FINAL

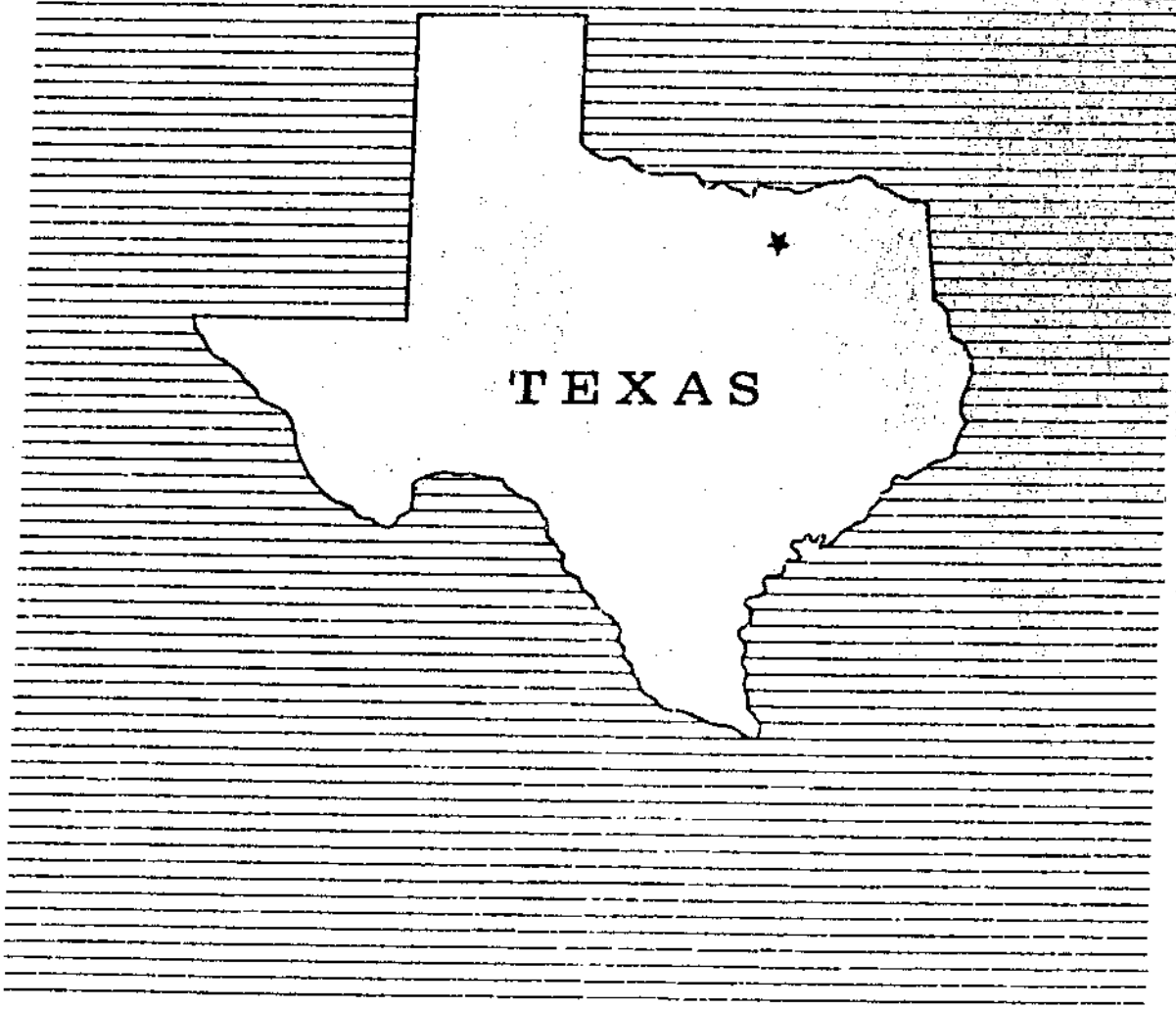
ENVIRONMENTAL IMPACT STATEMENT

USDA-SCS-EIS-WS-(ADM) 78-4-(F)-TX

BIG SANDY CREEK WATERSHED

OF THE TRINITY RIVER WATERSHED

CLAY, JACK, MONTAGUE, TARRANT and WISE COUNTIES, TEXAS



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BIG SANDY CREEK WATERSHED
Clay, Jack, Montague, Tarrant, and Wise Counties, Texas

FINAL ENVIRONMENTAL IMPACT STATEMENT

George C. Marks, State Conservationist
Soil Conservation Service

Sponsoring Local Organizations

Little Wichita Soil and Water Conservation District
Denton-Wise Soil and Water Conservation District
Upper Elm-Red Soil and Water Conservation District
Upper West Fork Soil and Water Conservation District
Clay County Commissioners Court
Montague County Commissioners Court
Wise County Commissioners Court
City of Bowie, Texas
Wise County Water Control and Improvement District Number 1

January 1979

Prepared by

United States Department of Agriculture
Soil Conservation Service
Temple, Texas 76501

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PREFACE

Project Status

The watershed plan for Big Sandy Creek watershed was developed in August 1955 and approved for operations on February 1, 1956. This plan provided for the installation of 25 floodwater retarding structures and technical assistance for application of land treatment measures on 185,464 acres of agricultural land for watershed protection and flood prevention. This plan provided for approximately 44 percent reduction in the average annual flood damages on Big Sandy Creek flood plain. A revision in June 1962 added an additional floodwater retarding structure to the original plan.

In the mid 1960's, the sponsors recognized the need for additional measures in order to provide for greater development of the resources in the watershed. They requested changes in the original plan to provide for the installation of land stabilization measures that could not be installed by individual landowners, and the installation of additional measures to reduce the increased flooding resulting from sediment-filled streams.

Supplement No. I was made in December 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 was made in April 1976 to include land treatment measures necessary to stabilize critical sediment source areas on about 2,100 acres. These measures included shaping, clearing, preparation for vegetation, mulching, fertilizing, vegetating, fencing, and construction of appurtenant grade stabilization measures such as pipe drops, drop inlets, formless concrete chutes, diversions, and dams.

Supplement No. III, in the approval process, deletes 6 of the originally planned floodwater retarding structures and adds 37 floodwater retarding structures, 31 grade stabilization structures, land stabilization measures on 825 acres of critically eroded lands, and critical area stabilization measures on 1,455 acres of critically eroding areas in the LBJ National Grasslands.

The watershed plan, as supplemented, will provide for the installation of 57 floodwater retarding structures; 31 grade stabilization structures; land stabilization measures on 825 acres of critically eroding lands; critical area stabilization measures on approximately 1,455 acres of critical sediment source areas in the LBJ National Grasslands; critical area treatment measures on 2,100 acres of privately owned critical sediment source areas; and technical assistance for application of land treatment measures on 185,464 acres of agricultural land. At the present time, approximately 75 percent of the land treatment has been applied and 13 floodwater retarding structures have been installed. The following environmental impact statement addresses the impacts resulting from the installation of the remaining project measures in the supplemented watershed plan.

USDA ENVIRONMENTAL IMPACT STATEMENT

Big Sandy Creek Watershed
of the
Trinity River Watershed
Clay, Jack, Montague, Tarrant, and Wise Counties, Texas

Prepared under the Authority of the Flood Control
Act of 1944, as Amended and Supplemented.

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 the Soil Conservation Act of 1935 (Public Law No. 46, 74th Congress) and the Flood Control Act of 1944 (Public Law No. 534, 78th Congress), as amended and supplemented, for the purpose of watershed protection and flood prevention. The project, which is located in parts of Clay, Jack, Montague, Tarrant, and Wise Counties, Texas, was approved for operations on February 1, 1956. This plan provided for the application of land treatment measures on 185,464 acres of agricultural land for watershed protection and the installation of 25 floodwater retsrding structures for flood protection in the downstream reaches of Big Sandy Creek watershed. The plan has been supplemented to include 57 floodwater retarding structures, 31 grade stabilization structures, land treatment measures on upland soils, land stabilization measures on 825 acres of privately owned eroded upland soils, critical area stabilization measures on 1,455 acres of the LBJ National Grasslands administered by the U.S. Forest Service, and critical area treatment measures on 2,100 acres of privately owned land. Thirteen floodwater retarding structures have been constructed and approximately 75 percent of the land treatment measures have been applied.

V. Summary of Environmental Impacts Including Favorable and Adverse Environmental Effects: The maintenance of existing land treatment measures and the application and maintenance of land treatment measures on areas having a change in land use will increase soil productivity and tilth, improve hydrologic cover and reduce peak runoff, reduce erosion on upland soils and sedimentation on the flood plain, and improve the composition and quality of vegetative cover of pastureland and rangelsnd. Construction and

maintenance of the structures will create new jobs for the local economy. Project implementation will permit flood plain users to use their resources more productively and efficiently and will provide for greater income stability. Sediment pools of the floodwater retarding structures will provide resting areas for migratory waterfowl, opportunities for fish production, and drinking water for livestock and wildlife, and will increase type 5 wetlands. Applied conservation practices, including wildlife upland habitat management, crop residue management, conservation cropping systems, critical area planting, proper grazing use, and deferred grazing, will benefit wildlife. Implementation of fish pond management practices will increase the pond fishery resources of the watershed.

Land use on 3,975 acres will be affected by installation of the remaining 44 floodwater retarding structures. The area in the detention pools (2,774 acres) will be subject to occasional inundation causing interruption of, but no change in, the land use. The area in the sediment pools (928 acres) will be converted from agricultural use to water area. The area dedicated to dams and spillways (273 acres) will be changed or restricted to pastureland that will have limited grazing use.

Wildlife habitat on the 3,975 acres of land will be affected by installation of the 44 structures. The area dedicated to dams and spillways (273 acres) will be restricted or changed to pastureland habitat. Of the 928 acres in the sediment pools, 5 acres of aquatic habitat and 923 acres of terrestrial habitat will be converted to water areas. The area in the detention pools (2,774 acres) will be subject to temporary inundation.

The area flooded by a 25-year frequency storm on Big Sandy Creek and its tributaries will be reduced from 19,797 to 16,503 acres, a reduction of 3,294 acres. The cumulative average annual acres flooded will be reduced from 28,770 to 20,541 acres, a reduction of 8,229 acres. The annual flood plain scour damage on 321 acres is expected to be reduced 53 percent. Overbank deposition of sediment on 3,517 acres of land will be reduced 73 percent.

Existing wildlife habitat will be reduced on 3,975 acres or about one percent in the watershed.

The structures will inundate five acres of existing water impoundments and cause 21 farm ponds to be subject to occasional inundation. Aquatic habitat will be increased by 923 acres in the sediment pools.

Three archeological sites that are not eligible for nomination to the Federal Register will be affected by project installation.

USDA SOIL CONSERVATION SERVICE

FINAL ENVIRONMENTAL IMPACT STATEMENT

FOR

BIG SANDY CREEK WATERSHED
of the
Trinity River Watershed
Clay, Jack, Montague, Tarrant, and Wise Counties, Texas

AUTHORITY

Federal Assistance under the Authority of the Flood Control Act of 1944, as Amended and Supplemented.

SPONSORING LOCAL ORGANIZATIONS

Little Wichita Soil and Water Conservation District
Denton-Wise Soil and Water Conservation District
Upper Elm-Red Soil and Water Conservation District
Upper West Fork Soil and Water Conservation District
Clay County Commissioners Court
Montague County Commissioners Court
Wise County Commissioners Court
Wise County Water Control and Improvement District Number 1
City of Bowie, Texas

PROJECT PURPOSES AND GOALS

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

Prior to the initiation of detailed investigations, the following specific objectives were agreed upon for supplementing the watershed plan:

1. Based on current conservation needs, the establishment of land treatment measures during the project installation period which contribute directly to watershed protection and flood prevention.

2. Stabilization of critical sediment source areas.

3. Provision for storage of water for municipal and recreational use.

4. Establishment of water-based recreational facilities at multiple-purpose reservoirs.

5. Attainment of a reduction of 70 to 75 percent in average floodwater and sediment damages.

The watershed plan was developed in August 1955 and was approved for operations on February 1, 1956. This plan provided for the application of land treatment measures on 185,464 acres of agricultural land for watershed protection and the installation of 25 floodwater retarding structures for flood prevention in the downstream reaches of Big Sandy Creek waterahed. Construction began with the first contract on June 13, 1957. Thirteen floodwater retarding structures have been constructed and approximately 75 percent of the needed land treatment measures have been applied.

In the mid 1960's, the sponsors recognized the need for supplementing the plan to provide for greater development of the resources in the watershed. They requested that the plan be supplemented to provide for the installation of land stabilization measures that could not be installed by individual landowners, the installation of additional measures to reduce the increased flooding resulting from sediment-filled streams, the inclusion of storage of water in the structures for municipal and recreational uses, and the development of recreational facilities.

The attainment of a reduction of 70 to 75 percent in average floodwater and sediment damages could not be reached without the installation of approximately 60 miles of excavated channel. Channel work was determined to be impractical because of the excessive cost associated with achieving a stable condition.

Storage for municipal and recreational water and the associated water-based recreational facilities were not included because of a possible seepage problem identified at the only site within the watershed otherwise suitable for a multiple-purpose structure.

PLANNED PROJECT

The project is an integrated one for the environmental protection needed for conservation of soil, plant, water, and wildlife in the Big Sandy Creek watershed of the Trinity River watershed.

Vegetative and structural measures which are needed to control erosion, maintain or improve soil fertility, reduce flooding, enhance wildlife, and stimulate the economy are planned. The quality of the environment will be improved to provide a more attractive, convenient, and satisfying place to live, work, and play. The quality of the natural resources of the area will be protected for sustained use.

A structural system of 57 floodwater retarding structures, 31 grade stabilization structures, land stabilization measures on 825 acres of privately owned eroded upland soils, critical area stabilization measures on 1,455 acres of the LBJ National Grasslands administered by the U.S. Forest Service, and critical area treatment measures on 2,100 acres of privately owned land are planned for construction in the Big Sandy Creek watershed. The locations of the structural measures are shown on the project map (Appendix B).

Measures remaining to be installed are 44 floodwater retarding structures, 31 grade stabilization structures, land stabilization measures on 825 acres of privately owned eroded upland soils, 1,455 acres of critical area stabilization measures in the LBJ National Grasslands, and critical area treatment measures on 2,100 acres of privately owned land.

Land Treatment

The status of land treatment measures for the watershed was developed by the soil and water conservation districts with assistance from the Soil Conservation Service field personnel located at Bowie, Henrietta, and Decatur, Texas. The project goals are to apply and maintain effective land treatment measurea on 80 percent of the land in the watershed. Approximately 75 percent of the needed land treatment measures have been applied.

The conservation and improvement of soil, water, plant, and related resources are of major significance and importance in the completion of the watershed protection and flood prevention project. Sound land use practices and proper conservation treatment of the watershed lands are prerequisites to attaining project objectives. The function and useful life of the structural measures are directly dependent upon the adequacy of conservation measures applied on the upstream land resources.

The land treatment is being accomplished by land users in cooperation with the Upper West Fork, Upper Elm-Red, Denton-Wise, and Little Wichita Soil and Water Conservation Districts. Assistance to the soil and water conservation districts is provided by the Soil Conservation Service through a memorandum of understanding with field offices at Bowie, Decatur, Henrietta, and Jacksboro. These field offices have assisted district cooperators in preparing 751 basic soil and water conservation plans on 208,650 acres and have given technical assistance in establishing and maintaining planned measures. Current revisions are needed on 282 basic conservation plans.

