treatment areas comprising 2,500 areas in this evaluation unit.

The following table shows the present and future without project erosion rates for the 8,000 acres:

CROPLAND EROSION RATES AND ACRES AFFECTED
(Average Annual Erosion - Tons per Acre)

Erosion Type	Present Conditions		Future Without Project	
	Total Acres	Erosion Rates	Total Acres	Erosion Rates
<u>Perennial Gully Erosion</u>				
Voided Area				
Evaluation Unit A	15	57.0	20	45.0
Evaluation Unit B	20	94.0	40	120.0
	35	73.0	60	77.0
<u>Ephemeral Gully Erosion</u>				
Depleted Area				
Evaluation Unit A	155	118.0	200	118.0
Evaluation Unit B	70	118.0	90	118.0
	225	118.0	290	118.0
Depreciated Area				
Evaluation Unit A	(310)*	35.0	(400)*	35.0
Evaluation Unit B	(130)*	35.0	(175)*	35.0
	(440)*	35.0	(575)*	35.0
<u>Sheet-Rill Erosion</u>				
Evaluation Unit A	5,330	11.6	5,280	11.6
Evaluation Unit B	2,410	11.8	2,370	11.8
	7,740	11.7	7,650	11.7
<u>All Erosion Types</u>				
Evaluation Unit A	5,500	16.7	5,500	18.2
Evaluation Unit B	2,500	17.3	2,500	19.2
	8,000	16.9	8,000	18.5

*Ephemeral gully depreciated acres included in sheet-rill area.

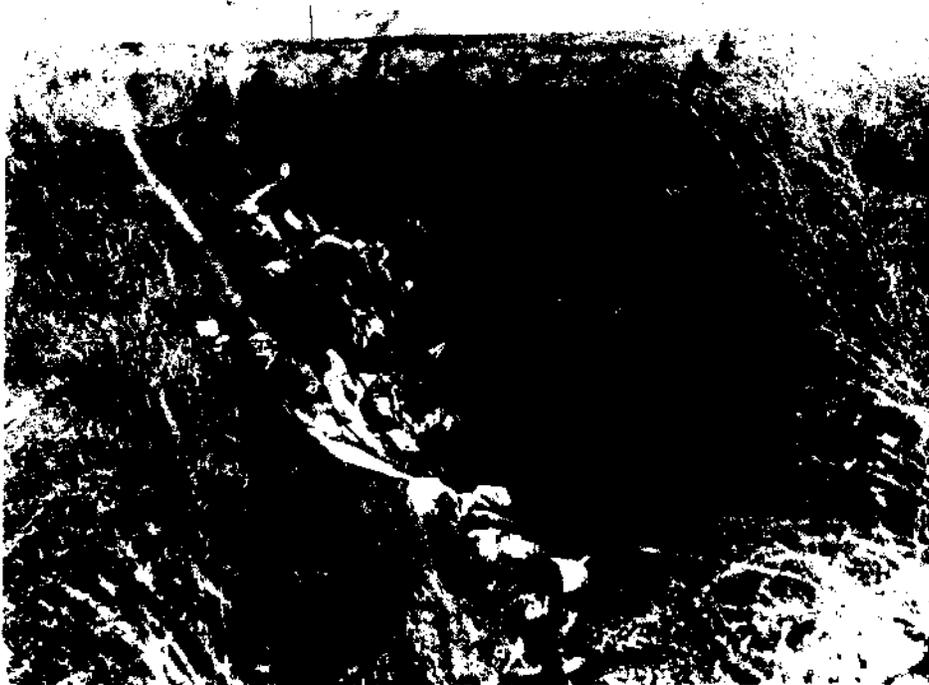


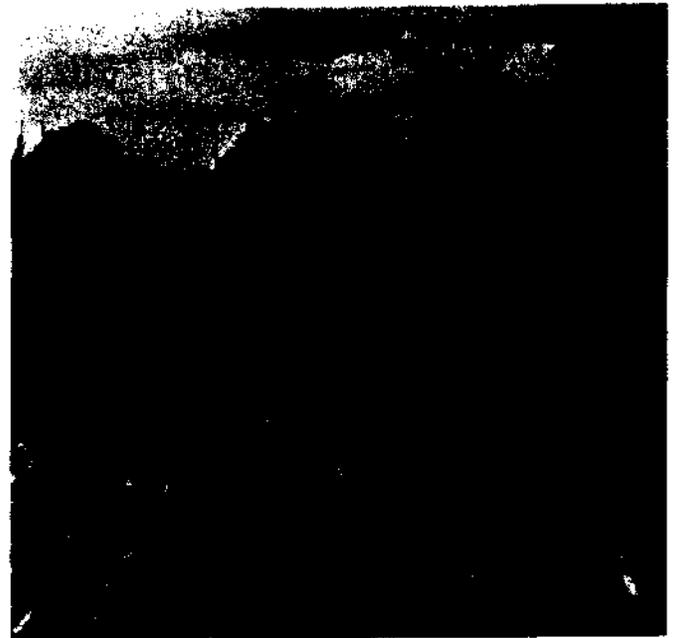
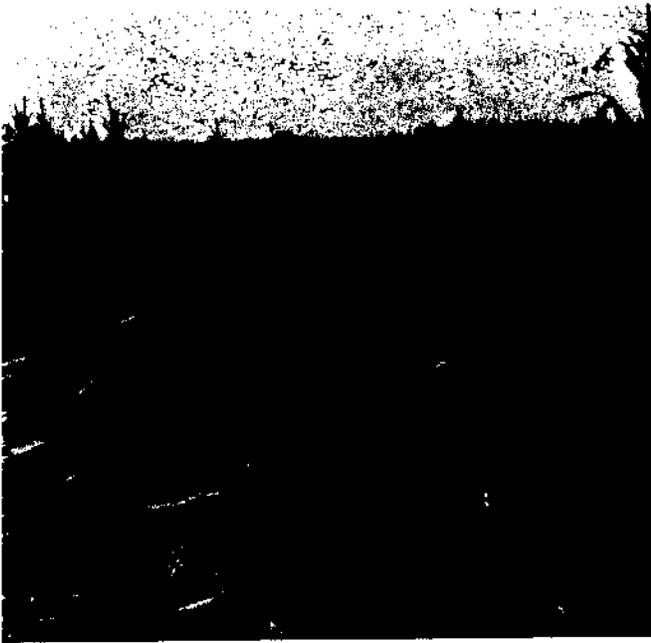
REPRESENTATIVE SECTION

EPHEMERAL GULLY



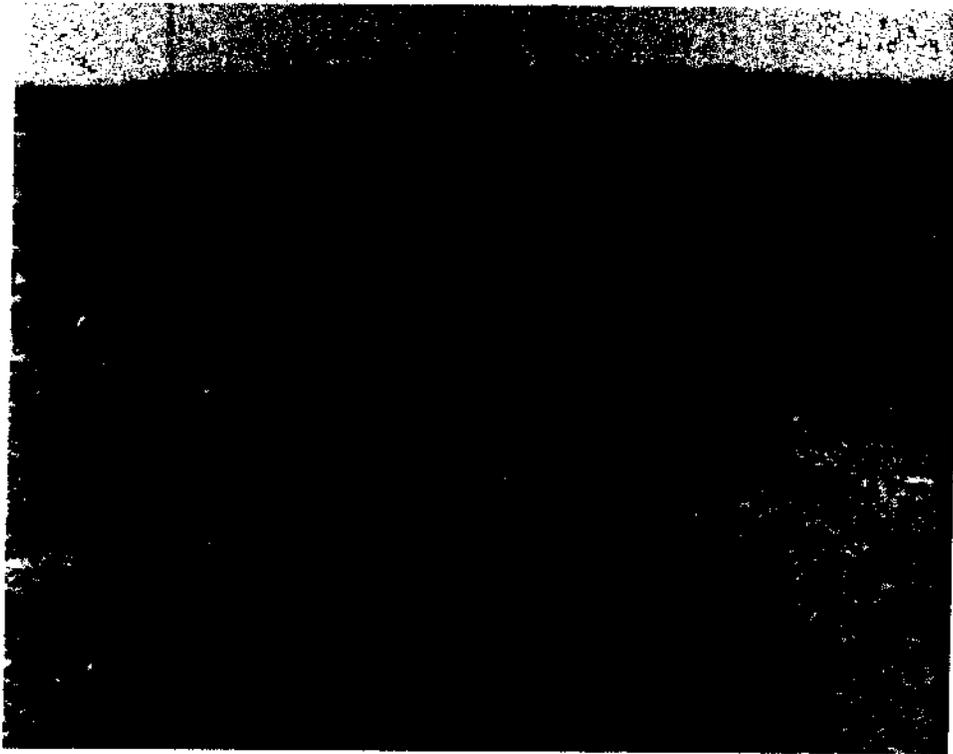
Where runoff water is concentrated and flows over unstable soil, a perennial gully develops. The head of most gullies is an almost vertical wall. Water flowing into the gully over this wall, sometimes called an overfall, causes severe erosion. These overfalls range from 4 to 15 feet deep. As the overfall erodes, the gully extends further up the slope at a rate of several feet each year. Cropland fields uplope from an overfall will eventually be consumed by the gully. In addition, terraces cannot be installed in the cropland field until the overfall is treated to provide a stable outlet for the terrace system. The gully in the bottom photo is adjacent to a county road and is a collection place for discarded rubbish.





