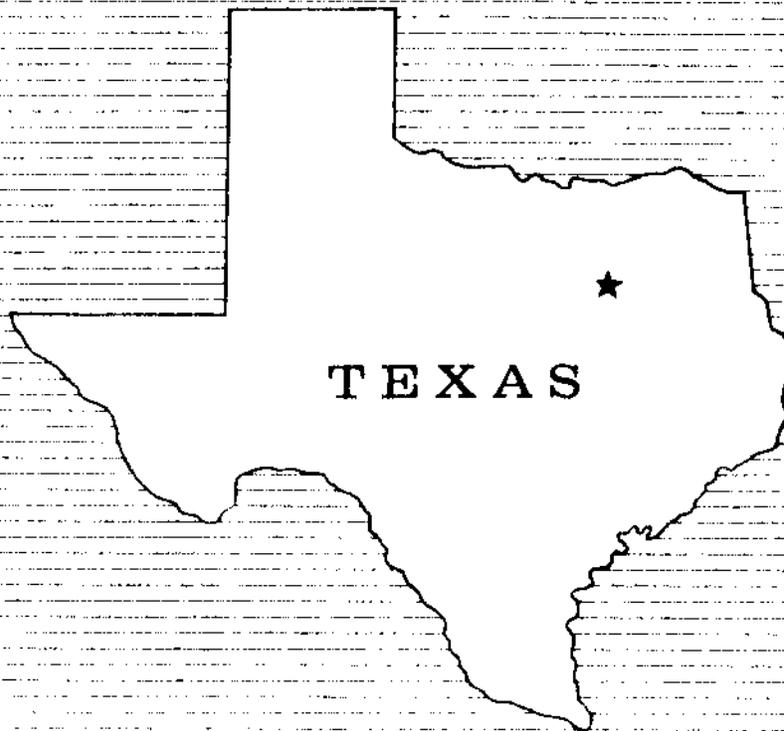


SUPPLEMENTAL WATERSHED PLAN NO. IV  
FOR WATERSHED PROTECTION AND FLOOD PREVENTION

**CEDAR CREEK WATERSHED  
OF THE TRINITY RIVER WATERSHED**

ROCKWALL, KAUFMAN, VAN ZANDT, HENDERSON AND HUNT  
COUNTIES, TEXAS



SUPPLEMENTAL WATERSHED PLAN NO. IV

CEDAR CREEK WATERSHED  
of the  
Trinity River Watershed  
Rockwall, Kaufman, Van Zandt, Henderson, and Hunt Counties, Texas

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

Prepared By:

Kaufman-Van Zandt Soil and Water Conservation District  
Trinity-Neches Soil and Water Conservation District  
Henderson County Commissioners Court  
Kaufman County Commissioners Court  
Van Zandt County Commissioners Court  
Rockwall County Commissioners Court  
City of Kaufman  
City of Terrell  
Texas Parks and Wildlife Department

With Assistance By:

U. S. Department of Agriculture  
Soil Conservation Service

In Cooperation With

U. S. Department of the Interior  
Fish and Wildlife Service

August 1979

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SUPPLEMENTAL WATERSHED PLAN AGREEMENT NO. IV

Between the

Kaufman-Van Zandt Soil and Water Conservation District  
Local Organization

Trinity-Neches Soil and Water Conservation District  
Local Organization

Henderson County Commissioners Court  
Local Organization

Kaufman County Commissioners Court  
Local Organization

Van Zandt County Commissioners Court  
Local Organization

Rockwall County Commissioners Court  
Local Organization

City of Kaufman  
Local Organization

City of Terrell  
Local Organization

Texas Parks and Wildlife Department  
Local Organization

(hereinafter referred to as the Sponsoring Local Organizations)

State of Texas

and the

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

Whereas, the Watershed Plan Agreement for Cedar Creek Watershed, Trinity River Watershed, State of Texas, executed by the Sponsoring Local Organizations named therein and the Service, became effective on the 23rd day of May 1961; and

Whereas, the Supplemental Watershed Plan Agreement for Cedar Creek Watershed, Trinity River Watershed, State of Texas, executed by the Sponsoring Local Organizations named therein and the Service, became effective on the 27th day of April 1965; and

Whereas, the Supplemental Watershed Plan Agreement No. II for said watershed, executed by the Sponsoring Local Organizations named therein and the Service, became effective on the 28th day of January 1972; and

Whereas, the Supplemental Watershed Plan Agreement No. III for said watershed, executed by the Sponsoring Local Organizations named therein and the Service, became effective on the 17th day of May 1978; 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 structure No. 143 and adding multiple-purpose structure No. 143A including basic recreational facilities; and

Whereas, a Supplemental Watershed Plan No. IV, which modifies the Watershed Plan dated October 1960, as supplemented, for said watershed, has been developed through the cooperative efforts of the Sponsoring Local Organizations and the Service, which plan is annexed to and made a part of this agreement;

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

1. The Texas Parks and Wildlife Department agrees to become one of the sponsoring organizations of the said watershed project (hereinafter referred to as the Department).
2. The Sponsoring Local Organizations will acquire such land rights as will be needed in connection with the works of improvement. The percentages of this cost to be borne by the Sponsoring Local Organizations and the Service are as follows:

<u>Works of Improvement</u>	<u>Sponsoring Local Organizations</u> (percent)	<u>Service</u> (percent)	<u>Estimated Land Rights Cost</u> (dollars)
Multiple-Purpose Structure No. 143A and Basic Recreational Facilities			
Payment to Landowners for About 1,270 Acres	50.00	50.00	1,144,000
Land Appraisal Fees	50.00	50.00	43,000
Costs of Alteration or Modification of Improvements	50.00	50.00	600,000
Legal Fees, Flowage Easements, Survey Costs, and Others	100.00	0.00	20,500
Floodwater Retarding Structure No. 144	100.00	0.00	78,000

The Sponsoring Local Organizations agree that all land acquired or improved with Public Law 534 financial or credit assistance will not be sold or otherwise disposed of for the evaluated life of the project except to a public agency which will continue to maintain and operate the development in accordance with the operation and maintenance agreement.

- The Sponsoring Local Organizations will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to State law as may be needed in the installation and operation of the works of improvement (estimated cost \$1,900).
- The percentages of construction costs of structural measures to be paid by the Sponsoring Local Organizations and by the Service are as follows:

<u>Works of Improvement</u>	<u>Sponsoring Local Organizations</u> (percent)	<u>Service</u> (percent)	<u>Estimated Construction Cost</u> (dollars)
Multiple-Purpose Structure No. 143A	27.12	72.88	512,200
Basic Recreational Facilities			
Concession Building	93.27	6.73	73,500
All Other Facilities	50.00	50.00	2,281,980
Floodwater Retarding Structure No. 144	0.00	100.00	209,140
Fish Management Improvements	100.00	0.00	23,000

5. The Department will provide a portion of its share of the cost of installing the basic recreational facilities by using its forces to install and construct partly or wholly several of the items. The quantity and value of such work will be determined by mutual agreement immediately prior to the signing of the project agreement and will be set forth in the agreement.
6. The percentages of the engineering costs to be borne by the Sponsoring Local Organizations and the Service are as follows:

<u>Works of Improvement</u>	<u>Sponsoring Local Organizations</u> (percent)	<u>Service</u> (percent)	<u>Estimated Engineering Cost</u> (dollars)
Floodwater Retarding Structure No. 144	0.00	100.00	18,820
Multiple-Purpose Structure No. 143A	0.00	100.00	64,900
Basic Recreational Facilities			
Concession Building	93.27	6.73	6,860
All Other Facilities	50.00	50.00	215,640

7. The Sponsoring Local Organizations and the Service will each bear the costs of project administration which it incurs, estimated to be \$10,250 and \$415,730, respectively, for the project installation.
8. The Department will be responsible for the operation and maintenance of multiple-purpose structure No. 143A and the recreational facilities by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.
9. The costs shown in this supplemental watershed plan represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.
10. This agreement is not a fund obligating document. Financial and other assistance to be furnished by the Service in carrying out the plan is contingent upon the fulfillment of applicable laws and regulations and the availability of appropriations for this purpose.
11. A separate agreement will be entered into between the Service and the Department 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.

