

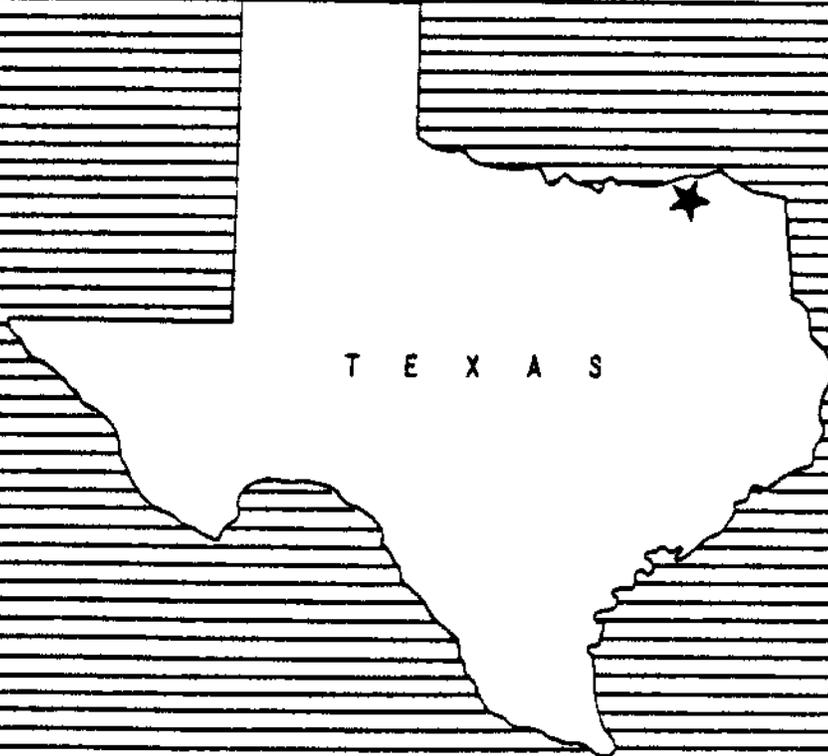
SUPPLEMENTAL PLAN NO. II

FOR WATERSHED PROTECTION AND FLOOD PREVENTION

PINE CREEK

WATERSHED

LAMAR COUNTY, TEXAS



T E X A S

JULY 1981

SUPPLEMENTAL WATERSHED PLAN NO. II

FOR

PINE CREEK WATERSHED

Lamar County, Texas

July 1981

SUPPLEMENTAL WATERSHED PLAN AGREEMENT NO. II

Between the

Lamar Soil and Water Conservation District
Local Organization

Lamar County Water Control and Improvement District Number 3
Local Organization

Lamar County Commissioners Court
Local Organization

City of Paris
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 Watershed Plan Agreement for Pine Creek Watershed, State of Texas, executed by the Sponsoring Local Organization named therein and the Service, became effective on the 6th day of March, 1964; and

Whereas, the Supplemental Watershed Plan Agreement No. I executed by the Sponsoring Local Organization named therein and the Service became effective on the 11th day of August, 1971; and

Whereas, in order to carry out the watershed plan, as supplemented, for said watershed, it has become necessary to modify said Watershed Plan Agreement, as supplemented; and

Whereas, it has become necessary to modify the watershed plan, as supplemented, by: deleting floodwater retarding structures Nos. 2, 4, and 19, adding the modification of Lake Crook to create floodwater detention capacity, including the installation of fish and wildlife facilities for Lake Crook, deleting 12.44 miles of channel work, and modifying 4 grade stabilization structures to stabilize the eroding side inlets on the reach where channel work was deleted; and

Whereas, a Supplemental Watershed Plan No. II, which modifies the Watershed Plan dated November 1962, as supplemented, for said watershed, has been developed through the cooperative efforts of the Sponsoring Local Organization and the Service, which plan is annexed to and made a part of this agreement;

Now, therefore, the Sponsoring Local Organization and the Service hereby agree upon the following modifications to the terms, conditions, and stipulations of said Watershed Plan Agreement, as supplemented:

1. The City of Paris, Texas hereby agrees to become one of the local organizations sponsoring said watershed project.
2. Paragraph numbered 1 is modified to read as follows:

The Sponsoring Local Organization will acquire without cost to the Federal Government such land rights as will be needed in connection with the works of improvement. (Estimated cost \$591,650.)