These pictures were taken on June 12, 1984, of the same field as shown on the preceding page. A surprising number of corn plants survived the effects of the severe sheet and rill erosion, but many were destroyed by the ephemeral gully erosion. The gully floor, which appears to be flowing water, is actually dry sediment displaced by erosion from higher in the corn field. These ephemeral gullies will be erased by plowing and planting to wheat during the next planting season. New ephemeral gullies develop each crop year.



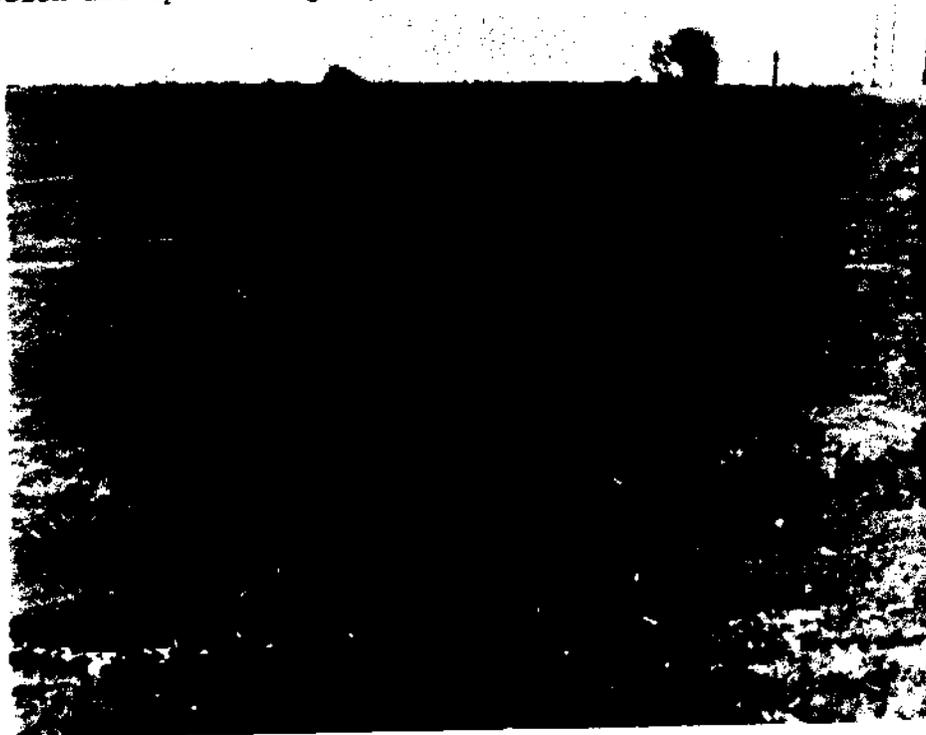


Sheet and rill erosion (top photo) is the uniform removal of soil from an area without the development of conspicuous water channels. Ephemeral gully erosion (bottom photos) results from a concentrated water flow causing water channels that have not developed perennial gully characteristics and are partially or totally erased by cultivation. This ephemeral gully has removed about 4 to 6 inches of topsoil this crop year (1984).





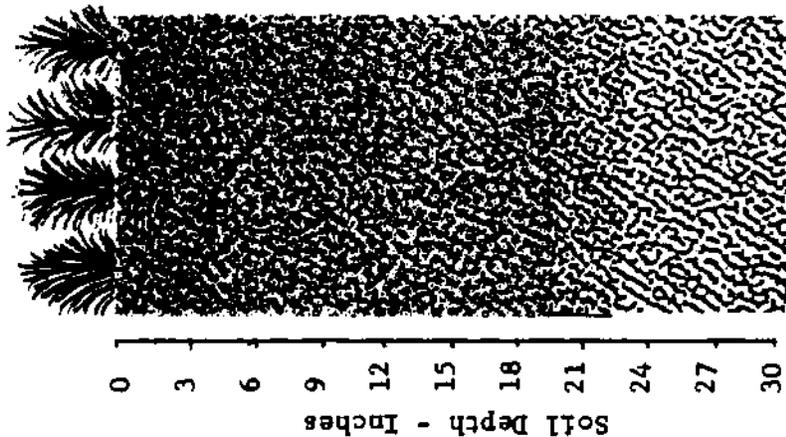
Erosion is destroying the potential for sustained long-term agricultural production in the watershed. It has caused a reduction of food and fiber output and monetary loss to local, regional, and national economies. Erosion of the topsoil results in reduced fertility and water-holding capacity, decreased organic matter content and biological activity, and diminished rooting depths. These pictures were taken on April 17, 1984, and show seedling corn plants struggling for survival on this field which is being affected by severe sheet and rill erosion and ephemeral gully erosion.



EFFECTS OF SHEET-RILL EROSION ON A SOIL PROFILE

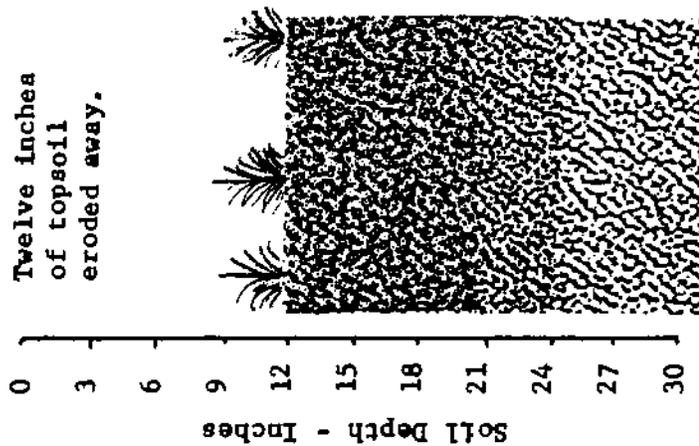
PAST CONDITION

When first cultivated land was rich in organic matter and the soil's productive capability was high.



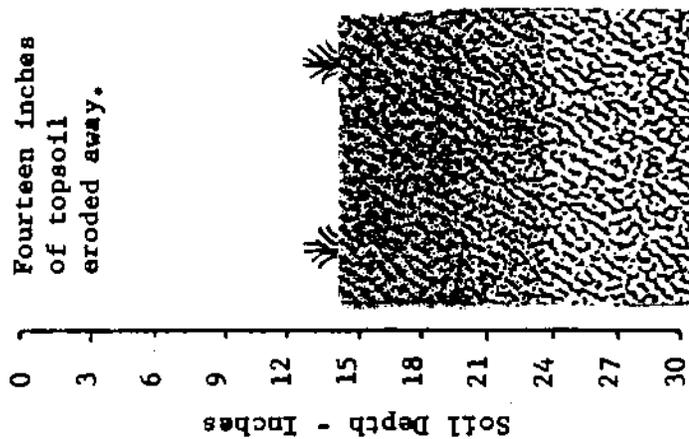
PRESENT CONDITION

After 100 years of cultivation and erosion, approximately 12 inches of topsoil have been eroded away. The soil's productive capability has been reduced.



FUTURE CONDITION

In 25 years, another two inches of topsoil will be removed if erosion continues at the present rate. The soil's productive capability will be further reduced.