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

Kaufman-Van Zandt Soil and  
Water Conservation District  
Local Organization

By Frank Springer  
Title Chairman  
Date 6/1/79

Rt. 1, Rockwall, Tex. 75087  
Address Zip Code

The signing of this agreement was authorized by a resolution of the governing body of the Kaufman-Van Zandt Soil and Water Conservation District

adopted at a meeting held on June 11, 1979

Jack Mallory  
Secretary, Local Organization

P.O. Box 135, Canton, Tex. 75103  
Address Zip Code

Date 6/1/79

Trinity-Neches Soil and Water  
Conservation District  
Local Organization

By J. H. Huff

Title District Director

BWL311, Athens, TX 75701  
Address Zip Code

Date 7-3-79

The signing of this agreement was authorized by a resolution of the governing  
body of the Trinity-Neches Soil and Water Conservation District

adopted at a meeting held on July 3, 1979

R. J. Pass  
Secretary, Local Organization

BWL311, Athens, TX 75701  
Address Zip Code

Date 7-3-79

Henderson County Commissioners Court  
Local Organization

By Winston Bryan

Title County Judge

Courthouse, Athens, TX 75751  
Address Zip Code

Date 6-25-79

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

adopted at a meeting held on 6-25-79

J. D. [Signature]  
Secretary, Local Organization  
County Clerk

Courthouse, Athens, TX 75751  
Address Zip Code

Date 6-25-79



Rockwall County Commissioners Court  
Local Organization

Courthouse  
Rockwall, TX 75087  
Address Zip Code

By Dwight Wimpee  
Title County Judge  
Date 7-23-79

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

adopted at a meeting held on July 23, 1979

Jane Wimpee  
Secretary, Local Organization  
Date 7-23-79

Courthouse  
Rockwall, TX 75087  
Address Zip Code

City of Kaufman  
Local Organization  
112 S. Jackson  
Kaufman, Texas 75142  
Address Zip Code

By Roy E Nelson  
Title Mayor  
Date June 13, 1979

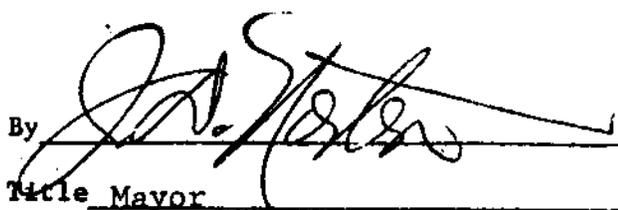
The signing of this agreement was authorized by a resolution of the governing body of the City of Kaufman

adopted at a meeting held on 6-11-79

Birchuth Keith  
Secretary, Local Organization  
Date June 13, 1979

112 S. Jackson Kaufman Texas 75142  
Address Zip Code

City of Terrell  
Local Organization

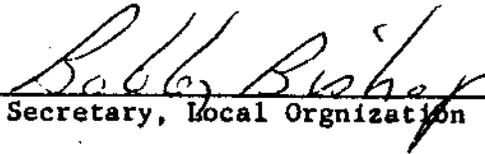
By   
Title Mayor

P.O. Box 310, Terrell, Texas 75160  
Address Zip Code

Date July 10, 1979

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

adopted at a meeting held on July 10, 1979

  
Secretary, Local Organization

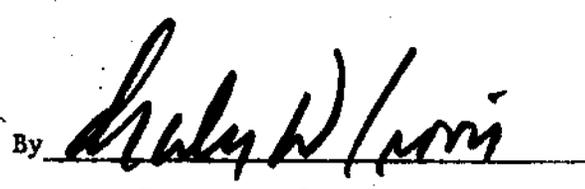
P.O. Box 310, Terrell, Texas 75160  
Address Zip Code

Date July 10, 1979

Texas Parks and Wildlife Department  
Local Organization

4200 Smith School Road  
Austin, Texas 78744

Address Zip Code

By   
Title Executive Director

Date AUG 22 1979

The signing of this agreement was authorized by a resolution of the governing body of the Texas Parks and Wildlife Department

adopted at a meeting held on September 1, 1978

Not Applicable

Secretary, Local Organization

Date Not Applicable

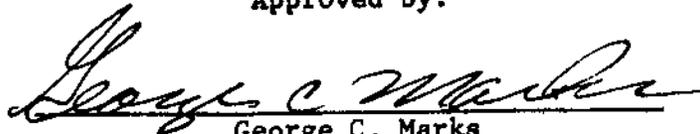
Not Applicable

Address

Zip Code

Soil Conservation Service  
United States Department of Agriculture

Approved by:



George C. Marks  
State Conservationist

8-27-79

Date

SUPPLEMENTAL WATERSHED PLAN NO. IV

Cedar Creek Watershed  
of the  
Trinity River Watershed  
Rockwall, Kaufman, Van Zandt, Henderson, and Hunt Counties, Texas  
August 1979

PURPOSE OF THE SUPPLEMENTAL WATERSHED PLAN

This supplemental watershed plan pertains only to the South Twin Creek portion of Cedar Creek watershed. The South Twin Creek portion is noted as Construction Unit No. 28 and described as an independent unit in the Cedar Creek Watershed Plan dated October 1960.

The purpose of this supplemental watershed plan is to make the following modifications:

1. Add multiple-purpose structure No. 143A. The site for this structure is located on Purtis Creek approximately two miles downstream of Farm-to-Market Road No. 316.
2. Delete planned floodwater retarding structure No. 143. The site for this structure is located on Purtis Creek in the southern part of Kaufman County and approximately 1,000 feet upstream of Farm-to-Market Road No. 316. Purtis Creek is a tributary of South Twin Creek. With the addition of multiple-purpose structure No. 143A, floodwater retarding structure No. 143 is not needed.
3. Include basic recreational facilities as a part of the structural measures. The facilities for recreational use will be installed at selected sites adjacent to the recreation pool of multiple-purpose structure No. 143A.
4. Add the Texas Parks and Wildlife Department, State of Texas, as a sponsor of the Cedar Creek watershed project.
5. Modify the South Twin Creek portion of the watershed plan to reflect current criteria and terminology relative to engineering and project administration costs.
6. Update costs to 1978 price levels for floodwater retarding structure No. 144.

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

## PLANNED PROJECT

### Structural Measures

Supplemental watershed plan No. IV provides for the deletion of planned floodwater retarding structure No. 143; the addition of multiple-purpose structure No. 143A; and the addition of basic recreational facilities.

The site for multiple-purpose structure No. 143A is located on Purdis Creek approximately two miles downstream of Farm-to-Market Road No. 316 and three miles north of Eustace, Texas. Structures Nos. 143A and 144 will provide flood protection to the flood plains of Purdis Creek and South Twin Creek. The structures will control runoff from 19.87 square miles of the drainage area of South Twin Creek and its tributaries. The two structures will provide a capacity of 491 acre-feet for sediment accumulation and 5,081 acre-feet for floodwater. Multiple-purpose structure No. 143A will also provide a capacity of 3,558 acre-feet for recreational purposes. Multiple-purpose structure No. 143A will create a lake of 354 surface acres.

The location of the sites for floodwater retarding structure No. 144 and multiple-purpose structure No. 143A is shown on public recreation development map (Appendix C).

The floodwater retarding and multiple-purpose structures will be earthen dams incorporating a drop inlet principal spillway. The principal spillways will control the storage of sediment and recreation water as applicable and automatically permit the controlled evacuation of detained floodwater. The emergency spillway for each structure will be an excavated channel around the end of the embankment. The emergency spillways, embankments, and disturbed areas will be vegetated to control erosion and provide wildlife food and cover.

Basic recreational facilities will be installed or developed at selected sites adjacent to the recreation pool of structure No. 143A. This recreational development will be named the Purdis Creek State Park. The facilities to be installed for recreational use include multi-purpose campsites, tent campsites, screened shelters, boat docks, fishing piers, playgrounds, picnic sites, access trails, boat ramp, and fish cleaning tables. Support facilities that will be installed include an entrance portal, a visitor control and first aid station, park signs, parking, roads, restrooms, and utility systems for water, electricity, and sewage. All the facilities will be of high quality, long life, and low maintenance design. Materials, where practical, will be of an organic nature and color to blend with the natural aspects of the park site. A complete list of facilities to be installed with cost-sharing Public Law 534 funds is shown in table 2B.

Fish management improvements will be installed at a suitable site within the proposed park. These improvements consist of a system of rearing ponds for game fish for stocking the recreation pool to maintain optimum fishing conditions.

Recreational facilities will be equipped to meet the standards and specifications prescribed by Article 678g, Vernon's Annotated Civil Statutes, and applicable federal regulations for the construction of public facilities in the State of Texas usable by the physically handicapped and disabled citizens.

Installation of multiple-purpose structure No. 143A and structure No. 144 will require the modification of a 28-inch fuel pipeline that will be affected by the recreation pool and detention pools.

The geology of the structure sites consists of poorly consolidated sands and clays. Silty and gravelly calcareous clays and sands occur in the foundations and in the upstream flood plains which will likely be the primary source for embankment materials. Some isolated thin lenses of lignite occur at moderate depths in the flood plain.

The emergency spillways will be excavated in abutments consisting of soils varying from sandy clays to clayey sands. Depths of cut will vary up to 9 feet with all excavations being made in nonconsolidated materials.

Plasticity indexes of the embankment materials and the materials in the abutments will average between 7 to 10, with indexes for some clay soils being as high as 15.

Under present conditions, no displacements of persons, farm operations, or businesses will occur as a result of installing the project measures on South Twin Creek. In the event that displacements do occur, necessary relocations will be carried out under the provisions of Public Law 91-646, Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

#### INSTALLATION COSTS - MONETARY

The total installation cost of the structural measures on South Twin Creek is estimated to be \$5,720,490. Public Law 534 costs are \$3,229,610 and local costs are \$2,491,880.

Estimated Public Law 534 costs for the planned structural measures covered by this supplement include \$1,728,380 for construction, \$192,000 for engineering services, \$415,730 for project administration, and \$893,500 for land rights. The estimated cost of land rights includes \$572,000 for land to be acquired in fee simple title, \$300,000 for modification of a pipeline, and \$21,500 for land appraisal fees.

The estimated local costs for the planned structural measures covered by this supplement include \$1,371,440 for construction, which includes the fish management improvements, \$116,290 for engineering services, \$992,000 for land rights, \$1,900 for water rights, and \$10,250 for project administration. The estimated cost of land rights includes \$11,000 for legal fees, \$649,500 for value of land and easements, \$310,000 for modification of a pipeline, and \$21,500 for land appraisal fees.

The local costs for project administration include sponsors' costs relative to contract administration, overhead and organization costs, and cost of construction inspections they desire to make.

