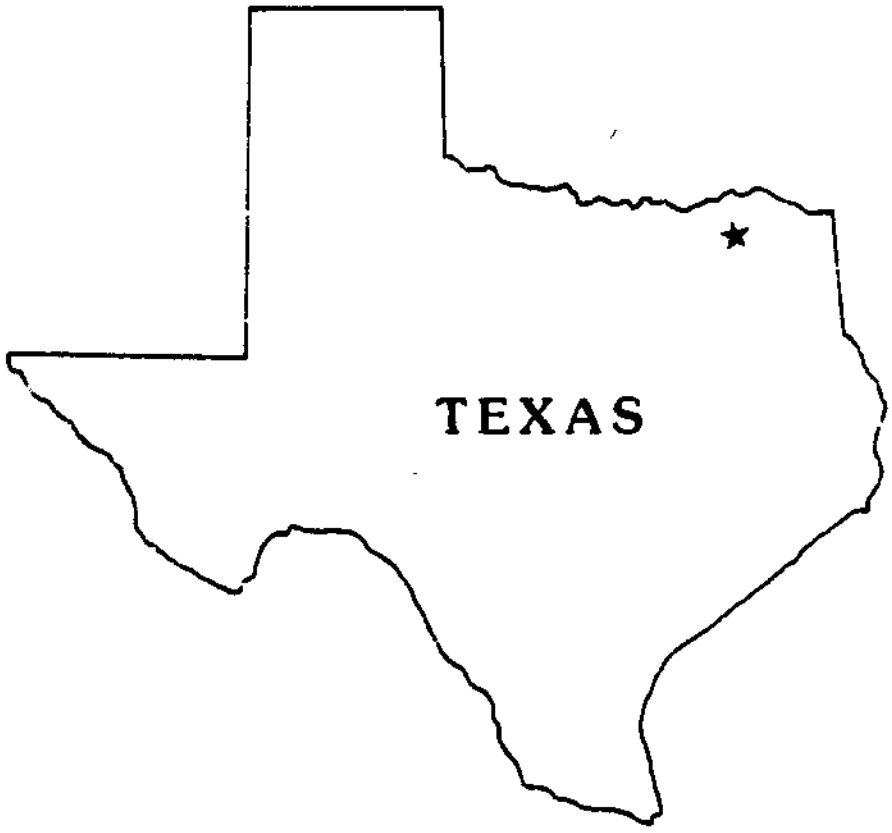
FINAL
ENVIRONMENTAL
IMPACT STATEMENT

PINE CREEK WATERSHED

Lamar County, Texas



Pine Creek Watershed
Lamar County, Texas

FINAL ENVIRONMENTAL IMPACT STATEMENT

George C. Marks, State Conservationist
Soil Conservation Service

Sponsoring Local Organizations:

Lamar Soil and Water Conservation District
1745B Ballard Drive, Paris, Texas 75460

Lamar County Water Control and Improvement District No. 3
1745B Ballard Drive, Paris, Texas 75460

Lamar County Commissioners Court
County Court House, Paris, Texas 75460

City of Paris
City Hall, Paris, Texas 75460

July 1981

Prepared By:

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
Temple, Texas 76501

FINAL
ENVIRONMENTAL IMPACT STATEMENT
PINE CREEK WATERSHED
Lamar County, Texas

Abstract:
This document describes a plan for installing remaining works of improvement in a watershed project authorized for operations on March 6, 1964. Measures to be installed are four grade stabilization structures, modification of an existing structure to add flood control, and two floodwater retarding structures. Various combinations of these and other measures, including channel work, plus the no-action alternative were studied in detail to determine which combination would maximize project objectives with minimum adverse impact to the environment. Economic benefits of the recommended alternative will exceed the cost of the project. Sponsors will pay 23.3 percent of the remaining $1,521,220 installation costs. Environmental impacts will include reduced scouring, reduced sedimentation, reduced flooding, a decreased amount of wildlife habitat, improved aquatic habitat in Lake Crook, and increased acreage of open water. This document is intended to fulfill requirements of the National Environmental Policy Act and to be considered for authorization of Public Law 566 funding.

Prepared under the Authority of the Watershed Protection and Flood Prevention Act, Public Law 83-566, as amended (16 USC 1001-1008) and in accordance with Section 102(2)(C) of the National Environmental Policy Act of 1969, Public Law 91-190, as amended (42 USC 4321 et seq).

Prepared by: Lamar County Water Control and Improvement District No. 3
Lamar Soil and Water Conservation District
Lamar County Commissioners Court
City of Paris
U.S. Department of Agriculture, Soil Conservation Service

For more information, contact: George C. Marks, State Conservationist, Soil Conservation Service, P. O. Box 648, Temple, Texas 76501; telephone No. (817) 774-1214.

Introduction

This final EIS has been revised as a result of extensive comments received on the draft EIS. Most comments of concern were related to the proposed channel work. The sponsors, after due deliberation, chose an alternative that did not include channel work. This alternative was modified from that displayed in the draft EIS to include grade stabilization measures for four areas that would have been treated by side inlet control measures as part of the channel work. As most comments were related to the channel work and the currently selected plan was displayed as an alternative and was reviewed in the draft plan, it was determined that a revised draft would not need to be circulated. All comments relating to areas other than the channel work have been addressed in this final EIS.

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Summary Sheet

I. Final

II. Soil Conservation Service

III. Administrative

IV. Description of Action: This is a watershed project being carried out by the sponsoring local organizations with assistance from the Soil Conservation Service, USDA, under the authority of Public Law 566, 83rd Congress, 68 Stat. 666, as amended, for the purpose of watershed protection and flood prevention. The project, located in Lamar County, Texas, was approved for operations on March 6, 1964, and as supplemented, contains provisions for accelerated technical assistance for the application of needed land treatment measures on the watershed lands and installing 15 floodwater retarding structures, modification of an existing structure to add flood control, 7.06 miles of channel work and four grade stabilization structures. To date, the accelerated technical assistance for application of conservation land treatment has been provided and 13 floodwater retarding structures and 7.06 miles of stream channel have been constructed. Two floodwater retarding structures, modification of an existing structure to add flood control, and the four grade stabilization structures remain to be installed for completion of the project.

V. Summary of Environmental Impacts Including Favorable and Adverse Environmental Effects: Installation of the remaining structural measures will reduce flooding, scouring, and sedimentation damages on the 11,828 acres of flood plain protected by the project measures. Average annual acres flooded with the measures already installed will be reduced from 17,439 acres to 14,250 acres. The area of flood plain flooded by a 25-year frequency storm will be reduced from 10,574 acres to 9,857 acres. Average annual benefits will be increased from $205,010 at present to $379,138, excluding $15,060 for fish and wildlife benefits to Lake Crook, with remaining measures installed. About 85 owners of 11,828 acres of flood plain land will be directly benefited.

The completed project will reduce the sediment load to 30,500 tons annually, or 220 mg/l in the average annual runoff. About 3.8 miles of stream with ephemeral flow conditions will be covered by the structural measures.

The installation of the floodwater retarding structures will change 126 acres of agricultural land and terrestrial wildlife habitat to surface water and aquatic habitat. Modification of Lake Crook will change 205 acres of poor aquatic habitat to terrestrial wildlife habitat. Land use on 38 acres in dams and emergency spillways will be restricted to forage production. Land use of 783 acres in the detention pools will be restricted to uses similar to their present use for pastureland and terrestrial wildlife habitat.

Wildlife resources will be adversely affected by clearing of 67 acres of woody upland wildlife habitat for installation of the structures.

Modification for improving aquatic habitat in Lake Crook will increase fishing from 5,475 fishing days to 9,125 fishing days annually. Opportunities for water-based recreation at Lake Crook will be increased.

Diversity of habitat in the upland areas will result from the change of 126 acres of terrestrial habitat to aquatic habitat.

The average annual discharge from the watershed will be reduced by about 0.3 percent due to evaporation losses from the structure pools. The conservation pool of Lake Crook will be reduced by 2,481 acre-feet and a like amount of floodwater detention storage provided.

The economic and social conditions will be benefited by reduced losses of direct income by flooding suffered by 85 farm and ranch operators and by the associated agricultural businesses serving these operators. Household income is expected to be increased by $275,370 annually. Approximately 42 new jobs will be created in the area and about 100 man-years of employment will be created by construction of the remaining measures.

A slight and temporary increase in air and water pollution may occur during the construction process for installation of the remaining project measures.

Three archeological sites, none of which are eligible for nomination to the National Register of Historic Places, will be affected by installation of the project measures.

VI. List of Alternatives Available:

1. Forego the installation of the remaining two floodwater retarding structures, the modification of Lake Crook into a multiple-purpose structure, and the 10.28 miles of channel work.

2. Install the remaining two floodwater retarding structures and the four grade stabilization structures, modify Lake Crook to add flood control, and forego the installation of the remaining 10.28 miles of channel work originally planned.

3. Install the remaining two floodwater retarding structures, modify an existing structure to add flood control, and install only 5.22 miles of channel work needed to provide capacity for release rates from the structures.

4. Install the remaining two floodwater retarding structures, modify an existing structure to add flood control, and install the remaining 10.28 miles of channel work.

VII. Agencies (and Groups) from Which Comments Have Been Received:

Department of the Army
Department of Health, Education, and Welfare
Department of the Interior
Environmental Protection Agency
Federal Power Commission
Office of Equal Opportunity
Budget and Planning Office (State agencies designated by Governor and State Clearing House)
Wildlife Management Institute

USDA SOIL CONSERVATION SERVICE
FINAL ENVIRONMENTAL IMPACT STATEMENT
for
PINE CREEK WATERSHED
Lamar County, Texas

AUTHORITY

Installation of the remaining planned measures for this project constitutes an administrative action. Federal assistance is being provided under authority of Public Law 83-566, 83rd Congress, 68 Stat. 666, as amended.

SPONSORING LOCAL ORGANIZATIONS

Lamar Soil and Water Conservation District
Lamar County Water Control and Improvement District No. 3
Lamar County Commissioners Court
City of Paris

PROJECT PURPOSES AND GOALS

The project purposes and goals were developed by representatives of the local organizations. Studies were made of watershed problems and meetings held to discuss these problems, possible solutions, watershed resource development needs, and formulation of project objectives.

The following project objectives were reached for developing the original watershed plan:

1. Plan for the establishment and maintenance of necessary land treatment measures which will maintain and enhance the soil, water, and related resources; reduce erosion and sediment yield; and contribute to downstream flood prevention.

2. Provide a level of protection which will reduce floodwater, sediment, and erosion damage to rates which will allow the productivity of the land to be sustained economically and indefinitely.

The landowners state that they will continue to try to use the flood plain land for the same uses that were in effect prior to the increase in frequency of flooding and wetness conditions.

The watershed plan was completed November 1962 and approved for operations on March 6, 1964. This plan provided technical assistance for the application of land treatment measures on the agricultural land for watershed protection and the installation of 19 floodwater retarding

structures and 19.5 miles of channel work for flood protection. Refined alignment and re-evaluation of existing channel capacities reduced the channel work needed to 17.34 miles. Construction began with the first contract on March 30, 1966. Technical assistance has been provided for application of the land treatment measures, 13 floodwater retarding structures have been completed, and 7.06 miles of channel work have been installed.

Minor revisions and modifications to the watershed plan were made on November 17, 1966, to delete floodwater retarding structure No. 9 and add structure No. 9A; on April 18, 1968, to make a minor change in the design of floodwater retarding structure No. 9A; on July 14, 1969, to delete floodwater retarding structure No. 1 and add structure No. 1A; on November 25, 1970, to move the dam for floodwater retarding structure No. 5 slightly; and on July 31, 1970, to delete floodwater retarding structure No. 6 because of the construction of the Campbell Soup Company at this site location.

Supplement No. I was made to the watershed plan on August 11, 1971, to comply with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84th Stat. 1894). Supplement No. II is being made for the purpose of deleting floodwater retarding structures Nos. 2, 4, and 19, modifying the City of Paris' Lake Crook to include provisions for storage of floodwater, deleting 12.44 miles of the originally planned channel work, and modifying four grade stabilization structures on the reach where channel work was deleted.

Under provisions of Public Law 566, the sponsors must provide all land rights needed for installation of the project measures. The sponsors provided all of the required land rights for the 13 floodwater retarding structures and the 7.06 miles of channel work which have been installed. They have acquired all of the land rights needed for installing the originally planned channel work and many of those needed for installing the remaining two floodwater retarding structures. Lake Crook and surrounding land is owned by the City of Paris.

PLANNED PROJECT

The project coordinates features for environmental protection. The purposes of structural measures are the reduction of flooding, restoration of stream capacity, and stimulation of the economy. The grade stabilization measures will stabilize critically eroding areas that would have been treated as part of the installation of the channel work.

Structural Measures - Critical Area Stabilization

Critical area stabilization measures consisting of four grade stabilization structures will be installed to stabilize critical erosion on tributaries entering Pine Creek in the reach where channel work has been deleted (see Project Map, appendix B). Eroding side inlets are treated as an integral part of channel work. During field investigations of the

impacts of deleting channel work, four areas were identified as serious enough to warrant treatment by project action. Structures Nos. 101 and 102 are rock riprap grsde structures and Nos. 103 and 104 are concrete chutes.

Structural Measures - Reservoir Type Structures

Floodwater retarding structures Nos. 1A and 11 and the modification of existing Lake Crook into a multiple-purpose structure remain to be installed (Project Map, appendix B). The combined drainage area controlled by these structures is 53.06 square miles.

The two floodwater retarding structures will have a total storage capacity of 8,464 acre-feet. This includes 985 acre-feet for storage of sediment and 7,479 acre-feet for floodwater detention. A combination of principal spillway capacity and retarding storage will assure that the emergency spillways will have less than 4 percent chance of use at end of design life. The principal spillway crest for the structures will be set at the capacity of the 50-year sediment volume predicted to be deposited as submerged sediment. The principal spillways will be the drop inlet type with cantilever outlets and will be ported at the 200 acre-foot capacity, including borrow areas. The inlets will be ungated to operate automatically, and will have a gate valve installed to release impounded water in order to perform maintenance, and if it becomes necessary, to avoid encroachment upon prior downstream water rights.

Lake Crook is a municipally owned reservoir used by the City of Paris for water supply in the past, but now used only as a standby source of water. It has a total storage capacity of 9,288 acre-feet and about 1,095 acres of surface area. The structure has a concrete chute spillway with a 300-foot crest length and provides for a maximum depth of flow of 10 feet. This reservoir is to be modified to provide 2,481 acre-feet of floodwater capacity by installing a principal spillway which will lower the present pool level by 2.5 feet. This will reduce the surface area of the lake by about 205 acres and reduce the conservation pool to 6,807 acre-feet. Lake Crook will continue to be maintained by the City of Paris for a standby water supply.

When the watershed plan was formulated in 1962, 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 created 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.

Presently, 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 capacity.

The lowering of the conservation pool of Lake Crook by 2.5 feet will expose 205 acres of new shoreline bordering the present eroded, wave-cut shoreline. These eroded areas of the old shoreline will be shaped and, along with the newly exposed land, will be vegetated to prevent erosion. The loss of 205 acres of existing aquatic habitat will be mitigated by the installation of measures needed to improve the remaining aquatic habitat. The fish and wildlife management measures include reservoir treatment during the initial drawdown to eliminate rough fish, planting of a cover crop on the exposed lake bottom, restocking of the reservoir, and providing gated ports in the principal spillway outlet structure. The gated ports will permit the lowering of the conservation pool to levels needed to re-establish cover crops in the reservoir bottom. The cover crop serves the purpose of removing suspended colloidal sediment from the water and providing other benefits.

The Texas Parks and Wildlife Department will provide technical and material assistance in the elimination of rough fish and the proper restocking of the reservoir.

Installation of the modification measures for Lake Crook will require partial dewatering of the reservoir. This will be performed at a time best suited for the establishment of a cover crop, such as japanese millet, on the exposed lake bottom. The reservoir will be allowed to refill to the new level after establishment of the bottom vegetation. Repeated periodic dewatering and planting of cover crops will be made as part of the maintenance program in order to maintain the beneficial effects as the effectiveness of previous seedings diminish and turbidity problems recur.

Supporting facilities for fish and wildlife development are to be installed on land owned by the City of Paris along the south shoreline of Lake Crook. These support facilities to be installed under federal cost-sharing include an entrance sign, access road improvement, fishing pier, comfort station, water line, and electrical service line with pole-mounted lights. All facilities in which federal 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.