3. Paragraph numbered 3 in the Watershed Plan Agreement is modified to read as follows:

The percentages of construction cost of structural measures to be paid by the Sponsoring Local Organization and by the Service are as follows:

<u>Works of Improvement</u>	<u>Sponsoring Local Organization</u> (percent)	<u>Service</u> (percent)	<u>Estimated Construction Cost</u> (dollars)
Lake Crook Modification	0	100	116,500
Basic Fish and Wildlife Facilities	50	50	51,600
15 Floodwater Retarding Structures	0	100	1,207,910
7.06 miles of Channel Work	0	100	388,930
4 Grade Stabilization Structures	0	100	290,650

4. Paragraph numbered 4 in the Watershed Plan Agreement is modified to read as follows:

The percentages of the engineering costs to be borne by the Sponsoring Local Organization and the Service are as follows:

<u>Works of Improvement</u>	<u>Sponsoring Local Organization</u> (percent)	<u>Service</u> (percent)	<u>Estimated Engineering Cost</u> (dollars)
Lake Crook Modification	0	100	12,820
Basic Fish and Wildlife Facilities	100	0	5,160
15 Floodwater Retarding Structures	0	100	207,580
7.06 miles of Channel Work	0	100	38,160
4 Grade Stabilization Structures	0	100	40,680

5. Paragraph numbered 5 in the Watershed Plan is modified to read as follows:

The Sponsoring Local Organization and the Service will each bear the costs of Project Administration which it incurs, estimated to be \$15,560 and \$520,130 respectively, for the total project installation.

6. The Sponsoring Local Organization and the Service further agree to all other terms, conditions, and stipulations of said Watershed Plan, as supplemented, not modified herein.

Lamar Soil and Water
Conservation District
Local Organization
1745-B Ballard Drive
Paris, TX 75460
Address Zip Code

By Alfred C. Marking
Title Chairman
Date 10-13-82

The signing of this agreement was authorized by a resolution of the governing body of the Lamar Soil and Water Conservation District adopted at a meeting held on October 13, 1982

Tom Watson
Secretary, Local Organization

1745-B Ballard Drive
Paris, TX 75460
Address Zip Code

Date 10-13-82

Lamar County Water Control and Improvement District Number 3

Local Organization

1745-B Ballard Drive
Paris, Texas 75460
Address Zip Code

By Ralph Glaser
Title President
Date 9-28-82

The signing of this agreement was authorized by a resolution of the governing body of the Lamar County Water Control and Improvement District Number 3

adopted at a meeting held on September 28, 1982

J. Eldon Tance
Secretary, Local Organization
Date 9-28-82

1745-B Ballard Drive
Paris, Texas 75460
Address Zip Code

Lamar County Commissioners Court
Local Organization

119 N. Main Paris, Tx 75460
Address Zip Code

By Lyndy Fisher
Title County Judge
Date July 9, 1984

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

adopted at a meeting held on July 9, 1984

Margaret Cochran
Secretary, Local Organization
Date July 9, 1984

119 N. Main Paris, Tx 75460
Address Zip Code

City of Paris
Local Organization

By Joe Graham
Title Joe Graham,
Mayor

P O Box 1037, Paris, TX 75460
Address Zip Code

Date July 9, 1984

The signing of this agreement was authorized by a resolution of the governing body of the City of Paris

adopted at a meeting held on July 9, 1984

H. C. Greene

PO Box 1037, Paris, TX 75460
Address Zip Code

Date H. C. Greene, City Clerk
July 9, 1984

Soil Conservation Service
United States Department of Agriculture

Approved by: [Signature]
State Conservationist

AUG 31 1984
Date

SUPPLEMENTAL
WATERSHED PLAN NO. II
FOR
WATERSHED PROTECTION AND FLOOD PREVENTION

PINE CREEK WATERSHED
Lamar County, Texas

Prepared Under the Authority of the Watershed
Protection and Flood Prevention Act, (Public Law
566, 83rd Congress, 68 Stat. 666), As Amended.

Prepared By:

Lamar Soil and Water Conservation District

Lamar County Water Control and Improvement District Number 3

Lamar County Commissioners Court

City of Paris, Texas

With Assistance By:

U.S. Department of Agriculture
Soil Conservation Service
July 1981

PREFACE

The supplemental watershed plan has been briefed to avoid excessive duplication with similar information presented in the Environmental Impact Statement. The Environmental Impact Statement should be reviewed for pertinent information regarding the planned project, environmental setting, water and related land resource problems, environmental impacts, project alternatives, and the irreversible and irretrievable commitment of resources.