About 10 percent (31,600 acres) of the watershed is in cropland. Most of the goals for treatment of cropland have been reached. Private land users have installed and are maintaining conservation treatment on cropland. These treatments are conservation cropping systems, crop residue management, parallel and gradient terraces, grassed waterways, and contour farming.

Pastureland and rangeland make up about 82 percent (258,438 acres) of the watershed. Pastureland and hayland is land on which permanent grasses are established in pure stands and managed as monocultures by the land user in order to achieve high yielding forage without causing damage to soil and water resources. Rangeland consists of land on which the climax (natural potential) plant community is composed principally of grasses, grass-like plants, forbs, and shrubs suitable for grazing or browsing use.

The land treatment measures being applied on pastureland and hayland are pasture and hayland management and pasture and hayland planting. These measures are normally applied to gullied and eroded, formerly cultivated lands and on overgrazed, poorly vegetated rangeland areas that will not respond favorably to grazing management techniques. The plants most commonly used are common and coastal bermudagrasses, King Ranch bluestem, kleingrass, and lovegrass. Management normally includes practices such as fertilization, weed control, and regulated grazing or haying operations.

The lsnd treatment measures being applied on rangeland for improvement and preservation of the plant ecosystems are proper grazing use, deferred grazing, planned grazing systems, and range seeding. Range seeding is accomplished with seeding mixtures compatible with the native plant community on areas that do not have the desired quantity or quality of native plants or on areas that cannot be improved within a reasonable period of time with grazing management practices.

Treatment measures that have been carried out on both rangeland and pastureland include ponds for livestock and wildlife water, brush management, wildlife upland habitat management, critical area planting, diversions, and grade stabilization structures. Land users are encouraged to consider many species of wildlife when applying brush management. Brush management typically consists of the manipulation of stands of brush by

mechanical and/or chemical means to restore natural plant communities through selective strip and patterned control methods to meet specific needs of the land and wildlife and objectives of the land users. All brush species are not removed by this conservation treatment.

Wildlife upland habitat management is being applied by land users who wish to retain, create, improve, or maintain wildlife habitat on their lands. The majority of this practice is applied on cropland and rangeland which has a secondary use as wildlife land. The practice consists of leaving crop residue as a food source for birds, annual food plantings, fallow disking to promote growth of annual weeds and forbs, and protection of habitat from fire and overgrazing by domestic livestock. Pasturelands are planted to seed producing plants when wildlife is planned as a secondary land use.

Critical area treatment measures normally consist of mechanically shaping and sodding or seeding active eroding gullies that occur on any of the land uses in the watershed. Application of this treatment is given high priority technical assistance. Some critical areas of the watershed have been shaped and sodded but many areas remain to be treated. Measures necessary to stabilize 2,100 acres of critical sediment source areas will be applied by private land users with Public Law 534 cost-share funds. Plantings on critical areas are primarily sod forming grasses but may include plant species, such as black locust, plum, autumnolive, and others, which have food and cover value for wildlife. The larger gully systems being treated as structural measures with Public Law 534 funds are discussed under structural measures.

Approximately 9,350 acres of the LBJ National Grasslands are within the watershed. Thirty grazing allotments of this land are severely eroded and are critical sediment sources. An estimated 1,455 acres of critical sediment producing areas containing 306,000 feet of gullies are in need of stabilization measures. The critical area stabilization measures to be applied by the U.S. Forest Service with Public Law 534 cost-share funds will be the shaping and reseeding of an estimated 708 acres of critically eroding areas, 37,000 feet of diversion terraces, 184 erosion control structures, and proper grazing use and deferred grazing on the entire 9,350 acres.

On-going federal cost-share assistance programs, the Agriculture Conservation Program administered financially by the Agricultural Stabilization and Conservation Service and technically by the Soil Conservation Service and the Great Plains Conservation Program administered totally by the Soil Conservation Service, are expected to aid land users in applying additional needed land treatment measures.

Technical assistance in the planning and application of land treatment is provided under the going programs of the soil and water conservation districts. A soil survey is in progress. There are 38,000 acres remaining to be surveyed in the watershed. This work will be completed during the installation period.

Structural Measures

A total of 44 floodwater retarding structures, 31 grade stabilization structures, and land stabilization measures on 825 acres of critically eroded land are planned for construction during the 8-year installation period. Thirteen floodwater retarding structures have been constructed. When all have been installed, these structural measures and land treatment will provide the acceptable level of protection to the watershed for reduction in floodwater and sediment damages to flood plain land.

The locations of all of the structural measures are shown on the project map (Appendix B). Runoff from 35.16 percent of the watershed above the confluence of the Big Sandy Creek and West Fork of the Trinity River will be retarded by the structural measures.

The total capacity in the planned 44 floodwater retarding structures is 42,969 acre-feet, of which 7,964 acre-feet are for sediment storage and 35,005 acre-feet are for temporary storage of floodwater which will be released over a period of two weeks or less. The principal spillway crest of all the planned floodwater retarding structures will be set at the capacity of the 100-year sediment volume predicted to be deposited as submerged sediment. The inlets for the planned floodwater retarding structures will be designed to limit initial impoundment to 200 acre-feet or less, including capacity of borrow. The principal spillways for structures Nos. 8A, 9, 13A, 13B, 13C, 14A, 15, 16, 17A, 22A, 22B, 23, 23A, 24, 24A, 24B, 24C, 24D, 25A, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, and 37 will be designed with two-stage inlets. The maximum discharge capacity of the low stage inlets is approximately three cubic feet per second per square mile of drainage area controlled. All inlets of the floodwater retarding structures will be ungated and will operate automatically. All of the structures will have appurtenances to permit release of impounded water in order to perform maintenance and, if it becomes necessary, to avoid encroachment upon downstream water rights.

The floodwater retarding structures will provide protection to the flood plain lands. The emergency spillways of each structure will have a 4 percent or less chance of use at the end of 100 years after construction.

Critical area stabilization measures consisting of 31 grade atabilization structures and land stabilization measures on 28 critically eroding areas consisting of 825 acres will be installed with flood prevention funds to stabilize critical erosion on extensive gully systems, reduce soil erosion and land depreciation, and eliminate unsightly scars on the landscape. All of the grade stabilization structures will be earthen dams with drop inlet type principal spillways and vegetated emergency spillways. These structures are designed to pass the 100-year frequency storm without overtopping. The elevation of the crest of the principal spillways will be set at the top of the overfall or on a projected non-silting grade for the channel. Fences will be constructed around the dam and spillway of each structure to protect the vegetation from damage by grazing.

The emergency spillways of all structures will be an excavated channel around the end of the embankments. All emergency spillways, embankments, disturbed areas, and odd areas on or adjacent to the works of improvement will be vegetated to control erosion, provide wildlife food and cover, minimize habitat loss resulting from construction, and to enhance the remaining habitat. Plant species will be selected, sited, and planted in accordance with SCS Technical Specifications for Establishment of Wildlife Habitat on or Adjacent to Watershed Works of Improvement. It is estimated that approximately 100 acres of odd areas such as those between the dams and spillways will be planted to vegetation beneficial to wildlife. 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 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 on disturbed odd areas within the rights-of-way. These plantings will be sited and planned in detail during the final design stage in consideration of specific site conditions. The exact species to be used will be selected from the adapted species of seed and plant stock available at the time of construction. Fences will be constructed around the embankment and emergency spillway of each structure to protect the vegetation from damage by grazing.

During construction operations, the areas needed for construction of the dams and emergency spillways and the borrow areas will be cleared of all existing vegetation. Sediment pools may be cleared up to the elevation of the crest of the lowest ungated outlet. However, when it ia desirable to leave selective standing woody vegetation in sediment pools to provide needed cover for fish, improve habitat for waterfowl, and locally influence wind velocities, less clearing will be done. In these cases, only that clearing necessary to insure proper functioning of the structure will be done. The need for this will be determined on a case by case basis during the planning or operation stage prior to construction by an interdisciplinary team.

The environment will be protected from soil erosion and water and air pollution during construction. Contractors will be required to adhere to strict guidelines set forth in each construction contract to minimize soil eroaion and water and air pollution during construction. Excavation and construction operations will be scheduled and controlled to prevent exposure of extraneous amounts of unprotected soil to erosion and the resulting translocation of sediment. Measures to control erosion will be uniquely specified at each work site and will include, as applicable, use of temporary vegetation or mulches, diversions, mechanical retardation of runoff, and traps. Harmful dust and other pollutants inherent to the construction process will be held to minimum practical limits. Haul roads and excavation areas and other work sites will be sprinkled with water as needed to keep dust within tolerable limits. Contract specifications will require that fuel, lubricants, and chemicals be adequately labeled and stored safely in protected areas, and disposal at work sites

will be by approved methods and procedures. All construction equipment will have safety and health features in compliance with the Occupational Safety and Health Act. Clearing and disposal of brush and vegetation will be carried out in accordance with applicable laws, ordinances, and regulations in respect to burning. Each contract will set forth specific stipulations to prevent uncontrolled grass or brush fires. Disposal of brush and vegetation will be by burying, hauling to approved off-site locations, or controlled burning, as applicable.

Existing trees and open grassland areas downstream from the structures will be left undisturbed to help blend the sites into the surrounding landscape.

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

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

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

All applicable state water laws will be complied with in the design and construction of the structural measures, as well as those pertaining to the storage, maintenance of quality, and use of water. It appears that a Section 404 permit of PL 92-500, as amended, will not be required.

If any previously unidentified evidence of cultural valuea is discovered during construction, the National Park Service will be notified, and the procedures as outlined in Public Law 93-291 will be followed. Inasmuch as this is a federally assisted local project, there will be no change in the existing responsibility of the Soil Conservation Service under Executive Order 11593 with respect to archeological and historical resources.

The following is the planned sequence of installation of the works of improvement:

Fiscal Year	Measures
1st	Floodwater retarding structures Nos. 1A, 1B, 1C, 1D, 8A, 9, and 29; grade stabilization structures Nos. 101, 130, and 131; land stabilization treatment areas Nos. 1, 30, and 31; and land treatment measures.
2nd	Floodwater retarding structures Nos. 13A, 13B, 13C, 23, 23A, 24, and 31; grade stabilization structures Nos. 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, and 116; land stabilization treatment areas Nos. 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, and 16; and land treatment measures.
3rd	Floodwater retarding structures Nos. 22B, 24A, 24B, 24C, and 24D; grade stabilization structures Nos. 117 and 118; land stabilization treatment areas Nos. 17, 18, 35, and 36, and land treatment measures.
4th	Floodwater retarding structures Nos. 14A, 15, 16, 17A, and 25A; grade stabilization structures Nos. 119, 120, and 122; land stabilization treatment area No. 33, and land treatment meaaures.
5th	Floodwater retarding structures Nos. 1, 3, 26, 27, 30, and 32; grade stabilization structures Nos. 121, 123, 124, 125, 126, 127, and 128; land stabilization treatment areas Nos. 27, 28, and 32; and land treatment measures.
6th	Floodwater retarding structures Nos. 28, 33, 34, 35, and 36; land stabilization treatment area No. 34; and land treatment measures.
7th	Floodwater retarding structures Nos. 37, 38, 39, and 40; and land treatment measures.
8th	Floodwater retarding structures Nos. 22A, 41, 42, 43, and 44; grade stabilization structure No. 129; land stabilization treatment area No. 29; and land treatment measures.

The U.S. Forest Service will install with Public Law 534 funds the land treatment measures on the LBJ National Grasslands. The estimated schedule of obligations for the installation period is as follows:

Estimated Schedule of Obligations for Land Treatment
on LBJ National Grasslands

Year	PL-534	Other1/	Total
1978	19,280	28,290	47,570
1979	32,360	31,090	63,450
1980	52,780	33,000	85,780
1981	63,650	35,780	99,430
1982	98,580	37,560	136,140
1983	101,040	36,450	137,490
1984	91,810	36,450	128,260
1985	-	36,450	36,450
1986	-	36,450	36,450
Total	459,500	311,520	771,020

1/ Other includes U.S. Forest Service P&M Range funds, P&M Watershed funds for Ranger District overhead for design, supervision, management, and maintenance of the land stabilization treatment measures accomplished with PL 534 funds, and conservation practices with the grazing permittees.

The minimum land rights required will be those necessary to construct, operate, maintain, and inspect the works of improvement; to provide for flowage of water in or upon or through the structures; and to provide for the permanent storage and temporary detention, either or both, of any sediment or water.

Installation of the structural measures may require changes in location or modification of known existing improvements as follows:

Structure No.	Item
1	County road, two oil wells
1A	County road
1B	County road
1C	Pipeline, disposal well
9	Powerline
15	County road
17A	Two county roads, powerline, pipeline, oil well
22A	Telephone line, powerline, pipeline, oil well, county road
31	Oil well, tank battery
33	Gas well
38	Powerline
39	Oil well
40	Pipeline
41	Pipeline

The Clay County Commissioners Court will be responsible for any required modification of the above improvements included in structures Nos. 1, 1A, 1B, and 1C. The Montague County Commissioners Court will be responsible for any required modification of the above improvements involved in structures Nos. 9 and 22A. The Wise County Commissioners Court and the Wise County Water Control and Improvement District No. 1 will share equally the responsibility for any required modifications of the above improvements involved in structures Nos. 15, 17A, 31, 33, 38, 39, 40, and 41.

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

Operation and Maintenance

Land treatment measures will be maintained by the landowners or operators of the farms on which the measures are installed under agreements with the Little Wichita, Denton-Wise, Upper Elm-Red, and Upper West Fork Soil and Water Conservation Districts. Representatives of the districts will encourage landowners to maintain land treatment measures. The U. S. Forest Service will maintain land treatment measures installed on federally owned lands.

The estimated annual operation and maintenance cost is $14,860 for the 57 floodwater retarding structures and $2,640 for the grade stabilization structures.

Operation of the floodwater retarding structures will be the responsibility of the soil and water conservation district governing that portion of the watershed in which the structures are located.

The Montague County Commissioners Court will be responsible for maintenance of floodwater retarding structures Nos. 1D, 5B, 6, 8, 8A, 9, 10, 11, 12, 13, 13A, 13C, 18, 20, 22A, 22B, and 23; and grade stabilization structures Nos. 101, 102, 103, 104, 105, 106, 107, 108, 109, 111, 112, 113, 114, 115, 130, and 131. The Clay County Commissioners Court will be responsible for maintenance of floodwater retarding structures Nos. 1, 1A, 1B, 1C, 2, 3, 4, and 5A. The Wise County Commissioners Court and the Wise County Water Control and Improvement District No. 1 will be equally responsible for maintenance of floodwater retarding structures Nos. 13B, 14, 14A, 15, 16, 17A, 23A, 24, 24A, 24B, 24C, 24D, 25A, and 26 through 44; and grade stabilization structures Nos. 110, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, and 129. Funda for maintenance will come from the general funds of the counties and the water control and improvement district. These funds are supported by existing taxes and are adequate and available for this purpose.

Immediately following completion of the structures by the contractor, the sponsors will be responsible for and promptly perform or have performed, without cost to the Soil Conservation Service, all maintenance of the structural measures as determined to be needed by either the sponsors or the Soil Conservation 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 Soil Conservation 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 nature that may adversely affect the structures. The Soil Conservation Service will participate in the inspections for the first three years following installation of each structure and as often as it elects to do so after the third year. Inspection items are those items which may need maintenance. Items of inspection and maintenance will include, but will not be limited to, condition of principal spillways, earth fills, emergency spillways, vegetative cover, fences, gates, and vegetative growth in reservoirs. Also, the structures will be monitored to determine that there are no water pollution problems being created by livestock watering, etc.