Installation of the two floodwater retarding structures will require 947 acres of land. The dams and emergency spillways will require 38 acres. Water impounded in the sediment pools will inundate 126 acres. The detention pools will temporarily inundate 783 acres of land. No additional land is needed for the modification of Lake Crook. The 205 acres of land dewatered by modification will be used for temporary storage of floodwater. The city owns 1,870 acres of land surrounding Lake Crook which will lie above the new pool elevation. Basic fish and wildlife measures and supporting facilities will be installed on this city owned land. The addition of release flows to existing base flows will not cause any loss of economic production or further restriction of land use. No flowage easements will be required.

The emergency spillway of the floodwater retarding structures will be a vegetated channel excavated in earth around the end of the embankment. The embankments, emergency spillways, disturbed areas, and odd areas on or adjacent to the works of improvement will be vegetated to control erosion and to minimize wildlife habitat losses associated with clearing, construction, and inundation. 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 type of vegetation to be used 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 for erosion control on embankments and spillways. Bunchgrasses, forbs, and shrubs such as bluestem species, kleingrass, maximilian sunflower, bushsunflower, dewberry, bush honeysuckle, buttonbush, 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 in odd areas within the rights-of-way. The selection of exact species to be used will be 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 exit channel of the floodwater retarding structures to protect the vegetation from damage by grazing.

Under present conditions, there will be no apparent displacements or relocations of persons, businesses, or farm operations as a result of installation of the structural measures. If relocations or displacements become necessary, they will be carried out in accordance with Public Law 91-646, Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

Special effort will be made to protect the environment 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 excessive 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 sediment 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 Safety and Health Act. Clearing

and disposal of brush and vegetation will be carried out in accordance with Regulations, Rule 1.25, of the Texas Air Control Board and other applicable laws, ordinances, and regulations pertaining 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 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 operations.

Efforts will be made to avoid creating conditions which will increase populations of vectors that affect public health. Prevention and controls 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, rodents, [illegible] that could occur with installation of the structures.

Efforts will be made to protect the environment from soil 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.

The sediment pools of the floodwater retarding structures are expected to hold water. The pools and surrounding areas have a potential for incidental recreational use. The problems, expenses, and liability associated with public access and use of privately owned land discourages landowners from opening their property to public use. The sponsors do not plan to assure public access to the structures. If, at some future time, public access is provided, the sponsors will assure that adequate sanitary facilities in compliance with public health laws are installed prior to making the areas available for public use.

Required Permits

All applicable state and federal 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. This will include requirements on actions such as reducing conservation storage in Lake Crook by the City of Paris. Modification of Lake Crook will not require a Section 404 permit.

Operation and Maintenance

The operation, maintenance, and coordination of the 15 floodwater retarding structures, 7.06 miles of channel work, and the 4 grade stabilization structures will be the responsibility of the Lamar County Commissioners Court and the Lamar County Water Control and Improvement District No. 3.

The necessary maintenance work will be accomplished through the use of contributed labor and equipment, by contract, by force account, or by a combination of these methods. The estimated average annual cost of operation and maintenance of these structural measures is $6,940 based on current prices. The City of Paris will be responsible for operation and maintenance of the Lake Crook modification and the fish and wildlife facilities. This will include periodic dewatering and planting of cover crops and will be coordinated with a biologist of the Texas Parks and Wildlife Department in order not to disrupt normal fish spawning activities. The estimated annual operation and maintenance cost of these facilities is $2,930 based on current prices.

Immediately following completion of the construction by the contractor, the sponsors will be responsible for and promptly perform or have performed, without cost to the Service, all maintenance of the structural meaasures as determined to be needed by either the sponsors or the Service. The sponsors will be responsible for maintenance of vegetation associated with structural measures after the initial vegetation work is adequately completed, as determined by the Service, but no later than three years following completion of each structural measure.

The sponsors will make an inspection of the structural measures annually and after unusually severe floods or other events of unusual nature that might adversely affect the structural measures. The Service will participate in the inspections for the first three years following installation and as often as it elects to do so after the third year. Inspection items are those which may need maintenance. Items of inspection and maintenance will include, but will not be limited to, control of vegetation.

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. Ordinances and standards concerned with the disposal or storage of unused chemicals, empty containers, contaminsted paraphernalia, etc., will be observed and applied, in addition to sound and prudent judgment.

Provisions will be made for free access of representatives of the sponsors and of federal representatives to inspect and provide for maintenance of sll structural measures at any time.

The Lamar County Water Control and Improvement District No. 3 will prepare a report of all maintenance inspections. A copy of this report will be submitted to the Service representative. The sponsors will keep summary control records in support of proper maintenance having been performed on these works of improvement.

An operation and maintenance agreement will be executed by the parties hereto prior to the signing of the initial project agreement and the

issuance of invitations to bid on construction of the structural measures. 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 Operations and Maintenance Handbook. An operation and maintenance plan will be prepared for each structural measure.

Project Costs

The cost for the structural measures already installed is $1,966,110. This includes total installation costs of $1,582,890 and project administration costs of $383,220. In addition, $95,870 of project funds have been provided for accelerated technical assistance for the application of $1,447,400 of land treatment measures.

The estimated costs of installation of the structural measures for the total project, as supplemented, are $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, $299,240 for engineering services, and $520,130 for project administration.

The local costs consist of $25,800 for construction, $5,160 for the City of Paris planning staff's input for planning of fish and wildlife facilities, $591,650 for land rights, and $15,560 for project administration. The local costs for project admininstration 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 or fish and wildlife facilities to be installed on property owned and operated by the City of Paris. There will be no easement costs incurred on this property and it is presently utilized as a standby water supply and a fish and wildlife management area.

ENVIRONMENTAL SETTING*

Physical Resources

Size and Location

Pine Creek watershed comprises an area of 119,040 acres, or 186 square miles, in Lamar County, Texas. Pine Creek is a tributary of the Red River and flows into the river about 75 miles downstream from Lake Texoma. The watershed lies within the Arkansas-White-Red Water Resource Region (USDA, 1971). Pine Creek below Lake Crook is a perennial stream with most of the base flow derived from industrial and sewage effluent.

* All information and data, except as otherwise noted by reference to source listed in the bibliography, were collected during watershed planning and investigations for supplementing the work plan by the Soil Conservation Service, U.S. Department of Agriculture.

Areas of Soil and Water Resource Problems

Intensive use of the uplands for cropland in the past without proper knowledge for conserving the soil resource resulted in depletion of fertility, erosion of the soil, and accelerated sedimentation on the flood plain and in the streams. Most of the upland soils have now been retired from cultivation. Also, land use conversions from cropland to pastureland have been made in the segments of flood plain that are subject to increased frequency of flooding due to poor stream capacity. The stream of Pine Creek has been further filled by the accumulation of sludge derived from the former Camp Maxey sewage treatment plant, built during World War II and subsequently used by the City of Paris after closing of the camp until 1974. Industrial effluent released into Pine Creek by the Campbell Soup Company combined with the increasing volume of effluent released from the City of Paris treatment plant now exceeds the remaining stream capacity in parts of the most severely sludge- and sediment-filled reach. Formerly cultivated land which is now used as pastureland is being changed to wetland areas due to increased surface wetness. Excessive overflow conditions in portions of Pine Creek have caused mortality of some bottomland hardwood species unable to adapt to changing conditions. Consequently, conditions are becoming more conducive for water-tolerant plant species to become established, creating additional new wetlands in land previously used for cropland, pastureland, or woodland grazing.

Climatology

The climate of the area is warm, temperate, and humid. The winters are short and cool with freezing weather limited to short periods of several days' duration. The mean annual temperature is 64 degrees, which varies from 34 degrees in January to 94 degrees in July. The average growing season of 235 days extends on the average from March 25 to November 14 (National Weather Service, 1973).

The recorded mean annual rainfall at Paris, Texas, is 45.11 inches, with April and May normally receiving the heaviest rainfall. January generally has the least amount of rainfall, with an average of 3.08 inches. May generally has the greatest, with an average of 5.40 inches. Rainfall during the spring, summer, and fall usually occurs in storms of high intensity and short duration. High rates of runoff and out-of-bank flooding are associated with these storms.

The prevailing winds are southerly, ranging from the southeast to the south and southwest about 65 percent of the time. Velocities in excess of 12 miles per hour from southerly winds occur about 15 percent of the time. Northerly winds do not predominate in any season but reach their maximum during the winter months.

Topography

The watershed has a dendritic drainage pattern with gentle to moderate slopes predominating. Steeper slopes occur along the southeastern edge of the alluvial flood plain and along stream valleys draining into the mainstem from the southeast. Several distinct levels of river terraces are recognizable in the watershed. The older terraces have been dissected by geologic erosion, but the more recent terraces are level or nearly level. Elevations range from 380 feet on the flood plain near the Red River to 630 feet above mean sea level on the watershed divide.

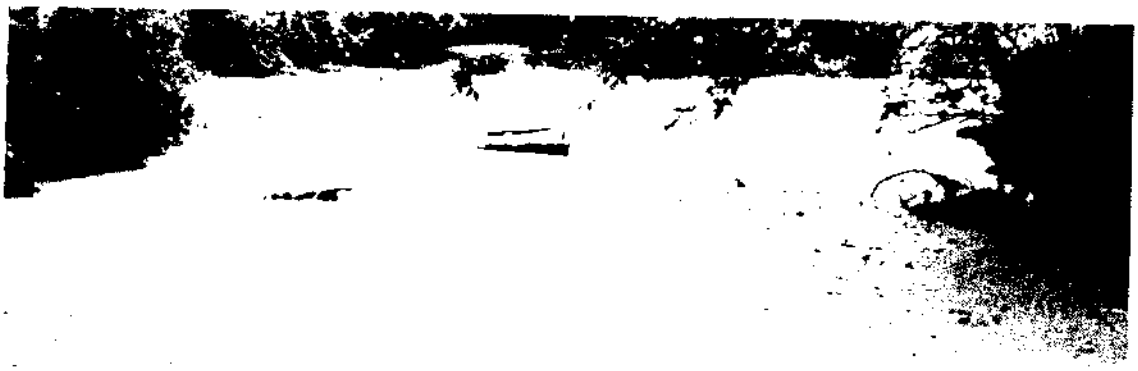
Geology

The watershed is underlain by soft sedimentary rocks of the Cretaceous and Quaternary Systems (Bureau of Economic Geology, 1966). Cretaceous ssndstone and soft shale of the Woodbine Group and the Eagle Ford Formation are exposed in the northeastern and lower portions of the watershed. Soft calcareous shale of the Bonham Formation and Brownstown Marl Formation, separated by a narrow belt of sandstone of the Blossom Sand Formation, crop out over the remainder of the watershed. Areas of the Cretaceous bedrock are covered remnants of unconsolidated sand and clay deposits of the Quaternary system. These deposits occur as terrsces on the uplands, with several levels of deposition recognized, and as alluvium in the valleys. Sand remnants of the terrace deposits occur in many areas of the watershed with major areas of older terrace occurring on the northern and eastern watershed divides. Lower lying younger terrace deposits occur in the valley bordering the flood plain of Pine Creek and in the central and northeastern parts of the watershed.

Soils

The watershed is located in the Texas Blackland Prairies and the Western Coastal Plain major land resource areas. The Texas Blackland Prairie area occupies about 34 percent of the watershed and occurs over the western part and valley slopes in the central parts along the south side of Pine Creek. The Western Coastal Plain area occupies about 56 percent of the watershed in the northern parts on the north side of Pine Creek and on and along the southern and eastern watershed divides. The remaining 10 percent of the watershed consists of flood plain soils of Pine Creek and bottomland and low terrace soils of the Red River.

Two soil associations occur within the Texas Blackland Prairies area. These associations in their order of prominence are the Wilson-Normangee-Crockett and the Houston-Black-Leson-Heiden. Generally, the soils of these associations are deep loams and clays having high shrink-swell characteristics and are very slowly permeable. They have moderate to high natural fertility and were extensively cultivated in the past.



Sediment and sewage sludge have filled this portion of the Pine Creek channel. Increased flood frequency and prolonged out-of-bank flood flows are the results of this reduced stream capacity.

The more than 9 million gallons per day of effluent released into Pine Creek causes out-of-bank flow. This increased wetness of the flood plain is killing the bottomland hardwood trees in low areas.

Increased wetness restricts the use of portions of the Pine Creek flood plain.

Duckweed (the floating material surrounding the grassy vegetation) occurs in the open water areas of Pine Creek where overflow waters have pooled. If not too dense, it is a good food source for waterfowl.

The Wilson-Kemmerer [illegible] nearly level to sloping, sloping [illegible] pasturelands are native meadows. [illegible] association is nearly level to gently sloping [illegible] They are used mainly for cropland, pastureland, [illegible] These soil areas contain approximately 6,000 acres [illegible] prime agricultural land.

The Western Coastal Plains [illegible] soils having low to moderate natural [illegible] very slow and [illegible] moderately to rapid. [illegible] soil associations, the Aurora-Freestone [illegible] occur in the area.

The Aurora-Freestone [illegible] dominates the Western Coastal Plains area in the [illegible] occupy the broad, gently sloping ridges and some [illegible] The Aurora soils are very slowly permeable and somewhat poorly drained and are used mainly for open and wood pasture. The Freestone soils are slowly permeable and are well drained. They were used mainly for cultivation in the past. The Woodtell soils are very slowly permeable and moderately well drained with slow to rapid runoff. [illegible] are used mainly for open and woody pastureland. This soil area contains approximately 20,240 acres of prime agricultural land.

The Wakana-Parum association occurs in the lower eastern part of the watershed. These soils occur [illegible] sloping to moderately steep slopes. The Wakana soils are moderately permeable and slightly less well drained than those of the Parum. These soils were cultivated in the past but are presently used as pastureland, cropland, and wooded pasture. This soil area contains approximately 1,3[illegible] acres of prime agricultural land.

The flood plain of Pine Creek [illegible] the Ambia series. These are high shrink-swell [illegible] developed on the sediment accumulated during the period of [illegible] cultivation in the uplands. Ambia soils are somewhat poorly drained [illegible] very slow runoff, internal drainage, and permeability. These soils are used mainly as woodland and pasture, with wetness [illegible] severe limitation to intensive use.

The Severn-Caspiana-Iusha [illegible] occur on low terrace and common flood plain of the Red [illegible] part of the watershed. These soils are nearly level [illegible] very slowly to moderately permeable, and somewhat poorly [illegible] to well drained. They are productive and are used [illegible] and pastureland. This area contains about 5,7[illegible] prime agricultural land.

Land Use

The land use trend in the [illegible] has been toward an increase in pastureland and hayland and an increase in [illegible] in and near Paris. The land use in the watershed [illegible] work plan development (1962) compared to a more recent [illegible] is as follows:

Land Use	1962 Acres	1962 Percent	1977 Acres	1977 Percent
Cropland	9,440	8	3,690	3
Pastureland	77,172	65	91,865	77
Native Pastureland (Wooded)	25,218	21	14,600	12
Miscellaneous 1/	7,210	6	8,885	8
Total	119,040	100	119,040	100

1/ Includes roads, highways, railroad rights-of-way, urban areas, reservoirs, etc.

At the present time, an estimated 300 to 500 acres of native pastureland are converted to pastureland and hayland each year. Most of the cropland and large areas of wooded native pastureland have been converted to improved pastureland. The urban growth is mainly within the wooded native pastureland. The remaining cropland is confined primarily to terrace soils and flood plain soils near the Red River.

There are about 12,900 acres of flood plain. The land use within this area consists of 51 percent pastureland, 21 percent cropland, and 28 percent wooded pastureland (bottomland hardwoods).

More of the flood plain was cultivated during the early settlement of Lamar County. However, increased frequency of flooding due to filling of the streams with sediment and decreased flow capacity resulted in the gradual conversion of the cropland to pastureland and the reversion of open land to wooded land. About 15 acres per year of open land reverted to wooded land on the flood plain between 1941 and 1961. Wooded areas also formed in the upper reaches of Lake Crook where Pine Creek and other major tributaries enter the lake. A trend to convert the wooded pastureland to open pastureland began in the 1950's and reached its peak in the 1960's. Approximately 1,194 acres were cleared between 1962 and 1970. About 200 acres were cleared by installation of channel work immediately prior to 1970 and another 310 acres have been cleared in reaches upstream from the completed channel work (appendix D).

Diversified crops are being produced on the 3,690 acres of cropland in the watershed. The kinds of crops grown and their production are shown in the following table:

Crop	Unit	Yield Present	Yield Potential
Cotton	Lbs. Lint/Ac.	175	300
Grain Sorghum	Lbs./Ac.	2,500	4,000
Forage Sorghum	Tons/Ac.	3.0	5.0
Small Grain			
Wheat	Bu./Ac.	25	40
Oats	Bu./Ac.	40	60
Soybeans	Bu./Ac.	25	40
Alfalfa	Tons/Ac.	3.0	5.0

Mineral Resources

There is no production of oil, gas, or other minerals of significant economic importance in the watershed. Sand and gravel could occur in some of the terrace deposits; however, none are extracted commercially.