Sedimentation

On cropland fields sediment deposition accumulates at the base or foot of slopes. Deposition in these areas will destroy emerging crops or suppress crop yields. No significant sediment problem was identified in the watershed.

Financial Problems

Financial assistance for the past several years through the Agriculture Conservation Program (ACP) has not met the need for conservation treatment in the watershed. ACP funds are allocated on a yearly basis. The annual ceiling of \$3,500 available per landowner and the uncertainty of future availability of funds limit the installation of high-cost conservation practices. Most assistance has been on land use conversion to pastureland and on construction of terraces. Sufficient funds have not been available for the needed accelerated land treatment.

INVENTORY AND FORECASTING

Scoping of Concerns

The scoping process, which began early in planning, has consisted of informational contacts with those agencies or individuals who had knowledge and data useful in assessment of resources. Scoping has been used to address significant issues related to the formulation of alternatives.

Meetings were held by the sponsor to gain input from individuals and to inform the general public. Newspapers serving the watershed area published articles announcing public meetings and reported information on the progress of watershed planning activities.

On December 14, 1982, the SCS, in conjunction with the sponsor, held a scoping meeting in Cooper. The purpose of the meeting was to discuss the potential project in order to determine the scope of issues to be

addressed and establish objectives. The 14 landowners in attendance expressed their concern for reducing erosion and resultant damages. The concern expressed by many is the degradation of the nonrenewable soil resource and the critical need to prevent further deterioration.

A broad range of environmental, economic, and social factors was considered during the scoping process. The degree of significance to decision making determined the intensity that each factor was studied during project planning. Following is a list of factors considered and their degree of significance:

EVALUATION OF IDENTIFIED CONCERNS

Economic, Environmental, and Social Factors	Degree of Significance to ¹ Decision Making	Remarks
Land management	High	
Prime farmland soils	High	
Erosion	High	
Sedimentation	Low	
Floodwater damages	Low	
Municipal water	Low	
Recreation	Low	
Streams and lakes	Low	
Ground water	Low	
Fish and wildlife habitat	Low	
Wetlands	Low	
Endangered species	Low	No known species affected
Social and cultural	Medium	
Transportation	Low	
Archeological resources	Low	No known resources affected
Air quality	Low	
Visual resources	Low	
Human health and safety	Low	
Mineral resources	Low	

- ¹ High - Must be considered in the analysis of alternatives
 Medium - May be affected by some alternative solutions
 Low - Consider, but not too significant

Existing Resources

Land Resources

The watershed is located in Major Land Resource Area (MLRA) 86, Texas Blackland Prairie. Soils of the watershed are mainly of the Houston Black, Leson, Heiden, and Wilson series. The Houston Black and Leson soils are deep, clayey, gently sloping and moderately well-drained. The Wilson soils are deep, loamy, nearly level, and somewhat poorly drained. Detailed soil surveys have been published for Delta County and are available at the SCS field office in Cooper.

Prime Farmland Soils

Prime farmland soils are lands best suited and available for producing food, feed, forage, fiber, and oilseed crops. These lands may be used as cropland, pastureland, rangeland, or other land. Prime farmland soils have the capability to produce sustained high yields of crops economically when treated and managed according to modern farming methods, including soil conservation practices. About 7,200 acres of cropland identified as comprising the treatment areas of this project are prime farmland soils. A list of soil mapping units classified as prime farmland soils is available in the local SCS office.

Water Quality

Water quality information for specific sites within the watershed is not available. However, studies of water quality conditions in existing ponds and streams lying within a similar soils area in a nearby watershed with similar land uses showed that good quality water exists within small impoundments in the area. Water quality is being affected by sediment entering stream channels and reservoirs.

Plant Resources

The native vegetation of the watershed is typical of the Texas Blackland Prairie with grassland predominating in most of the area. The plants

which occurred under climax conditions included grasses such as little bluestem, switchgrass, big bluestem, indiangrass, and sideoats grama (Gould 1962). Woody plants such as pecan, ash, cottonwood, bois d'arc, hackberry, and post oak occur along streams, fence rows, and in motts. Forbs and legumes such as western ragweed, maximilian sunflower, partridge pea, croton, snow-on-the-prairie, engelmann daisy, and illinois bundleflower add color and diversity to the landscape and variety to the diet of wildlife.

Much of the original native plant ecosystem has been altered through man's activities. The major plant species growing in the watershed include bermudagrass, splitbeard and bushy bluestem, Texas wintergrass, Canada wildrye, silver bluestem, poison ivy, greenbriar, cocklebur, and mustang grape.

Wetlands

The main wetlands that occur in the watershed are Type 5, open fresh water wetlands, which occur in farm ponds and small lakes having emergent shoreline vegetation.

Fish and Wildlife

The streams in the watershed have ephemeral or intermittent flow. Fishery resources within the watershed are found in farm ponds. Many of the farm ponds have been stocked with channel catfish, largemouth black bass, and sunfish. Fishing is limited to local residents or friends using the private farm ponds.

Important wildlife game species in the watershed are fox squirrel, mourning dove, and bobwhite quail. Nongame animals such as raccoon, beaver, nutria, opossum, coyote, fox, armadillo, cottontail rabbit, and jack rabbit are present. Songbirds, waterfowl, and birds of prey such as various species of hawk occur during seasonal migrations in light to heavy densities. The majority of the wildlife habitat will not support high game populations due to several factors. Past agricultural practices had

a detrimental effect on wildlife habitat due to intensive cultivation which altered existing cover and the resulting erosion has damaged or destroyed wildlife habitat.

Threatened and Endangered Species

Several threatened and endangered bird species may occur in the area. These include the endangered American peregrine falcon (Falco peregrinus anatum), threatened arctic peregrine falcon (Falco peregrinus tundrius), the endangered bald eagle (Haliaeetus leucocephalus), endangered Interior least tern (Sterna antillarum athalassos), threatened piping plover (Charadrius melodos), and the endangered whooping crane (Grus americana). Data indicate none of these species would be impacted by the proposed project.

Historical and Archeological Resources

Archeological surveys of the areas that are to receive conservation treatment have not been completed. These surveys will be made during the environmental evaluation phase of working with the involved land users. The Delta County Historical Commission was contacted concerning the existence of local recognized sites and the National Register of Historic Places was consulted for listed sites. No significant sites were identified within the proposed treatment areas.

Visual Resources

Big Creek watershed is located in a rural area where the primary activity is the production of agricultural crops. Travel through the watershed is mainly on State Highway 24 and on county roads. Viewers traveling through the watershed have an intermediate viewing time. Vegetative patterns in the landscape provide the main visual diversity in an otherwise homogeneous landscape. The scars of soil erosion and the low-producing or abandoned cropland fields are a detriment to the visual quality of the landscape. Landscape architecture rating elements establish the watershed as a low priority area.

Forecasted Conditions

The degradation of the resource base is expected to continue in the future without accelerated assistance in planning and applying conservation practices. An interdisciplinary group of watershed planning specialists and resource specialists from the field office and state office of the SCS developed the projected conditions. Local land users assisted in the projections through interviews and counseling during the assessment. Other factors considered in arriving at the projections were crop yields on land with conservation treatment practices applied where erosion is minimal and on land without conservation treatment where erosion rates are excessive. These studies were compared with trends of crop production, land treatment, and erosion rates over the past several years.

An ongoing program of land treatment is effective in the watershed. Technical assistance in applying conservation practices is being provided by the SCS in cooperation with the Delta County Soil and Water Conservation District. The technical assistance provided has accomplished adequate treatment on about 55 percent of the watershed. Accomplishments are made each year, but additional problem areas develop. The present rate of progress is not sufficient to complete the needed treatment. The severity of the problems on the identified areas in this watershed indicates the need to accelerate the ongoing program.

Funds through the Agriculture Conservation Program (ACP) have not been sufficient to meet the need for conservation treatment in the past. The problem areas identified in planning this project indicate the need for additional financial assistance. Funds through the ACP program are not expected to increase in the future.

FORMULATION OF ALTERNATIVES

General

Project formulation followed the specifications in the "Principles and Guidelines for Water and Related Land Resource Problems," and opportunities associated with the National Economic Development (NED) objective. Formulation also followed the inventory, forecasting, and analysis of the water and land resource conditions relevant to the identified problems and opportunities.