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

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

Appropriate soil and water conservation districts will prepare a report of all maintenance inspections. A copy of this report will be submitted to the Soil Conservation Service representative.

Operation and maintenance agreements have been signed on all structures within the watershed. The operation and maintenance agreements set forth specific details on procedure in line with recognized assignments of responsibility and are in accordance with the Texas Watersheds Operation and Maintenance Handbook.

Project Cost

The estimated costs for installation of the project are presented in the following tabulation:

ESTIMATED PROJECT INSTALLATION COST
Big Sandy Creek Watershed, Texas
(Trinity River Watershed)

Installation Cost Item	Estimated Cost (Dollars) 1/								
	PL 534 Funds				Other Funds				
	Federal Land		Nonfederal Land		Federal Land		Nonfederal Land		
	SCS2/	FS2/	SCS	Total	SCS2/	FS2/	SCS	Total	Total
TOTAL LAND TREATMENT	-	459,500	1,520,800	1,980,300	-	311,520	3,923,000	4,262,800	6,214,820
STRUCTURAL MEASURES									
Construction	810,160	-	5,902,280	6,712,440	-	-	-	-	6,712,440
Engineering Services	60,940	-	415,300	476,240	-	-	-	-	476,240
Project Administration									
Construction Inspection	80,430	-	524,580	605,010	-	-	-	-	605,010
Other	74,390	-	521,890	596,280	3,000	-	25,000	28,500	624,780
Subtotal	154,820	-	1,046,470	1,201,290	3,000	-	25,500	28,500	1,229,790
Other Costs									
Land Rights	-	-	-	-	84,480	-	929,090	1,013,570	1,013,570
TOTAL STRUCTURAL MEASURES	1,025,920	-	7,364,050	8,389,970	87,480	-	954,590	1,042,070	9,432,040
TOTAL PROJECT	1,025,920	4,500	8,884,850	10,370,270	87,480	311,520	4,877,590	5,304,870	15,646,860

1/ Price Base: Actual cost for 13 floodwater retarding structures (Nos. 2, 4, 5A, 5B, 6, 8, 10, 11, 12, 13, 14, 18, and 20) constructed. The remaining 44 floodwater retarding structures, 31 grade stabilization structures, land stabilization measures, and land treatment at 1976 prices.

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

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The ratio of the average annual benefits to the average annual cost is given in Appendix A.

ENVIRONMENTAL SETTING

Physical Resources

Big Sandy Creek watershed comprises an area of 317,000 acres, or 495 square miles, in portions of Clay, Jack, Montague, Wise, and Tarrant Counties, Texas.[1/] The watershed includes all of the drainage from the tributaries which flow into the West Fork of the Trinity River from the north-northeastern side between Eagle Mountain Reservoir and Lake Bridgeport. Big Sandy Creek is the largest of these tributaries. It comprises about 70 percent of the total drainage area. Smaller tributaries which also drain directly into the West Fork are Village Creek, Dry Creek, Marlin Branch, Walnut Creek, Deep Creek, Blue Creek, Burrett Creek, and several unnamed creeks.

The population in the watershed is dominantly rural. However, there has been an increase in the number of residents who buy and reside on small acreages in the lower portion of the watershed. This area lies about 25 miles from the metropolitan area of Fort Worth.

Area of Soil and Water Resource Problems

Intensive agricultural use of the land in the past without application of measures for conserving the soil and water resources resulted in severe erosion damage of upland soils within an area of 60 square miles. Extensive systems of deep gullies, some occurring to depths of 25 feet or more into soft sandstone bedrock, exist throughout the Windthorst-Duffau soils area of the watershed (Appendix D). These gullies are voiding an estimated 9.0 acres of land annually and active streambank erosion associated with the gully systems is destroying another 16.4 acres of land. The sediment derived from these gullies is damaging slightly over 3,500 acres of flood plain lands annually through the deposition of low fertility sands. Sediment deposits of up to 12 feet in depth have accumulated in the flood plain. Downstream segments of the mainstem Big Sandy Creek and large tributaries are filled and frequency of out-of-bank flooding has increased on the 21,085 acres of flood plain in the watershed. An estimated 235 acre-feet of sediment is being carried into Eagle Mountain Lake annually from the watershed and 51 acre-feet into Lake Amon G. Carter.

1/ 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.

Climatology

The climate is warm, temperate and subhumid. The average annual rainfall is about 30 inches. Rainfall occurs throughout the year, with the greatest amounts occurring in April, May, and October. Rainfall during the spring, summer, and fall usually occurs in storms of high intensity and short duration. High rates of runoff and erosion on unprotected soils are often associated with these storms. Excessive runoff from the bigger storms contributes to flash flooding problems in downstream areas.

The mean maximum temperature for July is 96° F. and the mean minimum temperature for January is 32° F. with the mean annual temperature being 64° F. The average date of the last freeze in the spring is March 27 and that of the first freeze in the fall is November 11, resulting in an average growing season of 229 days (U.S. Department of Commerce, 1971).

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 (Baldwin, 1973).

Topography and Geology

A gently to moderately rolling topography occurs over most of the central portions of the watershed. Prominent ridges capped by hard sandstone form a picturesque topography in areas surrounding Lake Amon G. Carter and the areas to the west and northwest. A pronounced escarpment lies along the eastern watershed divide, where hard limestone bedrock caps soft shale and poorly cemented sandstone bedrock. Deep valleys have been formed below this escarpment by streams originating in this area.

The flood plain adjoining Big Sandy Creek and the West Fork of the Trinity River is nearly level and has a maximum width of 5,000 feet. Widths on the smaller tributaries narrow down to 500 feet or less. Elevations above mean sea level range from 650 feet on the West Fork of the Trinity River near Eagle Mountain Lake to 1,250 feet on the northern watershed divide.

The watershed is underlain by soft sedimentary rocks of Pennsylvanian, Permian, Cretaceous, and Quaternary ages (Bureau of Economic Geology, 1967). The Pennsylvanian and Permian rocks are the oldest exposed rocks in the watershed. These rocks lie at an angular unconformity to the overlying younger Cretaceous rocks. The Pennsylvanian and Permian beds dip to the northwest at a rate of 70 to 120 feet per mile and the Cretaceous beds dip to the south-southeast at about 40 feet per mile. The Quaternary rocks occur mainly as terrace and flood plain deposits along the major streams.

Shale, hard limestone, and sandstone of the Graford, Caddo Creek, and Graham Formations of Pennsylvanian Age crop out over about 10 percent of the watershed in the Lake Amon G. Carter area and western parts. One prominent hard limestone member of the Graford Formation, the Chico Ridge Limestone, is an important source for production of crushed stone near the town of Chico.

The Permian rocks occur in the northern 18 percent of the watershed. These rocks are dominantly soft shale with some sandstone. The sandstone often occurs as a channel fill formation that is not continuous. This sandstone often caps prominent ridges in the area.

The Cretaceous rocks consist of poorly cemented sandstone, soft shale, and thin beds of hard limestone. The sandstone is fine grained and covers more than 50 percent of the watershed. It occurs as one unit, the Antlers Sand Formation, north of Decatur. South of Decatur, the Glen Rose Limestone separates the sandstone into two units, the Twin Mountains Formation and the Paluxy Formation. Shale and limestone of the Walnut Clay, Goodland Limestone, and Kiamichi Formations overlie the soft sandstone and form a prominent escarped ridge along the eastern and southeastern watershed divide. These latter formations comprise slightly over 10 percent of the watershed area.

Quaternary terrace deposits of clay, sand, and gravel occur as terrace deposits of Pleistocene Age along the West Fork of the Trinity River and a small area on Big Sandy Creek. Recent age alluvial deposits, consisting mainly of fine sand and clay, occur along the major streams and tributaries of the watershed. The Quaternary deposits comprise about seven percent of the watershed, with most of this area made up of the alluvium.

Soils

The watershed lies within three major land resource areas, the Cross Timbers and Prairies, the North Central Prairies, and the Grand Prairie. The soils within these three land resource areas are further broken down into eight major soil associations (Appendix D). Four of these associations, the Windthorst-Duffau, the Chaney, the Pulexas, and the Gowen, are soils of the Cross Timbers and Prairies area which comprise 60 percent of the watershed. Two assotiations, the Bonti-Cona-Truce and the Renfrow-Stoneburg-Anocon, are soils of the North Central Prairies, which comprise 25 percent of the watershed. The remaining two associations, the Purves-Maloterre and the Sanger-Purves, are soils of the Grand Prairie, which comprise the remaining 15 percent of the watershed. Approximately 30 percent of the soils in the watershed can be considered prime farmland.

The Windthorst-Duffau soils make up 46 percent of the watershed and are the largest group of soils within the watershed. These soils have developed on the soft, poorly cemented sandstone of the Antlers Sand, Paluxy, and Twin Mountains Formations. The surface layers are fine sandy loams and loamy fine sands over clayey or loamy subsoils. The

soils are deep, gently sloping to sloping, and moderate to moderately slowly permeable. The erosion hazard is high and more than 25 percent have been severely damaged by sheet and gully erosion brought about by intensive cultivation of these soils in the past. The gully systems are extensive and have eroded through the soil profiles into the underlying soft sandstone bedrock to depths of 25 feet or more. The soils with slight or moderate erosion have a medium potential use for cropland, pastureland, and rangeland. Approximately 58,300 acres of this association can be considered prime farmland.

The Windthorst soils of the Windthorst-Duffau Association occupy the ridges and eroded side slopes and make up about 50 percent of the association area. The Duffau soils occupy the valley fill and slopes and make up about 30 percent. The remaining 20 percent is made of other similar soils.

The Chaney Association soils make up about 7 percent of the watershed and like the Windthorst-Duffau soils have developed in the sandstone bedrock. These soils are generally less sloping and have more grayish mottled subsoils than the other Cross Timbers and Prairies soils. They have been affected less by erosion but have been extensively cultivated in the past. They are used mainly for pastureland now. Approximately 7,800 acres of this association can be considered prime farmland.

The Pulexas and the Gowen associations are alluvial soils along the streams of the watershed which are made up of Recent sediments derived largely from the upland Cross Timbers and Prairies soils. The Pulexas soils occur mainly along Big Sandy Creek and its tributaries while the Gowen soils occur mainly along the West Fork of the Trinity River. Both associations comprise about 7 percent of the watershed area. These soils are subject to flooding one or more times per year. Heavy loads of sandy sediment are deposited by the floodwater. This deposition is most significant on the Pulexas soils along Big Sandy Creek.

The Pulexas soils are deep, slightly acid, moderately rapidly permeable fine sandy loams. The Gowen soils are deep, neutral, moderately permeable clay loams. Both of these soils were once extensively cultivated but are now used for pastureland and cropland. These two associations contain approximately 5,400 acres of prime farmland.

Soils of the Bonti-Cona-Truce Association form the largest area within the North Central Prairies and comprise about 22 percent of the watershed. These are gently sloping to sloping, moderately deep to deep fine sandy loam soils that are underlain by hard sandstone and soft shales at 30- to 45-inch depths. The permeability ranges from moderately slow to slow. The moderately deep Bonti soils comprise about 30 percent of this association and occupy the ridges on the hard sandstone bedrock. The moderately deep Cona soils comprise about 25 percent of this association and occupy convex stony ridges that are underlain by shaly clay. The deeper Truce soils comprise about 25 percent of the association and occupy the side

slopes on the soft shale bedrock. The remaining 20 percent of the soils in this association are similar soils that have sandy surface layers or have limestone bedrock. Large areas of these soils were cultivated in the past but the main use now is for pastureland and rangeland. Many areas of these soils have experienced moderate to severe sheet erosion and small amounts of gully erosion. Erosion, however, has not been as severe as on other soils in the watershed. Approximately 10,500 acres of this association can be considered prime farmland.

Soils of the Renfrow-Stoneburg-Anocon Association comprise only about 3 percent of the watershed. These soils are gently sloping, deep and moderately deep loams that have developed in soft red shale and sandstone bedrock. They are used mainly for rangeland and pastureland and have not been affected by serious erosion. The Renfrow soils comprise about 30 percent of this association. They have neutral to slightly acid loam surface layers over blocky clay subsoils. The Stoneburg soils comprise about 18 percent of this association and are moderately deep, slightly acid fine sandy loam soils with clay loam subsoils over hard cemented sandstone bedrock. The Anocon soils comprise about 17 percent of the association and are deep, slightly acid fine sandy loam soils with sandy clay subsoils. Approximately 3,300 acres of this association can be considered prime farmland.

Soils of the Grand Prairie are represented by the Purves-Maloterre and the Sanger-Purves associations. These soils make up about 15 percent of the watershed and occupy the high areas on the western and southern watershed divide. They range from deep to very shallow clayey soils which have developed over hard limestone and soft calcareous shale bedrock under a tall grass prairie vegetation. The slopes range from gently sloping to moderately steep and the permeability is moderately slow to very slow.

The Sanger-Purves Association comprises an area of deep to shallow clayey soils. The Sanger soils, which comprise 35 percent of the association, are deep and occupy the filled valley areas. The Purves soils are shallow soils that comprise about 25 percent of the association. They occupy the ridges and higher areas above the valleys. About 40 percent of the association consists of similar soils that vary in surface textures or are noncalcareous. The deeper soils are used for cultivation. Approximately 6,000 acres of this association can be considered prime farmland.

The Purves-Maloterre Association comprises an area of shallow to very shallow soils. These soils are used mainly for rangeland. The shallow Purves soils make up about 35 percent of the association and occur on the less sloping areas. The very shallow Maloterre soils make up about 30 percent of the association and occupy the steep benched slopes and steep ridges. The remaining 35 percent of the soils differ in being somewhat deeper over the limestone bedrock. Approximately 1,200 acres of this association can be considered prime farmland.

Land Use

The land use of Big Sandy Creek watershed is principally agricultural, consisting of livestock and cash crop enterprises. A large part of the watershed was formerly devoted to cash crops such as grains, truck crops, peanuts, fruits, and hay; however, due to erosion and the depletion of soil fertility, much of it has been retired from cultivation to livestock enterprises consisting of beef cattle, dairy cattle and goats. Supplemental grazing is obtained from small grains, vetch, clover, and johnsongrass.

The overall land use for the watershed at the time of work plan development (1955), in 1968, and at the present time (1976) is as follows:

Land Use	1955 (acre)	1968 (acre)	1976 (acre)
Cropland	79,619	49,260	31,600
Pastureland	-	21,970	42,700
Rangeland 1/	217,775	224,120	215,750
Federally-owned land	9,350	9,350	9,350
State-owned land	1,500	1,500	1,500
Miscellaneous 2/	8,756	10,800	16,100
Total	317,000	317,000	317,000

1/ Includes recreation and wildlife land.
2/ Includes highways, roads, railroads, urban areas, farmsteads, etc.

The land use on the 21,085 acres of flood plain at time of work plan development (1956) and at the present time (1976) is as follows:

Land Use	1955 (acre)	1976 (acre)
Cropland	5,482	4,420
Pastureland	-	5,843
Rangeland 1/	15,182	10,654
Miscellaneous 2/	421	168
Total	21,085	21,085

1/ Includes open land, wooded land, formerly cultivated land, and stream channels.