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SUPPLEMENTAL
WATERSHED PLAN NO. II

PINE CREEK WATERSHED
Lamar County, Texas

July 1981

PURPOSE OF THE SUPPLEMENTAL WATERSHED PLAN

It has become necessary to modify the watershed plan, as supplemented, for Pine Creek watershed in order to: delete floodwater retarding structures Nos. 2, 4, and 19; modify Lake Crook, an existing reservoir, to convert 2,481 acre-feet of conservation storage to floodwater detention storage and add fish and wildlife development; delete the 12.44 miles of remaining channel work; and modify 4 grade stabilization structures planned on the reach where channel work was deleted.

The following are changes and modifications made in appropriate parts of the watershed plan.

WORKS OF IMPROVEMENT TO BE INSTALLED

The supplemental watershed plan provides for modifying Lake Crook to provide floodwater detention storage. Lake Crook is located on Pine Creek approximately one mile above U. S. Highway 271. The total drainage area of the structure is 53.06 square miles and the uncontrolled drainage area is 31.45 square miles. The existing structure has a concrete chute spillway with a 300-foot crest length and provides for a maximum depth of flow of 10 feet. Mean sea level crest elevation of the chute spillway is 476.0 feet, providing a total storage capacity of 9,288 acre-feet.

In 1962, when the watershed plan was being formulated, Lake Crook was being used as a municipal water supply for the city of Paris and water from the reservoir was being used regularly. This water usage provided floodwater detention capacity in the reservoir averaging approximately 0.6 inch runoff, or 1,698 acre-feet. This capacity was used in project formulation and evaluation.

At present, the city of Paris obtains its water supply from Pat Mayse reservoir, which is located outside the watershed project boundaries. Consequently, Lake Crook is only a standby water supply and the reservoir provides no effective floodwater detention capacity.

To maintain the same level of floodwater detention capacity below Lake Crook that was provided in the original watershed plan with floodwater retarding structures Nos. 1A, 2, 3, 4, and 5 and the incidental flood capacity in Lake Crook, it will require 2,481 acre-feet of floodwater detention capacity in Lake Crook in conjunction with floodwater retarding structures Nos. 1A, 3, and 5.

Preliminary investigations revealed that the dam at Lake Crook can be modified to adequately provide the required 2,481 acre-feet of detention

capacity. The modification will be accomplished by installing a principal spillway with a crest elevation of 473.5 feet mean sea level. This will lower the pool 2.5 feet, and decrease the surface area by 205 acres.

The combination of principal spillway capacity and retarding storage will result in the emergency spillway having a 78 percent chance of use. The principal spillway will be a drop inlet type employing a 48-inch diameter conduit with a discharge at maximum stage of 290 c.f.s.

With structures Nos. 1A, 3, and 5 installed upstream, the existing chute spillway is adequate to pass the class "b" freeboard hydrograph storm without overtopping the dam elevation of 486.0 feet mean sea level. Therefore, no modification to the chute spillway will be required.

The modification of Lake Crook to create floodwater detention capacity will require the lake to be partially drained. This operation will be performed at a time best suited for the establishment of a cover crop, such as Japanese millet, on the exposed bottom. (See Appendix A for list of common and scientific names of plants.) This measure will be beneficial to fish and wildlife by providing a source of organic matter which will precipitate suspended and colloidal sediment. Presently this sediment is the major limiting factor to the fisheries management of Lake Crook. This measure should be repeated periodically as needed or as indicated by turbidity conditions. To facilitate this, gated ports will be installed in the principal spillway so that the pool can be dewatered to elevation 466.0 feet. These ports will have sufficient capacity to lower the water surface from the crest of the principal spillway at elevation 473.5 feet to elevation 466.0 feet in 15 days. Lowering the permanent pool 2.5 feet will expose the shoreline. This area will be vegetated during the installation of the principal spillway to protect the exposed shoreline from wave action and erosion.

The cost of the initial plantings made during construction, along with the cost of the gated ports, will be borne by Public Law 566 construction funds for modifying Lake Crook. These measures are included to mitigate the loss of 205 acres of fish and wildlife water resource base caused by the lowering of the permanent pool in order to create detention capacity. Through the utilization of the drawdown facilities to periodically lower the lake and make plantings, the city of Paris can substantially increase the quality of the fish and wildlife habitat of Lake Crook.

Lake Crook will be maintained by the city of Paris as a standby water supply. This supply at the conservation pool level will have a total capacity of 6,807 acre-feet and a surface area of 890 acres. The conservation pool will also be utilized by the city as a fish and wildlife pool.