The watershed was studied in detail (100 percent inventory) to determine the location and extent of the problems. Following this inventory, the scoping process was used on the 22,140-acre watershed to identify the treatment areas (Appendix A, Project Map). A total of 146 treatment areas comprising 8,000 acres are eroding at high rates and it is these areas that warrant project action.

Alternative conservation practices were studied, using incremental analysis to determine their effects on the identified problems. Economic and environmental evaluations were made to determine which groups of conservation practices would qualify as the NED plan.

Formulation Process

Practices to treat identified problems were studied to determine their effectiveness, costs and benefits, positive or negative effect on the environment, and acceptability to the land users, the sponsor, and the SCS. Land use change was considered as a means of reducing erosion on cropland. This would convert eroding cropland to pasture or rangeland. It would reduce erosion by establishing a permanent grass cover through pasture planting or range seeding. Application of these practices would be acceptable to the sponsor and some land users; however, most land users indicated their preference to continue cropping these areas because of their need to maintain a greater monetary income. Studies indicated that

conversion of cropland to pastureland would meet project objectives but would result in reduced net returns to land users.

Critical area planting was considered as a practice to treat the more severely eroding pastureland and rangeland. These eroding areas occur mainly on fields that were previously used as cropland until the erosion problem forced abandonment. Now, most of these areas are not being treated nor used for agricultural production. Under current guidelines, the treatment of these isolated areas of erosion was determined not to be a practical inclusion in this project.

The most practical measures which could be installed on this watershed which would reduce one or more of the identified problems are shown on the following table:

PLANNING CONSIDERATIONS¹

Identified Problem	Effect of Treatment Practices			
	Land Use Change	Conservation Tillage	Crop Residue Use	Water Disposal System
Erosion on Cropland				
Sheet-Rill	+	+	+	+
Ephemeral Gully	+	0	-	+
Perennial Gully	+	-	-	+
Sedimentation	+	+	+	+

- ¹
- + - Significant positive effect
 - 0 - Minor effect
 - - Insignificant effect

Evaluation of Alternative Plans

Formulation proceeded with an analysis of land treatment needs in the watershed. Results of this analysis indicated erosion problems could best be treated with various combinations of the following practices: conservation cropping systems, conservation tillage, crop residue use, and a water disposal system. The water disposal system would consist of a terrace system and contour farming, and, where needed, a waterway and a grade stabilization structure.

The Universal Soil Loss Equation (USLE) was used to determine the rate of sheet-rill erosion. Data for this equation plus ephemeral and perennial gully width, length, depth, and drainage area was input for the ELT-4-TI computer program to determine the erosion loss from each type of erosion and the total or composite erosion. Computations were made for the present condition and expected future without project (25-year) condition and with various levels of treatment.

Costs for producing crops of cotton, grain sorghum, and wheat were determined from Texas Crops and Livestock Budgets and by interviews with local farmers. This data, plus yield estimates under various levels of treatment, were input into the ERCON4A computer program to determine economic values. The ERCON4A program encompasses data from the ELT-4-TI (erosion) program to compute net economic returns under the various treatment practices. Each practice was evaluated to determine its effects on erosion and net economic returns.

The following tables show the incremental analysis of erosion and the NED benefits and costs per acre:

INCREMENTAL ANALYSIS OF EROSION¹
(Tons Per Acre Per Year)

System and Iteration	Perennial Gully		Ephemeral Gully		Sheet-Rill		Composite (Weighted Average)				
	Tons	Percent	Tons	Percent	Tons	Percent					
Future Without Project - Conservation Cropping System	2	45.0	-	118.0	-	35.0	-	11.6	-	18.1	-

Iteration No. 1 - Conservation Cropping System Plus:

Crop Residue Use	2	45.0	0	103.0	13	31.0	13	10.1	13	15.9	12
Conservation Tillage	2	45.0	0	44.0	63	13.2	63	4.3	63	6.9	62
Waterway, Contour Farming, Terraces	16.0	64	8.8	92	5.9	83	5.8	50	6.1	66	

Iteration No. 2 - Conservation Cropping System, Waterway, Contour Farming, Terraces Plus:

Crop Residue Use	16.0	64	7.8	93	5.3	85	5.1	56	5.4	70	
Conservation Tillage	16.0	64	3.3	97	2.3	94	2.2	81	2.4	87	

¹ All erosion estimates based on acres affected by erosion types on the 5,500 acres in Evaluation Unit A.
² Erosion rate expected to decrease, with or without project, from present 57 tons/acre to 45 tons/acre.

INCREMENTAL ANALYSIS OF EROSION¹
(Tons Per Acre Per Year)

System and Iteration	Perennial Gully		Ephemeral Gully		Sheet-Rill		Composite (Weighted Average)		
	Tons Per Acre	Percent Reduction	Tons Per Acre	Percent Reduction	Tons Per Acre	Percent Reduction	Tons Per Acre	Percent Reduction	
EVALUATION UNIT B									
Future Without Project - Conservation Cropping System									
	120.0	-	118.0	-	35.0	-	11.8	-	19.8
Iteration No. 1 - Conservation Cropping System Plus:									
Crop Residue Use	120.0	0	103.0	13	31.0	13	10.3	13	17.6
Conservation Tillage	120.0	0	44.0	63	13.2	63	4.4	63	8.6
Waterway, Contour Farming, Terraces, Grade Stabilization Structures	16.0	87	8.7	92	5.7	84	5.8	51	6.0
Iteration No. 2 - Conservation Cropping System, Waterway, Contour Farming, Terraces, Grade Stabilization Structures Plus:									
Crop Residue Use	16.0	87	7.7	93	5.1	86	5.1	57	5.3
Conservation Tillage	16.0	87	3.3	97	2.1	94	2.2	81	2.4

¹ All erosion estimates based on acres affected by erosion types on the 2,500 acres in Evaluation Unit 8.

INCREMENTAL ANALYSIS OF BENEFITS AND COSTS PER ACRE
(Dollars)

System and Iteration	Cost			Benefits					Total Benefits	Benefit-Cost Ratio	Net Benefits
	Incremental Annual	Incremental O&M	Incremental Total	Incremental Sheet-Rill Annual	Incremental Sheet-Rill Enhancement Annual	Incremental Ephemeral Gully Annual	Incremental Ephemeral Gully Enhancement Annual	Reduction in Now Time Damage			
EVALUATION UNIT A											
Future Without Project - Conservation Cropping System											
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iteration No. 1 - Conservation Cropping System Plus:											
Conservation Tillage	0.00	0.00	0.00	1.50	0.00	0.00	0.00	5.43	0.00	1.50	1.50
Crop Residue Use	0.00	0.00	0.00	1.76	0.08	0.00	0.00	3.24	0.00	-0.16	-0.16
Waterway, Contour Farming, Terraces	6.47	0.55	7.02	1.65	0.00	0.04	0.04	5.09	19.62	2.79	12.60
Iteration No. 2 - Conservation Cropping System, Waterway, Contour Farming, Terraces Plus:											
Conservation Tillage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.13	MA	0.13
Crop Residue Use	0.00	0.00	0.00	0.11	0.03	0.08	0.08	0.30	0.30	MA	0.30

INCREMENTAL ANALYSIS OF BENEFITS AND COSTS PER ACRE
(Dollars)

System and Iteration	Cost			Benefits							Total Benefits	Benefit-Cost Ratio	Net Benefits	
	Incremental Annual	Incremental O&M	Incremental Total	Incremental Sheet-Rill Annual	Incremental Sheet-Rill Enhancement	Incremental Gully Annual	Incremental Gully Enhancement	Incremental Ephemeral Gully	Incremental Ephemeral Reduction in Mow Time	Incremental Damage				
EVALUATION UNIT B														
Future Without Project - Conservation Cropping System														
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00
Iteration No. 1 - Conservation Cropping System Plus:														
Conservation Tillage	0.00	0.00	0.00	1.45	0.00	-5.34	0.00	0.00	5.56	0.00	1.67	1.67	NA	1.67
Crop Residue Use	0.00	0.00	0.00	1.69	0.09	-5.11	0.00	0.00	3.27	0.00	-0.06	-0.06	NA	-0.06
Waterway, Contour Farming, Terraces, Grade Stabilization Structures	8.55	0.60	9.15	0.61	0.00	15.42	0.05	5.21	21.29	2.33	12.14	12.14	2.33	12.14
Iteration No. 2 - Conservation Cropping System, Waterway, Contour Farming, Terraces, Grade Stabilization Structures Plus:														
Conservation Tillage	0.00	0.00	0.00	0.99	0.00	0.13	0.12	0.35	1.59	1.59	1.59	1.59	NA	1.59
Crop Residue Use	0.00	0.00	0.00	1.08	0.03	0.23	0.11	0.31	1.76	1.76	1.76	1.76	NA	1.76

Alternative 1

Alternative 1 is the no action condition. The forecasted future conditions will prevail under this alternative. Erosion will continue to degrade soil resources with associated effects of lowering of economic values and the ability to produce food and fiber crops for use by regional, national, and international commerce.