2/ Includes highways, roads, railroads, urban areas, farmsteads, etc.

The trend in land use in the past has been to convert severely eroded and marginal cropland to improved pasture or to allow these areas to revert back to native vegetation under the slow process of natural succession.

There is a continuing trend for conversion of land to improved pastureland; however, most of this conversion is from lower forage producing rangeland that is covered with a heavy canopy of woody vegetation.

Approximately 14 percent of the watershed is in improved pastureland. The most common species of plants established on pastureland by land users are common bermudagrass, coastal bermudagrass, kleingrass, and weeping lovegrass. Pastureland is managed with one dominant vegetative species in order to maximize forage production.

Diversified crops are being produced on the 31,600 acres of cropland in the watershed. The kinds of crops grown and their production are shown in the following table:

Crop	Unit	Yield	
		Present	Potential
Cotton	Lbs. lint/Ac.	250	375
Grain Sorghum	Lbs./Ac.	2,000	3,000
Peanuts	Bu./Ac.	30	50
Forage sorghum	Ton/Ac.	3	5
Small Grain (grain)	Bu./Ac.	20	30
Small Grain (forage)	AUM	3	5
Pecans	Lbs./Ac.	200	500
Peaches	Bu./Ac.	200	250
Alfalfa	Ton/Ac.	3	6

The flood plain formerly used for cultivated crops has been partially converted to hay and improved paature due to frequent flooding, sediment, and erosion damages. In the future more of this flood plain can be used for feed and hay production in connection with the growing livestock industry.

Mineral Resources

The production of minerals within the watershed includes aand and gravel, clay, crushed limestone, and petroleum (both gas and oil). Sand and gravel are being mined mainly from terrace deposits along the West Fork of the Trinity River. Clay is mined for brick production at Bridgeport. Crushed stone is produced from the 300-foot thick Chico Ridge Limestone member of the Graford Formation near Chico. Gas and oil are being produced from the Boonsville Conglomerate Oil Field which covers most of the Wise County portion of the watershed, the Osage Bowie Southwest Oil Fields in Montague County, and a small field in Clay County. The value of these products produced within the watershed is estimated at $50,000,000.

Ground Water Resources

The basal sands of the Cretaceous System are important ground water aquifers within the area of their outcrop in the watershed as well as in the direction of downdip southeastwards from the watershed. Recharge of this aquifer is by rainfall falling on the area of surface outcrop. The excess water

entering the recharge zone is lost to streams in the watershed by intermittent and permanent springflow.

Water for domestic rural uses and the towns of Alvord, Chico, Newark, and Sunset is obtained from wells. Decatur obtains its water supply from wells and from Lake Bridgeport. Bowie obtains its water supply from Lake Amon G. Carter. Bridgeport obtains its water supply from the West Fork of the Trinity River.

Surface Water Resources

There are about 975 miles of recognizable streams in the watershed. Another 35 miles of stream, the West Fork of the Trinity River, forms the southwestern boundary of the watershed. The West Fork of the Trinity River maintains permanent flow conditions while Big Sandy Creek and most of its tributaries have intermittent flow with some permanent water holes and occasional spring-fed reaches. Studies of 14 years of gaged records (1961 through 1974) on the lower reach of Big Sandy Creek show that this stream had some form of flows 84 percent of the time (U.S. Department of the Interior, 1961-74). There were days of no flow every year during this period. The months which contained the days of no flow were June, July, August, September, October, and November.

Bodies of surface water in and adjacent to the watershed, which comprise 25,739 acres of surface water, include Eagle Mountain Lake, Lake Bridgeport, Lake Amon G. Carter, the water impounded in the sediment pools of 13 floodwater retarding structures, 1,050 farm and ranch ponds and 4 abandoned gravel pits. Eagle Mountain Lake, which has 9,200 acres surface area, lies on the southeastern edge of the watershed and Lake Bridgeport, with a surface area of 14,000 acres, lies on the western edge. Both of these reservoirs supply water for the city of Fort Worth. Lake Amon G. Carter, which has a surface area of 1,540 acres, is located in the northern part of the watershed and is the municipal water supply for the city of Bowie. The 13 existing floodwater retarding structures provide 299 acres of surface water. The 1,050 farm and ranch ponds are located throughout the watershed and range from about 1/4 acre to about 3/4 acre in size. The four abandoned gravel pits provide about 175 surface acres of water.

Surface Water Quality

The results of a one-time sampling of water and sediment in the streams and the sediment pools of existing floodwater retarding structures in the watershed are shown on the table on the next page. The locations of test stations are as follows:

1. At State Highway 59 crossing of Big Sandy Creek
2. At F.M. Road 114 crossing of Big Sandy Creek
3. At F.M. Road 2265 crossing of Big Sandy Creek

4. At State Highway 24 (U.S. 380) crossing of Big Sandy Creek
5. At Amon G. Carter Lake
6. At the sediment pool of floodwater retarding structure No. 4
7. At the sediment pool of floodwater retarding atructure No. 13

These samples were taken on May 18, 1976, by a water teating firm under contract. Comparison of flow on thia date at station No. 4, which is the location of a USGS gage, showed that flow conditions in Big Sandy Creek were characteristic of those which occur on average days in the apring.

Tests of the usual water quality parameters were made at all seven stations. In addition, tests of peaticides were made at two of these stations in both sediment and water. One test station was at an existing floodwater retarding structure lying within an area having a high amount of cropland and the other station was on the lower reaches of Big Sandy Creek. The pesticides tested for are the seven materials most widely used by farmers in the watershed. Testa were run on the medium of predominant transport mode: either water or sediment, or both. Tests were made of short-lived pesticides (having less than 90-day peraistence in the soil) and long-lived pesticides (having more than 300 days persistence).

Analyaes of the water samplea at all stations except No. 6 indicated that the general quality of the water was within the normal ranges expected from an upland agricultural watershed. The values for chloride and sulfate concentrations indicate that natural salt is not a problem. Station No. 6 indicates that nutrients from heavy cattle concentrationa are entering the sediment pool of floodwater retarding structure No. 4.

No pesticides were detected in the water or the sediment. Numerous reasons could be given for this absence. Generally the peaticides now approved for agricultural use would be expected to be found in runoff only when rainfall occurs immediately after application and probably more often due to careless dumping of leftover materials in and near watercouraes.

Suspended sediment load measurements have been made at the USGS gage on lower Big Sandy Creek since 1968 (USDI, Geological Survey). The highest suspended sediment concentration recorded ia 2,480 mg/1 on July 29, 1971. The calculated average suspended aediment based on recorded discharge and total suspended aediment discharge ranges from a low of 362 mg/1 for 1974 water year (October 1973 through September 1974) to a high of 1,019 for 1971 water year.

The Texas Water Quality Board has not established water quality standards for Big Sandy Creek but haa eatablished standards for the West Fork of the Trinity River (Appendix I). Comparison of the receiving stream standards to the test data showed that all parameters except fecal coliform levels will meet the Water Quality Board atandards.

RESULTS OF WATER QUALITY AND SEDIMENT ANALYSIS

Parameter	Unit	Station Number						
		Stream				Lake	Sediment Pools	
		1	2	3	4	5	6	7
Water Samples:								
Temperature	°F.	64	62	62	65	72	77	76
Dissolved Oxygen	mg/l	5.9	7.5	8.2	7.8	8.8	9.4	8.4
pH (in situ)		7.5	7.5	7.8	7.6	7.4	7.1	8.4
Nitrogen:								
Total Kjeldahl	mg/l	0.80	0.40	0.64	0.77	0.70	1.19	0.54
Ammonia	mg/l	<0.03	<0.03	0.09	<0.03	<0.03	<0.03	0.05
Nitrate	mg/l	0.03	0.20	0.14	0.17	0.24	0.04	0.02
Nitrite	mg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Phosphorus	mg/l	0.156	0.066	0.085	0.148	0.063	0.499	0.044
Specific Conductance	µmhos/cm	700	306	510	650	285	-	330
Turbidity	J.T.U.	2.3	45	50	65	52	180	23
Chloride	mg/l	85	38	55	80	50	4	42
Sulfate	mg/l	81.1	23	23	49.6	19.8	40.5	17.0
Total Suspended Solids	mg/l	21.2	49.6	94	140	11.2	211	12
Total Dissolved Solids	mg/l	520	236	331	480	224	178	222
Alkalinity	mg/l	145	81	170	192	64	21	98
Hardness	mg/l	217.3	102.6	193.2	257.5	86.5	32.2	122.7
BOD_5	mg/l	2.5	0.8	0.9	1.3	1.1	5.0	1.2
Fecal Coliform Bacteria	per 100 ml.	670	1,500	500	1,150	100	50	0
2, 4, 5 - T					None			None
Carbaryl					None			None
Malathion					None			None
Sediment Samples:								
Carbaryl					None			None
Simazine					None			None
Malathion					None			None
Trifluvalin					None			None
Streamflow Conditions	m/sec.	1/	0.19	0.31	0.27	NA	NA	NA

1/ Too slow to determine.

Air Quality

Air pollution within the watershed is generally of a minor nature. Sources of air pollutants are limited to urban pollutants generated within Decatur, Bowie, and the other smaller towns; various pollutants from agricultural activities including a minor potential for dust from sandy cropland; dust from sand and gravel production; and petroleum gases from oil fields.

Prevailing winds which are dominantly from a southerly to southeasterly direction tend to diffuse the air pollutants from the Dallas-Fort Worth metropolitan area in this direction. Northerly winds which reach their maximum in the winter months, but which do not predominate in any season, could diffuse air pollutants into the watershed from the Wichita Falls area which lies northwest from the watershed and to a minor extent from large metropolitan areas in Oklahoma which lie more than 100 miles away.

Wetlands

Using U. S. Department of the Interior, Fish and Wildlife Service's Circular 39, Wetlands of the United States, as a guide, two types of wetlands are identified as occurring in and near Big Sandy Creek watershed. There are approximately 25,739 acres of surface water, of which about 975 acres are Type 5 wetlands (inland open fresh water). Approximately 5,597 acres of Type 1 wetlands (seasonally flooded basins) are found within the wide flood plains of the West Fork of the Trinity River and portions of Big Sandy Creek. About 480 acres are subject to surface ponding of floodwater due to sediment buildup in stream bottoms and overbank deposits.

Farm ponds (including abandoned gravel pits) and water stored in the sediment pools of the floodwater retarding structures characterize the existing Type 5 wetlands. These areas are rated as fair to good quality waterfowl habitat during fall and spring migratory movements. During these times, the open water serves as resting area while the emergent vegetation around the shallower edges provides limited feeding opportunities. Those few resident wetland species recorded as breeding within the watershed area include: red-winged blackbird, green heron, great blue heron, killdeer, and a few blue-winged teal.

The open water also serves as an occasional source of drinking water for terrestrial animals and as required habitat for many reptiles, amphibians, and aquatic life forms. Most of the larger ponds and impoundments have been stocked with combinations of game fish such as black bass, hybrid sunfish, and/or channel catfish. Other fish species which may occur in these waters include European carp, green sunfish, golden shiner, and yellow bullhead.

SELECTED DEMOGRAPHIC CHARACTERISTICS FOR BIG SANDY CREEK WATERSHED AREA

	Total		Negro		White & Others		Spanish American 1/	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
STATE: TEXAS								
Population	11,196,730	100.0	1,419,677	12.7	9,777,053	87.3	2,059,671	18.4
Median Family Income	$8,489		$5,333		$8,923		$5,897	
Med. Per/Cap. Income	$1,944		$1,430		$2,060		$1,014	
Below Poverty Level: No. of Families	412,598	14.6	100,165	32.7	312,433	12.4	133,095	31.4
COUNTY: CLAY								
Population	8,079	100.0	105	1.3	7,974	98.7	65	0.8
Median Family Income	$7,225		$4,500		$7,266		2/	
Med. Per/Cap. Income	$1,669		$1,500		$1,670		2/	
Below Poverty Level: No. of Families	308	13.6	-	0.0	308	13.6	0	0.0
COUNTY: MONTAGUE								
Population	15,326	100.0	27	0.2	15,299	99.8	53	0.3
Median Family Income	$6,877		2/		$6,877		$7,500	
Med. Per/Cap. Income	$1,645		2/		$1,645		2/	
Below Poverty Level: No. of Families	687	15.6	0	0	687	15.6	0	0
COUNTY: WISE								
Population	19,687	100.0	358	1.8	19,329	98.2	689	3.5
Median Family Income	$7,764		$5,045		$7,786		$8,857	
Med. Per/Cap. Income	$1,678		$ 375		$1,693		$1,583	
Below Poverty Level: No. of Families	744	13.4	10	47.6	734	13.3	9	7.9

1/ Included in "White & Others"
2/ No amount was developed for original data.

Present and Projected Population

The population of Wise and Montague Counties, which comprise about 90 percent of the watershed, increased from 31,905 in 1960 to 35,013 in 1970. Decatur, situated on the eastern watershed divide and the county seat of Wise County, has a population of 3,750. Bowie, located in Montague County in the northern part of the watershed, has a population of 5,738. Bridgeport and Chico, which lie on the western side, boast populations of 3,650 and 723, respectively. Other small towns and communities in the watershed are Alvord, population 791, in the central part; Sunset, population 200, in the north central part; Vashti, population 140, and Newport, population 70, in Clay County in the northwestern part; and Rhome, population 393, and Newark, population 407, in the southern part.

The 1970 population of the three counties most repreaentative of the watershed area was 43,092. Projections for this area show a decrease in population of 4 percent to the year 1990 (U.S. Water Resource Council, 1972). The following tabulation shows the change in population for these three counties anticipated for the period 1970-1990:

County	Population 1970	Population 1990	Percent Change
Clay	8,079	6,300	-22
Montague	15,326	12,300	-20
Wise	19,687	22,900	+16

The latest statistics which are available show a labor force of 20,840 from a total population of 43,092 for the three counties most representative of the watershed area (USDA, 1976). Approximately 3.6 percent (752 workers, October 1976) are unemployed (Texas Employment Commission, October 1976). This is below the state and national rate of unemployment.

Economic Resources

Nearly all of the agricultural land in the watershed is privately owned, with the exception of 9,350 acres of federally owned land administered by the U. S. Forest Service and 1,500 acres of the Eagle Mountain National Guard Base that is owned by the Texas National Guard. The Department of the Army has 415 acres of the airfield facilities under lease from the Texas National Guard. There are about 1,067 farms, which average about 290 acres in size, located wholly or partially within the watershed. Agricultural land values range from $250 to $600 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.

Bowie, located in the northern part of the watershed, is the center of extensive gas and oil operations. Bowie is the chief commercial center of Montague County.

Decatur, the county seat of Wise County, is situated on the eastern divide and is the hub of dairying and farming activities. It is also the location of milk and meat processing plants.

The 1969 census for Jack, Clay, Montague, and Wise Counties showed 3,620 farm families, with a median income of $10,698 per year. Most operators of small farms and ranches supplement their income with employment in the nearby Dallas-Fort Worth metropolitan area. Approximately 150 of the family type farms use one and one-half or more man-years of hired labor (U.S. Department of Commerce, 1970).

Transportation needs in the watershed are fulfilled by approximately 240 miles of paved state and federal highways and 470 miles of improved county roads. Two railroads, the Chicago Rock Island and Pacific and the Fort Worth and Denver, cross the watershed. These roads and railroads make all parts of the watershed easily accessible to markets.