The city of Paris owns 1,870 acres of land above the fish and wildlife pool elevation of Lake Crook and this will be used as the basic fish and wildlife facility area.

Basic fish and wildlife facilities will be installed in association with Lake Crook's modification. Kinds and numbers of facilities to be installed are shown in revised table 2B. All facilities in which PL 566 cost-sharing is involved will be designed and constructed to assure accessibility and usability by physically handicapped people in accordance with Public Law 90-480.

The supplemental watershed plan also provides for the deletion of the remaining channel work. The downstream 7.06 miles of channel work is constructed.

The 4 grade stabilization structures are needed to stabilize the eroding side inlets to Pine Creek in evaluation reaches 3A and 3. Structure Nos. 101 and 102 are rock riprap grade structures and Nos. 103 and 104 are concrete chutes. These structures stabilize the inlets by eliminating excessive grade and conveying design discharges at non-erosive velocities. The modification of the design of these structures has been necessitated by the deletion of the channel work at their outlets. The existing outlet capacity is not as great nor as stable, and this had to be taken into consideration in the structural redesign.

The Soil Conservation Service contracted with North Texas State University, Institute of Applied Sciences, to perform an archeological survey of the watershed. Their survey disclosed that installation of the project measures will not affect any archeological resources that are eligible for nomination to the National Register of Historic Places.

The Service will keep the Secretary of the Interior informed through the Director, Southwest Region, National Park Service, of the construction schedule, as required by Public Law 86-523. The Secretary will be similarly notified if any archeological materials are found during construction.

EXPLANATION OF INSTALLATION COSTS

The total estimated installation cost of the structural measures, as supplemented, is \$3,487,330, of which Public Law 566 costs will be \$2,849,160 and the local share will be \$638,170.

Public Law 566 costs include \$2,029,790 for construction, of which \$14,360 is for mitigation measures; \$299,240 for engineering services; and \$520,130 for project administration.

The local costs consist of \$25,800 for construction, \$5,160 for engineering services provided by the City of Paris planning staff, \$591,650 for land rights, and \$15,560 for project administration. The local costs for project administration include sponsors' costs relative to contract administration, overhead, and organization costs and whatever construction inspection they desire to make at their own expense.

The local costs for land rights do not include any cost for the areas involved in the Lake Crook modification and fish and wildlife facilities to be installed on property owned and operated by the City of Paris.

The estimated schedule of obligations for the 5-year installation period, covering installation of the structural measures and related mitigation measures, is as follows:

Schedule of Obligations				
Fiscal:		: Public Law:	Other	:
Year :	Measures	: 566 Funds :	Funds	: Total
		(dollars)	(dollars)	(dollars)
1st	Floodwater Retarding Structure No. 1A	284,920	175,900	460,820
2nd	Lake Crook Modification	147,580	500	148,080
3rd	Grade Stabilization Structure Nos. 101 through 104	381,170	16,810	397,980
4th	Floodwater Retarding Structure No. 11	318,220	126,250	444,470
5th	Fish and Wildlife Facilities	34,350	35,520	69,870

EFFECTS OF WORKS OF IMPROVEMENT

The modification of Lake Crook will provide the same reduction of floodwater, sediment, and flood plain erosion damages below the lake as the project did when it included floodwater retarding structures Nos. 2 and 4. The total cost of installation, including project administration, for Lake Crook's modification is \$148,080 compared to the updated total cost for floodwater retarding structures Nos. 2 and 4 of \$533,400.

Modification of Lake Crook will result in the loss of about 205 surface acres of poor quality reservoir fishery. However, planned mitigation and management measures will not only offset this loss but will result in a substantial net increase in the total value of the fishery.

The installation of fish and wildlife facilities is expected to increase the utilization of Lake Crook from the present 5,475 fishing-days to 9,125 fishing-days.

Without floodwater retarding structure No. 2, the average annual acres flooded on Pine Creek above Lake Crook, evaluation reach 4, will be 1,817 acres instead of 1,341 acres. Without floodwater retarding structure No. 4, the average annual acres flooded on Little Pine Creek above Lake Crook, evaluation reach 5, will be 787 acres instead of 738 acres. Without floodwater retarding structure No. 19, the average annual acres flooded on Pine Creek from the confluence of Morans Branch downstream to

the Red River, evaluation reaches 1 and 2, will be 599 acres instead of 270 acres. Without the 12.44 miles of channel work, the average annual acres flooded in evaluation reaches 3A and 3, will be 8,636 acres instead of 3,498 acres. Floodwater retarding structures Nos. 2, 4, and 19 required 145 acres for sediment pools; additional areas would also have been required for the dam and spillway construction and maintenance.