Alternative 2 (National Economic Development Plan)

Components: This alternative consists of treating eroding cropland. Sociological studies of the watershed area and interviews with local land users indicated that about 55 percent of the problem area would be treated if this alternative was selected. Based on a 55 percent participation rate, this alternative consists of treating 4,400 acres with management and enduring conservation treatment practices. The management practices are contour farming, crop residue use, and conservation cropping systems on 4,312 acres. The enduring practices are 929,280 feet of terraces, 88 acres of grassed waterways, and 13 grade stabilization structures. Contour farming will be applied where supported by terrace systems. The enduring practices will be installed where needed to convey concentrated water flows to stable outlets. It reflects the treatment to be applied on 55 percent of the cropland identified in the "RESOURCE PROBLEMS AND OPPORTUNITIES" section of this plan.

Financial assistance of 65 percent cost share will be provided by the SCS to land users who agree to apply and maintain the designated conservation practices. Technical assistance will be provided by the SCS in cooperation with the Delta County Soil and Water Conservation District.

Costs: Total project costs are \$717,040. The total PL 566 share of the cost is \$562,040. The average annual installation cost is \$51,270. The annual operation and maintenance cost is \$2,280. The total annual cost is \$53,550.

Benefits: The average annual benefits will be \$66,150. The benefit-cost ratio is 1.2 to 1:0.

Effects: Soil productivity will be maintained by reducing cropland erosion rates an average of 13.9 tons per acre per year on 4,400 acres. The total (treatment area) erosion will be reduced from 18.5 tons per acre per year to 5.3 tons per acre per year. This reduction in damages will generate an annual increase of \$66,150 in net income, which will stimulate the local and regional economy.

This alternative will provide for sustained long-term agricultural production on 4,400 acres.

Soil degradation will be controlled on 4,000 acres of prime farmland needing conservation treatment.

The visual resource will be enhanced by changing erosion-scarred fields to well-maintained, productive fields.

During project installation, 21 person-years of employment will be available to possibly unemployed or underemployed labor resources.

More tax revenues will be generated by stimulating the local and regional economy.

Comparison of Plans

Alternative 1 is the no-action alternative. This alternative will allow the future without project conditions to occur. Ongoing programs for soil conservation technical assistance and limited financial assistance will continue to improve soil resources at a slow rate. Accelerated erosion will continue to degrade other soil resources, resulting in the loss of sustained agricultural production.

Alternative 2 is the NED plan and will provide for conservation treatment on 4,400 acres of eroding cropland. The erosion rate on these acres will be reduced from 18.5 tons per acre per year to 5.3 tons per year. The soil resources on these acres will be protected for long-term sustained agricultural production. Financial and technical assistance will be provided to cooperative land users. The benefit-cost ratio is 1.2 to 1.0.

The following table is a summary and comparison of alternative plans:

SUMMARY AND COMPARISON OF PLANS

Effects	Future Without Project	Alternative 1 (No Action)	Alternative 2 (Med Plan)
Description of Alternative	No treatment	No treatment	Installation of enduring and management practices to protect 4,400 acres
<u>NATIONAL ECONOMIC DEVELOPMENT ACCOUNT</u>			
Project Investment	0	0	\$717,040
Adverse Annualized	0	0	\$ 53,550
Beneficial Annualized	0	0	\$ 66,150
Net Benefits	0	0	1,211.0
<u>ENVIRONMENTAL QUALITY ACCOUNT</u>			
Beneficial	Erosion rates on 8,000 acres will continue at 18.5 tons per acre	No effect	Erosion rates on 4,400 acres will be reduced to 5.3 tons per year
	Continued degradation of soil resources on 8,000 acres of cropland production	No effect	Adequately protect 4,400 acres of cropland for sustained agricultural production
	60 acres will be voided	No effect	Acres voided will be reduced to 27 acres
	290 acres will be depleted and 575 acres will be depreciated annually by ephemeral gully erosion	No effect	Acres depleted and depreciated will be reduced to 130 and 259 acres, respectively
<u>OTHER SOCIAL EFFECTS ACCOUNT</u>			
Beneficial	Depression of economic values of agricultural community	No effect	Stimulate economic condition of agricultural community

Project Interaction

The soil and water conservation districts in Texas, together with the State of Texas and USDA Agricultural Stabilization and Conservation Service (ASCS) and the Farmers Home Administration (FmHA), are supporting the ongoing installation of land treatment. This plan will accelerate land treatment and technical assistance without duplication of current programs.

Risk and Uncertainty

All data used in evaluating and establishing future conditions in the watershed are based on recent history. Agricultural production estimates are based on local records of farm and ranch units. The net benefits of the recommended plan exceed the cost of the planned measures without consideration of any projections. Therefore, the uncertainty aspects of projections for project justification are not applicable. The participation of individual land users is entirely voluntary. Interviews with community leaders and land users indicate that users of about 55 percent of the area with identified land resource problems will participate in this project.

Rationale for Plan Selection

Alternative 2 is the recommended plan and NED plan. It provides for conservation practices that are acceptable to the land users, project sponsor, and SCS. These practices, when properly applied and maintained, will accomplish the project goal of sustaining long-term agricultural production on 4,400 acres in the watershed.

Treatment of the identified needs in the watershed, 8,000 acres of eroding cropland, was determined to be too ambitious, considering the 8-year installation period and the expected acceptance of the landowners and operators. A goal of 55 percent was selected as an acceptable participation rate based on interviews with land users.

There are no unresolved conflicts or objections to the recommended plan.

RECOMMENDED PLAN

General

The recommended plan consists of applying conservation practices to adequately protect 4,400 acres of cropland (3,025 acres in Evaluation Unit A and 1,375 acres in Evaluation Unit B). The following table shows the planned land treatment to be applied to each evaluation unit:

<u>Item</u>	<u>Unit</u>	<u>Evaluation Unit</u>		<u>Total</u>
		<u>A</u>	<u>B</u>	
Contracts	No.	80	13	93
Conservation Cropping Systems	Acres	2,965	1,347	4,312
Contour Farming	Acres	2,965	1,347	4,312
Crop Residue Use	Acres	2,965	1,347	4,312
Terraces	Feet	638,880	290,400	929,280
Grassed Waterways	Acres	60	28	88
Grade Stabilization Structures	No.	0	13	13

Detailed on-site planning with the land user will determine which conservation practices will be applied. The treatment to be applied may vary from the project designated treatment if the selected practices, including land use change, would accomplish the project purpose of protecting the land for sustained agricultural production. The per-acre cost share of the selected practices would not exceed the cost share of the practices designated by the project.

Operation and maintenance costs are the responsibility of the individual land user who agrees to apply the practices according to the long-term contract between the land user and the SCS. Upon completion of the contract, the land user is expected to continue the operation and maintenance through an agreement with the Delta County Soil and Water Conservation District.

Purpose and Summary

The recommended plan is alternative 2. Purpose of the plan is to reduce the loss of the productive capacity of the soil resource base and to provide for sustained agricultural production. The project will reduce erosion to an acceptable level. The plan consists of accelerated conservation treatment on 4,400 acres of eroding cropland. Project installation period is 8 years: 5 years to install the practices and 3 additional years of technical assistance to assure that proper operation and maintenance are performed according to the contractual agreements.

Plan Elements

The existing Agricultural Stabilization and Conservation Service (ASCS) cost-sharing programs will be unaffected by the actions of this watershed plan. Accelerated land treatment funds provided by this plan will be used to supplement the ongoing program.