The construction cost includes the engineer's estimate and a 10 percent allowance for contingencies. The engineer's estimate was made by determining the amount or quantity of specific items that will be needed for construction of each individual structure. Such items include, but are not limited to, land clearing, embankment fill, excavation, concrete pipe, concrete, fencing, rock riprap, and vegetation. The unit cost for the specific items was based on actual cost of structural measures in similar areas modified to conditions found in this watershed.

Engineering services and project administration costs are based on an analysis of previous work in similar areas. Engineering services costs include, but are not limited to, detailed surveys, geological investigations, laboratory reports, designs, and cartographic services.

Federal costs for project administration include the costs of construction inspection, contract administration, and maintenance of Soil Conservation Service records and accounts.

Value of land, easements, and rights-of-way was estimated by representatives of the local sponsors and concurred in by the Soil Conservation Service.

Joint construction and engineering services costs for multiple-purpose structure No. 143A were allocated to purpose by the Use of Facilities method as follows:

<u>Purpose</u>	<u>Acre-Feet</u>	<u>Percentages</u>
Flood Prevention	<u>1/ 3,002</u>	45.76
Recreation	<u>3,558</u>	<u>54.24</u>
Total	6,560	100.00

1/ Includes 239 acre-feet of sediment storage.

All costs of land, flood easements, legal fees, and modification and replacement of improvements were allocated to project purpose. All costs for the land, appraisal fees, and the modification of the pipeline were allocated to recreation. Public Law 534 funds will bear 50 percent of these costs. The cost of obtaining flood easements on 35 acres of land was allocated to flood prevention. The costs for water rights and legal fees were allocated to recreation. Cost of the installation of the basic recreational facilities was allocated to recreation as a specific purpose cost.

The Service and the Department will share equally the construction cost of the facilities listed on table 2B with the exception of the concession building. Only the restroom portion of this building is eligible for cost-sharing. The Service will bear 6.73 percent and the Department

will bear 93.27 percent of the cost. This percentage is based on that portion of the building which is eligible for cost-sharing. The Service and the Department will share equally the cost of the eligible portion, but the Department will bear the entire cost of the non-eligible part of the building.

The federal share for the modification of the pipeline and appraisal fees will be based on the actual payments made by the sponsors. Cost-sharing for the land to be acquired in fee simple title will be based on actual payments made by the sponsors or the fair market value of the land as jointly agreed to by the sponsors and the Service, whichever is the lesser amount. The sponsors will bear all engineering, legal, and administrative costs incurred for acquiring land and water rights. Refer to the supplemental watershed plan agreement for actual cost-sharing percentages and estimated amounts.

Cost allocation and cost-sharing for all the structural measures included in the supplemental watershed plan are shown in table 2A.

Estimated construction costs of the basic recreational facilities are shown in table 2B.

In the event that displacements of persons, farm operations, or businesses do occur, all associated relocation costs will be shared, with flood prevention funds providing 40.44 percent and local funds providing 59.56 percent, as set forth in Supplemental Watershed Plan Agreement No. II, signed January 28, 1972.

#### ECONOMIC BENEFITS

The estimated average annual monetary damages (table 5) within the South Twin Creek watershed will be reduced from \$34,620 to \$8,520, a reduction of 74 percent. Crop and pasture damages will be reduced from \$27,100 to \$6,610, or 76 percent. Other agricultural damages, such as loss of fences, farm equipment, livestock, and other property, will be reduced from \$2,990 to \$900, or 70 percent. Nonagricultural damage to roads and bridges will be reduced from \$920 to \$40, or 98 percent. Flood plain scour damages now averaging \$170 annually will be reduced to \$70, or 59 percent. Damages from overbank deposition of bottomland soils will be reduced from \$290 to \$130, or 55 percent. The number of recreation days is estimated at 119,000 annually. The quality of the park and facilities will be such that the value of the benefits per visitor will be about \$3.15. The total benefits attributable to the recreational development is estimated to be \$374,850 annually.

The estimated average annual monetary benefits, including recreation, will amount to \$400,950 (table 6) while the total annual costs amount to \$319,840, giving a benefit-cost ratio of 1.3:1.0.

## INSTALLATION AND FINANCING

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

The Soil Conservation Service will contract for the construction of floodwater retarding structure No. 144 and multiple-purpose structure No. 143A.

The Service will provide engineering services for preparing construction plans and specifications for multiple-purpose structure No. 143A and floodwater retarding structure No. 144.

The Department, with the concurrence of the Service, will negotiate architectural and engineering contracts with private firms to prepare construction plans and specifications for the basic recreational facilities.

The Service will be the contracting agency to advertise, award, and administer contracts for the materials and installation of the recreational facilities except those the Department, with the concurrence of the Service, may elect to install partly or wholly under force account. Items of work that the Department may want to install by force account are noted on table 2B. The quantity and price for the work that will be performed by force account will be established by negotiation between the Service and the Department and will be included in the project agreement. The Department will receive credit toward its cost-sharing for work so performed.

The local sponsors will provide, with other than Public Law 534 funds, all the land rights needed for the construction of floodwater retarding structure No. 144.

Land rights necessary for the installation of multiple-purpose structure No. 143A and the basic recreational facilities will be arranged for by the Department. Payments for land rights will be shared by the Service and the Department (table 2).

The Department will provide funds for the local sponsors' share of the costs of installing multiple-purpose structure No. 143A and the recreational development. These funds will be made available from state appropriated funds and allocated by the Texas Parks and Wildlife Commission for this development.

Funds for operation, maintenance, and replacement of the recreational facilities and multiple-purpose structure No. 143A will be provided by general revenues of the state and user fees paid by visitors to the park. User fees for the park will be consistent with the standards set by the Department and set forth in the operation and maintenance agreement.

Financial and other assistance to be furnished by the Service is contingent on the appropriation of funds for this purpose. In addition, the following prerequisite conditions will be met before federal funds will be made available for the installation of the structural measures:

1. The requirements for land treatment in the drainage areas above the floodwater retarding structure and multiple-purpose structure have been met.
2. All necessary land and water rights have been obtained for all structural measures, or the sponsors have furnished a written statement to the effect that they have the means of obtaining land rights, and the exact date by which all land rights will have been obtained.
3. Utilities, such as powerlines, telephone lines, and pipelines, have been modified or permits have been granted to inundate the properties involved.
4. Land rights agreements have been executed between the Service and the Texas Parks and Wildlife Department.
5. Project agreements have been executed.
6. Operation and maintenance agreements have been executed with the Texas Parks and Wildlife Department, the Trinity-Neches Soil and Water Conservation District, and the Henderson County Commissioners Court.

No recovery or preservation of cultural values is anticipated. However, if evidence of cultural values is discovered during construction, the Secretary of the Interior will be notified through the field office of the interagency Archeological Services Division in accordance with Section 3 of Public Law 93-291.

#### OPERATION, MAINTENANCE, AND REPLACEMENT

The Department will be responsible for the operation and maintenance of multiple-purpose structure No. 143A and the basic recreational facilities. The Trinity-Neches Soil and Water Conservation District and the Henderson County Commissioners Court will be jointly responsible for the operation and maintenance of floodwater retarding structure No. 144.

Representatives from the Department will inspect the recreational facilities and multiple-purpose structure No. 143A following each major storm, periods of heavy use, or at least monthly. Inspections during the season of heavy usage will be made as often as necessary to prevent deterioration of the facilities and the structure. Representatives of

the Trinity-Neches Soil and Water Conservation District and the Henderson County Commissioners Court will make similar periodic inspections of floodwater retarding structure No. 144. A representative of the Soil Conservation Service will participate in the inspections as often as may be required to assure proper maintenance, but not less than once each year.

The Service will maintain a file of inspection reports and notify the sponsors of improper operation, maintenance, or replacement.

The estimated annual operation, maintenance, and replacement cost is \$86,800 for the two structures and recreational development which includes \$85,600 for operation, maintenance, and replacement of the recreational facilities. The park will be staffed with competent personnel by the Department to assure that proper custodial, policing, sanitation, administrative, and safety services are carried out. Use of the park's resources and facilities will be controlled and limited to reasonable site loads that will preserve the resource and the facilities.

Items of the structures needing maintenance include, but are not limited to, fertilization, control of soil erosion, control of weeds and woody plants, debris removal, and fence repair. Items that may need replacement include fencing and principal spillway components.

Items needing maintenance, repair, or replacement of the recreational facilities include, but are not limited to, boat ramps and docks, fishing piers, picnic tables, screened shelters, fish cleaning tables, multi-use and tent campsites and components, restrooms, water supply systems, and electrical and sanitary systems. Funds generated from user fees will be available to provide for necessary maintenance and replacement, and custodial, policing, and administrative services for the park. Additional funds, if necessary, will come from funds appropriated by the State for this purpose.

Sponsors will control the handling, storage, and application of herbicides and pesticides that may be necessary for operation and maintenance of the structural measures. Only approved and authorized reagents and compounds will be used. These applications will be compatible with current laws regulating their use. In addition to sound and prudent judgment, ordinances and standards concerned with the disposal or storage of unused chemicals, empty containers, contaminated paraphernalia, etc., will be observed and applied.

Provision will be made for free access for representatives of the sponsoring local organizations and for federal representatives to inspect and provide for maintenance of the recreational facilities, structures, and their appurtenances at any time.

Operation and maintenance agreements will be executed by the Texas Parks and Wildlife Department, the Trinity-Neches Soil and Water Conservation District, the Henderson County Commissioners Court, and the Service prior to the signing of project agreements with these sponsors. The

agreement will set forth specific details on procedure in line with recognized assignments of responsibility and will be in accordance with the Texas Watersheds Operation and Maintenance Handbook. An operation and maintenance plan will be prepared for each structure and for the basic recreational facilities.