The installation of the remaining channel work required easements on 486 acres of land. A maximum of 262 acres of woody vegetation, 174 acres of pastureland, 38 acres of existing stream, and 12 acres of cropland would have been within the constructed channel or spoil placement.

The four grade stabilization structures furnish a stable outlet for 14,785 acres. These structures will require 23.7 acres of land for the construction of the structural components and their related embankments. Another 40.5 acres are required for temporary storage of runoff for three of the structures.

The two remaining floodwater retarding structures will require 38 acres of land for construction of the dams and emergency spillways and 126 acres for inundation by water impounded in the sediment pools. Another 783 acres of land in the detention pools will be subject to temporary inundation by floodwaters in the detention pools. The land in the detention pools can continue to be used in the present uses for open pastureland and wooded pastureland. The dams and emergency spillways will be revegetated to grassy vegetation and will have use for restricted grazing and forage production. Water impounded in the sediment pools will provide 126 acres of surface water having potential value for fishery resources and use by waterfowl. The extent of value will depend upon management given to the bodies of water.

PROJECT BENEFITS

The estimated average annual flood damage (table 5) will be reduced from \$610,850 to \$231,712, or 62 percent. Crop and pasture damages will be reduced from \$440,011 to \$146,260, or 67 percent. Other agricultural damage, such as loss of fences, farming equipment, livestock, and other property, will be reduced from \$64,610 to \$28,203, or 66 percent. Road and bridge damage will be reduced from \$17,902 to \$12,661, or 29 percent. Swamping damage on flood plain soils, now occurring at the rate of \$25,028 annually, will be reduced to \$19,223 or 23 percent. Flood plain scour damages will be reduced from \$554 to \$47, or 92 percent.

The average annual benefits from reduction in floodwater, sediment, flood plain erosion and indirect damages are estimated to be \$379,138. The estimated annual benefits expected to result from installation of fish and wildlife facilities are estimated to be \$15,060. Total estimated average annual benefits accruing to structural measures are \$394,198.

COMPARISON OF BENEFITS AND COSTS

The total average annual 1980 base cost of structural measures (amortized total installation and project administration cost plus average annual operation and maintenance costs) is \$199,662. These measures are expected to produce average annual primary benefits of \$394,198. The benefit-cost ratio is 2.0:1.0 (table 6).

PROJECT INSTALLATION

The installation period for the structural measures to be installed will be 5 years. The general sequence of installation is shown under the estimated schedule of obligations, "Explanation of Installation Costs."

In designing the Lake Crook modification, floodwater retarding structures Nos. 1A, 3, and 5 were assumed to be installed. Therefore, the unconstructed structure No. 1A will be installed prior to the Lake Crook modification.

The city of Paris will utilize its planning staff for preparation of design of the basic fish and wildlife facilities. The Soil Conservation Service will assist in the general layout and make inspections to insure that the facilities are installed as planned.

The sponsoring local organization has requested the Soil Conservation Service to advertise, award, and administer the contracts.

FINANCING PROJECT INSTALLATION

Funds for the local share of the cost of installation of the Lake Crook modification and fish and wildlife facilities will be provided by the city of Paris. The city has the required funds for this undertaking; these funds were obtained through the city's existing revenues.

PROVISIONS FOR OPERATION AND MAINTENANCE

The estimated annual operation and maintenance cost is \$3,000 for the floodwater retarding structures, \$3,140 for the channel work, and \$800 for the grade stabilization structures. The Lamar County Water Control and Improvement District No. 3 and the Lamar County Commissioners Court will be responsible for operation and maintenance of the 15 floodwater retarding structures, 7.06 miles of channel work, and the 4 grade stabilization structures.

The estimated annual operation and maintenance cost is \$1,020 for Lake Crook and related mitigation measures, and \$1,910 for the fish and wildlife facilities. The City of Paris will be responsible for operation and maintenance of the Lake Crook modification, the fish and wildlife facilities, and all mitigation measures installed on city property.

The Texas Parks and Wildlife Department, at the request of and along with the city of Paris, will make joint inspections of Lake Crook. The Texas Parks and Wildlife Department has agreed to furnish technical assistance on the management of the lake and in determining the frequency of drawdown and plantings required to reduce turbidity to an acceptable level.