Water Resources

The surface water resources of the watershed include both streams and man-made reservoirs and ponds. There are more than 100 miles of streams, of which about 30 miles have perennial flow conditions due mainly to wastewater effluent releases, 35 miles have intermittent flow, and the remaining 35 miles have ephemeral flow.

About 2.1 miles of perennial flow are in a tributary to Pine Creek and the remaining 27.9 miles are in Pine Creek downstream from Lake Crook. The intermittent natural base flow on Pine Creek is supplemented by seepage from Lake Crook, by an average of 6.2 million gallons per day of wastewater discharge from the Campbell Soup Company treatment facility, and by more than 3.5 million gallons per day of sewage effluent release from the City of Paris treatment plant.

Most of the streams have suffered significant loss of capacity due to the accumulation of sediment from past erosion. The sediment, combined with sewage accumulations of sludge, has further reduced channel capacities in Pine Creek. About one mile of stream was altered by the landowners in the late 1930's in an effort to restore capacity lost by sedimentation. A total of 7.06 miles in the lower portion has been altered as part of the project in order to restore flow-carrying capacities. Short segments of the remaining stream do not have sufficient capacity to carry the combined base streamflows and effluent releases.

Ground water resources within the watershed are limited to shallow, near-surface water in terrace and alluvial deposits. Small quantities of water are available from relatively shallow wells in sand of the Woodbine Group and the Blossom Sand in the southern parts of the watershed. Municipal and industrial water for Pine Creek watershed is supplied by Pat Mayse Reservoir, located north of Paris out of the watershed boundaries.

There are approximately 1,800 acres of surface water in the watershed impounded by municipal reservoirs, sediment pools of floodwater retarding structures, and large privately owned lakes. The acreages by the different impoundments are as follows:

Lake Crook (City of Paris)	1,095
Lake Gibbons (John C. Lambill Goose Preserve)	125
Sediment Pools of 12 Floodwater Retarding Structures	380
Other Private Lakes and Ponds	200

Water Quality Conditions

The overall quality of water in lower Pine Creek is poor as indicated by chemical and physical tests and by fish species composition which consists predominantly of carp, carpsucker, bullheads, gar, and a few sunfish. The chemical quality of water from the Lake Crook outfall and the industrial effluent released by the Campbell Soup Company is good. The effluent released from the City of Paris sewage treatment plant is rich in nutrients and is often of poor quality because of overloading problems.

The present City of Paris sewage treatment plant was constructed and placed in operation in 1974 to replace an inadequate older plant. Excess volume of sewage resulting from entry of storm water and seepage into the collection system during periods of wet weather has been overloading the new plant and has required the release of untreated sewage into Pine Creek. The quality of water in Pine Creek is also being degraded by the past accumulation of sewage sludge that was discharged into the stream from the old treatment plant. This accumulated sludge has replaced a large volume of the stream channel capacity in a 3- to 4-mile reach of Pine Creek downstream from the treatment plant.

Lake Crook, the largest single body of water in the watershed, has a turbidity problem that severely limits the overall aquatic productivity of the lake.

Detailed water quality data for Pine Creek are not available. However, the Campbell Soup Company continually monitors the effluent released from their treatment facility and submits monthly effluent reports to the state. The City of Paris also monitors and submits monthly effluent release reports. A tabulation of limited testing for water quality at various sampling stations on Pine Creek in 1969 (prior to installation of the new Paris sewage treatment plant) and in 1976 and 1978 (after operation of the new treatment plant) is shown in table 1. This table also contains information on soluble organic materials, heavy metals, and pesticides contained in the accumulated sludge in Pine Creek.

Sample collection points are shown in figure 1. Sampling point Nos. 1.a. and 1.b. are located on Pine Creek upstream from the point of discharge of sewage effluent into Pine Creek. Sampling point No. 2 is on the sewage treatment plant outfall. Sampling point No. 3 is located on Pine Creek immediately downstream from the confluence with the sewage treatment plant outfall. Sampling point No. 4 is located at the Givens Road crossing of Pine Creek 2.1 miles downstream from the sewage treatment plant outfall. Sampling point No. 5 is on Pine Creek near the confluence of Sixmile Creek 6 miles downstream from the sewage treatment plant outfall. Sampling point No. 6 is located at the F.M. Road 2648 crossing 10.5 miles downstream from the sewage treatment plant outfall. Sampling point No. 7 is at a county road crossing 14.8 miles downstream from the sewage treatment plant. Sampling point No. 8 is at F.M. Road 906 on lower Pine Creek 20.5 miles downstream from the sewage treatment plant and 3.2 miles upstream from the Red River.

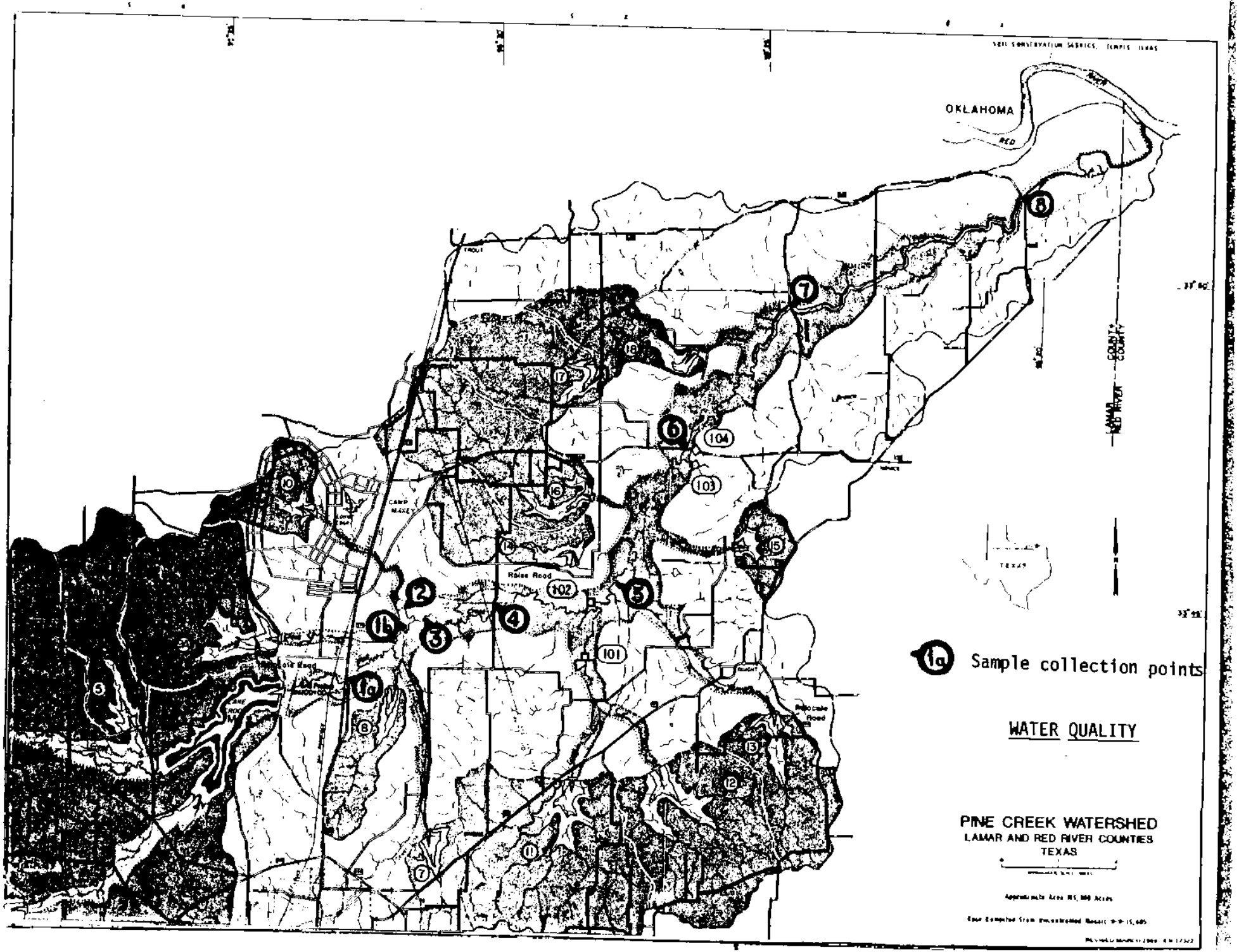

OKLAHOMA
RED
TEXAS
Sample collection points
WATER QUALITY
PINE CREEK WATERSHED
LAMAR AND RED RIVER COUNTIES
TEXAS

Table 1
WATER QUALITY DATA
Pine Creek Watershed, Texas

Parameter		Pine Cr. Upstream Of Confluence With Paris STP Outfall (1a) 1976 1/	Pine Cr. Upstream Of Confluence With Paris STP Outfall (1b) 1978 2/	Paris Sewage Treatment Plant Outfall (2) 1969 3/	(2) 1976	(2) 1978	Pine Cr. Below Paris STP Outfall (3) 1978	Pine Cr. 7.1 Mi. Below Paris STP Outfall (4) 1976	(4) 1978	Pine Cr. 6 Mi. Below STP Outfall (5) 1978	Pine Cr. 10.5 Mi. Below Paris STP Outfall (FMRO 2648) (6) 1969	(6) 1976	(6) 1978	Pine Cr. 14.8 Mi Below Paris STP Outfall (7) 1976	(7) 1978	Pine Cr. 20.5 Mi. Below Paris STP Outfall (FMRE 906) (8) 1969	(8) 1976	(8) 1978
WATER:																		
Temperature	C°	73	26.5		27.5	76.9	26.5	74	26.5	26.7		73	76.8	75	76.6		74.5	77.9
Dissolved Oxygen	mg/l	7.2	7.5	0	3.0	0.3	0.3	1.5	0.8	2.8	1.0	4.0	1.9	11.0	6.1	2.6	10.5	6.4
pH		7.1	7.6	7.1	7.4	7.1	7.2	6.4	7.1	7.5	7.7	6.5	7.6	6.7	7.7	7.4	5.8	8.0
BOD_5	mg/l	<5.0	1.2	55	18	50	24	15	9.0	9.0	20	8.0	14.7	<5.0	17.7	65	25	11.4
Conductivity	micromho		429			1179	703		813	738			852		798			805
Ortho Phosphate	mg/l	0.5			8.0			7.2				5.6		3.6			2.4	
Nitrate	mg/l	1.2			3.5			5.5				5.5		2.5			23.0	
Chloride	mg/l	10			41			52				77		45			79	
Alkalinity	mg/l	60			76			87				70		80			104	
Hardness	mg/l	78			96			121				120		138			118	
Total Solids				19							28					26		
SEDIMENT (mg/kg):																		
BOD_5	mg/l		12			47	98		9	6			1		12			5
BOD_{30}	mg/l		50			~250	280		84	86			54		78			47
Arsenic	mg/kg						.016		0.020	0.18								
Barium	mg/kg						5.93		5.74	5.18								
Cadmium	mg/kg						4.23		1.71	7.74								
Chromium	mg/kg						54.2		30.2	49.1								
Mercury	mg/kg						.0004		.00004	.0002								
Lead	mg/kg						35.1		16.5	18.1								
P,P'DDE	ppb						7.6		<.1	*								
P,P'DDT	ppb						6.1		1.6	*								
Dieldrin	ppb						5.3		7.3	*								

*Below detection limits. At detection limits of sediment, the following pesticides were below water grab detection limits: PCB, Lindane, Heptachlor, Aldrin, Heptachlor epoxide, Endosulfan I, Endosulfan II, p,p'DDD, Mirex, Methoxychlor, and Dieldrin.

1/ Data by William S. King, Paris Jr. College, Summer 1976.
2/ Data by Environment Consultants, Inc., Dallas, Texas, July 21, 1978.
3/ Data from Texas Water Quality Board, Austin, Texas, August 27, 1969.

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The testing shows that the nutrient levels in Pine Creek are very high downstream from the Paris sewage treatment plant. The flow in the summer months is dominantly wastewater with resultant serious oxygen deficiencies. Low to almost no dissolved oxygen levels of 0.3 mg/l to 0.8 mg/l were found on July 27, 1978, at the treatment plant outfall and in the first 3 to 4 miles of Pine Creek downstream from the outfall. The dissolved oxygen recovers to levels slightly above 2 mg/l in the next 8- to 9-mile segment of stream. Dissolved oxygen levels meeting or exceeding the 5 mg/l criteria (appendix I) set by the state for the downstream receiving stream (Red River) are attained in the lower 9- to 10-mile segment of Pine Creek before its entry into the Red River.

Profiles of accumulated sludge in Pine Creek showed that thicknesses of 2 to 3.5 feet were common throughout a 3- to 4-mile segment of the stream immediately downstream from the Paris sewage treatment plant outfall. The thickness of these accumulations decreases to 0.5 foot or less at sampling point No. 5 (6 miles downstream from the outfall).

Discreet sampling of the bottom sediments (sludge) at all sampling points disclosed that high amounts of soluble organic matter are contained in the sludge at the treatment plant outfall and in Pine Creek immediately downstream from the outfall. The high levels of soluble organic material decreases progressively downstream to levels that can be considered as normal for Pine Creek about 6 to 8 miles downstream from the outfall.

Tests of the sludge were conducted at three sampling points (Nos. 3, 4, and 5) to determine the presence of heavy metals and pesticides (table 1). The tests for six metals disclosed that four metals (arsenic, barium, cadmium, and mercury) occur in relatively low levels. Two metals, (chromium and lead) occur in high levels but are not the highest that have been found in Texas (Warshaw, 1976). Scans made for 14 pesticides disclosed that three pesticides (p,p'-DDD, p,p'-DDE, and chlordane) are present in sufficient quantity for accurate determinations at two of the three sampling points.

The possibility for present and on-going movement of the metals and pesticides into the aquatic food chain and concentration in harmful levels from the sediments can only be postulated. Few local residents fish Pine Creek downstream from the treatment plant outfall because of its polluted condition.

The present major nonpoint sources of pollution are from urban and built-up areas. No serious pollution is being generated by the dominantly pastureland and hayland agricultural activity in the watershed. Possible sources of pollution would be mainly by fecal coliforms from the dispersed livestock herds and some fertilizer losses from moderately fertilized pastureland.

Turbidity of the water in Lake Crook is a problem. Colloidal silt and clays from sediment in the shallow parts of this reservoir are stirred up by wave action and kept in suspension.

Air Quality

The watershed covers a predominantly rural area with urban and industrial development occurring along the southern divide. Air pollutants generated in the rural areas are limited to the low intensity operation of farm machinery and rural transportation needs. There are no concentrated cattle feedlots or broiler producers. The urban area of Paris and the associated manufacturing and processing industries are the most significant producers of air pollutants in or near the watershed. The larger metropolitan areas such as Dallas and Texarkana, which produce significant air pollutants, lie 100 miles or more away from the watershed.

Wetlands

Five types of wetlands that are described in USDI Circular 39, Wetlands of the United States, occur in the Pine Creek watershed. Wetlands found within the 25-year flood plain of Pine Creek include 1,395 acres of type 1 wetlands (seasonally flooded basins or flats), within 3,450 acres of woody vegetation, 72 acres of type 2 wetlands (inland fresh meadows), and 59 acres of type 3 wetlands (inland shallow fresh marshes). About 20 acres of type 6 wetlands (shrub swamps) occur, with 17 acres in the upstream areas of Lake Crook and the other 3 acres in the central part of the flood plain. Up to 1,800 acres of type 5 wetlands (inland open fresh water) are created by the surface areas of Lake Crook, Lake Gibbons, privately owned lakes, and the sediment pools of the 13 floodwater retarding structures which have been installed.

The wetland areas in the flood plain are being enlarged in the sludge- and sediment-filled reaches of Pine Creek due to even the low flows being out-of-bank. Some areas of wetlands have been damaged by the sewage sludge. The deposition of sediment as a result of these overflows has impaired the natural drainage, which has, in turn, reduced the productivity of agricultural lands in the flood plain. Prior to the accelerated overflow conditions, the type 2, 3, and 6 wetlands comprised less than 100 acres of low lying marshlands along the flood plain of Pine Creek.

Present and Projected Populations

The 1970 population for Lamar County is 36,062. Projections for this area show an increase in population of approximately 5 percent to the year 1990 (Population Research Center, 1971). The latest statistics which are available show a labor force of 16,276 from the total population for the county with approximately 5.8 percent, or 936 workers, being unemployed (Texas Employment Commission, 1977). This is above the state rate of unemployment, which was 5.1 percent on the same date.