**REVISED TABLE 1 - ESTIMATED INSTALLATION COST**

Cedar Creek Watershed, Texas  
(Trinity River Watershed)

Installation Cost Item	Unit	Number	Estimated Cost (Dollars) <sup>1/</sup>			Total
			PL 534 Funds		Other Funds	
			Non-	Non-		
			Fed. Land	Fed. Land		
			SCS	SCS		
			2/	2/		
<b>LAND TREATMENT - ACCELERATED</b>						
Land Areas <sup>3/</sup>						
Cropland	Acres To	207,180	-	3,005,570	3,005,570	
Pastureland	Be Protected	367,110	-	8,832,440	8,832,440	
Critical Area Stabilization		3,800	1,474,400	368,600	1,843,000	
Technical Assistance		-	757,450	-	757,450	
<b>TOTAL LAND TREATMENT</b>			<b>2,231,850</b>	<b>12,206,610</b>	<b>14,438,460</b>	
<b>STRUCTURAL MEASURES</b>						
Floodwater Retarding Structures	No.	129	11,759,470	3,263,390	15,022,860	
Multiple-Purpose Structure	No.	3	1,453,610	1,145,660	2,599,270	
Basic Recreational Facilities			1,254,220	1,323,760	2,577,980	
Channel Work (N) <sup>4/</sup>	Mi.	114.7	12,131,660	400,000	12,531,660	
Fish Management Improvements			-	25,070	25,070	
<b>Subtotal</b>			<b>26,598,960</b>	<b>6,157,880</b>	<b>32,756,840</b>	
Project Administration						
Construction Inspection			1,810,780	20,620	1,831,400	
Other			1,891,570	58,980	1,950,550	
<b>Subtotal - Administration</b>			<b>3,702,350</b>	<b>79,600</b>	<b>3,781,950</b>	
<b>TOTAL STRUCTURAL MEASURES</b>			<b>30,301,310</b>	<b>6,237,480</b>	<b>36,538,790</b>	
<b>TOTAL PROJECT</b>			<b>32,533,160</b>	<b>18,444,090</b>	<b>50,977,250</b>	

<sup>1/</sup> Price Base: Actual cost for 75 floodwater retarding and two multiple-purpose structures constructed. The cost for the remaining 54 floodwater retarding structures, one multiple-purpose structure, channel work, basic recreational facilities, fish management improvements, and critical area stabilization at 1978 prices.

<sup>2/</sup> Federal agency responsible for assisting in installation of works of improvement.

<sup>3/</sup> Includes only area estimated to be adequately protected during the project installation period. Treatment will be applied throughout the watershed; dollar amounts apply to total land areas, not just to adequately protected areas.

<sup>4/</sup> Type of channel before project: (N) - an unmodified, well-defined natural channel or stream.

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TABLE 2 - ESTIMATED COST DISTRIBUTION

Construction Unit No. 28  
Cedar Creek Watershed, Texas  
(Trinity River Watershed)

(Dollars)<sup>1/</sup>

Item	Installation Cost - Public Law 534 Funds :			Installation Cost - Other Funds :			Total Installation Cost
	Construction: Engineering: Rights :	Land :	Total :	Construction: Engineering: Rights :	Land :	Total :	
SOUTH TWIN CREEK PORTION							
Multiple-Purpose Structure No. 143A	373,300	893,500	1,331,700	138,900	914,000	1,900	2,386,500
Basic Recreational Facilities	1,145,940	108,280	1,254,220	1,209,540	114,220	-	2,577,980
Fish Management Improvements	-	-	-	23,000	2,070	-	25,070
Floodwater Retarding Structure No. 144	209,140	18,820	227,960	-	78,000	-	305,960
Subtotal - Structural Measures	1,728,380	192,000	2,813,880	1,371,440	116,290	1,900	5,295,510
Project Administration	-	-	415,730	-	-	-	425,980
GRAND TOTAL	1,728,380	192,000	3,229,610	1,371,440	116,290	1,900	5,721,490

1/ Price base: 1978

2/ Includes \$300,000 for modification of a pipeline and \$21,500 for appraisal fees.

3/ Includes \$310,000 for modification of a pipeline, \$21,500 for appraisal fees, and \$11,000 for legal fees.

TABLE 2A - COST ALLOCATION AND COST SHARING SUMMARY

Construction Unit No. 28  
 Cedar Creek Watershed, Texas  
 (Trinity River Watershed)  
 (Dollars)<sup>1/</sup>

Item	COST ALLOCATION		PL 534 Funds		COST SHARING		Other Funds	Total
	Flood Prevention	Recreation	Flood Prevention	Recreation	Flood Prevention	Recreation		
SOUTH TWIN CREEK PORTION								
Floodwater Retarding Structure No. 144	305,960	-	227,960	-	78,000	-	-	78,000
Multiple-Purpose Structure No. 143A	274,600	2,111,900	264,100	1,067,600	10,500	1,044,300	1,054,800	1,054,800
Basic Recreational Facilities	-	2,577,980	-	1,254,220	-	1,323,760	1,323,760	1,323,760
Fish Management Improvements	-	25,070	-	-	-	25,070	25,070	25,070
<b>GRAND TOTAL</b>	<b>580,560</b>	<b>4,714,950</b>	<b>492,060</b>	<b>2,321,820</b>	<b>88,500</b>	<b>2,393,130</b>	<b>2,481,630</b>	<b>2,481,630</b>

<sup>1/</sup> Price base: 1978

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TABLE 2B - ESTIMATED CONSTRUCTION COSTS - RECREATIONAL FACILITIES

Construction Unit No. 28  
Cedar Creek Watershed, Texas  
(Trinity River Watershed)

(Dollars)<sup>1/</sup>

Item	Quantity and Unit	Estimated Unit Cost (dollars)	Total Construction Costs (dollars)
Camping Areas (Areas J, M, N, and O)			
Multi-use campsites <sup>2/</sup> (table, fire pit, tent pad, lantern post, utility pole, and parking for auto and trailer)	96 sites	3,162	<sup>3/</sup> 304,900
Tent campsites (tent pad, table, fire pit, lantern post, hose bib, and parking for one auto)	44 sites	2,630	115,720
Screened shelter sites (screened shelter-196 sq. ft., fire pit, tent pad, lantern post, and hose bib)	20 sites	6,610	132,200
Restrooms (two @ 830 sq. ft. each)	1,660 sq. ft.	58	96,280
Restroom	625 sq. ft.	60	37,500
Boat Dock	2 each	8,000	16,000
Fishing Pier-Lighted (T-shaped, two @ 1,120 sq. ft. each)	2,240 sq. ft.	25	56,000
Playgrounds <sup>2/</sup> (3 areas)	Lump sum		5,000
Fish Cleaning Tables	2 each	1,190	2,380
Access Trails <sup>2/</sup>	1,050 lin. ft.	3	3,150
Landscaping <sup>2/</sup>	Lump sum		3,000
Day-Use Areas (Areas D and E)			
Picnic Sites <sup>2/</sup> (table, fire pit, trash receptacle, hose bib)	100 sites	900	<sup>4/</sup> 91,150
Comfort Station (350 sq. ft. each)	2 each	21,000	42,000
Playground <sup>2/</sup>	Lump sum		3,000
Landscaping <sup>2/</sup>	Lump sum		2,000
Boat Launch and Concession Area			
Boat Ramp w/Courtesy Dock (2 lanes)	1 each	20,000	20,000
Concession Building w/Restrooms <sup>5/</sup>	2,450 sq. ft.	30	73,500
Boat Dock @ Concession Bldg.	Lump sum		1,500
Fishing Pier-Lighted (T-shaped)	1,280 sq. ft.	30	38,400
Fish Cleaning Table	1 each	1,190	1,190
Access Trails <sup>2/</sup>	150 lin. ft.	3	450
Landscaping <sup>2/</sup>	Lump sum		1,000

(See footnotes at end of table.)

TABLE 2B - ESTIMATED CONSTRUCTION COSTS - RECREATIONAL FACILITIES - Cont'd.

Construction Unit No. 28  
Cedar Creek Watershed, Texas  
(Trinity River Watershed)

(Dollars)<sup>1/</sup>

Item	Quantity and Unit	Estimated Unit Cost (dollars)	Total Construction Costs (dollars)
<b>Support Facilities</b>			
Headquarters Area <sup>2/</sup>	Lump sum		5,000
Entrance Portal <sup>2/</sup>			
Visitor Control and First Aid Station	1,060 sq. ft.	48	50,880
Landscaping and Sprinkler System <sup>2/</sup>	Lump sum		3,200
Flag Pole and Area Lighting	Lump sum		2,000
Miscellaneous Park Signs	Lump sum		5,000
<b>Roads</b>			
Primary (20 ft. wide, paved, 2-lane)	2.135 mi.	115,000	245,700
Secondary (18 ft. wide, paved, 2-lane)	2.673 mi.	103,000	275,330
<b>Parking (paved) at:</b>			
Visitor Control and First Aid Station	14 spaces	150	2,100
Boat Launch	40 spaces	225	9,000
Day-Use Areas	162 spaces	150	24,300
Camping Areas	70 spaces	150	10,700
Water Supply System (well, water treatment, storage tanks, pump)	Lump sum		46,700
Water Distribution System	Lump sum		104,270
Electrical System (primary service)	Lump sum		237,650
Sewage System (treatment plant)	Lump sum		81,000
Sewage Collection System	Lump sum		200,830
Trailer Sanitary Disposal Station	Lump sum		5,000
Landscaping at Sewer Treatment Plant <sup>2/</sup>	Lump sum		500
<b>TOTAL</b>			<b>2,355,480</b>

<sup>1/</sup> Price base: 1978

<sup>2/</sup> Item of work that will be accomplished wholly or in part by force account.