Plant and Animal Resources

Floral Setting

The vegetal associations of the watershed are fairly typical of Cross Timbers and Prairies vegetation areas of Texas, as the watershed is made up of 60 percent Cross Timbers and Prairies, 25 percent North Central Prairies, and 15 percent Grand Prairie. Although the present composition is somewhat altered due to intense agricultural management, Dr. Frank Gould describes the vegetation of Cross Timbers and Prairies as follows:

> In spite of the wide variation in soils and range sites, the climax understory vegetation is rather uniform. The predominant grasses are little bluestem, big bluestem, Indiangrass, switchgrass, Canada wildrye (Elymus canadensis), sideoats and hairy grama, tall dropseed and Texas wintergrass. The East and West Cross Timbers range from open savannah to dense brush, largely of post and blackjack oak. Brush species also have invaded the prairie proper, along with the weedy annual and perennial grasses, including hairy tridens (Tridens pilosum), Texas grama, red grama (Bouteloua trifida), tumble windmillgrass (Chloris verticillata), tumblegrass, red lovegrass, and some perennial weeds (Gould, 1969).

There are six major range sites that occur in the watershed. They are the sandstone hills, sandy loam, sandy, loamy bottomland, loamy prairie, and deep upland range sites.

The sandstone hills range site makes up approximately 45 percent of the rangeland in the watershed. This site commonly occurs as a chain of hills, but may occur as a single isolated hill. The general aspect is sandstone or conglomerate boulder-type rocks scattered over the surface of strongly sloping terrain. These particular physical traits gave way to plant communities whose climax was a savannah of mid and tall grasses

with significant amounts of forbs and low growing vines and shrubs. The woody overstory consisted primarily of post oak, whose canopy shaded about 20 percent of the ground. Little bluestem dominated the site, making up 35 percent or more of the total annual yield. Other grasses present during climax, but in lesser amounts, were purpletop, indiangrass, beaked panicum, big bluestem, sand lovegrass, sideoats grama, tall dropseed, and texas wintergrass. Woody plants and forbs included greenbrier, dewberry, coralberry, bumelia, lespedeza, tickclovers, snoutbeans, and catclaw sensitivebrier. The approximate total annual yield of this site in excellent ecological condition ranges from 2,000 pounds per acre in poor years to 3,500 pounds per acre in good years (based on air-dry weights). (See Appendix E for listing of common and scientific plant names.)

In the present overall condition of this range site, the woody overstory, consisting of post oak, blackjack oak, woollybucket bumelia, eastern redcedar, redbud, skunkbush, flameleaf sumac, wild plum, and greenbrier, shades from 25 to 40 percent of the ground. The major graases found on the site are texas wintergrass, perennial threeawns, buffalograss, and silver bluestem. Tumble windmillgrass, meadow dropseed, hairy grama, purpletop, and little bluestem are also found on this site, but in lesser amounts.

Forbs present on the site include common broomweed, western ragweed, lemon beebalm, and trailing wildbean. The site ia in poor ecological condition with less than 25 percent of the original native plants now present. The site is presently producing about 1,500 to 2,000 pounds per acre of air-dry vegetation.

The sandy loam range site makes up approximately 30 percent of the rangeland in the watershed. This site occurs on erosional uplands. Slope gradients are dominantly from 3 to 5 percent, but range from 1 to 8 percent. Some of the steeper areas are diasected by gullies. The climax plant community was a post oak, blackjack oak aavannah of tall and mid grasses. Little bluestem dominated the site in pristine condition and made up approximately 60 percent of the total annual yield. Indiangrass, sand lovegrass, and purpletop made up approximately 10 percent of the total annual yield. Other grasaes present, but in lesser amounts, were big bluestem, virginia wildrye, switchgrass, tall dropseed, sideoats grama, meadow dropseed, silver bluestem, hairy grama, vine-mesquite, and texas wintergrass. Woody plants and forbs consisted of carolina snailseed, hackberry, dewberrys, plums, greenbriers, grapes, engelmanndaisy, wildbeans, lespedeza, western indigo, maximilian sunflower, tickclover, catclaw sensitivebrier, and gayfeather. The approximate total annual yield of this site in excellent condition ranges from 3,500 pounds per acre in poor years to 6,000 pounds per acre of air-dry vegetation in good years.

Presently, the woody vegetation found growing on the site is post oak, flameleaf sumac, wild plum, and some blackjack oak. The canopy cover of the woody species shades approximately 10 percent of the ground. The

major grasses found on the site include little bluestem, sideoats grama, texas wintergrass, and perennial threeawn. Other grasses found, but in lesser amounts, are meadow dropseed, silver bluestem, purpletop tridens, tumble windmillgrass, mat sandbur, low panicums, and winter annuals. Forbs included on the site consist of common broomweed, western ragweed, lemon beebalm, marestail, oneseed croton, and threeseed croton. The site is in fair ecological condition with 26 to 50 percent of the original native plants being found that were present under pristine conditions. The site is presently producing approximately 3,000 pounds per acre of air-dry vegetation.

The sandy range site makes up about 10 percent of the rangeland in the watershed. This site has mixed slopes ranging from 0 to 5 percent. This site is a post oak and blackjack oak savannah. Post oak was the dominant woody species on this site. The dominant grasses on this site were little bluestem, big bluestem, and indiangrass which made up about 45 percent of the total annual production. Other grasses important to the site were sand lovegrass, purpletop tridens, tall dropseed, silver bluestem, hairy grama, scribner panicum, canada wildrye, morning lovegrass, and fringeleaf paspalum. Other woody plants that occurred on the site were skunkbush sumac, greenbrier, bumelia, pricklyash, hackberry, poison-oak, blackhaw, ivy treebine, and carolina snailseed. The approximate total annual yield of this site in excellent condition ranges from 3,500 pounds per acre in poor years to 4,600 pounds per acre of air-dry vegetation in good years.

Presently, the woody vegetation found growing on the site consists of post oak, woollybucket bumelia, herculesclub pricklyash, wild plum, flameleaf sumac, greenbrier, and carolina snailseed. The canopy cover shades 25 to 40 percent of the ground. The major grasses found growing on the site include mat sandbur, lovegrass, low panicums, and fringeleaf paspalum. Other grasses found, but in lesser amounts, are little bluestem, silver bluestem, broadleaf signalgrass, and hooded windmillgrass. Forbs found growing on the site include pricklypoppy, texas bullnettle, western ragweed, common broomweed, oneseed croton, threeseed croton, and thistles. The site is presently in poor condition with less than 25 percent of the original native plants present that were found under pristine conditions. The site is presently producing approximately 2,000 pounds per acre of air-dry vegetation.

The loamy prairie range site makes up approximately 5 percent of the range sites in the watershed. This site is nearly level to gently rolling. The climax plant community is a treeless, mid and tall grass prairie. Grasses and grasslike plants composed about 40 percent of the total annual herbage yield on the site. Forbs made up about 10 percent and woody species contributed only trace amounts. Little bluestem dominated the site making up 30 to 50 percent of the total annual yield. Other grasses important to the site included big bluestem, indiangrass, switchgrass, canada wildrye, sideoats grama, blue grama, meadow dropseed, buffalograss, silver bluestem, vine-mesquite, white tridens, and texas

wintergrass. Forbs indigenous to the site were engelmanndaisy, baldwin ironweed, illinois bundleflower, white prairieclover, yellow neptunia, and pinkscale gayfeather. The approximate total annual yield of this site in excellent condition ranges from 4,000 pounds per acre in poor years to 7,000 pounds per acre of air-dry vegetation in good years.

Presently, the major woody species found growing on the site is mesquite, most being 4 to 5 inches in diameter and 8 to 10 feet tall. The canopy cover shades 10 percent or less of the ground. The major grasses found growing on the site include buffalograss, texas wintergrass, texas grama, perennial threeawn, and little bluestem. Other grasses present, but in lesser amounts, are silver bluestem, meadow dropseed, sideoats grama, and hairy grama. Forbs found on the site include common broomweed, upright prairie-coneflower, western ragweed, crotons, baldwin ironweed, american basketflower, gayfeathers, illinois bundleflower, and winter annuals. The site is presently in fair ecological condition with more than 26 percent of the native plants being present that were found under pristine conditions. The site is presently producing approximately 3,500 pounds per acre of air-dry vegetation.

The loamy bottomland range site makes up approximately 5 percent of the rangeland in the watershed. This site occurs along permanent or intermittent streams on relatively flat topography and flood plains. The climax plant community is a savannah dominated by mid and tall grasses. A tree canopy of pecan, elm, hackberry, post oak, and live oak shaded about 25 percent of the ground. Little bluestem dominated as the understory herbaceous vegetation, making up 30 percent or more of the total annual yield. Perennial wildryes and switchgrass were subdominants. Other grasses important to the site were big bluestem, indiangrass, purpletop, tall dropseed, vine-mesquite, sand lovegrass, texas bluegrass, beaked panicum, florida paspalum, sideoats grama, white tridens, meadow dropseed, texas wintergrass, and sedges. Woody plants made up approximately 20 percent of the total annual production and consisted of pecan, elm, live and post oak, hackberry, greenbrier, sumac, buckthorn, ash, redbud, mulberry, western soapberry, coralberry, and grapes. Indigenous forbs on the site consisted of maximilian sunflower, wildbeans, snoutbeans, lespedeza, gaura, gayfeathers, engelmanndaisy, penstemons, and tickclovers. The approximate total annual yield of this site in excellent condition ranges from 5,000 pounds per acre in poor years to 8,000 pounds per acre of air-dry vegetation in good years.

Presently the woody vegetation found growing on this site includes pecan, american elm, green ash, post oak, sugar hackberry, chinaberry, black willow, red mulberry, boxelder, cottonwood, eastern redcedar, osageorange, and woollybucket bumelia. The canopy cover of the woody vegetation shades 30 percent or more of the ground. The major grasses found growing on the site include broadleaf uniola, canada and virginia wildrye, sedges, and buffalograss. Other grasses found, but in lesser amounts, are rescuegrass, little barley, sixweeks fescue, and downy brome. Vines found growing on the site include greenbrier, virginia

creeper, trumpetcreeper, poisonivy, grapes, smooth swallowwort, and carolina snailseed. Forbs found on the site include yellow woodsorrel, white avens, milkweed, sowthistle, baldwin ironweed, yellow hop clover, and texas bullnettle. The site is presently in fair ecological condition with more than 26 percent of the native plants being present that were found under pristine conditions. The site is presently producing approximately 4,500 pounds per acre of air-dry vegetation.

The deep upland range site makes up the remaining 5 percent of rangeland in the watershed. This range site occurs as a smooth rolling prairie with slopes generally less than 5 percent. This site occasionally occurs on ridge tops but predominantly occurs in valleys and the lower part of long slopes. The climax plant community occurs as a true grass prairie with mid and tall grasses as dominants. Woody vegetation was confined to watercourses in the pure site, and consisted of about 5 percent open canopy of trees such as elm, hackberry, plum, and pecan. Little and big bluestem made up 30 to 60 percent of the total annual yield. Indiangrass was a subdominant species. Other grasses that were found on the site included switchgrass, virginia and canada wildrye, sideoats grama, texas wintergrass, tall dropseed, vine-mesquite, texas cupgrass, white tridens, and silver bluestem. Forbs found growing on the site were engelmanndaisy, maximilian sunflower, neptunia, sensitive-brier, prairieclovers, gaura, wildbeans, tickclovers, and gayfeathers. The approximate total annual yield of this site in excellent condition ranges from 3,000 pounds per acre in poor years to 6,500 pounds per acre of air-dry vegetation in good years.

Presently the woody vegetation consists of cedar elm, sugar hackberry, and live oaks. The canopy cover occurs in scattered motts and shades approximately 5 percent of the ground. The major grasses found growing on the site include texas wintergrass, little bluestem, buffalograss, perennial threeawn, and meadow and tall dropseed. Other grasses found, but in lesser amounts, are sideoats grama, texas cupgrass, hairy grama, texas grama, tumblegrass, silver bluestem, virginia wildrye, and canada wildrye. Forbs found on the site include skullcap, queensdelight, western ragweed, baldwin ironweed, common broomweed, wild alfalfa, and pricklypear. The site is presently in fair ecological condition with more than 26 percent of the native plants being present that were found under pristine conditions. The site is producing approximately 3,000 pounds per acre of air-dry vegetation.

The Federal Register on Endangered and Threatened Plants published Wednesday, June 16, 1976, does not list any plant within the watershed as being in danger of being extirpated (U.S. Department of the Interior, 1976).

Faunal Setting

Two major wildlife habitat types, the upland and the bottomland, occur in the watershed. Approximately 93 percent of the wildlife habitat is

classified as upland type. This habitat is largely farming and ranching land characterized by open native grassland interspersed with post oak woods, small improved pastures, and cultivated fields. Most of the tillable soils of the uplands were intensively cultivated in the past, but due to eroded soil conditions, were retired from cultivation. Over half of the retired cropland has been allowed to revert to native grasses and the remainder converted to pastureland. On the cropland that remains, the principal crops include forage sorghum, peanuts, small grain, and grain sorghum, all of which are utilized by many wildlife forms. Some cropping practices such as minimum tillage, crop residue management, and incomplete harvest benefit many species of birds, mammals, and reptiles.

The native grasslands range in appearance from true savannahs to brush-infested grasslands and support a variety of vegetation. The species composition of these grasslands includes annual and perennial forbs with high values for wildlife, such as western ragweed, annual broomweed, maximilian sunflower, prairie senna, engelmanndaisy, woolly croton, orange zexmenia, ratany, halfshrub sundrop, snow-on-the-prairie, and tickclovers. Several species of woody plants and trees along watercourses in the upland provide travelways, roosting areas, nesting habitat, and feeding cover for most wildlife species. The habitat value of the wooded areas is dependent on the species of vegetation present, the density of the woody plants, and their nearness to other habitat types.

Another land use in the upland habitat is improved pasture, which typically consists of monocultures of common bermudagrass, coastal bermudagrass, or ermelo lovegrass that are managed for moderate to high levels of production. Most of these pastures were cultivated fields until they became severely eroded and their fertility decreased.

Old fence rows, drainageways and similar odd areas located throughout the uplands support moderate to dense stands of weeds, johnsongrass, greenbrier, dewberries, and other plants. These areas afford some of the essential habitat elements required for the survival of many terrestrial and avian animal species.

Approximately seven percent of the watershed is classified as bottomland wildlife habitat. This type of habitat is found in the flood plain of the West Fork of the Trinity River, and along the banks of Big Sandy Creek and its major tributaries. These flat-bottomed alluvial valleys, which range from a few hundred to several thousand feet in width, support bands of riparian hardwood species. The riparian woodlands are, in turn, bordered by vegetal communities that are dictated by the other land uses such as cropland, native grasslsnd, and improved pastureland. Tree species found in the bottomland habitat include american elm, pecan, cedar elm, hackberry, green ash, black willow, osageorange, and eastern cottonwood. Various understory plants, both woody and herbaceous, occur in association with the varying densities of tree species.

Present Wildlife Habitat

There is a great diversification of land uses and of vegetative communities within the upland and bottomland habitat types. This diversification increases the interspersion factor and results in higher quality habitat for many species. This is particularly true for those animal species that rely on the elements of "edge" to fulfill their optimum habitat requirements.