Lake Crook and the fish and wildlife facilities will be inspected by representatives of the City of Paris after unusually severe floods, or in the event of other unusual conditions that may adversely affect the works of improvement, for three years following installation of each structure. A Soil Conservation Service representative will participate in these inspections at least annually. Inspection after the third year will be made annually by the city of Paris. The Soil Conservation Service will participate in annual inspections as often as it elects to do so after the third year.

REVISED TABLE 1 - ESTIMATED PROJECT INSTALLATION COST

Pine Creek Watershed, Texas

Installation Cost Item	Number	Federal Funds		Estimated Cost (Dollars) 1/		Total
		Non-	Fed. Land	Non-	Other	
Build	Fed. Land	SCS	Total	Fed. Land	SCS	Total
Land Treatment						
Land Areas 2/	-	-	95,070	95,070	1,447,400	1,541,270
STRUCTURAL MEASURES						
Construction						
Floodwater Retarding Structures	No. 15		1,787,160	1,787,160	553,630	2,140,790
Lake Creek Modification	No. 1		147,580	147,580	500	148,080
Flab and Whittle Facilities	No. 1	34,350		34,350	35,520	69,870
Channel Work (N) 4/	7.06	498,900		498,900	31,710	530,610
Grade Stabilization Structure	No. 4		381,170	381,170	16,810	397,980
TOTAL STRUCTURAL MEASURES			2,849,160	2,849,160	638,170	3,487,130
TOTAL PROJECT			2,945,030	2,945,030	2,085,570	5,010,610

1/ Price base: Actual cost for measures constructed and under construction; 1980 prices for structural measures not constructed.
 2/ Federal agency responsible for assisting in installation of works of improvement.
 3/ Planned land treatment completed.
 4/ Type of channel project to project: (N) - an unmodified, well defined natural channel or stream.

REVISED TABLE 2 - ESTIMATED STRUCTURAL COST DISTRIBUTION
 Pine Creek Watershed, Texas
 (Dollars)

Item	Installation Cost	PC 566 Funds	Installation Cost		Other Funds		Total		
			Project	Total	Project	Administrative			
Construction Engineering: Administration:	PC 566	Construction: Engineering:	Land	Rights	Administrative:	Other	Cost		
STRUCTURAL HEADLINES NOT CONSTRUCTED									
Floodwater Retarding Structures Nos. 4, 5, 7, 8, 9A, 10, 12, 11, 13, 15, 16, 17, 18, and 7.06 miles of Channel Work	1,111,420	206,680	175,720	1,682,920	-	275,690	7,500	283,190	1,966,110
STRUCTURAL HEADLINES NOT CONSTRUCTED									
Floodwater Retarding Structures Nos. 1A, 11	216,170	18,760	32,010	284,920	-	175,400	500	175,900	460,820
Lake Creek Modification Floodwater Retarding Structure Fish and Wildlife Project	261,550	20,920	35,750	318,220	-	125,750	500	126,250	444,470
Grade Stabilization Structures Nos. 101	116,500	12,820	18,260	147,580	-	-	500	500	148,080
102	25,800	-	8,550	34,350	25,800	5,160	6,560	35,520	69,870
103	109,410	12,750	17,490	139,650	-	1,730	500	2,230	141,880
104	99,160	12,080	16,100	127,220	-	3,680	500	4,180	131,400
	55,960	9,510	10,290	75,750	-	7,450	500	7,950	83,700
	26,240	6,350	5,960	38,550	-	1,950	500	2,450	41,000
LEAD TOTAL	2,429,790	299,240	520,130	2,849,160	25,800	5,160	15,560	638,170	1,487,340

1/ Price Based: Actual cost for structural measures constructed and under construction; 1980 prices for structural measures not constructed.
 2/ Type of channel before project: (R) - an unmodified well-defined natural channel or stream.