<sup>3/</sup> Includes \$1,350 for equipping two sites for handicapped persons.

<sup>4/</sup> Includes \$1,150 for equipping two sites for handicapped persons.

<sup>5/</sup> Restrooms only (330 sq. ft.) will be cost-shared. Cost of restrooms is \$9,900.

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**TABLE 3 - STRUCTURAL DATA - DAMS WITH PLANNED STORAGE CAPACITY**

Construction Unit No. 28  
Cedar Creek Watershed, Texas  
(Trinity River Watershed)

ITEM	UNIT	STRUCTURE NUMBER		TOTAL
		143A	144	
Class of Structure		A	A	
Drainage Area	Sq. Mi.	10.42	9.45	19.87
Runoff Curve No. (1-day)(AMC II)		74	72	xxx
Elevation Top of Dam	Ft.	413.9	407.4	xxx
Elevation Crest Emergency Spillway	Ft.	410.4	402.6	xxx
Elevation Crest Principal Spillway	Ft.	404.0	386.5	xxx
Elevation Crest Lowest Ungated Outlet	Ft.	404.0	385.7	xxx
Maximum Height of Dam	Ft.	45	38	xxx
Volume of Fill <sup>1/</sup>	Cu. Yd.	257,000	130,000	378,900
Total Capacity <sup>1/</sup>	Ac. Ft.	6,560	2,570	9,130
Sediment Submerged	Ac. Ft.	210	200	410
Sediment Aerated	Ac. Ft.	29	52	81
Sediment Pool (Lowest Ungated Outlet) <sup>2/</sup>	Ac. Ft.	-	159	159
Recreation	Ac. Ft.	3,558	-	3,558
Floodwater Retarding	Ac. Ft.	2,763	2,318	5,081
Surface Area				
Sediment Pool (Lowest Ungated Outlet)	Ac.	-	47	47
Sediment Pool (Prin. Spillway Crest)	Ac.	-	55	55
Recreational Pool	Ac.	354	-	354
Floodwater Retarding Pool	Ac.	520	256	776
Principal Spillway Design				
Rainfall Volume (Areal)(1-day)	In.	8.80	8.60	xxx
Rainfall Volume (Areal)(10-day)	In.	15.00	14.60	xxx
Runoff Volume (10-day)	In.	8.40	7.38	xxx
Capacity (Maximum)	C.F.S.	255	156	xxx
Diameter of Conduit	In.	42	36	xxx
Emergency Spillway Design				
Frequency Operation - Emer. Spillway	% Chance	2.1	2.6	xxx
Rainfall Volume (ESH)(Areal) <sup>3/</sup>	In.	8.72	8.72	xxx
Runoff Volume (ESH)	In.	5.57	5.33	xxx
Type	Veg.	Veg.	Veg.	xxx
Bottom Width	Ft.	200	200	xxx
Velocity of Flow (V <sub>e</sub> )	Ft./Sec.	1.5	2.7	xxx
Slope of Exit Channel	Ft./Ft.	.035	.050	xxx
Max. Reservoir Water Surface Elevation	Ft.	410.7	403.3	xxx
Freeboard Design				
Rainfall Volume (FH)(Areal) <sup>3/</sup>	In.	13.50	13.50	xxx
Runoff Volume (FH)	In.	10.04	9.74	xxx
Max. Reservoir Water Surface Elevation	Ft.	413.9	407.4	xxx
Capacity Equivalents				
Sediment Volume	In.	0.43	0.50	xxx
Floodwater Retarding Volume	In.	4.97	4.60	xxx
Recreational Volume	In.	6.40	-	xxx

<sup>1/</sup> Crest of emergency spillway.

<sup>2/</sup> Capacity below lowest ungated outlet, excluding anticipated borrow volume. Capacity including borrow does not exceed 200 acre-feet.

<sup>3/</sup> Storm duration is six hours.

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**TABLE 4 - ANNUAL COST**

Construction Unit No. 28  
Cedar Creek Watershed, Texas  
(Trinity River Watershed)  
(Dollars)<sup>1/</sup>

Evaluation Unit	: Installation : Cost <sup>2/</sup>	: Operation, : Maintenance, : and : Replacement : Cost <sup>3/</sup>	: Total
Floodwater Retarding Structure No. 144 and Multiple-Purpose Structure No. 143A and Basic Recrestional Facilities	215,690	86,800	302,490
Project Administration	17,350	-	17,350
<b>GRAND TOTAL</b>	<b>233,040</b>	<b>86,800</b>	<b>319,840</b>

<sup>1/</sup> Price base: 1978

<sup>2/</sup> Amortized @ 3.25 percent interest rate for 50 years.

<sup>3/</sup> Includes \$85,600 for operation, maintenance, and replacement cost of the basic recreational facilities.

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**TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS**

Construction Unit No. 28  
 Cedar Creek Watershed, Texas  
 (Trinity River Watershed)  
 (Dollars)<sup>1/</sup>

Item	: Estimated Average Annual Damage :		Damage Reduction <sup>2/</sup> Benefits
	: Without Project	: With Project	
<b>Floodwater</b>			
Crop and Pasture	27,100	6,610	20,490
Other Agricultural	2,990	900	2,090
Nonagricultural	920	40	880
<b>Subtotal</b>	<b>31,010</b>	<b>7,550</b>	<b>23,460</b>
<b>Sediment</b>			
Overbank Deposition	290	130	160
<b>Erosion</b>			
Flood Plain Scour	170	70	100
<b>Indirect</b>	<b>3,150</b>	<b>770</b>	<b>2,380</b>
<b>TOTAL</b>	<b>34,620</b>	<b>8,520</b>	<b>26,100</b>

- 1/ Price base: Current normalized price levels (October 1977) for crop and pasture; 1978 prices for all other.  
 2/ Excludes effects of accelerated land treatment measures.

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TABLE 6 - COMPARISON OF BENEFITS AND COSTS

Construction Unit No. 28  
 Cedar Creek Watershed, Texas  
 (Trinity River Watershed)  
 (Dollars)

Evaluation Unit	: AVERAGE ANNUAL BENEFITS <sup>1/</sup>			: Avg. <sup>3/</sup> : Annual : Cost	: Benefit : Cost : Ratio
	: Damage <sup>2/</sup> : Reduction	: Recrea- : tion	: Total		
Multiple-Purpose Structure No. 143A and Flood-water Retarding Structure No. 144	26,100	374,850	400,950	302,490	1.3:1.0
Project Administration	-	-	-	17,350	-
<b>GRAND TOTAL</b>	<b>26,100</b>	<b>374,850</b>	<b>400,950</b>	<b>319,840</b>	<b>1.3:1.0</b>

- 1/ Price base: Current normalized price levels (October 1977) for crop and pasture; 1978 prices for all other.  
2/ From Table 5  
3/ From Table 4

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## APPENDIX A

### ENVIRONMENTAL INFORMATION Cedar Creek Watershed, Texas (Trinity River Watershed)

The project measures included in the supplement, along with all remaining work in Cedar Creek subwatershed, will be covered in the environmental impact statement currently being prepared for the Trinity River watershed project. For the convenience of the reviewers, this appendix contains facts pertinent to the effects of measures included in Supplemental Watershed Plan No. IV.

#### PLANNED PROJECT

The project planned for the South Twin Creek portion of the watershed is one for the environmental protection needed for the conservation of soil, plant, water, and wildlife resources.

A system of one floodwater retarding structure and one multiple-purpose structure with basic recreational facilities is planned for construction in the South Twin Creek portion of the Cedar Creek watershed. The locations of the structural measures are shown on the public recreation development map (Appendix C).

#### Structural Measures

One floodwater retarding structure and one multiple-purpose structure with basic recreational facilities are planned for construction on the South Twin Creek portion of the Cedar Creek watershed. These structural measures will provide a reduction in floodwater and sediment damages to flood plain lands. Multiple-purpose structure No. 143A will also provide 3,558 acre-feet of storage capacity for recreational use and 239 acre-feet for sediment accumulation. The two structures will provide 5,081 acre-feet capacity for floodwater.

The quality and quantity of water should be sufficient to meet the intended plans for a water-based recreational program. No significant point source of pollution exists within the drainage area of multiple-purpose structure No. 143A. Inspection and tests of water in existing farm ponds and streams in the vicinity presently indicate that the water quality is suitable for all water-oriented activities except water contact sports. Facilities to support water contact activities are not planned for this development. The results of a reservoir operation study indicate that the water surface of the recreational pool will be within two feet of the top of the principal spillway inlet (elevation 404.0) approximately 87 percent of the time.

The two structures will be earthen dams incorporating a drop inlet principal spillway and a vegetated emergency spillway excavated into the abutments. The emergency spillways, embankments, and disturbed areas will be vegetated to control erosion, provide wildlife food and cover,

minimize habitat loss resulting from construction, and to enhance the remaining habitat. Plant species will be selected, sited, and planted in accordance with SCS Technical Specifications for Establishment of Wildlife Habitat On or Adjacent to Watershed Works of Improvement.