Economic Resources

Nearly all of the agricultural land in the watershed is privately owned, with the exception of 5,740 acres which includes Camp Maxey, Lake Crook, Lake Gibbons, and Paris Junior College, which are owned by state and local governments. There are about 502 farms, which average about 260 acres in size, located wholly or partially in the watershed. Agricultural land values range from $350 to $750 per acre, depending upon soil capability and location. Urban land values range from a few thousand dollars for a city lot to many thousands of dollars for commercial property.

There are over $15 million in average income derived from agriculture in the county. Over three-fourths of this income is derived from cattle, hogs, and poultry (Dallas Morning News, 1976-77). The chief crops grown are cotton, grain sorghum, and soybeans. Lamar County is one of the leading hay-producing counties of the state.

Good highways and roads link the watershed residents with other population and marketing centers in all directions. Approximately 72 miles of paved roads and over 230 miles of all-weather roads serve the watershed residents.

Other selected 1970 demographic characteristics for the State of Texas and Lamar County are shown in table 2 (USDA, Soil Conservation Service, 1976):

This former cropland is changing into a type 2 wetland because of increased frequency of flooding and wetness. Note the dying bottomland hardwoods in the background.

Trees killed by year-long inundations contribute to log jams which further impede flows in Pine Creek.

Table 2

SELECTED DEMOGRAPHIC CHARACTERISTICS (1970)

	Total		Negro		White & Others		Spanish American	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
STATE: TEXAS								
Population	11,196,730	100.0	1,421,985	12.7	7,738,635	65.9	2,396,100	21.4
Rural Population	2,266,898	20.2						
Median Family Income								
Med. Per/Cap. Income	$3,303							
Below Poverty Level:								
No. of Families	2,093,788	18.7						
COUNTY: LAMAR								
Population	36,062	100.0	6,274	17.4	29,851	82.5	360	0.1
Rural Population	12,621	35.0						
Median Family Income								
Med. Per/Cap. Income	$2,827							
Below Poverty Level:								
No. of Families	9,015	25.0						

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Paris, located in the southern part of the watershed, is the center of marketing activities in the watershed. Numerous industries, such as Campbell Soup Company, Westinghouse, and Ford Tractor Company, provide jobs for residents of the watershed and surrounding area.

Plant Resources

The vegetation of the Pine Creek watershed resembles the description of the Post Oak Savannah and Blackland Prairies vegetation areas of Texas, as described by Gould, 1969. The Blackland Prairies comprises about 34 percent of the watershed with the Post Oak Savannah comprising 56 percent. The remaining 10 percent includes the bottomland areas of Pine Creek.

The original vegetation on the Blackland Prairie soils consisted of the tall grass prairie. Significant areas of these soils are now used as native grass meadows for hay production. Most of the areas that were formerly used for cropland have been returned to grassland. The well-known Smiley's meadow on the western edge of the watershed is considered one of the largest native hay meadows in the world and is recognized as containing most of the original native plants that grew on the prairie when grazed by the massive buffalo herds. The principal vegetation of the tall grass prairie vegetation region included little bluestem, big bluestem, indiangrass, switchgrass, eastern gamagrass, and perennial wildryes. Lesser amounts of sideoats grama, silver bluestem, tall dropseeds, silveus dropseed, florida paspalum, purpletop, and longspike tridens occurred. Woody species included flameleaf sumac, smooth sumac, woollybucket bumelia, osageorange, possumhaw, saw greenbrier, and coral-berry. Forbs included maximilian sunflower, blacksamson, coneflowers, gayfeather, bundleflowers, goldenrods, penstemon, and scurfpea.

The Post Oak Savannah occurs predominantly in the north and eastern portion of the watershed. This area is west of the primary forest region in Texas and receives less annual rainfall and is a little higher in elevation. The climax grasses included in this region included such species as little bluestem, big bluestem, indiangrass, switchgrass, purpletop, silver bluestem, longleaf uniola, and texas wintergrass. Woody plants such as post oak, blackjack oak, white oak, red oak, sweet-gum, elm, and hackberry were common to the area. Many forbs and legumes such as lespedeza, tickclover, bundleflower, and evening primrose added color and variety to the area.

There are two major range sites that occur in the Blackland portion of the watershed. They are locally known as the Blackland and Claypan Prairie range sites.

The climax condition of the Claypan Prairie range site was a true prairie. A few elm, hackberry, and oak trees occurred along stream courses. The major grasses that occurred on the site were big bluestem, indiangrass, little bluestem, florida paspalum, longspike tridens, purpletop, silveus, tall and meadow dropseed, texas wintergrass, sedges, and virginia

wildrye. Lesser amounts of sideoats grama, switchgrass, texas cupgrass, vine-mesquite, buffalograss, fall witchgrass, knotroot bristlegrass, broomsedge bluestem, carolina jointtail, and perennial threeawns occurred. Several legumes and forbs such as maximilian sunflower, coneflower, blacksamson, gayfeather, halfshrub sundrop, western ragweed, plantains, sensitivebrier, bundleflowers, and prairieclover added color and variety to the diets of animals grazing the area. Woody species included flameleaf and smooth sumacs, woollybucket bumelia, osageorange, possumhaw, coralberry, and greenbrier.

The approximate total annual yield of the Claypan range site in excellent range condition varies from 3,500 to 6,500 pounds of air-dry vegetation per acre, depending on rainfall and other growing conditions.

The Claypan range site is presently in fair condition, producing approximately 2,500 pounds of air-dry vegetation per acre per year. Woody plants found growing on the site include such species as hackberry, elm, bumelia, osageorange, flameleaf and smooth sumac, and greenbrier. Herbaceous species found growing on the site include such species as dropseeds, broomsedge and bushy bluestem, threeawns, texas wintergrass, tumblegrass, common bermudagrass, tridens, snow-on-the-prairie, milkweeds, crotons, and western ragweed.

The Blackland range site is also a true prairie with a few elm and hackberry trees along the drains. Eastern gamagrass, big bluestem, and indiangrass dominated the plant community. Switchgrass, little bluestem, tall dropseed, florida paspalum, longspike tridens, sideoats grama, and texas wintergrass occurred less frequently and in smaller amounts. Many forbs and legumes, and a few shrubs and woody vines, are endemic to the site. Broomsedge bluestem is an aggressive increaser on the noncalcareous soils of the range site, while meadow dropseed is an aggressive increaser on the calcareous soils. Common bermudagrass often invades the site when it is subjected to years of continuous heavy use. This is the most productive range site of the Blackland Prairie and in excellent condition produces an annual yield from 5,000 to 8,500 pounds of air-dry vegetation per acre, depending on rainfall and growing condition.

The Blackland range site is presently in fair condition, producing about 3,000 pounds of air-dry vegetation per acre which consists of such plants as little bluestem, meadow dropseed, silver bluestem, tall dropseed, texas wintergrass, wildryes, broomsedge bluestem, buffalograss, and perennial threeawns.

The major range site of the Post Oak Savannah vegetation region is the Sandy Loam range site. This range site consists of a plant community of post oak, red oak, and blackjack oak savannah which shades approximately 25 to 30 percent of the ground. The plant-soil-moisture relationship and acid reaction of these soils favor growth of woody vegetation. When the site is subject to heavy grazing use, big and little bluestem, indiangrass, eastern gamagrass, and beaked panicum decrease in the plant

community. Consequently oaks, elms, hickory, hawthorns, and associated woody species increase to resemble a scrub forest. Shade tolerant plants such as longleaf uniola, wildryes, sedges, and low panicums usually increase along with the thickening canopy.

The approximate total annual yield of this site in excellent condition ranges from 3,500 to 7,000 pounds of air-dry vegetation per acre, depending upon canopy, leaf and litter buildup, rainfall, and other growing conditions.

This site is presently in fair condition, producing on the average 2,500 pounds of air-dry vegetation per acre. Vegetation consists of such plants as post oak, blackjack oak, elms, hackberry, broomsedge bluestem, purpletop, splitbeard and bushy bluestem, red lovegrass, little bluestem, longleaf uniola, virginia wildrye, and various forbs and legumes.

The bottomland areas of the watershed (approximatel, 10 percent) are characterized by the clayey bottomland grazing group. The significant trees found growing in the bottomland areas include water and willow oaks, cottonwood, blackwillow, pecan, red ash, hackberry, birch, ash, hickory, osageorange, and red maple. The understory vegetation is moderate, and is composed of elm, locust, hawthorn, rattan, grapes, cowitch vine, greenbrier, and poisonivy. The herbaceous plants are composed of beaked panicum, red panicums, virginia wildrye, switchcane, longleaf uniola, low panicums, and low paspalums.

Most of the cropland areas of the watershed have been converted to grassland. This is predominantly improved pastureland which is supporting stands of coastal, common, and other improved bermudagrasses, clovers, tall fescue, and weeping lovegrass.

Animal Resources

Pine Creek watershed is comprised of two major habitat types, upland (90 percent) and bottomland (10 percent), and the animal species endemic to each are indicative of the many habitat components. The upland habitat type is characterized by wooded mottes interspersed with pastureland, a few native grass meadows, and cropland. The bottomland habitat type, which occurs in the flood plains, is characterized by wooded tracts surrounded by pastureland, wetland areas, and some cropland.

The wildlife habitat of the project area was inventoried and evaluated by Soil Conservation Service biologists during field assessment. Values were assigned to each habitat type as a means of comparing project alternatives during planning.

The most common game species in the upland habitat are mourning dove and bobwhite quail. Other important game animals are white-tailed deer, fox squirrel, and migratory waterfowl. Deer are most numerous around Camp Maxey and are found in scattered numbers along the wooded drainageways throughout the watershed. Fox squirrels utilize wooded areas of the uplands. Waterfowl are frequently seen on farm ponds, lakes, streams, and other surface waters in the uplands during their spring and fall migrations.

Eastern wild turkeys were released in the watershed by the Texas Parks and Wildlife Department as part of their restocking program. Nongame animals such as opossum, raccoon, skunk, cottontail rabbits, fox, coyote, field mice, snakes, lizards, toads, and songbirds are numerous throughout the upland habitat type.

The most common game species in the bottomland habitat is the Eastern gray squirrel. Its movements are restricted to large hardwood tracts along Pine Creek. Migratory and resident waterfowl such as mallard, teal, and wood duck feed and rest on Pine Creek, sloughs, shallow potholes, ponds, lakes, and other wetland areas associated with the bottomlands. These areas are also heavily used by marsh-nesting birds such as the American bittern, redwing blackbird, prothonotary warbler, and various egrets and herons. The furbearing mammals are of considerable economic importance. High prices for the pelts of raccoon, coyote, gray fox, red fox, beaver, nutria, oppossum, mink, and skunk attract much trapping activity. The vegetal assemblages of the bottomlands provide important habitat elements for these furbearers. Other wildlife species inhabiting the bottomland include the white-tailed deer, fox squirrel, Eastern flying squirrel, swamp rabbit, common snipe, and various songbirds, woodpeckers, amphibians, and reptiles.

The surveys indicate that about 20 percent of the bottomland hardwoods consist of predominantly post size trees (less than four inches diameter breast height or DBH). Tree species include winged elm, hackberry, black willow, ash, and boxelder with understory species including osageorange, greenbriers, and alabama supplejack. Areas supporting this vegetal assemblage are relatively flat with few channel scars and are not well interspersed with higher value wetland types. Due to these factors, areas of this description are considered to be overall low value wildlife habitat. Another 60 percent of the woody vegetation in the flood plain consists of ash, winged elm, hackberry, and black willow, with occasional bur oak, willow oak, pecan, and mockernut hickory. These trees are predominantly pole size (greater than four inches and less than 12 inches DBH). The mast-producing species seasonally provide food for wildlife and the few older and larger hardwood trees provide den sites for arboreal animal species. Therefore, habitat of this type was given a moderate value for the wildlife that is found there. The remaining 20 percent consists of high quality, mature stands (greater than 12 inches DBH) of willow oak, water oak, bur oak, shumard oak, mockernut hickory,

shagbark hickory, black willow, red mulberry, flowering mulberry, redbud, and sassafras, with understory plants including alabama supplejack, greenbriers, blackberry, switchgrass, white tridens, and sedges. This habitat type is interlaced with channel scars that retain slowly draining overflow waters. It was given a high value for wildlife species.

There are two types of fish habitat within the project area: stream fisheries and pond or lake fisheries. Pine Creek is the major perennial stream and obtains most of its daily flow from effluent released by the Campbell Soup Company treatment facility and by the City of Paris sewage treatment plant. The quality of effluent from the Campbell Soup Company is considered good and will support a stream fishery. However, the sewage effluent from the Paris sewage treatment plant has remained of poor quality.

A diversified fish fauna exists in Pine Creek in spite of poor water quality conditions. A total of 46 different species of fish has been documented (appendix G) in Texas Parks and Wildlife Department report, "Management Recommendations for Proposed Reservoirs and Other Public Waters Project, Pine Creek 1977, F-30-R-3." According to this report, low numbers of rough fishes (spotted gar, spotted suckers, and blue sucker bullheads) were collected at stations 1, 4, and 5. No fishes were collected from stations 2 and 3. Remaining segments of Pine Creek support game species such as largemouth bass, white crappie, warmouth, longear sunfish, green sunfish, bluegill, and channel catfish, along with rough fish and forage species.

The local residents make very little use of this resource because of the poor water quality condition.

Lake and pond fisheries are an important resource within the watershed. Bodies of water vary in size from Lake Crook, with about 1,095 surface acres, to many farm ponds of less than one acre in size. Many of the lakes and ponds have been stocked with bass and sunfish and provide sport fishing to area residents.

In its present condition, Lake Crook has a low overall productivity. In Texas Parks and Wildlife Department's performance report of January 28, 1976, the fishery biologists reported extreme turbidity, an abundance of cut-grass around the shoreline, and stunted white crappie populations. Lake Crook has a current daily visitation rate of 10 to 20 persons, with most fishermen using trot lines or pole fishing from the deteriorated pier.

Endangered and Threatened Species

The watershed lies within the migratory ranges of the Northern bald eagle, the Southern bald eagle, and the American peregrine falcon, which are listed as endangered birds by the Federal Register (Thursday, July 14,

1977; Part V). Active nests have not been verified in the watershed. No critical habitat has been designated in the watershed.

The Federal Register on Endangered and Threatened Plants does not list any plants in the region of the watershed that are in danger of extinction (USDI, 1976).

Recreational and Unique Scenic Resources

The watershed and surrounding area provide excellent opportunities for water-based and other forms of recreation. Areas for water-based recreation in the watershed include Lake Crook, Lake Gibbons, Lamar Lake, the sediment pools of 13 floodwater retarding structures, and numerous small farm ponds. Recreation on Pine Creek is limited mainly to hunting activities. Other water areas lying near the watershed are Pat Mayse Reservoir and the Red River with its numerous oxbow lakes. Natural and scenic areas in and near the watershed include Smiley's Meadow Prairie, Womack Lake, and the John C. Gambill Goose Preserve at Lake Gibbons. The wooded hills bordering the Red River on the northern watershed divide offer a scenic contrast to the open prairies of the central and western parts of the watershed.

Most of the larger lakes and the goose preserve are open to the public. Ponds and lakes on private lands are generally used by the owners and their families and friends. Public demand and economic support for recreation and use of recreational facilities on private lands have not developed in this area. Traditionally, the public in this area have considered that they have the right to enter private lands to hunt and fish. Only a few landowners lease their lands for hunting.

Archeological and Historical Resources

There are no historical sites listed on the National Register of Historic Places at or in the vicinity of the planned structural measures. The Lamar County Historical Survey Committee has indicated that there are no historical sites in areas to be affected by structural measures.

An archeological survey made by the Institute of Applied Sciences, North Texas University, for the Soil Conservation Service identified five archeological sites and one historical cemetery as located in or near the remaining project measures to be installed. None of these sites are eligible for nomination to the National Register of Historic Places.

Soil, Water, and Plant Management Status

Agricultural development in the watershed and surrounding area began with pioneer settlement in 1825. The sandy timbered upland soils and the Red River terrace and bottomland soils were the first to be cleared for cultivation. The use of clean tillage methods, primarily for production of cotton, allowed considerable erosion to occur and severely damage most of the steeper sloping upland soils prior to the beginning of the

conservation movement in the 1930's. The sandy soils, which were low in fertility, were abandoned for cropland use and in a relatively short time became revegetated with regrowth of low quality hardwoods and brushy vegetation. Large areas of these formerly cultivated fields have been cleared in recent years and converted to improved pastureland. Only about 3 percent of the watershed is still being cultivated.