A field survey of the watershed identified six distinct habitat types. The quantities and description of these habitat types is as follows:

Open Native Grassland Habitat

Open native grasslands comprise 40 percent (approximately 127,000 acres) of the wildlife habitat areas in the watershed. Woody vegetation of scattered trees such as post oak, hackberry, blackjack oak, cedar elm, and woollybucket bumelia may be present, but in amounts of less than 10 percent canopy. Plum thickets and dense stands of flameleaf sumac provide additional woody cover when present in the landscape. The primary herbaceous species varies, depending upon the advancement or degradation of the ecological condition of the native grassland. The species most often encountered include little bluestem, texas grama, texas wintergrass, buffalograss, western ragweed, annual broomweed, crotons, and prairie senna. Overgrazing has reduced the value for most wildlife species due to lack of desirable food plants and cover. Areas that are properly grazed furnish fawning areas, nesting areas, and other types of cover in addition to the open grassland desired by deer, turkey, and numerous small mammals.

Post Oak - Greenbrier Assemblage Habitat

The post oak-greenbrier assemblage is the dominant wooded habitat type, encompassing about 17 percent (approximately 54,000 acres) of the wildlife habitat in the watershed. Post oak is the predominant tree speciea, comprising approximately 85 percent of the assemblage. Blackjack oak, woollybucket bumelia, hackberry, eastern redcedar, and cedar elm are interspersed where soil conditions, moisture relationships, and other factors are conducive to their growth success. Understory vegetation includes greenbrier, coralberry, and skunkbush sumac. The average canopy cover is estimated at 60 percent. This habitat type is located within the drier, more well-drained upland areas in the watershed. It has a moderate value rating for eastern fox squirrel due to available woody cover, den sites, quality of mast, and fruits of associated woody species.

Riparian Woodland Habitat

This habitat type comprises about 11 percent (approximately 35,000 acres) of the wildlife habitat inventoried. It is dominated by american

elm and pecan with occurrences of cedar elm, hsckberry, green ash, honeylocust, blsck willow, red mulberry, eastern cottonwood, chinaberry, osageorange, and boxelder. American elm snd pecsn compose 50 and 20 percent, respectively. The majority of these trees are large, ranging from 20 to 32 inches in diameter and 50 to 65 feet in height. Understory vegetation consists of a reproduction of the overstory components with small trees and shrubs such as mexican plum, roughleaf dogwood, redbud, possumhaw, blackberry, carolina buckthorn, rusty blackhsws, and other hawthorns; vines such as greenbrier, grspes, carolina snailseed, poisonivy, virginia creeper, smooth swsllowwort, trumpetcreeper, and dewberry. Few grasses and herbaceous forbs thrive under the dense canopy of trees. Broadleaf uniola, american elder, sedges, tickclovers, violets, white avens, sanicle, scouring rush, woodsorrel, asters, rescuegrass, and wildryes are found in varying quantities, depending on grszing msnagement, duff accumulation, canopy, soils, avsilsble moisture, and other factors. This hsbitat type hss the highest habitst value for all species considered with the exception of dove and quail.

Pastureland Habitst

Pastureland makes up 14 percent (approximately 43,000 acres) of the wildlife hsbitat in the watershed. Pasture grasses are predominantly common bermudagrass, coastal bermudagrass, ermelo lovegrass, and a few scattered fields of kleingrass. Annual weeds are utilized by wildlife, but, due to the high level of mansgement that is employed by most landowners, in the uplands this hsbitat type is rated low for most wildlife species (with the exception of the Eastern cottontail).

Cropland Habitat

Cropland embodies ten percent (approximately 32,000 acres) of the wildlife habitat in the watershed. The major crops are forage sorghum, small grain, and peanuts. Grain sorghum, corn, and truck crops are being grown on a limited basis. In most csses, moderate amounts of woody vegetstion exist slong fence rows, roadsides, and odd areas. These woody associations consist of woody shrubs and vines, several grasses, and numerous weeds, most of which are annuals. The cropland provides a food source for dove, quail, and other seed-esting birds. The wildlife habitat value of this area is enhanced when conservation practices such as minimum tillage, crop residue mansgement, incomplete harvest of grains, and odd area mansgement are applied.

Brushy Native Grssslands Habitat

This type encompasses three percent (approximstely 10,000 acres) of the wildlife hsbitat in the watershed. Honey mesquite, 3 to 10 inches in diameter st breast height, is the primary woody species. Other woody plants in this habitat sre cedar elm, woollybucket bumelia, post oak, pencil cholla, and elbowbush. Ground cover includes texas wintergrass, vine-mesquite, buffalograss, threeawns, hooded windmillgrass, and a

variety of seed-producing forbs such as western ragweed, croton, snow-on-the-prairie, ironweed, and common broomweed. Almost all of the areas of this type are found on sites located in Montague and Clay Counties. This brushy type habitat is rated as having a moderate value for dove, quail, and rabbits and a low value for squirrel because of available woody cover and forbs.

Miscellaneous Lands

The miscellaneous lands in the watershed comprise five percent (approximately 16,000 acres) of the area. These lands provide only limited wildlife habitat value.

Fishery Resources

Fishery resources in the watershed are limited to the Trinity River, Big Sandy Creek, existing floodwater retarding structures, small lakes, farm ponds, abandoned gravel pits, and Lake Amon G. Carter.

There are 13 existing floodwater retarding structures in the watershed that provide 299 acres of open surface water. These bodies of water range in size from 9 to 47 acres. All 13 have been stocked with sport fish; none are leased for fishing but are utilized by the landowners, their families, and friends.

Approximately 1,050 farm ponds exist in the watershed. Over 90 percent of the farm ponds were constructed as sources for livestock water. About 65 percent of the ponds are stocked with sport fish. The ponds range from 1/4 to 3/4 acre in size and from 7 to 10 feet in depth. Approximately 6 percent of the farm ponds are managed to provide a sustained high-quality fishery resource. Most of the farm ponds, however, provide poor to good recreational fishing opportunities. Some landowners allow fishing on their ponds if verbal or written permission is sought prior to entry upon their lands. Two landowners in the Montague County portion of Big Sandy Creek watershed make their water resources available to those segments of the public that are willing to pay user fees to gain entrance.

There are four large abandoned gravel pita in the watershed furnishing landowners and friends with water-based recreational opportunities on an additional 175 acres.

Lake Amon G. Carter, which serves as the municipal water supply for the city of Bowie, is the only large reservoir in the watershed open to the public for fishing, picnicking, boating, etc. The lake has been stocked and managed with the assistance of the Texas Parks and Wildlife Department fishery biologists.

The Trinity River is the only permanent stream fishery in the watershed.

Big Sandy Creek is classified as an intermittent stream. The flow that occurs in Big Sandy Creek is very shallow. The pools examined during the inventory vary from 14 to 48 inches deep and from 6 to 17 feet wide. The temperature of the shallow water changes readily with the seasons and is suited only for eurythermal aquatic species.

All other streams in the watershed are classed as intermittent or ephemeral and the aquatic habitat is poor to nonexistent.

Representative game or sport fish inhabiting watershed waters are largemouth bass, channel catfish, flathead catfish, green sunfish, bluegill, redear sunfish, white and black crappie, and white bass. Typical forage species are red shiner, bullhead minnow, fathead minnow, and blackstripe topminnow. Other fish species or rough fish present are European carp, smallmouth buffalo, river carpsucker, longnose gar, and freshwater drum.

In the backwater areas (the confluence of Big Sandy and the Trinity River), the estimated standing fish crops are 250 pounds per surface acre. Large individuals of both game fish and rough fish species constitute a high percentage of this standing crop. Progressing upstream, the predicted standing crops decrease to 50 pounds per surface acre in the lower reaches, to 20 pounds per surface acre in the middle stream reaches, and 5 pounds per surface acre in the upper stream reaches (Bonn, 1976).

As the standing fish crops decrease, the composition of the stream fish population changes. In the middle reaches, rough fish become less dominant with forage species becoming more dominant. The relative abundance of sport species remains much the same; however, larger individuals give way to smaller individuals. On the upper reaches of the tributaries, forage species become dominant. Rough fish are represented by a few small individuals in these reaches and sport species are represented by young of the year and one-year old individuals.

Pole and line fishing is common along access points where farm roads cross the Trinity River and Big Sandy Creek. Limb lines and trot lines are also used by local fishermen along the Trinity River. Eight landowners along the Trinity River lease their fishing rights to private individuals.

No information is available regarding fish populations, yields, or usage on the ponds and lakes. There are no known commercial fisheries in the watershed.

Wildlife Species and Population

The species of wildlife occurring in the Big Sandy Creek watershed are indicative of the kind, amount, and condition of habitat that exists. Primary game species in the area are mourning dove and bobwhite quail. Some hunting pressure is also exerted on the marginal populations of white-tailed deer, fox squirrel, and cottontail rabbits. Many landowners use dogs to hunt raccoon, red fox, gray fox, and coyote. Wild turkeys also occur in the watershed, but are generally confined to its western reaches. Furbearers that inhabit the watershed include beaver, nutria, Eastern spotted skunk, striped skunk, bobcat, ringtail, and opossum.

The Big Sandy Creek watershed is within the prescribed boundary of the Central Waterfowl Flyway. During the migratory periods, various species of ducks, geese, shorebirds, and related waterbirds frequent wetland areas within the watershed. Wood ducks, shovelers, mallards, and teal were found along Big Sandy Creek during the inventory. Ruddy ducks, canvasbacks, shovelers, teal, and coots were observed on existing floodwater retarding structures within Wise and Montague Counties. Many species of songbirds, raptors, shorebirds, and others are found in the watershed.

Reptiles and amphibians found in the watershed area include representative members of the following orders: salamanders (Caudata), frogs (Anura) and toads, turtles (Testudinata), and lizards and snakes (Squamata).

Information on population estimates for various wildlife species was obtained from the Texas Parks and Wildlife Department (Holt, 1976).

White-tailed deer populations are isolated within Wise, Montague, and Clay Counties, being confined to areas with available wooded habitat for cover. As of the February 1976 tabulation, white-tailed deer range in Wise, Montague, and Clay Counties amounts to 233,108 acres.

During the 1974-1975 hunting season, 61 bucks were harvested from the three-county area, with 44 being harvested in Wise County.

Fox squirrel populations are confined to the wooded areas along creeks and drains or within brushy motts that are adjacent to these areas. The lack of mast-producing trees and the low production of existing trees limits squirrel numbers in portions of the watershed. The estimated population for the squirrel habitat in the watershed is one squirrel per every three acres. The watershed is presently experiencing one of the highest population densities on record.

Mourning dove populations vary greatly within the watershed. The population density depends upon availability of quality food supplies and related habitat conditions within their migration area.

The population of doves, based on a 1975 census count that recorded the individual dove per mile, is as follows:

Wise County	0.90 per mile
Montague County	1.80 per mile
Clay County	1.55 per mile

Bobwhite quail populations are variable due to changes in habitat condition within Wise, Montague, and Clay Counties. Populations fluctuate annually, depending primarily upon rainfall, which determines the abundance of annual forbs and other food plants. Quail reproduction and survival are closely linked by rainfall amounts and climatic patterns. During favorable years, populations of one quail per 5 acres may occur in areas of good habitat. During unfavorable years, populations may be reduced to one quail per 20 acres.

Wild turkeys are found within the watershed. Their range in Wise, Montague, and Clay Counties includes 356,961 acres of habitat in their summer range and 164,454 acres of winter-range-type habitat. The following is a tabulation by counties:

Wise County	Summer inhabited range	22,932 acres
	Winter inhabited range	12,186 acres
Montague County	Summer inhabited range	86,017 acres
	Winter inhabited rsnge	28,159 acres
Clay County	Summer inhabited rsnge	248,012 acres
	Winter inhabited range	124,109 acres

Furbearer and other mammal populations vary within the watershed due to habitat conditions, reproduction, survival, and a host of other associated factors. The following population densities have been estimated:

Raccoon	High
Bobcat	High
Coyote	High
Red fox	Low
Gray fox	Low
Skunk (both species)	Low
Ringtail	Moderate
Opossum	Low

Population density or census data on unmentioned species of wildlife, such as reptiles, amphibians, burrowing animals, and other non-game species are not available. However, wildlife populations are generally higher in the upper portions of the watershed due to the greater amount of woody vegetation and the decrease in rural population encroachment. It must also be noted that wildlife species, diversity, and populations vary greatly within the watershed on a farm-to-farm or even on a pasture-to-pasture basis. This is due to a variety of reasons, including habitat quality, hunting pressure, livestock grazing pressure, and other associated conditions. Normally, with the exception of waterfowl and squirrel, the same species of wildlife occur in the uplands as well as in the bottomlands; however, populations are higher in the bottomlands.

Approximately 15 percent of the landowners in the watershed lease their lands for hunting and about 75 percent of the farms are used by the landowners themselves for hunting, fishing, or other outdoor activities. Although most hunting for wild game is limited to landowners, their families and friends, some public hunting is availsble on the U. S. Forest Service land.

Endangered or Threatened Fauna

The U. S. Fish and Wildlife Service and Texas Parks and Wildlife Department recognize two species of endangered animals whose natural range extends over and throughout the project area of the watershed. These two species

are transient birds, the Southern bsld eagle and the American peregrine falcon. The watershed offers neither preferred nesting sites nor a sustained food source for these birds.

No other endangered or threatened species are known to have range distributions within the watershed and no sightings or evidence has been recorded of any other species.

Recreational Resources

Recreational development possibilities of this area are extremely favorable. Approximately 1,300,000 people who live within a 50- to 75-mile radius of Decatur, including a portion of the Dallas-Fort Worth metropolitan area, have easy accessibility to the area. Historical sites located in the area enhance the recreational development possibilities of the watershed. Lake Bridgeport, Lake Amon G. Carter, and Eagle Mountain Lake offer the nearest water-based recreational opportunities.

Archeological, Historic, and Unique Scenic Resources

There are no historical sites listed on the National Register of Historic Places at or in the vicinity of the structural measures. Historical sites are listed within the cities of Bowie and Decatur.

An archeological survey of areas to be affected by structural measures was made under contract by the Archeology Research Program, Southern Methodist University, and by Environmental Assessments, Inc. of Pauls Valley, Oklahoma. Three archeological and historical sites were identified in these surveys, none of which are considered eligible for nomination to the National Register of Historic Places.

The following recommendations by the archeologist summarize the archeological resources in the areas to be affected by the project:

> The archeologic sites located in the survey of the Big Sandy Creek Project flood control structures are small and poorly preserved. No sites of National Register status or potential National Register status were located during the survey. Further research at these sites would not increase greatly our understanding of the prehistory of the area. For this reason, no further research is recommended at these sites. However, if archeological remains are uncovered during the construction of the flood control structures, a trained archeologist should be asked to evaluate the site.

Soil, Water, and Plant Management Status

Conservation plans developed by land users with the district with technical assistance from the Soil Conservation Service are the basis for most land treatment measures being installed on watershed lands. These conservation plans contain soil, water, and other needed inventories;

data on critical conservation problems; and a record of decisions which have been agreed upon by the landowner in order to reach conservation objectives.

There are a total of 1,067 farm and ranch units wholly or partially within the watershed. Of these, 751 farm and ranch units have developed conservation plans with the local soil and wster conservation district on about 208,650 acres or about 70 percent of the agricultural land in the watershed.

Soil surveys, which are essential to sound planning and application of land treatment measures, have been completed on all the watershed land except for 38,000 acres.

There are presently some changes in primary land use occurring in the watershed. Rangeland that is producing low amounts of forage and is infested with a dense canopy of brushy and woody vegetation is being cleared and planted to improved bermudagrass where maximum forage production is desired.