The recreational development to be installed around and adjacent to multiple-purpose structure No. 143A will be named the Purdis Creek State Park. It will provide ample opportunity for active recreation, such as fishing, walking, hiking, camping, picnicking, and unprogrammed nature study and appreciation. The development of the park facilities will be such that natural aspects of the park site will be protected. Clearing will be held to a minimum. Certain areas will be designated for nature study and appreciation. Some areas, where clearing or other degradation of the resource has occurred, will be reforested or otherwise restored to as near a natural state as possible.

The system for waste management for the proposed park will consist of a sewer system, incorporating grinder pumps, to collect and transport the sewage, and a plant to treat the waste. The effluent will be disposed of through irrigation. The design, construction, and operation of the system will be in accordance with applicable state laws.

Water supply for the proposed park will be from a well. A minimum storage capacity of one day usage will be provided. It is estimated that 105,000 gallons per week will be needed to meet the demands of the proposed park. The water will be treated to meet the requirements for public water supply.

The type of vegetation to be used for the embankments and spillways will include annual and perennial vegetation of native and introduced grasses, forbs, shrubs, and trees. Sod-forming vegetation such as bermudagrass will be used as the base vegetation on embankments and spillways. Bunchgrasses, forbs, and shrubs such as bluestem species, kleingrass, maximilian sunflower, bushsunflower, dewberry, bush honeysuckle, button-bush, and indigobush will be planted on disturbed and odd areas. Woody species such as crabapple, autumnolive, russianolive, mulberry, walnut, oaks, and pecan will also be planted on odd areas within the rights-of-way. These plantings will be sited and planned in detail during the final design stage in consideration of specific site conditions. The exact species to be used will be selected from the adapted species of seed and plant stock available at the time of construction. Fences will be constructed around the embankment and emergency spillway of structure No. 144 to protect the vegetation from damage by grazing and vehicular traffic. Fences will be maintained or constructed around and in the proposed park, as needed, to control trespassing and vandalism, and prevent grazing by livestock.

Preliminary site investigations indicate that all needed borrow for the embankments should be obtainable from the emergency spillway areas and from within the sediment and recreation pools. Selected areas of woody vegetation will be left in the sediment and recreation pools to provide

cover and spawning areas for fish species after the pools fill with water.

The environment will be protected from soil erosion and water and air pollution during construction. Contractors will be required to adhere to strict guidelines set forth in each construction contract to minimize soil erosion and water and air pollution during construction. Excavation and construction operations will be scheduled and controlled to prevent exposure of extraneous amounts of unprotected soil to erosion and the resulting translocation of sediment. Measures to control erosion will be uniquely specified at each work site and will include, as applicable, use of temporary vegetation or mulches, diversions, mechanical retardation of runoff, and traps. Harmful dust and other pollutants inherent to the construction process will be held to minimum practical limits. Haul roads and excavation areas and other work sites will be sprinkled with water as needed to keep dust within tolerable limits. Contract specifications will require that fuel, lubricants, and chemicals be adequately labeled and stored safely in protected areas, and disposal at work sites will be by approved methods and procedures. All construction equipment will have safety and health features in compliance with the Occupational Safety and Health Act. Clearing and disposal of brush and vegetation will be carried out in accordance with applicable laws, ordinances, and regulations in respect to burning. Each contract will set forth specific stipulations to prevent uncontrolled grass or brush fires. Disposal of brush and vegetation will be by burying, hauling to approved off-site locations, or controlled burning, as applicable.

Necessary sanitary facilities, including garbage disposal facilities, will be located to prohibit such facilities being injuriously adjacent to live streams, wells, or springs in conformance with federal, state, and local water pollution control regulations. Conformance to all environmental control requirements will be monitored constantly by a construction inspector who will be on-site during all periods of construction operation.

Efforts will be made to avoid creating conditions which will increase populations of noxious vectors which affect public health conditions. Prevention and control measures will be implemented, if needed, in cooperation with appropriate federal, state, and local health agencies to suppress proliferation of vectors such as aquatic insects, terrestrial arthropods and rodents, etc., that could occur with installation of the structural measures.

The environment will continue to be protected from erosion and water pollution following completion of construction. Project sponsors will operate and maintain the structural measures in accordance with a specific operation and maintenance agreement. The agreement will set forth the inspections to be made and the maintenance to be performed to prevent soil erosion and water pollution.

All applicable state water laws will be complied with in the design and construction of the structural measures, as well as those pertaining to the storage, maintenance of quality, and use of water.

There are no archeological sites within the structural sites and the park site that are listed on the National Register of Historic Places, nor are any archeological sites listed in records at the University of Texas and Southern Methodist University. Two archeological sites were discovered within the proposed park area during survey investigation conducted by the Texas Parks and Wildlife Department. Only one of these sites was prehistoric and was greatly disturbed. Neither site has any value for preservation and further investigation is unwarranted.

If any previously unidentified evidence of cultural values is discovered during construction, the National Park Service will be notified, and the procedures as outlined in Public Law 93-291 will be followed. Inasmuch as this is a federally assisted local project, the Soil Conservation Service has responsibility with respect to archeological and historical resources as prescribed in Executive Order 11593.

#### Land Use Changes

Purtis Creek State Park will involve a total of 1,533 acres of land, which will be fenced off from adjoining land. Installation of multiple-purpose structure No. 143A and the recreational facilities will require 859 acres of this land. The other 674 acres will become a buffer zone and will allow for future expansion if it becomes necessary.

Land use changes will occur on all of this land. A total of 115 acres of wooded lands and 239 acres of pastureland will go into the creation of 354 acres of permanent water in the recreation pool. The remaining acreage will also be lost from all agricultural productivity as it converts to a recreational land use. Land use changes will not occur on 21 acres that lie in the upstream reaches of the detention pool which is not included in the area for the state park.

Floodwater retarding structure No. 144 will require 268 acres of land, of which all or most will be acquired by flood easements. Land use changes will occur on 47 acres involved in the sediment pool which will be converted from pastureland to a body of permanent water. The dam and spillway will require 12 acres of land which will be converted from pastureland to areas revegetated with multi-use plants for use by wildlife. Land use changes will not occur on the 209 acres involved in the detention pool. Occasional minor flooding will cause only minor interference to the grazing of livestock and other uses by wildlife.

### ENVIRONMENTAL SETTING

#### Physical Resources

The South Twin Creek portion of the Cedar Creek watershed comprises an area of 22,200 acres in the southern part of Van Zandt County and the

northern part of Henderson County. Purtis Creek and Mill Creek are the two major tributaries of South Twin Creek. South Twin Creek flows directly into the Cedar Creek reservoir, which inundates the confluence of North Twin Creek and South Twin Creek.

The population of this portion of Cedar Creek watershed is rural. The small towns of Mabank and Eustace lie nearby. The city of Athens, population 9,500, lies about 16 miles south of the watershed.

#### Climatology

The climate is generally classified as humid subtropical, with hot summers. Rainfall averages 39 inches annually and is evenly distributed throughout the year, except for a relatively dry period in July and August. Prevailing winds vary from south to southeast.

Winter temperatures are mild with only about one day each year, on an average, when the daily maximum fails to rise above freezing. The mean maximum temperature for July is 84° F and the mean minimum temperature for January is 47° F with the mean annual temperature being 67° F. The average date of the last freeze in the spring is March 11, and that of the first freeze in the fall is November 26, resulting in an average growing season of 260 days (U.S. Department of Commerce, 1966).

Precipitation falls mostly during thunderstorms, resulting in heavy amounts in late spring and early fall. Slow general rains are common in winter, while the predominance of high pressures in East Texas in summer and the exclusion of cold fronts from the area result in a decrease in rainfall during summer.

#### Topography

Topography of the structure sites and park site is nearly level to strongly sloping, being dissected by several small intermittent and ephemeral streams and drainages. Major streams are Purtis Creek and South Twin Creek. Elevation ranges from 375 feet to 468 feet above mean sea level.

#### Ground Water Resources

The watershed is located within the Carrizo-Wilcox Aquifer. This aquifer is one of the most geographically extensive aquifers in Texas. It furnishes water to wells in a wide belt extending from the Rio Grande northeastward into Arkansas and Louisiana. The aquifer consists of hydrologically connected water-bearing sands, sandstone, and gravel of the Wilcox Group and overlying Carrizo Group. This aquifer is exposed at the surface along the northern and western edge of its extent (the park site is located along the western extent) where it is recharged by precipitation and streams crossing the outcrop area. Ground water is generally under artesian head down dip from the outcrop and flowing wells are common in areas of low elevation.

The Queen City Aquifer is the minor aquifer associated with the park. This aquifer consists principally of sands and loosely cemented sandstone and supplies water for domestic, livestock, municipal, and industrial uses in East Texas. Well yields are generally low, few exceeding 400 gallons per minute.

#### Surface Water Resources

There are about 18 miles of recognizable streams in the South Twin Creek portion of the watershed. South Twin Creek, which flows directly into Cedar Creek Reservoir, comprises about 7 miles of stream while Purtil Creek and Mill Creek, the two major tributaries which flow into South Twin Creek, comprise about 11 miles of stream. All of the flow in South Twin Creek and its two tributaries is intermittent.

### WATER AND RELATED LAND RESOURCE PROBLEMS

#### Floodwater Problems

The flood plain of South Twin Creek is defined as that area inundated by the runoff from the largest storm considered in the 30-year evaluation series, 1924 through 1953. This storm produced a runoff approximately equal to that resulting from a 25-year frequency event.

There are 850 acres of flood plain downstream from the structural measures. These land areas are flooded frequently, causing high annual damages including interruption of traffic and damage to roads and bridges. The flood plain is wide and flat and runoff-producing rains in the upland areas of the watershed cause large areas to be inundated. Floods develop rapidly and occur most often during the growing season. Livestock are lost unless evacuation can be accomplished promptly.