Project funds will be made available to provide 12.25 staff years for technical assistance for conservation planning and/or application. Additional funds will be available for cost sharing to install conservation practices. Table 1 lists the acres to be treated and the source of funding. The project map (Appendix A) shows the location of the areas where project treatment will be applied. Specific locations of identified treatment areas eligible for cost-share assistance are on file in the local SCS field office. Technical and financial assistance funds provided by this project will be used only on identified treatment areas. The land users' participation in the project is voluntary and he/she makes the final decision on land use and practices to be installed.

Cropland resource management systems will be planned on-site with the land user. Incremental analysis studies show the degree that management practices and enduring practices will reduce the erosion and change net income. The management practices which proved to be environmentally preferable are conservation cropping systems, contour farming, and crop

residue use. These practices will be used in combination with the enduring practice of terracing. Where necessary to convey the concentrated water flow to a stable grade, grassed waterways may be used. In addition, where necessary because of an unstable outlet, a grade stabilization structure will be installed.

Mitigation Features

SCS planning activities for protecting and preserving cultural resources will be in accordance with the Programmatic Memorandum of Agreement with the Advisory Council on Historic Preservation. The procedures published in the SCS General Manual, Title 420, Part 401, will be followed. In addition, impact areas of grade stabilization structures will be evaluated by SCS prior to construction to determine if cultural resources may exist. If found, significant resources will be avoided whenever practical or feasible, or significant data will be recovered prior to construction disturbance.

Permits and Compliance

Proposed project action is covered by Section 404 of the Clean Water Act nationwide permit that authorizes discharge of dredged or fill material in non-tidal streams that are located above the headwaters.

Installation of planned land treatment measures will be on a voluntary basis by individual landowners with Federal cost-sharing. No individual measure involves the placement of dredged or fill material in the waters of the United States above the headwaters in excess of the area specified in COE regulations for special authorization under Section 404. If any individual landowner has planned land treatment measures that impact the area subject to regulation in excess of 1.0 acre, the landowner will be advised to seek a determination from the COE for compliance with Section 404 prior to SCS participation.

No other Federal permits are required for project action.

Costs

Total project cost is \$717,040, of which \$155,000 will be borne by local funds and \$562,040 by PL 566 funds. The local funds are comprised of cost of installing the conservation practices. The PL 566 funds consist of \$287,840 for cost-share payment for land treatment practices applied and \$274,200 for technical assistance (Table 1). All costs reflect the 1985 price base.

Operation and maintenance cost averages \$2,280 annually (Table 2).

Operation is the administration and management needed to keep a completed conservation practice safe and functioning as planned.

Maintenance includes preventing deterioration of applied conservation practices and repairing damage to, or replacement of, the practice if one or more of its components fail. Repairing damages to completed practices caused by normal deterioration, drought, rainfall in excess of design rainfall, or vandalism is considered maintenance.

The PL 566 cost-share rate will be 65 percent. The average cost or other approved cost-sharing methods will be used to determine payment per practice. Cost-share payments to land users will be made by SCS after a planned eligible practice in the contract has been completed and certified. Payment will be based on cost-share documents prescribed by SCS. Participants must file a claim to SCS for payment.

Installation and Financing

Project practices have been planned and funds scheduled to be obligated during a 5-year period. Technical assistance is included for an additional 3 years to maintain contracts still in effect. The following table estimates annual obligations for the 8-year installation period:

SCHEDULE OF OBLIGATIONS

Year :	Element :	PL 566 Funds :	Other Funds :	Total Other :
		(dollars)	(dollars)	(dollars)
1st	Land Treatment	44,530	24,000	68,530
	Technical Assistance	21,550	0	21,550
	Subtotal	66,080	24,000	90,080
2nd	Land Treatment	81,070	43,650	124,720
	Technical Assistance	38,250	0	38,250
	Subtotal	119,320	43,650	162,970
3rd	Land Treatment	86,200	46,410	132,610
	Technical Assistance	66,800	0	66,800
	Subtotal	153,000	46,410	199,410
4th	Land Treatment	50,830	27,370	78,200
	Technical Assistance	66,800	0	66,800
	Subtotal	117,630	27,370	145,000
5th	Land Treatment	25,210	13,570	38,780
	Technical Assistance	33,400	0	33,400
	Subtotal	58,610	13,570	72,180
6th	Land Treatment	0	0	0
	Technical Assistance	23,700	0	23,700
	Subtotal	23,700	0	23,700
7th	Land Treatment	0	0	0
	Technical Assistance	11,850	0	11,850
	Subtotal	11,850	0	11,850
8th	Land Treatment	0	0	0
	Technical Assistance	11,850	0	11,850
	Subtotal	11,850	0	11,850
GRAND TOTAL		562,040	155,000	717,040

Responsibilities

Land treatment, itemized in Table 1, will be established during the project installation period by land users in cooperation with the Delta County Soil and Water Conservation District. The district will arrange for meetings to promote installation of conservation practices.

Land users will be responsible for making all necessary arrangements to assure land treatment work is started and completed in accordance with the installation schedule of the conservation plan of operations.

Technical assistance will be provided by SCS to plan and apply conservation practices.

Contracting

Conservation practices will be established during the 8-year installation period by means of long-term contracts between the SCS and participants on the land they own or control. Cost-sharing is to be based on eligible conservation practices in this plan. The conservation plan will be used as a basis for developing the long-term contract to solve identified problems. The plan is to include a combination of conservation practices that, when installed, will provide the treatment required to solve the identified problems to the degree needed to meet the objectives of the project. Funding limitations and formulation of the contracts will follow the guidance in the SCS General Manual which is in existence at the time the contract is written.

The land user will decide which resource management system to apply in accordance with Field Office Technical Guides. Alternative practices, including land use changes, may be selected by the land user, but the cost share will be based on the lesser of: (1) The amount paid for the practices actually applied; or (2) The amount which would have been paid for the recommended practices in the selected plan.

Cultural Resources

The conservation practices that are to be installed by this planned action are classified as nonproject undertakings. They fall under the procedures outlined under Section 401.6 of "SCS Policy and Procedures for Protecting Archeological and Historic Properties (Cultural Resources)," as published in the SCS General Manual, Title 420, Part 401. If significant cultural resources are discovered during construction, they will be handled in accordance with Section 401.8(b), "Nonproject Construction."

Financing

Federal assistance will be provided under authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress, 68 Stat. 666), as amended. The other funds will be provided by land users or operators.

Federal assistance is subject to the appropriation of funds for the application of project practices.

Noncost-shared management practices, such as crop residue use, contour farming, and conservation cropping systems, will be required as a condition to cost-shared assistance for other practices to achieve project objectives. Noncost-shared management practices will be installed concurrently with cost-shared enduring practices.

Operation and Maintenance

The land user will be responsible for operation and maintenance (O&M) of installed practices. O&M requires effort and expenditures throughout the life of the practice to maintain safe conditions and assure proper functioning.

The O&M will be documented in the conservation plan of operations. The cooperator must agree to a conservation plan of operations (long-term

Attachment 1

Maps

Attachment 2

Photographs

Attachment 1

Maps

Attachment 2

Photographs

contract) which provides adequate and sound arrangements for proper operation, prompt and appropriate performance of needed maintenance, and financing the costs of operation and maintenance. The cooperators should carry out the provisions of the agreed-to plan in a manner consistent with the spirit, intent, and purpose of the plan and project. The conservation plan file should reflect the actions required and taken. After termination of the long-term contract, the cooperator is expected to continue the O&M requirements for practices in the same manner as prescribed for other conservation practices covered by the district agreement. Requirements for O&M will be incorporated in the cooperator's conservation plan of operations.

Representatives of the Delta County Soil and Water Conservation District will periodically inspect the conservation practices. Following expiration of the long-term contract, the district will encourage land users to perform needed maintenance, replace damaged measures, and to plan and install new measures to maintain an adequate level of protection. Special maintenance may be necessary to repair damage from unusual storms.