The Lamar Soil and Water Conservation District was organized in 1941 by interested landowners to encourage the application of needed conservation land treatment. Technical assistance is supplied to the district by Soil Conservation Service personnel headquartered in the field office at Paris.

Soil and water conservation plans have been developed on 333 of the 502 operating units, involving 83 percent of the agricultural land in the watershed. The average size operating unit in the watershed is 260 acres.

It is estimated that needed land treatment has been applied on 90 percent of the agricultural land in the watershed.

The areas of native grasslands, wooded areas, and open pasturelands are now affording good to excellent protection to the soils of the watershed. The erosion losses have been significantly reduced over those when much of the land was in cultivation and now average less than two tons of soil loss per acre per year.

Financial assistance for application of land treatment measures has been provided by the Agricultural Conservation Program administered financially by the Agricultural Stabilization and Conservation Service and supported technically by the Soil Conservation Service. These programs cost-share with landowners for application of various land treatment measures.

Projects of Other Agencies

There are no projects of other agencies that will be affected by the project. The City of Paris owns two reservoirs, Lake Gibbons and Lake Crook, in the watershed. Both reservoirs have provided municipal water in the past. Lake Gibbons, with a drainage area of 1.46 square miles and original capacity of 1,394 acre-feet, was replaced in 1923 by Lake Crook as the municipal water supply. Lake Gibbons is now managed as the John C. Gambill Goose Preserve by the Texas Parks and Wildlife Department. Lake Crook, with a drainage area of 53.06 square miles and original capacity of 11,487 acre-feet, served as municipal water supply until recent years when Pat Mayse Reservoir began to supply the water needs of Paris. Lake Crook is now used only for limited recreation and is on standby as an emergency municipal water supply.

The City of Paris' new sewage treatment plant was built with a grant from the Environmental Protection Agency. It replaced the old Camp

Maxey sewage treatment plant which was acquired by Paris when Camp Maxey was closed after World War II.

The Environmental Protection Agency has awarded funds to the City of Paris for a study of interceptor sewer and collection system improvements to their wastewater treatment plant. This study and any improvement activities will be without the effects of channel work that would have been complementary to their purpose. These efforts should, however, result in some improvement in the water quality of Pine Creek.

WATER AND RELATED RESOURCE PROBLEMS

Land and Water Management

The concept of resource conservation has been accepted by most land users in the watershed as evidenced by the progress in application and maintenance of conservation land treatment measures. The maintenance and improvement of a productive vegetative cover that will produce the desired volume of forage and still protect the soil and water resource is an ongoing problem. There are adequate assistance programs to make it possible and feasible for the land users to apply needed conservation treatment and make any planned land use changes.

Increased frequency of flooding and increasing wetness of productive agricultural flood plain land are problems throughout the central reaches of Pine Creek. Reduction of stream capacity, by past filling with clayey sediment and the accumulation of sewage sludge, has resulted in almost complete filling of a 3- to 4-mile reach of Pine Creek. Prolonged seasonal out-of-bank flows from the combined base flow and slightly over 9 million gallons of sewage and industrial effluent daily is changing former cropland and open pastureland into type 2 and type 3 wetlands. Normally seasonally-flooded bottomlands (type 1 wetlands) contain some hardwood species that are not adapted to prolonged wetness and are dying.

About 59 acres of natural type 3 wetlands have been enhanced by the increasing wetness and the increased flooding. The enhancement of flood plain lands for wetlands and the consequent reduction of its value for agricultural use are of concern to the landowners. There has been little economic incentive from hunting leases or from logging enterprises that would compensate for this loss of agricultural income. Thus there has been general lack of concern for management of this low economic value resource.

Floodwater Damage

Prior to installation of any project measures in the Pine Creek watershed, flooding could be expected to occur an average of four times annually with an average of two floods each year covering more than one-half of the flood plain. Storm events which occurred on an average of once in 25 years flooded about 11,828 acres of flood plain land. Large floods which covered

75 percent or more of the flood plain of Pine Creek occurred on November 2, 1946, and April 26-27, 1957. Large floods which have occurred since watershed plan development and covered more than 90 percent of the flood plain occurred in 1967, 1971, 1973, 1974, and 1976, and ranged in duration from a period of 18 hours to more than one week.

The 13 floodwater retarding structures and 7.06 miles of channel work that are constructed have reduced average annual cumulative flooding from 21,773 acres to 17,439 acres on the areas of flood plain downstream from the structures and adjacent to the channel work. Area flooded by the 25-year frequency flood has been reduced from 11,828 acres to 10,574 acres, eliminating flooding on 1,254 acres. Depth of flooding has been reduced in the remaining flood plain areas, but the duration of flooding and prolonged out-of-bank flows remain a problem in the stream segments with poor channel capacity.

Remaining flooding from Pine Creek is still causing problems other than agricultural damages in the watershed. The North Lamar Independent School District reports that five or six bus routes crossing Pine Creek have to be rerouted each time rains of 2-3 inches or more occur. This frequently delays students arriving at school in the morning and returning home in the afternoon. This problem also impedes the travel of the rural residents and affects road maintenance and repair.

During the planning process many landowners along Pine Creek expressed dissatisfaction about ponded water and sewage effluent that are slow to drain because of inadequate channel capacities. This ponding, a source of vector problems and bad odors, is magnified by the fact that most of Pine Creek's base flow is derived from industrial and sewage effluent.

Erosion Problems

The present upland erosion rates are low, averaging less than three tons per acre annually. Only about 3 percent of the watershed is in cultivation and vegetative cover is generally good. Of the total estimated upland annual gross erosion, 90 percent is derived from sheet erosion, 9 percent from gully and roadside erosion, and 1 percent from streambank erosion.

Flood plain erosion is low since most of the land subject to scour damage has been converted to pastureland. About 62 acres of land were being damaged by scouring before any project measures had been installed. This damage occurs in the reaches of flood plain on which effective reduction of floodwater and erosion damages has not been achieved.

Sediment Damage

The present rates of sediment yield are low, averaging less than 0.30 acre-foot per square mile. However, they have been much higher in the past. Extensive cultivation in this region began on the sandy

timbered soils of the uplands and expanded into the sandy bottomlands of the Red River. It spread to the clay prairie soils about 1875 when the railroad was extended to Paris. Cultivation of clean tilled crops, predominantly cotton, resulted in severe soil erosion and high rates of sediment production. The scars of this past erosion, the intricate patterns of gullies and damaged soil profiles, are still visible in the watershed. The application of conservation treatment which started on a continuing scale in the 1930's has stabilized and healed these areas. Adjustments in agriculture have resulted in a change from cropland to grassland and a general improvement of all vegetative cover in the watershed. An estimated 32,400 tons of sediment are now being carried out of the watershed annually. This represents a concentration of about 235 mg/l in the average annual runoff of 101,382 acre-feet.

Detailed sedimentation surveys were made by the Soil Conservation Service on both Lake Gibbons and Lake Crook in 1936 and again in 1956. The 1936 survey on Lake Crook showed that the original capacity had been reduced from 11,487 acre-feet to 10,755 acre-feet for an average annual sediment accumulation rate of 56 acre-feet. In 1956, the capacity had been further reduced to 9,964 acre-feet. The annual average rate for the period 1936 through 1956 was 40 acre-feet.

Detailed investigations of land use practices and erosion conditions in the drainage area above Lake Crook at the time of plan development indicated that the average annual rate of sediment deposition in the reservoir had been reduced to approximately 34 acre-feet. The land treatment measures applied to date and the two floodwater retarding structures that have been installed upstream from Lake Crook have reduced sedimentation to an estimated annual rate of deposition of 23 acre-feet.

The accumulation of sediment from the severe erosion in the uplands in the past drastically reduced the natural capacity of Pine Creek throughout the central and upper reaches of Pine Creek. The remaining capacity of the 3- to 4-mile segment of Pine Creek lying downstream from the City of Paris sewage treatment plant was further reduced to a point of little or no capacity by accumulations of sewage sludge derived from the old treatment plant. Swamping or increasing wetness due to prolonged out-of-bank flows was recognized as a problem on 2,200 acres of agricultural land at the time of work plan development in 1962. This area included about 300 acres of former cropland and open pastureland which changed to woody pastureland between 1941 and 1961. The wetness has further increased on this land and adjoining lands so that about 40 acres of open pastureland have been changed to a type 2 wetland and bottomland hardwoods in a type 1 wetland area are being killed.

Drainage Problems

Surface water drainage problems are concentrated along Pine Creek from its crossing of U.S. Highway 271 downstream to F.M. Road 2648 crossing.

The existing Pine Creek channel is adequate to serve as a major outlet for on-farm surface water drainage systems in the lower half of this reach. On-farm drainage will meet the drainage needs in this segment when the frequency of flooding is reduced. Almost complete filling with sewage sludge in the upper half of this reach prevents on-farm drainage of surface water and released effluent now flows acrss these lands.

Water Quality Problems

Texas Department of Water Resources' files indicate that the City of Paris is keenly aware of the urgent need to correct the problems of "the excess volume of sewage resulting from the entry of storm water and seepage into the collection system and the overloading of the new plant requiring the release of untreated sewage into Pine Creek." TDWR indicated that the City of Paris is using some of its available funds to correct the storm water infiltration problem.

The EPA has awarded funds to the City of Paris for a study of interceptor sewer and collection system improvements to their wastewater treatment plant. This activity will have an important bearing on Pine Creek water quality. The deep accumulation of sludge in Pine Creek can be expected to be a continued source of pollution in future years unless it is removed by dredging or other means.

Turbidity will continue to be a water quality problem in Lake Crook until measures are provided to settle the colloidal sediment out of the water and shoreline erosion is controlled.

Economic and Social Problems

Approximately 30 percent, or 150 of the farms in the watershed, are classified as low-income producing units. These family farms are usually small in size, limited in both acres and capital. Low returns and high cost of mechanical treatment needed to improve returns from the land have prevented the operators of small farms from utilizing the most recent management practices. This, along with the increased wages paid by industrial firms in the area, has resulted in the development of the weekend farmer. People unable to make an adequate income on the farm have been able to find jobs in the local industrial plants to supplement their farm income.

The local economy has grown in the last 10 years mainly as a result of local industrial development. The Campbell Soup Company plant and Westinghouse provide jobs for many farmers and residents in Paris and the surrounding area.

Fish and Wildlife Problems

The major problem with fish and wildlife resources is economic. Landowners have realized little or no economic returns from land that is managed as wildlife-recreation land. This is due partly to the tradition

Increased wetness restricts the use of portions of the Pine Creek flood plain.

Duckweed (the floating material surrounding the grassy vegetation) occurs in the open water areas of Pine Creek where overflow waters have ponded. If not too dense, it is a good food source for waterfowl.

The out-of-bank flow from Pine Creek is altering the environment of these bottomland hardwood trees. The trees, adapted only to natural, short-term, infrequent inundations, are being killed by the more frequent, extended inundations.

The natural vegetation in the areas where wetlands are being created by the continuous out-of-bank flow of Pine Creek lacks many of the plant species native to natural wetland areas. Revegetation through natural plant succession will require many years.

prevalent in the area that the fish and game belong to the public and the public should not have to pay to hunt and fish. The fishery resource in Pine Creek is utilized very little because of odors and poor water quality resulting from the large volume of sewage sludge in the stream and continued release of untreated sewage. Non-point sources of pollutants in runoff from the urban and built-up areas also reduce water quality. The potential for improvement of the fishery resource by improvement of waste-water quality will be limited because of lack of any significant waterholes in the stream. Turbidity in Lake Crook limits the fishery productivity as well as the aesthetics of the lake.

The land use trend is toward improved pasture and livestock production when an adequate return on investments can be realized. Land users are concerned with the production of crops and improved grasses that generate the greatest economic return for the land. There is little or no economic incentive for providing for the needs of various species of wildlife. The conversion of cropland and native woody grasslands to improved pastureland that is intensively managed for high levels of production has further reduced food supplies and habitat quality for many wildlife forms.

Recreation Problems

Recreational use of Pine Creek and surrounding area is limited to hunting because the overall poor quality of water makes this stream undesirable for other forms of recreational use. The high turbidity of water in Lake Crook and the lack of adequate recreational facilities are a deterrent to the use of this reservoir and surrounding land to the fullest potential for recreation. Little fishing is done because of low fishery production in the turbid waters. Adequate boat ramps are lacking for boating or other water sports. Little use is made of existing picnic tables, which are in deteriorated condition due to vandalism and lack of maintenance. These conditions in the watershed are in contrast to an overall appraisal of the potentials of Lamar County for outdoor recreation. A medium to high potential for 12 types of outdoor recreation are recognized for this county (North Texas Soil Conservation District, July 1967).

ENVIRONMENTAL IMPACTS

Conservation Land Treatment

No additional project funds are to be used for accelerated technical assistance for application of land treatment measures by private land users. However, technical assistance provided under on-going programs will assure the continuing application and maintenance of the land treatment measures.

Structural Measures

The installation of the remaining project measures, consisting of 2 planned floodwater retarding structures, conversion of Lake Crook to a multiple-purpose structure, and 4 grade stabilization structures will reduce the average annual cumulative area flooded from the 17,439 acres flooded with measures already installed to 14,250 acres. The area flooded by a 25-year frequency storm will be reduced from the present 10,574 acres to 9,857 acres flooded. The average annual benefits produced will be increased from the $205,010 estimated for the measures already installed to $379,138 (excluding $15,060 fish and wildlife benefits to Lake Crook).

These measures, in combination with the 13 structures and 7.06 miles of modified channel already installed, will reduce the area flooded by a 25-year, 5-year, 2-year, and 1-year frequency flood by 1,971, 2,319, 2,344, and 2,636 acres, respectively. Average annual floodwater damages will be reduced from $610,850 to $231,713, a reduction of 62 percent. This includes an average annual floodwater damage reduction of 66 percent for crop and pasture, 66 percent for other agriculture, 29 percent for roads and bridges, 27 percent for sediment, 92 percent for erosion, and 62 percent for indirect damages.

A total of about 85 owners and operators of 11,828 acres of agricultural land will be directly benefited. These owners and operators of flood plain land report that with flood protection they will restore some of the formerly cultivated lands now in open pasture to higher value, more productive cropland because of the reduced area and depth of flooding.

The watershed project will not adversely affect the wetlands of the watershed. Lake Crook modification will reduce the amount of open fresh water by 205 surface acres. However, there is no overall loss of aquatic habitat value because the resulting open water of Lake Crook will have reduced turbidity, improved fertility, and improved shoreline development. The wetlands adjacent to Pine Creek (Types 1, 2, 3, and 6) will continue to receive local runoff and seasonal inundation from channel overflow, and there is no project-related incentive for land use changes.

Installation of the remaining project measures will not require the commitment of any prime farmland. The reduction in area flooded will enhance prime farmland in the flood plain.

Water tables in the alluvium of Pine Creek will not be adversely affected by the modification of Lake Crook. The alluvial soils are dominantly clays with very slow permeability and poor internal water movement capabilities. Neither the lowering of Lake Crook's water surface elevation nor its dewatering for short durations will measurably effect any adjacent ground water levels.

The two floodwater retarding structures remaining to be installed will require the use of the following wildlife habitat types and amounts:

	Dam/Spillway	Sediment Pool	Detention Pool
Site 1A	18 acres	66 acres	454 acres
Wooded Area	10 acres	36 acres	182 acres
Open Pasture	8 acres	30 acres	272 acres
Site 11	20 acres	60 acres	329 acres
Wooded Area	8 acres	52 acres	113 acres
Open Pasture	12 acres	8 acres	216 acres
Totals	38 acres	126 acres	783 acres
Wooded Area	18 acres	88 acres	295 acres
Open Pasture	20 acres	38 acres	488 acres

The vegetation of the wooded areas includes shumard oak, willow oak, green ash, mockernut hickory, slippery elm, hackberry, American elm, Eastern red cedar, sweetgum, and boxelder. Cherrybark oak, water hickory, water oak, pecan, bitternut hickory, willow, and cottonwood occur in wetter areas. The open pasture habitat type is comprised of coastal bermudagrass that is not intensively managed and allows the presence of other grasses and forbs (e.g. panicums, paspalums, and clovers). The dams and emergency spillways will be revegetated with bermudagrass for erosion control. Disturbed and odd areas will be planted with various native and introduced grasses, forbs, and shrubs. The sediment pools will be converted to open water and will be lost to agricultural production and as terrestrial wildlife habitat. The borrow to construct the dam will, as far as possible, be obtained from within the sediment pool. Clearing of woody vegetation will be restricted to within 400 feet from the principal spillway inlet and parallel to the dam. The remaining woody vegetation that is below the lowest ungated outlet will provide aquatic habitat. An area around the shoreline of structure No. 11 will be fenced to preserve the remaining vegetation and improve the quality of wildlife habitat. The 783 acres of land in the detention pools above the sediment pools will not be directly affected by construction activities. This area will be subject to an occasional interruption of use because of temporary detention of floodwater and the existing vegetation may undergo some changes towards a wetlands type vegetation near the sediment pools.