There is a trend toward the application of specific management practices that will benefit wildlife as a secondary land use. This trend is expected to continue as the demand for hunting increases.

Critical area treatment is being carried out on the severely eroded areas of the watershed by various cost-share programs available to land users. This will greatly reduce the amount of sediment that is being carried to the flood plain. This practice is being carried out under the Agriculture Conservation Program administered financially by the Agricultural Stabilization and Conservation Service and by the Great Plains Conservation Program and PL 534 program administered by the Soil Conservation Service.

Grazing management is being carried out on the grassland areas of the watershed. The adoption of deferred grazing is increasing and an estimated 130,750 acres are now being operated under some type of deferred grazing program. This will improve this valusble resource in the watershed and this trend is expected to continue.

Projects of Other Agencies

Eagle Mountain Lake is located on the West Fork of the Trinity at the lower extremity of the Big Sandy Creek watershed. Lake Bridgeport is also located on the West Fork at the west boundary of the watershed. Both of these reservoirs serve as part of a water supply system for the City of Fort Worth, Texas, and are owned and operated by the Tarrant County Water Control and Improvement District No. 1.

The U. S. Forest Service administers 9,350 acres of federally owned land within the watershed. The land was purchased in many small tracts under

authority of Public Law 210, 75th Congress, taken out of cultivation, and seeded to native grasses. These lands were severely eroded and submarginal for crop production.

Fifteen hundred acres of the Eagle Mountain National Guard Base lie in the watershed and are owned by the Texas National Guard. The Department of the Army has 415 acres of the airfield facilities under lease from the Texas National Guard.

WATER AND RELATED LAND RESOURCE PROBLEMS

Land and Water Management

There is a constant need to apply and maintain land treatment measures that reduce or control erosion. The broad concept of resource conservation has been accepted by most of the farmers and ranchers in the watershed as evidenced by their individual progress in applying and maintaining conservation measures on their lsnds. It is apparent that some land units are being managed as submarginal economic units. These smaller units of land have been bought by people in the larger metropolitan areas such as Fort Worth-Dallas. The rate of application of land treatment measures on these smaller units is often slow because many of the landowners lack the necessary capital and management skills for applying needed measures.

The most serious remaining resource problem is within a 60 square-mile area of gullied Cross Timbers and Prairies soils which lie in the east central portion of the watershed within the Windthorst-Duffau Association (Appendix D). Approximately 15 percent of this area consists of eroded, formerly cultivated land that is dissected by extensive systems of large gullies. The soils are depleted of their natural fertility and in most instances will not support needed vegetation for erosion control or forage production without fertilization or management. Erosion is continuing to produce large volumes of sediment that is being carried into downstream areas.

The sandy and loamy soils of the watershed are inherently susceptible to water and wind erosion when cultivated or overgrazed. Soil erosion and reduced organic content of the soil are primary problems on the remaining untreated croplsnd. Soil erosion ia most severe on land having slopes greater than one percent that have not had the needed conservation practices installed.

Problems on pastureland and rangeland are poor cover and degraded plant composition. The amount of forage produced from the grassland areas depends on the amount and distribution of the rainfall as well as the proper management of the plant resources. Forage production during years of below average rainfall is usually less than that of normal rainfall periods. During such periods, care must be taken by the land

users to prevent overuse and degradation of the plant resources. Prolonged overgrazing can result in soil erosion and an increase of less palatable plants on the areas.

Floodwater Problems

The flood plain, 21,085 acres, is defined as that area inundated by the runoff from the largest storm considered in the 20-year evaluation series, 1939 through 1958. This storm produced a runoff approximately equal to that resulting from a 25-year frequency event. The flood plain includes the bottomland along the east side of the West Fork of the Trinity River.

There are 19,797 acres of flood plain downstream from existing and planned floodwater retarding structures. Of this amount, 13,240 acres are located along Big Sandy Creek and its tributaries, 573 acres along the laterals, and 5,984 acres along the east side of the West Fork of the Trinity River.

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

During the 20-year evaluation period, there were 18 major floods that covered one-half or more of the flood plain and 53 minor floods covering less than half of the flood plain on Big Sandy Creek and laterals. During the same period there were 37 major and 34 minor floods on the flood plain of the West Fork. More than 53 percent of the floods on the flood plain of Big Sandy Creek occurred during the months of April, May, and June. During the same months there were 18 major and 20 minor floods on the West Fork portion of the flood plain. This 3-month period is the season when crops and paatures are at a critical stage in growth and are very susceptible to damage from floodwater.

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

A major flood occurred June 22 and 23, 1959. The total 2-dsy rainfall recorded at the Bowie station was 4.96 inches. This storm produced a flow of approximately 12,500 c.f.s. This flood approximated that of a 4-year frequency and caused an estimated damage of $236,402.

Based on the floods considered in the 20-year evaluation series, annual direct floodwater damages on Big Sandy Creek and tributaries, without the program of land treatment and structural measures in place, are estimated to total $761,562. This total includes $440,482 of crop and pasture damage, $97,016 of other agricultural damage, and $224,064 of road and bridge damage.

Individual landowners have attempted to straighten channels and to levee bottomlands along portions of the mainstem of Big Sandy Creek and West Fork. These efforts, generally, have proved to be inadequate and unsatisfactory. There has been some improvement in the alignment on the West Fork channel by the Tarrant County Water Control and Improvement District No. 1. In general, this improvement has alleviated some problems, but additional capacity is needed.

Erosion Problems

Severe erosion in the form of systems of deep gullies in a 60 square-mile area of critically eroded sandy Cross Timbers and Prairies soils produces more than 40 percent of the 1,410,000 tons of annual gross erosion within the watershed. Erosion rates within this area average 15 tons per acre as compared to about 3 tons per acre in the remainder of the watershed. Gully and associated streambank erosion account for 87 percent of the gross erosion within this area and sheet erosion the remaining 13 percent. Of the total gross erosion in the watershed, about 45 percent is by sheet erosion, 40 percent by gully erosion, and 15 percent by streambank erosion.

The 60-square-mile area of critically eroded Cross Timbers and Prairies soils occurs within an elongated area 3 to 5 miles wide and 15 miles long, stretching from the vicinity of Decatur in Wise County to the vicinity of Sunset in Montague County. Gullies and associated eroding stream systems range from depths of alightly less than 10 feet to 30 feet. The gullies began forming prior to the 1920's and resultant erosion reached an all time high in the 1920's and 1930's. Factors involved in the development of the gullies and eroding streams include the high erodibility of the soils and soft sandstone bedrock, steep relief, climatic events, and cultural practices that upset the balance between protective cover and land surface stability.

The conversion of the severely gullied cropland to idle land and grassland in the 1930's and 1940's and the application of other conservation measures helped heal many of the shallower gullies and areas damaged by sheet erosion. The purchase, revegetation, and treatment with structural measures of 9,350 acres of former cropland within this severely eroded area by the federal government under Public Law 210, 75th Congress, have also helped reduce erosion. However, the deep gullies are still very active and are critical sediment source areas.

An estimated 25.4 acres of land are being voided annually by gully and streambank erosion. Slightly over 16 acres of the land voiding occurs

within the 60-square-mile, critically eroded area and the remainder in small areas throughout the watershed. Stream enlargement and streambank erosion on the mainstem of Big Sandy Creek is affecting about two acres annually.

The estimated value of land loss and land depreciation by gully erosion is $23,689.

The streambank erosion on the mainstem is confined to reaches of newly forming channels lying downstream from sediment clogged reaches. This stream degradation process is directly related to unstable stream conditions brought about by critical sediment loads being delivered from the gullied uplands.

Flood plain erosion damage by scour is generally low. This can be attributed to grass vegetation on pastureland which provides protective cover on a high percentage of the flood plain lands. It is estimated that the productive capacity of 321 acres is being reduced 10 to 60 percent annually by acour. The estimated average annual damage by flood plain scour is $4,417.

Sediment Problems

Large volumes of sandy aediment produced within the critically gullied areas of the Cross Timbers and Prairies area are being deposited on the flood plain and in the atream aystem of the watershed. The flood plain deposits are extensive and occur to depths of 12 feet over the original flood plain soils since settlement of this area. This deposition has completely altered the stream system, which is now very unatable, and has changed the soil from a dark colored fertile loam and clay loam to a light-colored, less fertile silty aand with high sand content.

Sediment deposition reached an all time peak during the 1920's and 1930's when soil erosion became moat active and the dendritic gully systems developed. Inveatigations indicate that aediment deposition has now leveled off at a aomewhat constant rate. A total of 3,517 acres of flood plain land is receiving depoaition of damaging sediment each year. This damage rangea from 10 to 90 percent in terms of reduced productivity of the soil. Thia acreage includes about 480 acres of land which is damaged by ponded water trapped behind sand bars and overbank deposita. The areas affected are constantly changing due to changes in the stream systems brought about by aediment deposition and stream filling. The total loas in production from sediment deposition on the flood plain is estimated to be $53,237.

Aggradation of the stream system has reduced channel capacities significantly, resulting in increased frequency and depth of flooding. The lower reaches of the channels of most of the tributaries which flow into Big Sandy Creek from the severely gullied area between Decatur and Sunset on the eastern side of the watershed are completely filled with sandy sediment. The mainatem of Big Sandy Creek is also very aeverely affected by capacity loss in this area. The two-mile segment of Big

Sandy Creek lying upstream from F.M. Road 1810 presently has very little channel capacity. Flows reaching this point drop their heavy loads of sediment and sand bedload as the water slows down and spreads across the flood plain into numerous poorly defined depressions. This area of filling moves progressively upstream with each depositional event. This has been occurring at an approximate rate of 1,000 feet each year during an 8-year period. A new channel is being formed at the downstream point of this segment as the desilted waters again become confined in a stream. This new stream is deep enough (about 10 feet) to transport the sandy sediment produced by its own degradation process to another segment of "overloaded" stream. This "overloaded" segment, which is about one mile long, lies immediately upstream from the bridge of State Highway 24 (U.S. 380). Part of the overloading of this stream appears to be coming in from a side tributary, Sandy Creek. Downstream from Highway 24 a state of equilibrium appears to exist between amount of sand coming in from upstream and amount deposited overbank and carried on downstream into Eagle Mountain Lake.

The annual recorded suspended sediment load as recorded between 1968 and 1976 at the USGS gage on lower Big Sandy Creek ranges from a low of 7,353 tons for water-year 1971, a year with little runoff, to a high of 59,984 tons for water-year 1969 (USDI, Geological Survey). More than 75 percent of this suspended sediment consists of clay and clayey materials 0.002 millimeter and finer. Less than 15 percent of the volume of eroded soil in the uplands is 0.002 millimeter or finer. Most of the eroded material consists of fine sands which are moved as sand bedload or deposited on the flood plain and in the streams.

The annual loss of storage capacity to Eagle Mountain Lake from sediment originating in the Big Sandy Creek watershed is estimated to average 235 acre-feet. Lake Amon G. Carter is losing capacity due to sediment deposition from the watershed at the rate of 51 acre-feet annually according to a sedimentation survey made by the Soil Conservation Service in May 1967. The annual damages to the reservoirs by depletion of their capacities is estimated to be $60,701.

Municipal and Industrial Water Problems

The city of Bowie presently obtains its water supply from Lake Amon G. Carter which was constructed in 1956. This reservoir has a firm yield of less than 1,000 acre-feet per annum. The city of Bowie's annual water use is approximately 1.5 million gallons per day or 1,680 acre-feet. Based on the present water use, the city of Bowie would be critically short of water if the area were to experience an extended drought. A shortage of water will retard industrial growth and development, increase potential losses by fire, and curtail residential use. The shortage of water will decrease the potential municipal and industrial developments for the watershed.

Recreation Problems

There is a population of approximately 1,300,000 within a 50-mile radius of the watershed. Lakes Amon G. Carter, Eagle Mountain, and Bridgeport,

located within the 50-mile radius, and several large reservoirs just outside this area provide water-baaed recreation for residents of the watershed and surrounding towns. Because of the large population served, these facilities are often overcrowded during periods of high uae. The Texas Outdoor Recreation Plan indicates a need for additional recreational facilities for this region of the state.

Plant and Animal Problems

The primary problem which limits the production of quality fisheries in the ponds and small lakes in the watershed is the imbalance of food fish and game fish in many stocked impoundments. This is due to lack of fishery management practices. Other major problems include lack of sufficient water in farm ponds during drought periods and excessive siltation. Over 90 percent of the ponds are constructed for livestock water and are subject to drastic fluctuations in water level. This wide variation in volume of water impounded is not conducive to supporting desirable fish populations. Siltation further reduces depth, water quality, and the volume of water impounded.

Overgrazing by domestic livestock has removed valuable forage plants and increased the intensity of competition for remaining plants between liveatock and wildlife. Wildlife are generally affected more by stress conditions and changes in diet than are domestic livestock, which usually receive supplemental feed and care during periods of stress. Reduced wildlife populationa have occurred as a result of improper grazing use, particularly during periods of adverse weather.

Land users are concerned with the production of crops and improved grasses that generate the greatest economic return from the land. There is little or no economic incentive for providing for the needs of varioua species of wildlife.

The conversion of cropland and native grassland to improved pastureland that is intensively managed for high levels of production has further reduced food suppliea and habitat quality for many forms of wildlife.

Economic and Social Problems

About 150 operating units in the watershed are family-type farm operations employing less than 1-1/2 man-years of outside labor. About 30 of these units suffer damages from flooding. About 450 of the 1,067 operating units in the watershed require outside employment by their operators to maintain an adequate standard of living. The small landowners are being forced to the cities in search of employment to supplement their farm income. Other farmers will be forced to seek additional income if floodwater, sediment, and erosion damages continue at their present rate. There is also a need for additional employment opportunities for the 752 unemployed in the three-county watershed area. A concentrated effort in rural community development is needed to increase income and employment opportunitiea for local watershed residents.

ENVIRONMENTAL IMPACTS

Conservation Land Treatment

The continuing application of land treatment measures and maintenance of those already applied will reduce soil and water losses, assure proper functioning of the project structural measures, reduce flooding, and improve fish and wildlife resources.

The application of cropland treatment measures such as conservation cropping systems and crop residue management will return needed organic matter to the soil. The increased organic matter in the soil will protect the soil surface from raindrop impact and wind erosion, improve hydrologic cover, and allow more surface water to enter the soil, thereby reducing the peak rate of runoff. The overall soil productivity, biologic activity, and soil tilth will be improved.

The application of treatment measures on the rangeland will increase the productivity and density of desirable native grasses and forbs that are found in the natural plant community. The effective soil-protective cover will be improved as well as provide for improved quality and quantity. Ponds installed at needed locations will help facilitate better distribution of grazing and proper utilization of forage.

The application of pastureland treatment measures will provide the needed vegetation to protect the soil from erosion and decrease the rate of runoff from this intensively used land as well as producing the volume of forage desired by the land users.

Critical area plantings and grade stabilization structures are being installed on the smaller gully systems and the less severely gullied lands on which the individual landowners can apply these needed stabilization and treatment measures with their own funds or with cost-share assistance funds provided by Public Law 534 funds, the Agriculture Conservation Program, and the Great Plains Conservation Program.

The installation and application of 708 acres of reshaping and revegetating of critically eroding areas, 184 erosion control structures, and 37,000 feet of diversion terraces by the U.S. Forest Service with PL 534 funds will stabilize 1,455 acres of critical sediment producing areas on the LBJ National Grasslands.