TABLE 1 - ESTIMATED INSTALLATION COST¹
(Dollars)

Installation Cost Item	Unit	Number	PL 566 Funds	Other Funds	Total
Land Treatment Accelerated					
Evaluation Unit A	acres	3,025	152,110	81,900	234,010
Evaluation Unit B	acres	1,375	135,730	73,100	208,830
Subtotal			287,840	155,000	442,840
Technical Assistance SCS	staff years	12.25	274,200	0	274,200
TOTAL PROJECT			562,040	155,000	717,040

¹Price Base: 1985

December 1986

TABLE 2 - ANNUALIZED ADVERSE NED EFFECTS
 Big Creek (Delta County)¹ Watershed, Texas
 (Dollars)

Evaluation Unit	: Amortization of Installation Cost	: Operation and Maintenance Cost	: Total
A	30,130	1,420	31,550
B	21,140	860	22,000
TOTAL	51,270	2,280	53,550

¹ Price Base: 1985 discounted and annualized at 8.625 percent for 33 years.

December 1986

TABLE 3 - COMPARISON OF NED BENEFITS AND COSTS
 Big Creek (Delta County) Watershed, Texas
 (Dollars)¹

Evaluation Unit	Total Annualized Benefits	Annualized Cost ²	Benefit-Cost Ratio
A	44,150	31,550	1.4:1.00
B	22,000	22,000	1.0:1.00
TOTAL	66,150	53,550	1.2:1.00

¹ Price Base: 1985 and current normalized prices (November 1985) for agricultural commodities.

² From Table 2

December 1986

EFFECTS OF RECOMMENOEED PLAN

General Effects

This section describes the economic, environmental, and social effects of the recommended plan. Only those factors that received either a high or medium significance rating in the "Concerns Section" are discussed in this section.

The total cost of the project is shown on Table 1. The ratio of average annual benefits to the annual cost is 1.2:1.0.

A description of the project impacts is presented below. Appropriate baseline data have been included to establish needed perspective. Areas of impact believed to be of key importance to decision making are summarized for the alternatives in the "Summary and Comparison of Candidate Plans."

Land Management

The recommended plan consists of an accelerated conservation program with funds for technical assistance to apply management practices such as contour farming, crop residue use, and conservation cropping systems. Technical and financial assistance is provided to apply enduring practices for excess water disposal.

It was determined by interviews that about 55 percent of the land users with 4,400 acres of cropland would participate in this project.

Application of the management practices will improve the tilth, add organic matter to the surface layer, increase the soil's water and nutrient holding capacity, and help to prevent erosion. The water disposal systems, when installed and maintained in conjunction with the management practices, will reduce soil erosion to an acceptable level.

The project will have a long-term impact on land management in the watershed by protecting the soil resource base and providing for continued crop production capacity. It is expected that with the project the reduction of cropland will be less than future without project. In addition, a larger area of abandoned cropland will be planted to improved pastureland. The following table shows the present, expected future without project, and future with project land use:

<u>Land Use</u>	<u>Present</u> (acres)	<u>Future</u> <u>Without Project</u> (acres)	<u>Future</u> <u>With Project</u> (acres)
Cropland	10,300	8,500	9,000
Pastureland	9,120	9,500	9,840
Native Grassland	1,970	3,340	2,500
Other	750	800	800

Installation of the water disposal systems will require 88 acres of cropland to be used for waterways. These acres will be vegetated and may be used for hay production.

The following table shows the expected effect of the project on crop yields. The figures reflect the production from a typical acre identified as having an erosion problem and after treatment by project measures.

YIELD AND MONETARY VALUE PER ACRE

Crop	Unit	Present Yield	Future Yield		Annual Monetary		Annual Monetary		Total Monetary Effect of Project (dollars)
			Without Project	With Project	Damage Due to Loss of Productive Capacity	Value of Increased Productive Capacity	Loss of Productive Capacity (dollars)	Value of Increased Productive Capacity (dollars)	
Cotton	lb.	281	265	309	8.64	15.12	23.76		
Grain Sorghum	cwt	32	29	35	13.35	13.44	26.79		
Wheat	bu.	33	30	36	10.47	10.64	21.11		

Erosion and Sedimentation

Application of the planned management and enduring practices will significantly reduce erosion and the related sedimentation in the watershed. The effects will be primarily on the 4,400 acres expected to be treated. This is 55 percent of the 8,000 acres identified as needing treatment.

The table on page 13 shows the erosion rates on the problem area (8,000 acres). The rates shown are for future (25-year) conditions without project action.

The following table shows the erosion rates for each type of erosion and the acres to be treated by project action. These rates and acres are for future (25-year) conditions with project action.

EROSION RATES AND ACRES AFFECTED
(Average Annual Erosion - Tons Per Acre)

Erosion Type	Future Without Project		Future with Project	
	Total Acres	Erosion Rate	Treated Acres	Untreated Acres
	Total Acres	Erosion Rate	Total Acres	Total Erosion Rate
<u>Perennial Gully Erosion</u> <u>Voided Area</u> Evaluation Unit A Evaluation Unit B	20	45.0	11	9
	40	120.0	22	18
	60	77.0	33*	27**
<u>Ephemeral Gully Erosion</u> <u>Depleted Area</u> Evaluation Unit A Evaluation Unit B	200	118.0	110	90
	90	118.0	50	40
	290	118.0	160	130
Depreciated Area Evaluation Unit A Evaluation Unit B	(400)***	35.0	(220)***	(180)***
	(175)***	35.0	(96)***	(79)***
	(575)***	35.0	(316)***	(259)***
<u>Sheet-Rill Erosion</u> Evaluation Unit A Evaluation Unit B	5,280	11.6	2,904	2,376
	2,370	11.8	1,303	1,067
	7,650	11.7	4,207	3,443
Total Evaluation Unit A Evaluation Unit B	5,500	18.2	3,025	2,475
	2,560	19.2	1,375	1,125
	8,060	18.5	4,400	3,600

*Includes 19 acres of gullied land that is to be treated and will be eroding at a reduced rate and 14 acres of other land that treatment will prevent from becoming gullied.

**Includes 16 acres of untreated gullied land and 11 acres of new gullies that will develop on untreated land.

***Depreciated area acres included in sheet-rill acreage. Depreciated area subjected to "cultural erosion" and "sheet rill" erosion.

Prime Farmland Soils

Assessments of the watershed show that about 7,200 acres of the land identified as needing treatment are classified as prime farmland soils. Without the technical and financial assistance that will be provided by this project, this land will continue to erode at a high rate.

About 4,000 acres of this prime farmland will be protected for future use.

Social and Cultural

The project is expected to create 21 person-years of employment during the installation period. The employment will be related to the construction of 929,280 feet of terraces, 88 acres of waterways, and 13 grade stabilization structures. The economic condition of this agricultural community will be stimulated by this project. This project will benefit and affect minorities and non-minorities alike.

CONSULTATION AND PUBLIC PARTICIPATION

Planning for this watershed began as a result of interest and a need recognized by local land users. A number of public meetings and informational meetings have been held during the project development period.

Additional meetings have been held with the project sponsor and individual land users to provide information on progress of the project plan development.

Comments will be requested from the following agencies and organizations:

- (1) Office of the Governor
- (2) Texas State Soil and Water Conservation Board
- (3) Ark-Tex Council of Governments
- (4) Environmental Protection Agency - Regional office

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The technical review plan was reviewed and concurred in by state staff specialists having responsibility for administrative services, engineering, soils, agronomy, biology, economics, and geology.