Construction of the dams and impoundment of water in the sediment pools will destroy 3.8 miles of existing ephemeral streams and waterways and the associated riparian woods. The detention pools will temporarily inundate up to 10.8 miles of streams and waterways with ephemeral flow conditions and increase wetness in these areas.

The modification of Lake Crook will result in the loss of about 205 surface acres of poor quality aquatic habitat and 2,481 acre-feet of conservation storage. The lowering of the Lake Crook water surface will expose about 0.75 miles of additional ephemeral streams and waterways at the upper end of the reservoir. Planned mitigation and management measures will offset this loss and result in a substantial increase in the total value of the remaining aquatic resources. Improvement of fish resources is expected

to increase fishing from the present 5,475 fishing-days to 9,125 fishing-days annually with installation of fish and wildlife facilities.

The construction of the four grade stabilization structures will involve about 24 acres of land. Collectively, they will involve 6 acres of woody vegetation that is primarily willow, water oak, eastern redcedar, elm, and green ash. The remainder of the land involved is eroded land that is either void of vegetation or is vegetated with a sparse growth of common bermudagrass, Johnsongrass, low panicums, paspalums, and annual forbs.

The modification of Lake Crook will lower the permanent water level 2.5 feet and will transform 205 acres of low quality aquatic habitat into revegetated shoreline terrestrial habitat. During drawdown of the reservoir for modification work, the exposed lake bottom will be planted to a high residue cover crop such as japanese millet to provide specific fish and wildlife benefits. Refilling of the reservoir to the new level after establishment and maturity of the cover crop will stabilize the colloidal bottom sediment and provide decomposing organic residues for flocculating the colloidal suspended sediment and causing its settlement to the lake bottom. The clearing of this turbidity will improve planktonic growth for better aquatic habitat. Some waterfowl benefits will also be provided by these plantings. Repetition of plantings, as needed, will be made possible by the installation of gated ports in the principal spillway to permit drawdowns of the reservoir. The fish and waterfowl habitat of Lake Crook can be improved and maintained through periodic drawdown and planting of cover crops.

Water impounded in the sediment pools will change 126 acres of terrestrial wildlife habitat to surface water. These impoundments will provide fishery habitat, some feeding areas and resting areas for waterfowl, aquatic habitat for other species, and watering facilities. The impoundments will have insignificant impacts on water yields from the watershed. Reducing the surface area of Lake Crook will offset impacts of water surface evaporation from other structural measures. The estimated loss by evaporation will initially amount to about 0.3 percent of the runoff from the watershed.

The opportunities for water-based recreation will be increased with the creation of two additional lakes and the modification of Lake Crook. The opportunities for duck hunting should increase slightly because of the increased amount of habitat for waterfowl. Although storage quantity will be reduced in Lake Crook, the quality of its fishery resource will be improved and recreational fishing opportunities will increase.

There will be a slight increase in air and water pollution during the construction of structural measures. Possible erosion on the area to be affected by installation of the floodwater retarding structures during construction will be offset by the immediate effectiveness of the structures in trapping sediment.

Construction activities associated with the installation of floodwater retarding structures will not cause noise levels in excess of standards. There will be no adverse impacts on residents within the project area.

Three of the archeological sites identified, none of which are eligible for nomination to the National Register of Historic Places and none of which are worthy of further study, are located in or near the planned detention pool of floodwater retarding structure No. 11. These sites will not be affected by actual construction activities. Should cultural resources be encountered during construction, work will cease and the State Historic Preservation Officer and the Advisory Council on Historic Preservation will be afforded the opportunity to comment in accordance with the Procedures for the Protection of Historic and Cultural Properties (36 C.F.R., Part 800).

The area required for the two floodwater retarding structures consists of 401 acres of wooded area and 546 acres of open pasture. Installation of the dams and spillways will destroy 18 acres of wooded habitat. The sediment pool will impact on 88 acres of wooded habitat. If possible at the time of construction, actually clearing will be limited to 400 feet upstream of the principal spillway. If this is achieved, the severe impact will be limited to 18 of the 88 acres of wooded habitat. The detention pools will, on occasion, temporarily inundate another 295 acres of wooded habitat.

The dams and emergency spillways of structure site No. 1A will not be visible from existing roads. The sediment pool of this structure will be visible at one-half mile distance from a moderately traveled farm-to-market road. Structure site No. 11 is upstream from another more heavily used farm-to-market road. Remaining trees below this dam will tend to provide screening value to the dam and revegetation of the embankment with grasses similar to that in the pastureland will help blend in with the surrounding land use.

The visual aspects of Lake Crook will be improved by the reduction of turbidity of the reservoir, the shaping and revegetation of the wave-eroded shoreline, and the improvement of the deteriorated boat ramps and fishing facilities.

Economic and Social

The total economic impact of the project on the local economy from the increased marketable production resulting from the reduction of crop and pasture, sediment, and erosion damages will amount to an increase in household income of over $275,370 annually. It will provide employment opportunities for local residents by creating approximately 42 new jobs. In addition, the expenditure of funds for the construction of the works of improvement will create approximately 100 man-years of employment. Each construction contract will include provisions for equal opportunity employment.

The reduction of agricultural flood damages in the flood plain will ensure more dependable crop yields and help stabilize the agricultural

sector of the local economy. This improvement in farm income will boost the local economy by reducing the need for farmers to seek employment for supplemental income and in many cases, farmers will employ part-time laborers, thus creating new jobs. Also, farmers will be able to shift funds previously used to repair flood damages to other items that improve their standard of living and environment.

There are 30 minorities utilizing 4,515 acres in the watershed. None will be directly affected by installation of project measures, but all will receive the economic and social benefits attributable to the project. Significant intangible benefits will accrue to the project, allowing an opportunity for the shifting of public funds from the repair of flood damage to roads, bridges, and other public facilities to investment in public facilities that improve the quality of living.

Indirect damages will be reduced as a result of less frequent flooding. Practically all of the interruption of and extra travel for school buses and mail carriers caused by flooded roads and washed-out bridges will be eliminated with the project installed. The total average annual 1980 base cost of structural measures (amortized total installation and project administration costs plus operation and maintenance) is $199,662. The total average annual benefits accruing to structural measures are $394,198. The benefit-cost ratio is 2.0 to 1.0.

FAVORABLE ENVIRONMENTAL IMPACTS

The favorable impacts which have been identified with remaining project measures are as follows:

1. The area flooded by the 25-year frequency storm will be reduced from 11,828 to 9,857.

2. The average annual benefits will be increased from $205,010 estimated for measures already installed to $394,198.

3. The area flooded by 25-, 5-, 2-, and 1-year frequency events will be reduced by 1,971, 2,319, 2,344, and 2,636 acres, respectively.

4. The 85 owners of 11,828 acres of agricultural land will be directly benefited.

5. An estimated 0.75 miles of stream will be exposed by lowering Lake Crook water surface 2.5 feet.

6. Fishery resources of Lake Crook will be improved by fish and wildlife development measures.

7. Opportunities for recreation will be increased by installation of support measures for fish and wildlife development.

8. Visual aspects of Lake Crook will be improved by reduction in turbidity.

9. Estimated annual sediment load presently leaving the watershed will be reduced from 32,400 tons to 30,500 tons with remaining structures.

10. The quality of the remaining Lake Crook fresh water area will be improved by reduced turbidity, improved fertility, and improved shoreline development.

11. Diversity of habitat in upland areas will be created by changing the 126 acres in the sediment pools from terrestrial habitat into fish and waterfowl habitat.

12. Improve economic and social conditions by:

    a. Increasing household income by $275,370 annually due to marketable production resulting from reduced damages on the flood plain.

    b. Creating approximately 42 new jobs in the areas.

    c. Creating 100 man-years of employment during construction and maintenance phases.

    d. Reducing flood damage and cost of repairs on roads, bridges, fences, etc.

ADVERSE ENVIRONMENTAL IMPACTS

The identified adverse impacts which cannot be avoided by installation of the project are as follows:

1. Restrict future use of the 38 acres of land used for construction of the dams and emergency spillways of the floodwater retarding structures.

2. Restrict future use of the 783 acres of land used for temporary impoundment of floodwater in the detention pools to uses similar to their present uses for pastureland, woody pastureland, and terrestrial wildlife habitat.

3. Destroy 3.8 miles of ephemeral streams by the dams, emergency spillways, and sediment pools of the structures.

4. Temporarily inundate up to 10.8 miles of streams in the detention pool areas.

5. Reduce Lake Crook's open freshwater area by 205 acres.

6. Reduce the conservation pool of Lake Crook by 2,481 acre-feet.

7. Increase the overall concentration of sediment in the annual run-off from the watershed from 235 mg/1 at present to 240 mg/1 during the 2-year construction period.

8. Destroy 6 acres of woody habitat by installation of grade stabilization structures.

9. Require commitment of 401 acres of wooded habitat as follows:

   a. 18 acres destroyed by installation of dams and spillways.

   b. A minimum of 18 acres and a maximum of 88 acres destroyed by installation of sediment pools.

   c. 295 acres will be subjected to occasional periods of temporary inundation.

ALTERNATIVES

The alternatives that were considered during the planning process for watershed plan development in 1962 included the application of land treatment measures alone; the application of land treatment and different combinations of floodwater retarding systems; and the installation of 19.5 miles of channel work in addition to the application of the land treatment and the structural measures. Alternative designs for the channel work were studied to determine the most economical design. Modifications to Lake Crook for inclusion of storage space for floodwater were not found to be feasible at the time of watershed plan development because of use of this reservoir for a primary source of water supply by the city of Paris. The termination of use of this reservoir for primary water supply and its use for a standby water source only has reduced this reservoir's floodwater retarding effects.

The total cost, federal and non-federal, of the project measures already installed in $1,966,110. This figure includes $1,125,090 for the 13 floodwater retarding structures, $457,800 for the 7.06 miles of channel work, and $383,220 for project administration. A total of $95,870 of project funds was expended for accelerated technical assistance for the application of $1,447,400 of land treatment measures.

A brief description and summary (table 3) of possible alternatives to completion of installation of the project which would reduce or avoid adverse impacts of the remaining measures are presented below:

Alternative 1 - This alternative consists of foregoing implementation of the remainder of the project. The provision of accelerated technical assistance for the application of land treatment measures to reach project goals has been completed. Technical assistance for continued application and maintenance of land treatment will be carried on under on-going programs. The adverse environmental impacts associated with

installation of the remaining two floodwater retarding structures, one multiple-purpose structure, and 10.28 miles of channel work would be avoided. The beneficial effects and project goals would not be achieved.

The total installation cost of this alternative is $1,966,110 for the structural measures installed. The local share of this cost is $283,190. The annual cost (1980 base), excluding land treatment, is $146,801 and the annual benefits, excluding land treatment, are $205,010.

Cumulative average annual flooding has been reduced from 21,773 acres to 17,439 acres and the area flooded by the 25-year frequency storm has been reduced from 11,828 acres to 10,574 acres. Frequency of flooding and prolonged out-of-bank flows of base flows and release rates remain a problem in the 3- to 4-mile reach of Pine Creek which is almost completely filled with sewage sludge.

The conversion of 126 acres of agricultural land and terrestrial wildlife habitat to surface water and aquatic habitat would be avoided. The Lake Crook surface area would not be reduced by 205 acres and the conservation storage would not be reduced by 2,481 acre-feet. The fish and waterfowl habitat in Lake Crook would not be improved. The poor fishery resource in Pine Creek would remain unaffected and the loss of 262 acres of bottomland hardwood vegetation would be avoided. The planting of 163 acres of quality-improving vegetation in existing poor woody vegetation above Lake Crook and in channel work areas would be foregone. The overall wildlife habitat value within the area to be affected by the selected plan would remain unchanged from its present value.

This alternative is not acceptable to the local sponsoring organizations since it does not reduce flood damages to an acceptable level. The sponsors have obtained all of the land rights for the channel work and many of those needed for the structural measures. They have been collecting taxes for flood damage reduction on flood plain lands through a special taxation.

Alternative 2 - This alternative consists of installing the remaining two floodwater retarding structures and four grade stabilization structures, modification of Lake Crook to add flood control, and foregoing installation of 10.28 miles of channel work. The four grade stabilization structures were included as appurtenances to the channel in Alternative 4. They are included in this alternative to stabilize inlets into the mainstem of Pine Creek.

This alternative would avoid the adverse impacts identified with installation of remaining channel work and achieve some of the beneficial effects identified with installation of the remaining floodwater retarding structures and the modification of Lake Crook into a multiple-purpose reservoir.

The installation cost of this alternative is $3,487,330, which includes $1,966,110 for the structural measures already installed. The local share of this cost is $638,170. The annual cost (1980 base) excluding land treatment, is $199,662 and the annual benefits, excluding land treatment and $15,060 fish and wildlife benefits to Lake Crook, are $379,138.

Cumulative annual flooding would be reduced from 17,439 acres still flooded with the measures already installed to 14,250 acres. The area flooded by the 25-year frequency storm would be reduced from 10,574 acres to 9,857 acres. Release flows would add to the out-of-bank base flow which is now occurring in the 3- to 4-mile segment of Pine Creek which is filled with sediment and sewage sludge. This slight increase would not significantly alter the present problem of prolonged seasonal out-of-bank flows which prevents the landowners from using the land to its maximum agricultural potential.

The surface area of Lake Crook would be reduced by 205 acres and conservation storage reduced by 2,481 acre-feet. The fishery resource and waterfowl habitat in Lake Crook would be improved and measures installed to permit maintenance of these resources. The poor fishery in Pine Creek would be unaffected and the loss of 262 acres of bottomland hardwood vegetation would be avoided. The planting of 163 acres of quality-improving vegetation in existing poor woody vegetation above Lake Crook and in channel work areas would be foregone.

This alternative is the selected plan. It is not the plan initially preferred by the local sponsoring organizations since it does not fully meet the objectives established in the 1962 plan for reducing flood damages. They have obtained all of the needed land rights for the channel work. During the interagency review process, it became evident that Alternative 3 and then Alternative 4 could not be successfully installed.

Alternative 3 - This alternative consists of installing the remaining two floodwater retarding structures, modifying Lake Crook into a multiple-purpose structure, installing 5.22 miles of channel work with adequate capacity for release rates, and foregoing the 10.28 miles of channel work to provide needed capacity for flood damage reduction (appendix E).

This alternative would avoid many of the adverse impacts associated with installation of 10.28 miles of channel work. It would achieve many of the other beneficial impacts from the structural measures, but would not achieve the project goals for flood prevention.

The installation cost of this alternative is $3,910,420, which includes $1,966,110 for the structural measures already installed. The local share of this cost is $731,310. The annual cost (1980 base), excluding land treatment, is $214,335 and the annual benefits, excluding land treatment and $15,060 fish and wildlife benefits for Lake Crook, are $379,138.

Cumulative annual flooding would be reduced from 17,439 acres still flooded with the measures already installed to 14,250 acres. The area flooded by the 25-year frequency storm would be reduced from 10,574 acres to 9,857. Increasing wetness by prolonged out-of-bank flows, base flows, and release rates would be eliminated but the level of flood damage desired by the local sponsoring organizations would not be achieved.

The length of stream channel modification would be reduced from 10.28 miles in the preferred plan to 5.22 miles. The amount of land committed

to the channel work would be reduced from 486 acres with the preferred plan to 130 acres. The amount of woody vegetation cleared would be reduced from 262 acres with the selected plan to 85 acres. About 20 acres of quality hardwood vegetation would be planted to offset the loss of woody vegetation.

The surface area of Lake Crook would be reduced by 205 acres and conservation storage reduced by 2,481 acre-feet. The fishery resource and waterfowl habitat in Lake Crook would be improved and measures installed to permit maintenance of a good fishery. There would be very little effect on the poor fishery in Pine Creek. No woody vegetation would be planted.