During the 30-year evaluation period, there were 84 floods that covered one-half or more of the flood plain. Most floods occur during the season when crops and pastures are at a critical stage in growth and are very susceptible to damages from floodwater.

Even though flooding is severe, farmers continue to use the flood plain because of its high productivity. Fences and other improvements are difficult to maintain, restricting diversified farming practices, especially in livestock farming. Improved pastures are not being managed for maximum use due to the loss of fertilizers and crop seeds by flooding. Seeds from noxious plants are scattered by floodwater and add to the cost of crop and pasture production. This results in inefficient use of time and resources of the farmers and ranchers.

#### Recreation Problems

The Texas Outdoor Recreation Plan, prepared by the Texas Parks and Wildlife Department, divides the state into 37 regions for analytical purposes. The purpose of the plan is to guide the allocation of outdoor

recreational resources in the state and, as such, indicates recreational requirements within each region.

Structure No. 143A is located within analytical Region 14, an arbitrarily defined area consisting of 14 counties in the northeast part of the state. The population of Region 14, according to the 1970 census, was 436,100. The population within a 50-mile radius of the watershed is approximately 601,000.

Summary of rural recreation activities occurring in Region 14 is as follows:

<u>Activity</u>	<u>Participation Days (1968)</u>
Fishing	4,651,000
Camping	2,636,000
Swimming	2,412,000
Horseback Riding	1,966,000
Boating	1,888,000
Picnicking	1,808,000
Bicycling	1,416,000

Approximately 54 percent of the recreation participation in Region 14 was contributed by Region 14 residents. The Dallas area of Region 11 contributed 36 percent, with the remainder being contributed by other regions.

By 1976, there were eight state parks in Region 14. They are Caddo Lake State Park, 478 acres; Caddoan Mounds State Historic Site, 70 acres; Governor Hogg Shrine State Historical Park, 27 acres; Jim Hogg State Historical Park, 177 acres; Martin Creek Site State Recreation Area, 216 acres; Texas State Railroad State Historical Park, 518 acres; and Tyler State Park, 994 acres. In addition to state park lands, there are 14,518 acres of recreation lands administered by the private sector and other levels of government which include 8,284 acres of privately administered recreational lands and 6,234 acres of public administered lands. The public recreational lands are the Texas Water Districts with 1 park of 420 acres, the Texas Forest Service with 1 park of 2,896 acres, the Corps of Engineers with 13 parks totalling 606 acres, the counties with 15 parks totalling 484 acres, and the municipalities with 19 parks totalling 1,828 acres. The privately administered acreage is divided into 95 units.

By 1980, the predicted recreation resource requirements for Region 14 are as follows: Camping, 3,411 campsites; picnicking, 3,725 sites; swimming, 2,797,000 square yards of swim beach and water; bicycle trails, 138 miles; horseback trails, 337 miles; and walking/hiking/nature study trails, 236 miles (Texas Outdoor Recreation Plan).

## ENVIRONMENTAL IMPACTS

Installation of the two structures and development of the park will involve or affect a total of 1,822 acres of agricultural land. Included are 47 acres required for the dams and spillways, 401 acres required for the sediment and recreational pools, 375 acres involved in the detention pools, and 674 acres comprising a buffer zone around the park. Recreational and support facilities will be installed or developed on 491 acres of the land lying adjacent to the recreational pool of structure No. 143A, which includes 145 acres that lie in the detention pool.

Vegetation will be lost or altered as a result of installation of the project. All existing vegetation on 47 acres required for the dams and spillways will be stripped to allow for shaping and excavation and placement of fill material. This acreage includes 6 acres of wooded land and 41 acres of pastureland. The vegetation on the 401 acres in the sediment and recreation pools will be partially cleared and permanently inundated. This acreage includes 129 acres of wooded land, of which approximately 7 acres will be left undisturbed except for inundation to provide spawning areas and cover for aquatic life. Paving of roads and parking will result in the loss of 23 acres of land. Construction and installation of the remaining recreational and support facilities will destroy or affect the vegetation on another 77 acres of land.

On the remaining land involved in the 1,533-acre park, the natural condition will be enhanced and preserved as much as possible. Certain areas will be designated nature study and appreciation areas and will be reforested or otherwise restored to as near a natural state as possible. The character of the facilities will be in close harmony with the natural surroundings. All sites for facilities will be carefully studied to fit each building and campsite to the existing environment with as little ecological disturbance as possible.

Approximately two miles of intermittent and ephemeral streams will be covered by the dams and sediment and recreation pools. Another one mile lies within the areas to be affected by the detention pools.

Vegetation within the reservoir areas below the elevation of the lowest ungated outlets will be cleared to the extent necessary to obtain borrow material and to insure proper functioning of the completed structures. The embankments, emergency spillways, disturbed areas, and idle areas adjacent to the dams will be revegetated with a mixture of adapted plant species for wildlife food, habitat improvement, and erosion control.

Minor and temporary inundation will occur on a total of 375 acres of land involved in the detention pools, which include 117 acres of wooded rangeland and 258 acres of pastureland. Such inundation occurring occasionally in varying degrees will cause only minor interference to the grazing of livestock and other uses by wildlife.

Sediment deposition into Cedar Creek will be reduced by 369 acre-feet.

Faunal species will be affected only slightly. The small populations of species will undergo minor dispersion and minor loss of habitat. The creation of 401 acres of open water will provide aquatic habitat and the potential to improve the fishery through management.

Transportation routes will be affected. An increased loading of arteries may cause some minor problems.

Construction will result in an increase in noise levels and a decrease in air quality. These are expected to be of short duration and of minor significance.

Management practices for the area will depend upon the amount of usage and subsequent deterioration of the terrestrial system. The following design elements will be employed to maximize fishery management:

1. Gate valves will be installed in the principal spillways that will permit lowering and maintaining the water level at a desired elevation and to reduce the amount of overflow; allow aquatic vegetation control; allow an increase in water fertility; and allow replacement of spawning devices and fish shelters.
2. Design and construction of the inlets of the principal spillways will permit the evacuation of floodwater or overflow from a depth of 20 or more feet. This prevents upward migration of unwanted fish species.
3. Timber clearance in the lake basins will be carried out in such a manner as to leave at least 7 acres of woody vegetation for fish shelter and cover.
4. Water quality will be maintained through the use of underwater peninsulas to decrease the turbidity by breaking the water wave action.
5. A cover crop will be planted to stabilize the lake basins, increase water fertility, and also aid in the decrease of turbidity.
6. A rearing pond will be maintained to permit the rearing and release of forage and game fish on a planned schedule.
7. Stocking of forage and game fish will be carried out on a planned basis as needed, based on recommendations from Texas Parks and Wildlife Department fisheries biologists.

Socio-economic conditions will change very little. Incomes generated from grazing leases will be replaced by incomes generated from recreation-oriented businesses. Some 1,533 acres which will be owned by the State of Texas will be removed from the tax base.

No known significant archeological or historical sites will be affected by this project. Two sites, one prehistoric and one historic, were found on the proposed park land. The prehistoric site lies approximately 2 feet below the permanent recreation pool elevation. It is greatly disturbed and of no value. The historic site is an old homestead which shows a scattering of metal, bricks, and trash and is of no significance.

#### ALTERNATIVES

Alternatives that were considered during the planning process for watershed plan development in 1959 included the application of needed land treatment measures alone and a combination of land treatment measures and a system of floodwater retarding structures. Alternatives available at the present time must consider the land treatment measures applied to date.