REVISER TABLE ZA - COST ALLOCATION AND COST SHARING SUMMARY

Pine Creek Watershed, Texas

(dollars) ^{1/}

Item	COST ALLOCATION			COST SHARING		
	PURPOSE			PL 566		
	Flood	Fish and Wildlife	Total	Flood	Fish and Wildlife	Total
Grade Stabilization Structures						
Construction	290,650	-	290,650	290,650	-	290,650
Engineering	40,680	-	40,680	40,680	-	40,680
Land Rights	14,810	-	14,810	-	14,810	14,810
Project Admin.	51,860	-	51,860	49,860	-	49,860
Subtotal	397,990	-	397,990	381,170	-	381,170
Floodwater Retarding Structures						
Construction	1,324,410	-	1,324,410	1,324,410	-	1,324,410
Engineering	220,400	-	220,400	220,400	-	220,400
Land Rights	546,130	-	546,130	-	546,130	546,130
Project Admin.	197,930	-	197,930	389,930	-	389,930
Subtotal	2,488,870	-	2,488,870	1,934,740	-	1,934,740
Fish and Wildlife						
Construction	-	51,600	51,600	-	25,800	25,800
Engineering	-	5,160	5,160	-	-	5,160
Project Admin.	-	13,110	13,110	-	8,550	8,550
Subtotal	-	69,870	69,870	-	34,350	34,350
Channel Work						
Construction	388,930	-	388,930	388,930	-	388,930
Engineering	38,160	-	38,160	38,160	-	38,160
Land Rights	30,710	-	30,710	-	30,710	30,710
Project Admin.	72,810	-	72,810	71,810	-	71,810
Subtotal	530,610	-	530,610	498,900	-	498,900
GRAND TOTAL	1,617,600	69,870	3,687,330	2,814,810	34,350	2,849,160
				607,650		35,520
						618,170

1/ Price Based. Actual cost for measures constructed and under construction; 1980 prices for structural measures not constructed.
 2/ includes cost for Lake Clark's modification to install floodwater detention storage.

REVISED TABLE 2B - FISH AND WILDLIFE FACILITIES -- ESTIMATED CONSTRUCTION COSTS

Pine Creek Watershed, Texas

(Dollars)^{1/},

Item	Number ^{2/}	Estimated Unit Cost	Estimated Total Construction Cost
Fishing Pier	1 (900 Sq. Ft.)	19,800.00	19,800.00
Entrance Sign	1	350.00	350.00
Comfort Station (2x2 flush type w/septic system)	1 (200 Sq. Ft.)	10,480.00	10,480.00
Water Line	375 Ft.	2.32	870.00
Pole Mounted Lights	6	300.00	1,800.00
Electric Service Line	2,500 Ft.	.92	2,300.00
Access Road Improvement (gravel surface)	2,500 Ft.	6.40	16,000.00
GRAND TOTAL			51,600.00

^{1/} Price Base: 1980

^{2/} Estimated quantity, subject to minor variation at time of detailed planning, with the exception of the fishing pier and comfort station.

December 1980

REVISED TABLE 3 - STRUCTURAL DATA
DAMS WITH PLANNED STORAGE CAPACITY

Pine Creek Watershed, Texas

Item	Unit	Structure Name Lake Crook
Class of Structure		B
Seismic Zone		1
Uncontrolled Drainage Area	Sq. Mi.	21.81
Controlled Drainage Area	Sq. Mi.	31.45
Total Drainage Area	Sq. Mi.	53.06
Runoff Curve No. (1-Day) (AMC II)		81
Time of Concentration (T_c)	Hr.	1.92
Elevation Top of Dam	Ft.	486.0
Elevation Crest of Emergency Spillway	Ft.	476.0
Elevation Crest High Stage Inlet	Ft.	473.5
Emergency Spillway Type		Concrete Chuta
Emergency Spillway Bottom Width	Ft.	300
Emergency Spillway Exit Slope	Ft./Ft.	-
Maximum Height of Dam	Ft.	34
Volume of Fill	Cu. Yd.	$\frac{1}{-}$
Total Capacity $\frac{2}{-}$	Ac. Ft.	9,288
Sediment Submerged	Ac. Ft.	-
Sediment Aerated	Ac. Ft.	-
Water Supply	Ac. Ft.	$\frac{3}{-}$ 6,807
Floodwater Retarding	Ac. Ft.	2,481
Surface Area		
Sediment Pool $\frac{2}{-}$	Acre	-
Water Supply Pool	Acre	890
Floodwater Retarding Pool $\frac{1}{-}$	Acre	1,095
Principal Spillway Design		
Rainfall Volume (1-Day)	In.	2.75
Rainfall Volume (10-Day)	In.	5.00
Runoff Volume (10-Day)	In.	1.73
Capacity of High Stage (Maximum)	C.F.S.	290
Dimensions of Conduit	In.	48
Frequency Operation - Emergency Spillway	% Chance	78.0
Emergency Spillway Hydrograph		
Rainfall Volume	In.	3.28
Runoff Volume	In.	6.10
Storm Duration	Hr.	6
Velocity of Flow (V_s)	Ft./Sec.	9.9
Maximum Reservoir Water Surface Elevation	Ft.	480.5
Freeboard Hydrograph		
Rainfall Volume	In.	11.11
Runoff Volume	In.	11.63
Storm Duration	Hr.	6
Maximum Reservoir Water Surface Elevation	Ft.	484.6
Capacity Equivalents		
Sediment Volume	In.	-
Floodwater Retarding Volume	In.	1.46

$\frac{1}{-}$ No additional fill to existing dam. Addition of principal spillway only.
 $\frac{2}{-}$ Crest of emergency spillway.
 $\frac{3}{-}$ Includes anticipated sediment.