This alternative is not preferred by the local sponsoring organizations since it does not meet the objectives established in the 1962 plan for reducing flood damages. The sponsors have obtained all the needed land rights for the 10.28 miles of channel work. During the interagency review process, Alternative 4 became unacceptable due to concerns other than those of the local sponsoring organizations. The sponsors selected Alternative 3 as second choice. During follow-up consultation with fish and wildlife interests, it became evident that the release rate channel as proposed would not be acceptable to these other concerns. Field coordination with fish and wildlife interests established that the only alignment they would find acceptable required new easements for preservation of certain habitats. The new easements were beyond the sponsors' capability. This alternative then became unacceptable.

Alternative 4 - This alternative is the plan preferred by the sponsors. It consists of installing the remaining two floodwater retarding structures, modifying Lake Crook into a multiple-purpose structure, and installing 10.28 miles of channel work for reduction of flood damages (appendix F).

The installation cost of this alternative is $6,676,650, which includes $1,966,110 for the structural measures already installed. The local share of this cost is $837,350. The annual cost (1980 base), excluding land treatment, is $300,847 and the annual benefits, excluding land treatment and $15,060 fish and wildlife benefits for Lake Crook, are $584,150.

Cumulative annual flooding would be reduced from 17,439 acres still flooded with the measures already installed to 8,804 acres. The area flooded by the 25-year frequency storm would be reduced from 10,574 acres to 9,273 acres. Prolonged out-of-bank flows would be eliminated and flood flows would more nearly approach those expected under natural conditions.

Lake Crook surface area would be reduced by 205 acres and conservation storage reduced by 2,481 acre-feet. The fishery resource and waterfowl habitat in Lake Crook would be improved and measures installed to permit maintenance of a good fishery. The poor to fair fishery in Pine Creek

TABLE 3 - SUMMARY OF ALTERNATIVES

Pine Creek Watershed, Texas

ENVIRONMENTAL, ECONOMIC, AND SOCIAL INDICATORS	CONDITIONS WITH ALTERNATIVES			
	ALTERNATIVE 1	ALTERNATIVE 2 Selected Plan	ALTERNATIVE 3	ALTERNATIVE 4 Locally Preferred Plan
	Forego Installation of Remaining Planned Measures	Install Remaining 2 F. R. Strs. and M-P Str., and Forego Channel Work	Install Remaining Two F. R. Strs., M-P Str., and 5.22 Mi. Channel Work*	Install Two F. R. Strs., M-P Str., and 10.28 Mi. Channel Work
Total Installation Cost	$ 1,966,110	$ 3,487,330	$ 3,910,420	$ 6,676,650
Local Share Installation Cost	$ 283,190	$ 638,170	$ 731,310	$ 837,350
Annual Cost (Excluding Land Treatment)	**$ 146,801	**$ 199,662	**$ 214,355	**$ 300,847
Annual Benefits (Excluding Land Treatment)	$ 205,010	***$ 379,138	***$ 379,138	***$ 584,150
Cumulative Average Annual Flooding (Ac.)	17,439	14,250	14,250	8,804
Area Flooded by 25-Year Storm (Ac.)	10,574	9,857	9,857	9,273
Stream Fishery Resources:				
Good Condition (Miles)	1.5	1.5	1.5	1.5
Fair to Good Condition (Miles)	4.4	4.4	2.4	2.4
Fair Condftion (Miles)	6.1	6.1	6.1	3.3
Poor to Fair Condition (Miles)	4.5	4.5	4.5	-0-
Poor Condition (Miles)	10.5	10.5	12.3	17.4
None to Poor Condition (Miles)	3.0	3.0	-0-	-0-
Wetland Resources:				
Type I (Ac.)	1,395	1,395	1,310	1,133
Type II (Ac.)	72	72	72	72
Type III (Ac.)	59	59	59	59
Type V (Ac.)	1,800	1,721	1,721	1,721
Type VI (Ac.)	20	20	20	20
Lake Crook Resources:				
Flood Oetention Storage	None	2,481	2,481	2,481
Conservation Storage (Ac.-Ft.)	9,288	6,807	6,807	6,807
Suriace Area (Ac.)	1,095	890	890	890
Fishery Resources	Poor	Good	Good	Good
Prime Farmland Soils Protected (Ac.)	2,600	3,325	3,325	3,325
Land Committed by Measures:				
Dams and Emergency Spillways (Ac.)	-	45	45	45
Sediment Pools (Ac.)	-	126	126	126
Detention Pools (Ac.)	-	783	783	783
Channel Work Area (Ac.)	-	-	130	486
Miles of Stream To Be Modified	-	-	5.22	10.28
Bottomland Hardwoods To Be Cleared (Ac.)	-	-	85	262
Woody Vegetation Planted (Ac.)	-	-	20	163
Overall Wildlife Habitat Value In and Adjoining Lands Committed by Project Measures (appendix G)	8,911	10,311	10,265	10,198
Endangered and Threatened Species	No Impact	No Impact	No Impact	No Impact
Archeological Resources	No Impact	Minor Impact on Three Insignificant Sites	Minor Impatt on Three Insignificant Sites	Minor Impact on Three Insignificant Sites

* Release flow channel - this will result in minor additional reductions in flooding which were not evaluated.
** Price base 1980, actual as built cost updated.
*** Excludes fish and wildlife benefits of $15,060 for Lake Crook improvement measures.

would be modified slightly. The loss of 262 acres of bottomland hardwood associated with the installation of the 10.28 miles of channel work would be offset by planting of 163 acres of quality woody vegetation in upstream areas of poor quality vegetation in upper Lake Crook and along the channel work areas.

This is the preferred alternative of the sponsors. It will meet the goals for flood damage reduction in accordance with original plan completed in 1967. This plan conforms to SCS policy for protection and minimization of adverse impacts to environmental resources and provides mitigation insofar as practical. However, this plan is opposed by USDI, Fish and Wildlife Service because of the impacts on fish and wildlife.

Other Alternatives - In the planning aid letter of December 16, 1976, the Fish and Wildlife Service provided two alternatives to the remaining planned channel work. This letter rejected any work which would restore any form of stream capacity in even the most severely sludge- and sediment-filled stream segments of Pine Creek. The alternatives presented consisted of (1) changing the use of the land to uses compatible with flooding and (2) installing a levee system to provide a floodway.

The components for the alternative of changing land use to uses compatible with flooding are contained in alternatives 1 and 2. Pastureland, both wooded pastureland and open pastureland, is the dominant use of the flood plain at present and this use is compatible with normal or natural type flooding. However, the prolonged out-of-bank flows and related surface wetness conditions resulting from the volume of waste-water and base flows which exceed stream capacity are damaging the soil productivity for pasture forage production as well as killing the natural bottomland hardwoods.

The alternative of installing a levee system to provide a floodway for conveyance of floodwater was investigated to determine its feasibility as an alternative. It was not found to be a practical alternative because of physical restrictions and environmental and economic conditions. The clayey alluvial sediments deposited along the banks of Pine Creek in natural levees to depths of 3 to 5 feet have raised the elevations of the streambanks well above the elevation of the adjoining flood plain. Some of the most severely affected segments of Pine Creek channel have been filled with sediment and sewage sludge to the extent that the streambed is at or near the same elevation as low points on the flood plain. A levee system would have to provide capacity for containment of flood flows within this raised or high area of the flood plain and, in addition, must provide for bringing floodwater across the low flood plain into the floodway from the numerous large and small tributaries.

A complicated dual levee system and tributary channelization would be required to bring in side inlets and tributaries into the floodway. The

second levee system would need to parallel the main levee for sufficient distances to attain the gradients needed to bring these inlets into the floodway. The amount of land required for levees and borrow would be more than doubled. Costs would be affected similarly. The area protected would be reduced to the extent that benefits from the benefited area would not justify costs. These remaining protected areas, however, would receive a higher level of flood protection than is to be provided to flood plain areas by the selected plan.

The adverse environmental impacts from a levee system would not be limited to the destruction of terrestrial habitat on the areas on which construction is performed. All of the type 2, 3, and 6 wetlands occur out on low areas of the flood plain well away from Pine Creek (note location on maps in appendices E and F). A levee system would enclose most of these wetland areas within the area of flood plain to be protected. The confinement of the base and wastewater flows in a levee system bordering the 7-mile sediment- and sludge-filled segment of Pine Creek would result in continuous inundation and killing of the enclosed bottomland hardwoods which developed under only a normal type of flooding situation.

Clearing, snagging, and channel dredging to remove debris and sediment obstructions were considered as means of increasing the channel capacity. These practices have limited effect on the stream capacity and do not usually result in sufficient economic return to justify their cost. They are most effective where the increase in capacity needed does not exceed twice the rated capacity of the existing channel. The channel capacity of Pine Creek was planned to be increased from 50 cfs to 3,400 cfs. The capacity would have to be increased to 650 cfs to carry only structure releases as proposed in Alternative 2. Clearing, snagging, and channel dredging were judged unfeasible for this project.

RELATIONSHIP TO LAND USE PLANS, POLICIES, AND CONTROLS

None of the flood plain lies within the city limits of an incorporated or unincorporated municipality and there are no built-up areas or threats of development. The flood plain is in agricultural use and the level of protection to be provided is sufficient only for this or similar use.

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Approximately 93 percent of the land in the watershed is used for agricultural purposes. Urban growth in the city of Paris is converting agricultural land into built-up areas and is increasing effluent releases into Pine Creek from the City of Paris sewage treatment plant. There is no threat of urban development on the flood plain lands.

The Pine Creek watershed project lies within the Red River basin, downstream from the Lake Texoma dam. The Red River heads in eastern New Mexico. Besides draining a small area of eastern New Mexico, the river drains portion of north Texas, southern Oklahoma, southeastern Arkansas, and northwest and central Louisiana. Approximately 24,463 square miles of the Red River basin lies within Texas.

There are eight Public Law 566 watersheds located within the Texas portion of the Red River basin on which watershed projects have been installed or which have been approved for operation. The drainage area of these eight projects is 1,262.2 square miles. A total of 64,789 acres of productive agricultural land subject to flooding and surface water problems will be benefited by installation of the measures contained in the projects.

These projects provide for the application of land treatment measures and the installation of 130 floodwater retarding structures and 81.1 miles of channel work. Sixty-five floodwater retarding structures and 27.2 miles of channel work have been installed. Water impounded in the sediment pools of these structures initially created 2,598 acres of surface water. Another 3,076 acres of surface water will be created by installation of the remaining structural measures. The detention pools of the structures already installed required the commitment of 9,132 acres for temporary inundation by floodwater and another 5,968 acres will be committed for this purpose by the remaining structures. This land remains in private ownership, with the primary uses being grazing, livestock production, and use by wildlife.

Installation of all of the 81.1 miles of channel work will affect about 5 percent of the streams in the eight watersheds. About 58 percent of this length is on natural streams that have suffered partial to complete filling with sediment. The other 42 percent is on previously modified channels and laterals. About 21.1 miles of the planned channel work remaining to be installed will be on streams with significant environmental concerns. The remaining 32.8 miles will be on streams and watercourses with insignificant environmental concerns.

It is anticipated that the installation of the remaining project measures in Pine Creek and the other authorized projects will contribute to the conservation and enhancement of the soil, water, and related resources and allow their productivity to be sustained economically and indefinitely. The standard and quality of living of the residents will be improved through added income. Destruction of vegetation for construction of the project measures will have varying degrees of impacts on wildlife species on the areas not covered by water and will change terrestrial habitat to aquatic habitat on the areas covered by water.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The installation of the remaining project measures will result in the initial commitment of a total of 949 acres of land.

Installation of the two remaining floodwater retarding structures will require the commitment of 947 acres of land. Water impounded in the sediment pools will inundate 126 acres, the dams and emergency spillways will require 38 acres, and the detention pools will require 783 acres. The land in the dams and emergency spillways will have agricultural value for forage production and some wildlife use. The land in the detention pool areas can continue to be used in its present agricultural use for grazing and livestock production. The 132 acres of water impounded in the two sediment pools, while creating aquatic habitat, will be a loss of terrestrial wildlife habitat.

In adherence to Executive Order 11990, Protection of Wetlands, and SCS's compliance with it (Federal Register Vol. 44, No. 147; pages 44464-44467), the installation of project measures will not adversely reduce total habitat values of wetland areas.

The installation of the multiple-purpose structure will not require the commitment of any land. It will require a reduction of the water surface area of existing Lake Crook by 205 acres, or 2,481 acre-feet. The evacuated area will be used for floodwater retardation and will have use for recreation and wildlife.

The installation of the grade stabilization structures will require 24 acres of land: 6 acres of woody vegetation and 18 acres of open pastureland. Grade stabilization structure No. 101 and 102 will be rock riprap lined channel. Grade stabilization structure Nos. 103 and 104 will be drop structures that will impound water.

The commitment of labor, material resources, and energy required for construction will be irretrievable.

CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

The following consultations and reviews were made with appropriate agencies and others during the preplanning stage, the planning stages, and the period after start of project operations up to the present action.

Watershed activities in Pine Creek began with formation of a watershed association on November 23, 1954. The water control and improvement district was formed on March 11, 1957, through the Lamar County Commissioners Court and unanimously approved by the voters on January 10, 1959. The water district was confirmed by the Texas Legislature in May 1959.

The application for assistance for Pine Creek watershed was submitted to the Secretary of Agriculture through the Texas State Soil and Water Conservation Board (designated state agency). A field examination was made in June 1957 by the Soil Conservation Service and representatives of appropriate state agencies. The sponsors held a public meeting concerning the field examination on June 5, 1957, which was attended by 39 people. The Texas State Board held a public hearing attended by 30 persons on September 13, 1957, in Paris to determine that there were no apparent obstacles to planning and implementing a watershed project. The board then recommended that the Soil Conservation Service furnish planning assistance.

Assistance for planning was granted on March 31, 1961. Written notice of initiation of watershed plan development and requests for inputs into the project were sent to the following: Bureau of Sport Fisheries and Wildlife (now U.S. Fish and Wildlife Service); Bureau of Reclamation; U.S. Forest Service; National Park Service (archeologist); Farmers Home Administration; U.S. Department of Health, Education, and Welfare (Water Supply and Pollution Control); Bureau of Mines; U.S. Corps of Engineers; Southern Power Administration; U.S. Geological Survey; U.S. Department of Commerce (Weather Bureau); Texas Game and Fish Commission (now Texas Parks and Wildlife Department); State Board of Water Engineers (now Texas Department of Water Resources); Texas Department of Health; Texas Highway Department (now State Department of Highways and Public Transportation); Texas Forest Service; Dean of Agriculture, Texas A&M System; and State Agricultural Stabilization and Conservation Committee.

Assistance and resource data inputs for use in planning Pine Creek were initially supplied by the Fish and Wildlife Service on April 28, 1958, and follow-up planning inputs were provided on December 13, 1961. The Texas Game and Fish Commission (Texas Parks and Wildlife Department) supplied fishery information on existing lakes and streams on July 14, 1961. The U.S. Forest Service and the Texas Forest Service provided planning information and met with the sponsors to provide information on program assistance available from their respective agencies.

The sponsors held an informal field review of the proposed watershed plan for Pine Creek on March 26, 1963, in Paris, Texas, at which time written and oral statements were invited from interested agencies and individuals. The comments received were incorporated into the final watershed plan.

Following the passage of the National Environmental Policy Act, additional consultation and reviews of the remaining project measures were made. On September 8, 1971, the Texas Parks and Wildlife Department reviewed the Soil Conservation Service WS-108 classification of the remaining channel work and placed it into Group 2. (Some adverse effects. Modifications needed and can be made to reduce or eliminate adverse effects.)

This classification was concurred in by the Fish and Wildlife Service on October 1, 1971. On February 5, 1973, the Texas Parks and Wildlife Department changed their recommendation for the channel work to Group 3. (Serious adverse effects requiring major modifications including reformulation, changes in purpose or scope, substantial mitigation.) This reclassification was concurred in by the Fish and Wildlife Service on February 20, 1973.

The State Historic Preservation Officer (SHPO) supplied requested information concerning historical and archeological resources in the watershed on August 11, 1972.

On February 28, 1978, the SHPO was informed that the archeological investigation of remaining project measures did not find any archeological resources of sufficient value to be further investigated or to be nominated to the National Register of Historic Places.

On January 4, 1979 the SHPO concurred in writing with the above findings.

Informal consultation on endangered species, as required by the Endangered Species Act, was provided by the Fish and Wildlife Service on June 5, 1981.

The present plans for the Lake Crook modifications incorporate the major recommendations of the January 28, 1976, fisheries management plan made for the lake by the Texas Parks and Wildlife Department, Inland Fisheries Branch.

Assistance was requested from the U.S. Fish and Wildlife Service and the Texas Parks and Wildlife Department on October 20-22, 1976, to make a field study of the channel work in order to develop planning input data for modifying the channel work to reduce adverse effects and to identify possible mitigation measures. The Fish and Wildlife Service provided a planning aid letter for non-channel work alternatives on December 16, 1976, that superseded their June 3, 1967, letter.