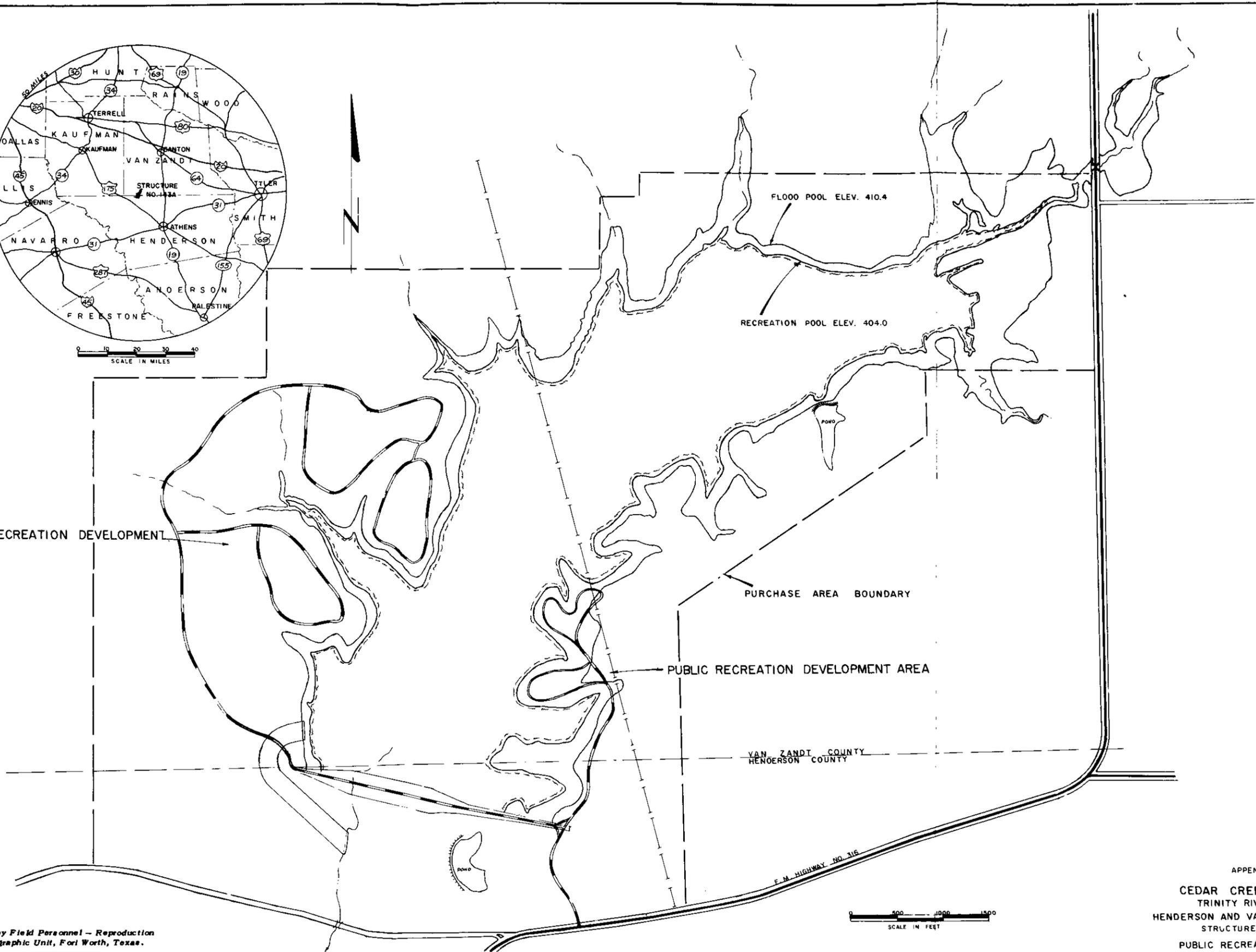
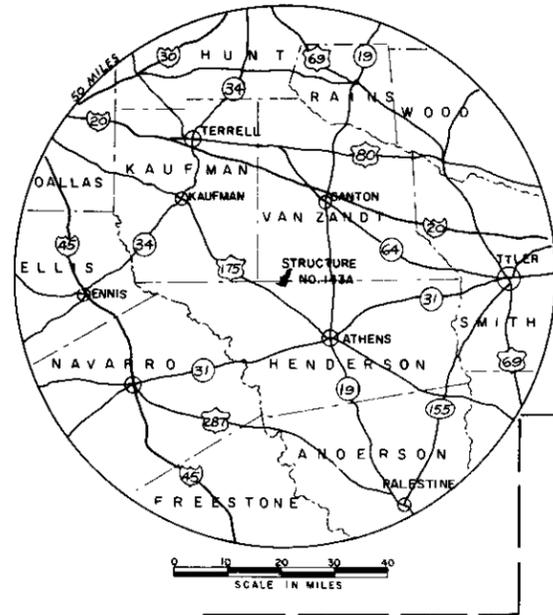
Possible alternatives to the completion of the project, as supplemented, for the South Twin Creek portion are the following:

Alternative 1 - Alternative 1 consists of stopping all further action on the project. This includes foregoing the application of accelerated land treatment and foregoing the installation of two floodwater retarding structures at selected sites on Purtil and Mill Creeks.

Alternative 2 - This alternative was selected and included in the original watershed plan developed in 1960. It consists of the application of needed land treatment measures and the installation of two floodwater retarding structures. This alternative does not presently meet the public recreational needs of the area or the project objectives of the sponsors.

Alternative 3 - This alternative is the selected plan and consists of applying the remaining accelerated land treatment and installing one floodwater retarding structure and one multiple-purpose structure with basic recreational facilities.





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APPENDIX C  
CEDAR CREEK WATERSHED  
TRINITY RIVER WATERSHED  
HENDERSON AND VAN ZANDT COUNTIES, TEXAS  
STRUCTURE NO. 143A  
PUBLIC RECREATION DEVELOPMENT



AREA J—MULTI-USE CAMPING  
 46 CAMPSITES  
 1 RESTROOM WITH SHOWERS  
 BOAT DOCK  
 PLAYGROUND  
 FISHING PIER

AREA M—MULTI-USE CAMPING  
 50 CAMPSITES  
 1 RESTROOM WITH SHOWERS  
 PLAYGROUND

AREA O—SCREENED SHELTERS  
 20 SCREENED SHELTERS

SEWAGE TREATMENT AREA



MAX. ELEV. RECREATION POOL - 404.0

FLOOD POOL ELEV. 410.4

AREA N—TENT CAMPING  
 44 CAMPSITES  
 1 RESTROOM WITH SHOWERS  
 FISHING PIER  
 BOAT DOCK

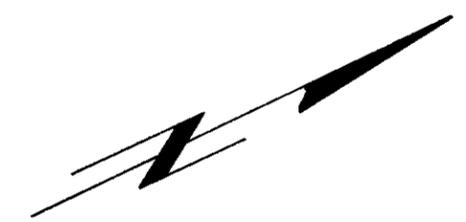
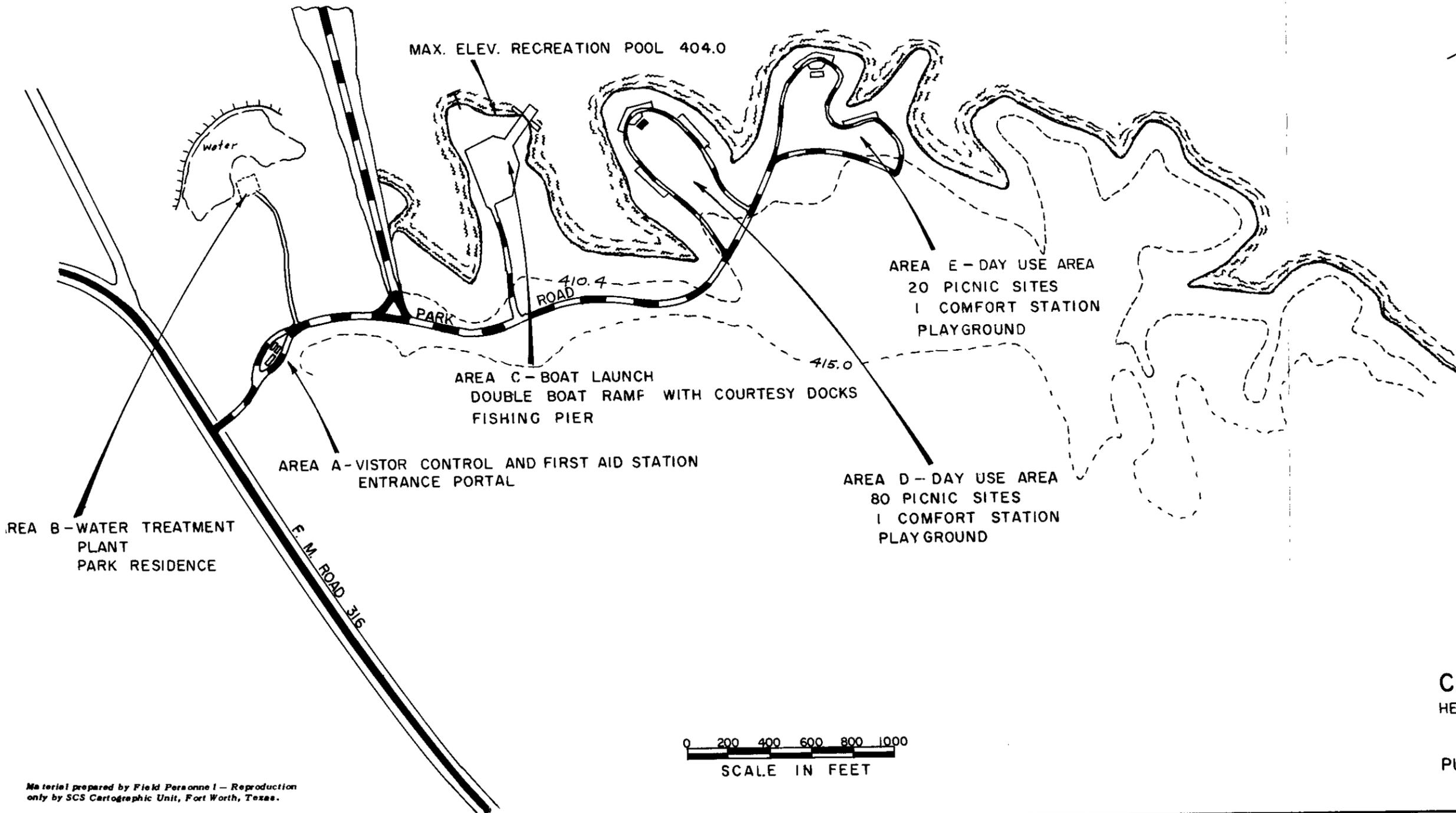
APPENDIX D

**CEDAR CREEK WATERSHED**  
 HENDERSON, VAN ZANDT COUNTIES, TEXAS  
 STRUCTURE NO. 143A

PUBLIC RECREATION DEVELOPMENT  
 WEST SIDE OF LAKE

0 200 400 600 800 1000

SCALE IN FEET



APPENDIX E

**CEDAR CREEK WATERSHED**  
 HENDERSON, VAN ZANDT COUNTIES, TEXAS  
 STRUCTURE NO. 143A  
 PUBLIC RECREATION DEVELOPMENT  
 EAST SIDE OF LAKE

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