INDEX

	<u>Page</u>
- A -	
Acres benefited	4
ACP	20, 25
Agricultural Stabilization Conservation Service (ASCS)	20, 45, 47
Air quality	21
Alternatives	26, 29, 39, 40, 42, 43, 45, 47, 53
American peregrine falcon	2, 24
Archeological resources	21, 24
Arctic peregrine falcon	2, 24
Area	
Depleted	10, 13, 14, 43, 67, 69
Depreciated	9, 10, 13, 14, 43, 67, 69
Problem	2, 3, 9, 40, 67
Treatment	1, 2, 9, 11, 22, 26, 40, 47
Voided	9, 10, 13, 43, 67, 69
Watershed	2, 6

Assistance

Financial

i, iii, iv,
20, 25, 40, 42, 47, 63

Technical

i, iii, 4, 25, 40, 42
45, 47, 48, 49, 51, 53, 57, 63

- B -

Bald eagle

2, 24

Benefits

4, 35, 37
40, 42, 43, 61, 63

- C -

Candidate plans

i, 1

Civil rights

iv

Climate

6

Conservation cropping systems

i, 1, 3, 29, 31, 33
35, 37, 40, 46, 47, 54, 63

Conservation practices

iii, 1, 12, 20
40, 46, 53, 54, 55

Conservation tillage

29, 31, 33, 35, 37

Contour farming

i, 1, 3, 29, 31, 33
35, 37, 40, 46, 47, 54, 63

Costs	i, iii, 4, 29, 35, 37 40, 43, 46, 48, 51, 53, 57, 59, 61, 63
Cost share (sharing)	iii, 40, 46, 47, 48, 49, 53, 54
Crop residue use	i, 1, 3, 29, 31, 33 35, 37, 40, 46, 47, 54, 63
Cultural erosion	10, 69
Cultural resources	2, 48, 54

- E -

Effects	40, 41, 43, 63, 64
ELT-4-T1	29
Employment	40, 71
Endangered species	2, 21, 24
Enduring practices	i, iii, 1, 3 40, 43, 47, 48, 54, 63
Ephemeral gully	9, 10, 28, 31 33, 35, 37, 43, 69
ERCON4A	29
Erosion	1, 3, 4, 7, 8, 9, 10 11, 12, 13, 14, 15, 21, 25, 26, 27 28, 29, 31, 33, 35, 37, 39, 43, 63, 67, 69
Evaluation period	1

Evaluation unit 11, 12, 31, 33, 35, 37, 46, 57, 59, 61, 69

- F -

Farm units

Number 2, 6

Size 2, 6

Farmers Home Administration 45

Fish and wildlife 2, 21, 23, 24

Floodwater damages 21

Forecasted conditions 25, 39

- G -

Geologic formations 6, 7

Grade stabilization structures i, 1, 3, 29
37, 40, 46, 48, 71

- I -

Impacts i, 4, 8, 4, 63, 64

Incremental analysis 29, 31, 33, 35, 37, 47

Installation period 45, 49, 51, 53

Interior least tern 2, 24

Inventory 20, 26

- L -

Land ownership 2

Landscape Architecture Rating Elements 3, 24

Land use 2, 4, 6, 7, 8, 20, 26, 46, 64

Long-term contracts iii, iv, 53, 54, 55

Location of watershed 6

- M -

Major Land Resource Area 6, 22

Management practices i, 1, 3, 40, 47, 53, 63

Measures 27, 28, 55

Meetings 20, 71

Mineral resources 21

Minorities 71

Mitigation features 48

- N -

National Economic Development 26, 29, 42, 43, 45, 61

Now time damage	11, 35, 37
- 0 -	
Operation and maintenance	iii, 35, 37, 40 46, 48, 49, 54, 55, 59
- P -	
Participation rate	40, 45, 63
Perennial gullies	1, 9, 10, 12, 13, 28, 31, 33, 35, 37, 69
Permits	48
Plan(s)	
Candidate	i, 1
Recommended	i, 1, 45, 46, 63
Plant resources	22
Population	6
Prime Farmland	2, 4, 21, 22, 40, 41, 71
Problem(s)	3, 7, 8, 20, 25
Project	
Measures	3, 27, 28, 55
Purpose	3, 5, 47

- R -

Risk and uncertainty 45

- S -

Schedule of obligations 51

Scoping 20, 21, 26

Sediment/Sedimentation 20, 21, 22, 28, 67

Sheet-rill 9, 10, 13, 14, 15, 28
29, 31, 33, 35, 37, 69

Soils 6, 7, 11, 12, 22

Terrace(s) i, 1, 3, 20, 29, 31
33, 35, 37, 40, 46, 47, 71

- U -

Universal Soil Loss Equation (USLE) 29

- V -

Vegetation 22, 23

Visual resources 3, 8, 21, 24, 41

- W -

Water disposal systems i, 9, 63, 64

Water quality 22

Watershed

Area

2, 6

Location

6

Waterways

i, 1, 3, 29

31, 33, 40, 46, 47, 64, 71

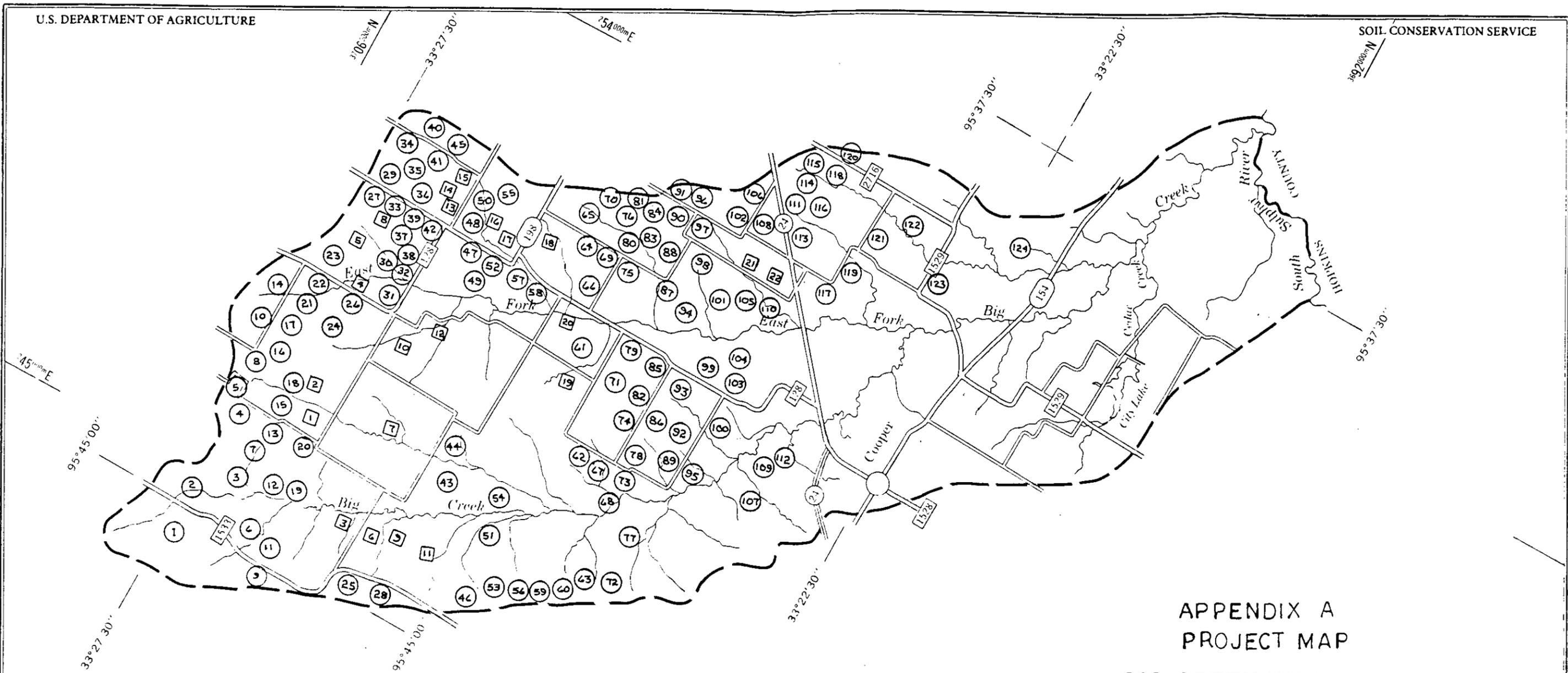
Wetlands

21, 23

- Y -

Yields

8, 10, 11, 29, 64, 65

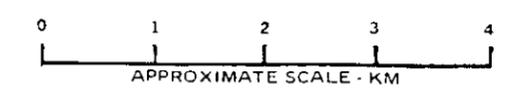


APPENDIX A
PROJECT MAP
BIG CREEK WATERSHED
DELTA COUNTY, TEXAS

- LEGEND
- STATE HIGHWAY
 - FARM ROAD
 - PRIMARY ROAD
 - SECONDARY ROAD
 - DIVIDED HIGHWAY
 - TOWN
 - CEMETERY
 - DRAINAGE
 - WATERSHED BOUNDARY
 - TREATMENT AREA IN EVALUATION UNIT "A"
 - TREATMENT AREA IN EVALUATION UNIT "B"



VICINITY MAP



BASE COMPILED FROM USGS QUADANGLE SHEETS AND GENERAL HIGHWAY MAP. POLYCONIC PROJECTION.

UNIVERSAL TRANSVERSE MERCATOR GRID TICKS, ZONE 15.