A public hearing on the remaining project measures and alternatives was held jointly by the Soil Conservation Service and the sponsors. This meeting was held July 29, 1977, in Paris, Texas, following published notices in the Paris News. Notices of the hearing with attached summaries of the project measures, alternatives, and the environmental impacts were mailed to 111 local representatives of civic organizations, community leaders, involved landowners, local and state governmental agencies, federal agencies, conservation groups, and others. A total of 23 participants completed registration cards. Of this number, eight gave written or oral statements. Seven favored project action (Bud Peace, representative for the Lamar County Commissioners Court; Kelton Shaw, landowner; Charlie P. Whal, citizen; Roy C. Chadwick, North Lamar Independent School District; Alfred Mackin, Lamar County Soil and Water Conservation District; and Frank Dooley, citizen). One (the Fish and Wildlife Service) opposed project action. Their letter of opposition was aimed primarily at the inclusion of 10.28 miles of channel work in the watershed project.

On December 26, 1978, the draft environmental impact statement was sent to federal, state, and local agencies and to interested groups and individuals.

The following federal agencies were requested to review the draft EIS and submit comments and recommendations:

Department of the Army
Department of Commerce
Department of Health, Education and Welfare
Department of the Interior
Department of Transportation
Environmental Protection Agency
Federal Power Commission
Office of Equal Opportunity, USDA

The following state and local agencies were requested to review the draft EIS and submit comments and recommendations:

Budget and Planning Office (State agencies designated by Governor and State Clearinghouse)
Ark-Tex Council of Governments (Regional Clearinghouse)
Advisory Council on Historic Preservation

Of the individuals and groups formally receiving copies of the draft EIS, written comments were received from 10. The State Budget and Planning Office had the draft reviewed by involved state agencies and provided copies of the comments from nine of these. Congressman Sam B. Hall also responded. A total of 19 written responses was received. Of these, eight made substantive comments. Most of the comments of concern were relative to the planned channel work.

The sponsors recognized that the fish and wildlife interests would not allow them to complete the project as originally planned in 1962. They requested that the Fish and Wildlife Service, the Texas Parks and Wildlife Department, and the Soil Conservation Service jointly determine the alignment and extent of channel work that would be acceptable to all three agencies.

This cooperation was accomplished in the field and an alignment for a release-rate channel outside the already acquired right-of-way was agreed to as minimizing adverse impacts to wildlife habitat. As an added precaution, preservation easements were to be acquired for some adjacent wetlands to assure their preservation.

This plan was reviewed by the sponsors. They determined it to be impracticable since its location in open areas crosses prime farmland soils near the edge of the floodplain, interferes with the agricultural use patterns of the land, and adversely affects landownership by ignoring property lines. This plan was totally rejected by the landusers.

At this time the sponsors requested an analysis of the feasibility of completing the project without channel work. This would be a modification of Alternative 2. Additional investigations were made to document the extent of release flow impacts. Extensive surveys were made in the 3- to 4-mile reach that will be affected by prolonged release flows. This area is already subject to extensive periods of wetness from effluent and base flow. The increased volume of prolonged flow due to release would neither hinder the properties' economic production nor cause adverse environmental impacts. It was determined that land rights would not be required for release rates as no damages were identified. These investigations also identified four side inlet areas in the reach where channel work was planned that would have been treated as part of the channel work but would need grade stabilizing measures if the channel work was deleted. Alternative 2 was revised to include these and became the selected plan. This decision was reviewed with the EIS Review Section of the Dallas Environmental Protection Agency office. Their letter of concurrence is included in appendix C.

A copy of each written comment received is included in appendix C. Since channel work is not now included in the selected plan, responses have not been developed for comments related to channel work. Response to all other comments that were noteworthy or made specific recommendations are as follows:

Texas Department of Water Resources

Comment: The Department stated:

> TDWR's records for the past 15 years, including records of TDWR's District Office No. 5, at Kilgore, Texas and also of the former Texas Water Quality Board, do not contain any evidence of formal public complaints by landowners, or others, relative to the specific type of water quality problem referred to in the following statement in the DEIS at page 33 (third paragraph):
>
> "Many landowners along Pine Creek have complaints about ponded water and sewage effluent that are slow to drain because of inadequate channel capacities. This ponding is a source of vector problems, fish kills, and bad odors." (Underlining added for emphasis.)
>
> TDWR believes that this statement should be clarified in order to preclude any unwarranted inferences of inaction by responsible regulatory agencies. Also, TDWR believes that the above quoted statement should be proximately supplemented by the fact, cited earlier in the DEIS at page 13 (first paragraph), i.e.,
>
> > "Pine Creek below Lake Crook is a peremial stream with most of the base flow derived from industrial and sewage effluent." (Underlining added for emphasis.)

Response: The last paragraph of the "Floodwater Damage" section was revised to read:

> During the planning process many landowners along Pine Creek expressed dissatisfaction about ponded water and sewage effluent that are slow to drain because of inadequate channel capacities. This ponding, a source of vector problems and bad odors, is magnified by the fact that most of Pine Creek's base flow is derived from industrial and sewage effluent.

Comment: The Department further stated:

> TDWR's files indicate that the City of Paris is keenly aware of the urgent need to correct the problem of "the excess volume of sewage resulting from the entry of storm water and seepage into the collection system...overloading the new plant and...required the release of untreated sewage into Pine Creek." (pp. 18, 34, 35).
>
> TDWR understands that the City of Paris is using some of its available funds to correct the storm water infiltration problem. Also, the City has applied for Federal grant funds in order to renovate portions of the sewage collection system. TDWR estimates that funds for this work may be available in approximately three years. In the interim, the Pine Creek stream improvements should contribute substantially to the prevention of new sludge deposits and should improve the downstream water quality of Pine Creek.

Response: Noted.

Comment: The Department further stated:

> Insofar as TDWR is concerned, we believe that the following finding in the DEIS at page 31 (seventh paragraph) is valid:
>
> "There are no projects of other agencies that will be affected by this project."

Response: Affirmation of EIS statements noted.

Texas Historical Commission

Comment: The commission stated:

> We have reviewed the above-referenced undertaking and find that, as described, the proposal should not affect sites on the National Register of Historic Places, nor any site in the process of submission to the National Register. However, should caltural resources be encountered during construction, work will cease and the State Historic Preservation Officer and the Advisory Council on Historic Preservation will be afforded the opportunity to comment in accordance with the Procedures for the Protection of Historic and Cultural Properties (36 C.F.R., Part 800).

Response: Paragraph in "Impacts" section that deals with archaeological sites was revised to read:

> Three archeological sites, none of which are eligible for nomination to the National Register of Historic Places and none of which are worthy of further study, are located in or near the planned detention pool of floodwater retarding structure No. 11. These sites will not be affected by actual construction activities. Should cultural resources be encountered during construction, work will cease and the State Historic Preservation Officer and the Advisory Council on Historic Preservation will be afforded the opportunity to comment in accordance with the Procedures for the Protection of Historic and Cultural Properties (36 C.F.R., Part 800).

Texas Parks and Wildlife Department

Comment: The Department stated:

> Page i (Section V) is unclear, but seems to indicate that average annual cumulative flooding will be prevented on 8,094 acres. This means that each and every time a given acre is protected thoughout the life of this project it will be counted. However, a reader might conclude that a block of land 8,094 acres in size will be protected, which is not the case. This rationale and the statement are misleading and should be omitted from the document. The only discussion pertinent is the discussion of the amount of floodplain to be protected. The project will provide protection for only 1,215 acres of the 25-year floodplain. The amount of land in each of the 10-, 5-, 2-, and 1-year floodplains respectively should be included here as it is on page 43 (percentages of each floodplain protected).

Response:

> We agree that the rationale suggested by the Department based on their interpretation of the statement is incorrect. The statement itself and the cumulative nature of average annual acres flooded are correct and pertinent as it is a part of the economic evaluation process. The very next sentence in the text identifies the "block of land" receiving protection from the 25-year event. This was included in the summary to help identify the cumulative nature of "average annual acres" for the inexperienced reader. The complete display of all storm events in the summary is not necessary for this pnrpose.

Comment: The Department stated:

> Page ii (paragraph 3) states that "another 250 acres of floodplain woody habitat may be cleared by landowners because of enhancement by the project." The SCS has no assurances that the clearing will be

limited to 250 acres. According to the EIS, there are 3,450 acres of bottomland hardwoods present in the 25-year flood plain (page 37). It is highly probable that the majority of these hardwoods will be lost within the life of the project once flooding of the bottomland hardwoods is reduced even though only limited protection from floods would be provided to these areas.

Response:

The SCS has no assurances that the clearing will be limited to 250 acres, neither does it have assurances that it will actually reach the 250-acre level. The use of the flood plain will be influenced mainly by the national economic situation and its impacts on the agricultural industry. The best judgement of SCS planners is that, in addition to the clearing that might be caused by economic conditions, an additional 250 acres might be cleared because of project action. With the deletion of channel work it is now estimated that there will be no project induced clearing.

Comment: The Department stated:

Page 2 (paragraph 5) states that land treatment measures on 80 percent of the land is complete, as is accelerated technical assistance to all landowners. The Department staff assumes that this statement does not apply to the land presently leased and farmed by the Ford Tractor Center. Plowing is being carried out down-slope, thus contributing inordinate amounts of sediment to Pine Creek.

Response:

The comment is misleading as it does not accurately portray the statement in the DEIS. The DEIS states:

"The original project goals were to provide accelerated technical assistance to landowners to apply and maintain effective land treatment measures on 80 percent of the land in the watershed. This goal has been achieved."

This does not imply that accelerated technical assistance was to be given to "all" landowners. This assistance is provided to the landowners on a voluntary basis. The Ford Tractor Training Center represents less than 0.25 percent of the watershed. Since the planned accelerated technical assistance has been provided, the section on planned land treatment has been deleted from the "Planned Project" section in the Final EIS.

Comment: The Department stated:

The discussion of "basic fish and wildlife facilities" (page 5, paragraph 2) is misleading. The facilities listed are recreation facilities--not fish and wildlife facilities--because all types of outdoor activities would benefit.

Response:

It was agreed with the Texas Parks and Wildlife Department fisheries biologist during planning that this would be for fish and wildlife development. We agree that the planned measures are not "basic fish and wildlife facilities." They are support facilities for the fish and wildlife development. The EIS has been changed to reflect this.

Comment: The Department stated:

The proposal of the SCS and the local sponsors to replace the loss of 267 acres of bottomland hardwoods (from structure construction) and 250 acres (from induced clearing) and 67 acres of upland hardwoods with initial before-canopy planting of 64 acres is not considered adequate. Complete in-kind mitigation of losses is necessary. This means direct losses (334 acres) and project related secondary losses (250+ acres) will need to be replaced for compensation.

Response:

With the deletion of the remaining planned channel work the habitat loss is limited to the 106 acres of wooded area associated with the floodwater retarding structures. The vegetative plantings planned with installation of the floodwater retarding structures is adequate mitigation when the actual impacts of the structure already installed without the benefit of such plantings are evaluated.

Comment: The Department stated:

It is commendable that the SCS has incorporated fishery management recommendations made by this Department concerning Lake Crook. However, cost sharing management did not include rotenone cost for eradication of existing fishes within the dewatered reservoir. Also, periodic drawdowns were mentioned but no responsibility for this action was identified. If the City of Paris has not agreed to provide this, the entire program would be adversely affected and benefits from SCS cost sharing would be questionable. Therefore, their agreement to participate in the Lake Crook management program may not be as important as it appears. Complete eradication of fishes is an integral part of the overall management plan, without which money spent initially will be wasted. Also, SCS plans to use Japanese millet (page 5) may not be as beneficial as the recommended hybrid sudan due to less vegetative bulk.

Response:

The management practices are local responsibilities. This would include rotenone. The City of Paris will be responsible for operation and maintenance. The "Operation and Maintenance" section has been revised to clarify this. During planning, city representatives have accepted this responsibility. Formal acceptance by the city will follow the Final EIS when the Watershed Plan Supplement and Supplemental Agreement

to include Fish and Wildlife Development are signed. The DEIS states "...establishment of a cover crop, such as Japanese millet" and does not limit the selection of a better cover crop species.

Comment: The Department stated:

On page 18 reference is made to "dominant fish species of carp, carpsucker, bullheads, gar, and a few sunfish." This statement, in combination with a fish listing on page 29, does not accurately portray the fishery of Pine Creek. A diversified fish fauna exists in Pine Creek in spite of poor water quality conditions within some sections. A total of 45 different species has been documented in "Management Recommendations for Proposed Reservoirs and Other Public Waters Project, Pine Creek 1977, F-30-R-3" job report. Four additional species were recovered from Lake Crook, which makes a total of 50 species recovered within the watershed. Among fishes recovered were paddlefish (Polyodon spathula), a Texas endangered species, and blue sucker (Cycleptus elongatus), a Texas protected nongame species. General statements made in the EIS concerning existing fish fauna are incorrect.

Response:

The referenced statements were revised to more accurately portray the diversity of fish fauna in Pine Creek.

Comment: The Department stated:

Statements relative to no local resident use of the stream on pages 21, 29, and 35 conflict with reports of this agency's field personnel. Fishermen do utilize Pine Creek with catfish being the most sought-after species.

Response:

We agree that "no use" by local residents is probably incorrect. The EIS was revised to reflect that limited use as a fishery source is made of Pine Creek in the polluted reach. The Department's field personnel observed the occasional user during one of their visits.

Comment: The Department stated:

The discussion of wetlands (page 22) fails to address the status of wetland types 1, 2, 3, and 6 after the completion of the project. Additionally, no mention is made of wetlands in appendix G. The document should state the condition of all wetlands, not just type 2, after culmination of the project.

Response:

The discussion of wetlands was revised to include types 1, 2, 3, and 6.

Comment: The Department stated:

Page 28, paragraph 1, should be expanded to include information concerning wild turkeys. The turkeys were released by this Department and utilize upland and bottomland components of portions of this watershed.

Response:

Reference to wild turkey was included in the "Animal Resources" section.

Comment: The Department stated:

The discussion of wildlife habitat values (page 28) understates the value of bottomland areas undergoing secondary succession. Successional areas of this type often provide a great diversity for wildlife. Adjacent land use patterns such as intensive farming and/or improved pastures render these areas as oases for resident and transient wildlife.

Response:

The values described above are general values, they are not necessarily site specific. It is SCS's opinion that the habitat described in the DEIS is of moderate value for the wildlife in the watershed.

Comment: The Department stated:

Page 28, paragraph 3, should include discussion of the gray fox and the fox squirrel.

Response:

These two species were included in the discussion in the "Animal Resources" section.

Comment: The Department stated:

The discussion of endangered species (pages 29 and 30) should include the northern bald eagle along with the southern bald eagle and the American peregrine falcon.

Response:

The northern bald eagle was included.

Comment: The Department stated:

Page 30, paragraph 1, should be amended to read "Suitable nesting habitat for the southern bald eagle does occur in the watershed. However, no active nests have been verified."

Response:

The paragraph was revised by deleting the sentence indicating that suitable habitat does not occur in the watershed and adding "Active nests have not been verified in the watershed. No critical habitat has been designated in the watershed."

Comment: The Department stated:

The discussion of the project and its relationship with other projects (page 31) should include a statement concerning the ramifications of this project in the wild turkey stocking program of this agency.

Response:

The project as reformulated will not impact the wild turkey stocking program.

Comment: The Department stated:

Page 35 (paragraph 5) fails to point out that the Pine Creek watershed is a high producer of furbearers. Current fur prices are creating substantial increases in the demand for these animals. The EIS does not direct attention to this important economic and natural resource nor to the impacts the project would have on this resource. Economics in terms of man-days of hunting, trapping, bird watching, wildlife photography, etc. provided by this watershed, are not sufficiently discussed. Economics should be discussed with respect to all consumer/users, not simply the landowners.

Response:

The project as reformulated has no quantifiable impact on the referenced resource or activities. Additional discussion would not contribute to decision making.

Comment: The Department stated:

The discussion, on page 37, of "restoration of a portion of the floodplain land to its former level of production" should identify and quantify those acreages. This quantification should not be given in terms of cumulative average annual acreages, but in more realistic terms.

Response:

The sentence containing the referenced quotation was deleted.

Comment: The Department stated:

If 250 acres (at a minimum) of bottomlands will be drained sufficiently to induce clearing (page 37, paragraph 2), impacts will occur to wetland types 1, 2, 3, and 6 which are associated with these bottomlands.