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REVISED TABLE 3B - STRUCTURAL DATA

GRADE STABILIZATION STRUCTURES
Pine Creek Watershed, Texas

								Estimated	
								Volumes	
								Rock	
Structure	Drainage	Design	Design	Type	Bottom	Width	Fall	Riprap	Concrete
No.	(Ac.)	(cfs)	% Chance	Structure	(Ft.)	(Ft.)		Cu. Yds.	Cu. Yds.
101	13,480	2,115	45.	Rock Riprap Chute	6.5	6.5		5,430	-
102	<u>1/</u> 307	1,550	100.	Rock Riprap Chute	12	11.0		4,270	-
103	550	656	4.	Concrete Chute	6	10		-	50
104	448	656	5.	Concrete Chute	6	10		-	50

1/ Out-of-bank flow from Pine Creek is included in the design discharge and frequency.

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REVISED TABLE 4 - ANNUAL COST

Pine Creek Watershed, Texas

(Dollars)^{1/}

Evaluation Unit	: Installation : Cost ^{2/}	: Operation, : Maintenance, : and : Replacement : Cost	: Total
Floodwater Retarding Structures Nos. 1A, 3, 5, 7, 8, 9A, 10, 11, 12, 13, 14, 15, 16, 17, and 18, 7.06 miles of Channel Work, Grade Stabilization Structures Nos. 101 through 104, Lake Crook Modifica- tion, and Basic Fish and Wildlife Facilities	189,792	9,870	199,662
GRAND TOTAL	189,792	^{3/} 9,870	199,662

^{1/} Price base: Actual costs for measures constructed and under construction as shown in tables 1 and 2 were updated to 1980 prices.

^{2/} Floodwater retarding structures Nos. 1A and 9A, Lake Crook modification, and basic fish and wildlife support facilities amortized at 3-1/4 percent interest rate for 100 years. All other floodwater retarding structures amortized at 2-7/8 percent interest rate for 100 years. Channel work and the grade stabilization structures amortized at 2-7/8 percent interest rate for 100 years.

^{3/} Includes \$1,910 for operation, maintenance, and replacement of the fish and wildlife facilities.

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REVISED TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

Pine Creek Watershed, Texas

(Dollars)^{1/}

Item	: Estimated Average Annual Damage :		: Damage Reduction ^{2/} Benefits :
	: Without Project :	: With Project :	
Floodwater			
Crop and Pasture	440,011	146,200	293,811
Other Agricultural	64,610	28,203	36,407
Nonagricultural	17,902	12,661	5,241
Subtotal	522,523	187,604	335,459
Sediment			
Swamping	25,028	19,223	5,805
Reservoirs	7,214	4,313	2,901
Subtotal	32,242	23,536	8,706
Erosion			
Flood Plain Scour	554	47	507
Indirect	55,531	21,065	34,466
TOTAL	610,850	231,712	379,138

^{1/} Price base: Current normalized prices (October 1979) for agricultural damages and current prices (1979) for non-agricultural damages.

^{2/} Excludes effects of accelerated land treatment measures.

December 1980

REVISED TABLE 6 - COMPARISON OF BENEFITS AND COSTS

Pine Creek Watershed, Texas

(Dollars)

Evaluation Unit	: <u>AVERAGE ANNUAL BENEFITS</u> ^{1/}			: Average :	
	: Damage Reduction :	: Fish and Wildlife :	: Total :	: Annual Cost :	: Benefit-Cost Ratio :
	: <u>2/</u>	: Wildlife:	: Total	: <u>3/</u>	: Ratio
Floodwater Retarding Structures Nos. 1A, 3, 5, 7, 8, 9A, 10 through 18; Grade Stabilization Structures Nos. 101, 102, 103, and 104; 7.06 miles of Channel Work; Lake Crook Modification; and Basic Fish and Wildlife Facilities	379,138	15,060	394,198	199,662	2.0:1.0
GRAND TOTAL	379,138	15,060	394,198	199,662	2.0:1.0

1/ Price base: Current normalized price levels (October 1979) for agricultural damages and current (1979) for non-agricultural damages

2/ From table 5

3/ From table 4

July 1981