The larger and more extensive gully systems that are existing on private lands are being treated with grade stabilization structures and critical area stabilization measures included in the structural measures of this project.

The application of critical area planting and the installation of grade stabilization structures on the severely eroding areas of the watershed will reduce the amount of sediment that is presently being deposited

downstream and in the Trinity River. These areas will be available for limited grazing after establishment to grass where they are now unproductive areas.

Annual gross erosion within the 60-square-mile critically eroded area will be reduced from 573,000 tons (15 tons per acre) to 167,000 tons (slightly over 4 tons per acre) after the land treatment measures and structural measures have been installed.

Annual gross erosion in the watershed will be reduced from 1,410,000 tons to an estimated 892,000 tons, or a reduction of 518,000 tons. About 50 percent of this reduction is attributed to the accelerated technical assistance, cost-sharing on the 2,100 acres of critical area treatment to be provided by the project, and the on-going programs. Another 45 percent of the reduction will be from the installation of land stabilization measures on 825 acres, the 31 grade stabilization structures, and the critical area stabilization measures on 1,455 acres of U.S. Forest Service land. The remaining 5 percent reduction will be by stabilization provided by the pool areas of 21 floodwater retarding structures located in the critically eroding area. Sediment deposition damage on 3,517 acres of flood plain land will be reduced by 73 percent.

The application of wildlife upland habitat management on the agricultural lands of the watershed will directly benefit wildlife through maintenance and enhancement of existing habitat.

The application of crop residue management in a manner which retains most of the waste grain from harvested crops on the soil surface will improve food supply for seed-eating birds. Minimum tillage operations are conducive to favoring many wildlife species.

The application of conservation cropping systems will improve food quality for numerous seed-eating birds and improve habitat for wildlife species such as the Eastern cottontail rabbit through crop interspersion. Strip cropping, rest-rotation of crops, and minimum tillage are farming practices that are increasing the wildlife habitat value of croplands in the watershed.

The incorporation of seed-producing plants in pastures and the overseeding of established pastures with legumes, annuals, and other seed-producing plants will improve food sources for wildlife.

Brush management, when applied with SCS assistance, encourages the land user to consider the wildlife resource. These techniques include retaining naturally occurring strips of brush, leaving motts of woody plants, encouraging woody fence rows, and creating brush piles. Reseeding practices using seed-producing grasses or combinations of grasses and forbs of value to wildlife will complement all brush management practices. Leaving small odd areas of native grasses and forbs adjacent to cropland fields and other similar open habitat provides travel lanes for larger mammals and nesting areas for many birds and small animals. The installation

of grassed waterways and critical area planting will improve the interspersion of vegetative cover on agricultural lands, and will create travel lanes for rabbits, furbearers, and other crepuscular and nocturnal wildlife species. The portions of these treated areas which are planted exclusively to non-seed producing plants limit food availability for seed-eating birds.

Other conservation practices such as proper grazing use and deferred grazing, both coupled with planned grazing systems, will increase the ecological condition of native grasslands. The better managed grassland fields provide more cover and more high quality wildlife plants that furnish seed, berries, mast or browse.

The construction of farm ponds will provide additional water for livestock, furbearers, dove, waterfowl, and others. The reduction in erosion and sedimentation above the farm ponds will improve water quality and fishery habitat. The implementation of various fishpond management practices will create a significant fishery for the concerned landowners that are interested in a higher resource potential.

Structural Measures

Installation of the 44 floodwater retarding structures will require the use of 3,975 acres of agricultural land for the dams and emergency spillways, sediment pools, and detention pools. Impoundment of water in the sediment pools of the 44 floodwater retarding atructures will require 928 acres, which includes 60 acres (0.19 percent) of the cropland, 61 acres (0.14 percent) of the improved pasture, and 802 acres (0.37 percent) of the rangeland in the watershed and 5 acres of existing water areas. This area will be lost to agricultural production. The dams and emergency spillways will require 273 acres, which includes 15 acres (0.05 percent) of the cropland, 67 acres (0.16 percent) of the improved pastureland, and 191 acres (0.09 percent) of the rangeland in the watershed. These areas will be vegetated to improved bermudagrass and will have restricted agricultural use for forage production. The detention pools will require the use of 2,774 acres, which includes 248 acres (0.78 percent) of the cropland, 272 acres (0.64 percent) of the improved pastureland, and 2,254 acres (1.04 percent) of the rangeland in the watershed. It is expected that a majority of the 248 acres of cropland in the detention pools will be converted to pastureland and the 272 acres of pastureland and 2,254 acres of rangeland will remain in their present use. The 2,774 acres of land in the detention pools will be subject to occasional interruption of use due to inundstion by floodwater.

The installation of structures will require approximately 1,000 acres (1.1 percent) of the approximate 92,500 acres of prime farmlsnd in the watershed. Approximately 75 percent of the 1,000 acres is currently used for pasture or rangeland which is relatively inaccessible and/or in tracts too small to farm economically. It is anticipated that with the project installed, frequency of flooding on approximately 2,500 acres of

productive flood plain will be reduced sufficiently to be classified as prime land. The loss of the acreage of prime farmland appears to be insignificant compared to the economic and environmental gains that will be realized by the completed project.

Approximately 21 miles (2.15 percent) of the intermittent and ephemeral streams in the watershed will be covered by the dams and sediment pools. Another 23 miles (2.36 percent) lie within the area to be affected by the detention pools.

Installation of 31 grade stabilization structures will require approximately 303 acres of land and land stabilization measures will be applied on 825 acres of land on and adjacent to eroded and gullied areas.

During construction operations, the areas needed for construction of the dams and emergency spillways and the borrow areas will be cleared of all existing vegetation. Sediment pools may be cleared up to the elevation of the crest of the lowest ungated outlet. However, when it is desirable to leave selective standing woody vegetation in sediment pools to provide needed cover for fish, improve habitat for waterfowl, and locally influence wind velocities, less clearing will be done. In these cases, only that clearing necessary to insure proper functioning of the structure will be done. The need for this will be determined on a case by case basis during the planning or operation stage prior to construction by an interdisciplinary team. It is estimated that 467 acres of woody vegetation will be cleared. The structure slopes, emergency spillways, disturbed areas, and idle areas around the structures will be revegetated with a mixture of adapted plant species for wildlife food, habitat improvement, and erosion control.

The installation of the land stabilization measures on the more extensive and deeper gully systems and critically eroding areas will reduce land loss by gullying from 16.4 acres to approximately 5.0 acres annually, reduce depreciation and increase the productivity of adjacent lands, decrease sedimentation in downstream tributaries and reservoirs, and improve the overall appearance of the landscape. Installation of all project measures will reduce streambank erosion from 9 acres to 4.8 acres voided annually. The natural channelization process on the mainstem is expected to continue at or near its present rate until a stage of equilibrium is reached sometime in the future.

Construction of the structural measures will cause a slight increase in air pollution. Impacts on air quality will be limited mainly to exhausts from equipment and a slight chance of dust during construction operations. There will also be an increase in the noise levels during construction. The structures are located outside any urban area and it is expected that the construction activities will not be of auch a level to be anything more than a nuisance within the construction areas.

After the complete project is installed, overbank deposition on 3,517 acres of land will be reduced 73 percent. Annual deposition of sediment in Eagle Mountain Lake and Lake Amon G. Carter will be reduced to 129 and 29 acre-feet, respectively. The extent and depth of flooding on 19,797 acres of flood plain will be reduced by 3,294 acres. Nine of the 18 major floods that occurred on Big Sandy during the 20-year evaluation

period, 1939-1958, would be reduced to minor floods. Flooding on Big Sandy would be eliminated from 29 storms that caused damage during that same evaluation period.

A 48-hour storm under antecedent moisture condition II (runoff curve number 75) and representing a 25-year frequency will produce 5.10 inches of runoff from the watershed. Such a storm occurred on April 26-27, 1957. The runoff from this storm produced an estimated peak discharge of 34,700 cubic feet per second. Runoff from this storm inundated 13,375 acres of flood plain. With the project installed, the peak discharge from this storm would have been reduced to 18,792 cubic feet per second and the area inundated would have been reduced to 10,438 acres. Cumulative average annual acres flooded will be reduced from the present 28,770 acres annually to 20,541 acres annually.

The area flooded by a 25-year frequency storm on Big Sandy Creek and its tributaries would be reduced from 19,797 to 16,503 acres, a reduction of 3,294 acres. The planned structural measures will provide flood protection on 8,229 acres annually on the flood plain lying along Big Sandy Creek and its tributaries. More intensive agricultural use of these areas will reduce the wildlife habitat value as a secondary impact.

The most severe damage to roads and bridges is caused by floods that cover 75 percent or more of the flood plain. With the project installed, the number of floods that would inundate 75 percent of the flood plain would be reduced 60 percent. Out-of-bank flows by releaae rates will occur within about a 4.4-mile segment of Big Sandy Creek that is filled with sand bedload.

The annual flood plain scour damage on 321 acres is expected to be reduced 53 percent.

The initial reduction in average annual runoff due to evaporation and seepage from the sediment poola of the remaining floodwater retarding structures is estimated to be 1.49 percent on Big Sandy Creek at the point of entry into the West Fork of the Trinity River and 1.18 percent from the total drainage area included in the project. These estimates are based on an anticipated reduction in average annual streamflow at the structure sites due to evaporation and seepage of 6.8 percent. These reductions were related to the points of interest on the basis of percent of drainage area controlled. The structures control 32.23 percent of the drainage area on Big Sandy Creek above the point of entry into the West Fork of the Trinity River and 25.57 percent of the total drainage included in the project. The magnitude of the 6.8 percent initial reduction at the structure sites diminishes downstream from the structures because of seepage losses in the alluvium. The channel loss factor is estimated to be 0.68 percent. The initial seepage and evaporation losses at the structures will diminish as sediment accumulates in the sediment pools. Appendix F contains a tabulation of the estimated initial reduction of streamflow at Eagle Mountain Reservoir resulting from the installation of project measures on Big Sandy Creek and Salt Creek and Laterals watersheds.

The basal sands of the Cretaceous System are the important ground water aquifers within the waterahed area. Recharge of the aquifers is by rainfall on the area of surface outcrops. However, local recharge may occur to some extent from the water that is retained in floodwater retarding structures. The extended release flows and impoundment of water in the sediment pools may result in recharge of an estimated 1,500 to 2,000 acre-feet of water over the 100-year life period for the structures. An undetermined amount of this recharge may return to the runoff in the form of spring flow into the streams of the watershed.

Installation of the dams and emergency spillways, sediment pools and water areas of the 44 floodwater retarding structures will affect wildlife habitat associated with 496 acres (0.41 percent) of the open native grasslands, 177 acres (0.39 percent) of the post oak-greenbrier type habitat, 290 acres (0.82 percent) of the riparian woodland, 128 acres (0.31 percent) of the pastureland, 75 acres (0.09 percent) of the cropland, and 35 acres (0.39 percent) of the brushy native grasslands that are present within the watershed. The structures will cause removal or inundation of 5 acres of existing water impoundments (2 small lakes, 3 farm ponds) and subject 21 farm ponds to inundation when the structures function at their designed capacity.

A temporary increase in annual grasses and forbs with food value for quail, dove, and songbirds will occur due to soil disturbance during the construction process. Following completion of the structures, periodic flooding for periods of 5 to 10 days will temporarily displace wildlife which utilize the flood pools. Additional fish and waterfowl habitat will be created by the impoundment of water. The temporary flooding will result in increased growth of annual weeds and other plants such as vine-mesquite, buffalograss, white tridens, sunflowers, thistles, gumweed, cocklebur, and others in the flood pools. In order to accurately determine the effects of installation of the planned works of improvement, it is necessary to make a subjective comparison of existing habitats and to compare the changes and alterations that may take place with the project. To that end, a system of quantitative and qualitative measures were developed in order to determine approximate gain or loss for selected wildlife species.

The existing habitat to be impacted was evaluated by Soil Conservation Service biologists, using definitive terms for habitat quality. Each acre was evaluated on the basis of its habitat value with respect to various wildlife species present. Present wildlife habitat was determined by habitat type as shown in Appendix G. Projected wildlife habitat was evaluated by hypothetically changing the land use to that which would exist under project conditions. The results of this projected evaluation are shown in Appendix H.

A subjective comparison was made to reflect the change in wildlife habitats with and without project. Overall, the installation of the floodwater retarding structures will not have a significant effect upon wildlife habitat. The 928 acres of surface water impounded in the sediment pools of the 44 floodwater retarding structures will create

fish and waterfowl habitat where little presently exists. This conversion to water area will reduce the existing terrestrial wildlife habitat.

Wildlife habitat in the 3,975 acres of land needed for the structural measures or about one percent of the habitat will be affected in the watershed. Habitat will be decreased in the immediate structural site areas for the following species:

White-tailed Deer	22 percent
Furbearers	13 percent
Bobwhite Quail	17 percent
Mourning Dove	14 percent
Fox Squirrel	26 percent
Eastern Cottontail	29 percent

Aquatic habitat would be created or increased by 923 acres for fish and waterfowl.

Overall habitat value will be increased by 2,265 value rating or less than two percent due to the increase in fishery resources.

The 5,597 acres of Type 1 wetlands that occur along the West Fork of the Trinity River and portions of Big Sandy Creek lie within the 20,541 acres annually flooded. These wetlands will undergo reduced depths of floodwaters but will not have reduced frequencies of flooding. This will not affect the existing wetland vegetation.

Three poorly preserved archeological and historical sites identified in the archeological surveys of the watershed will be affected by installation of project measures. One will be affected by construction of a dam and two will be affected by the sediment pool of a structure. None of these sites are eligible for nomination to the National Register of Historic Places.

The visual impacts of the project measures will vary from pleasing in most instances to distracting to some people in a few instances. The land treatment measures will be beneficial in stabilizing and revegetating the unsightly eroded and gullied lands of the watershed. The grade stabilization structures and the critical area treatment will have beneficial impacts similar to the land treatment measures in removing the unsightly scars of erosion. The floodwater retarding structures will be unsightly to some people, especially when viewed from the downstream side, but may be pleasing to others. About 16 of the floodwater retarding structures will lie upstream from county roads at distances close enough to be seen on the downstream side. The pools will be visible on about 10 other structures and the remainder will not be readily visible. About 7 of the 16 structures will be visible from paved farm-to-market roads with the remainder being visible from rural gravel roads that are traveled predominantly by watershed residents. Existing trees and open grassland areas will be left downstream of all structures in order to help blend the structures into the existing

landscape. The project is not expected to have any undesirable effect on the landscape quality of the watershed.

Economic and Social

The application of land treatment measures and the grade stabilization measures benefit most of the 1,067 landowners and residents who reside in the watershed.

The installation of the structural measures will reduce substantially the direct income losses due to floodwater damage suffered by farm and ranch operators and associated agricultural business. This reduction in floodwater damage will result in greater agricultural efficiency and income stability for the 420 owners and operators receiving flood damages and strengthen the local agricultural economy. A strong local agricultural economy is essential in reducing the number of farmers and ranchers who are forced to the city in search of employment to maintain an adequate standard of living.

The sediment pools of all floodwater retarding structures are expected to hold water. The pools and surrounding areas have a good potential for incidental recreational use. Structure Nos. 8 and 8A are located on land owned by the Boy Scouts of America. The sediment pools and surrounding areas of these sites will be used for scouting activities. Structure Nos. 14A, 24D, 25A, 29, and 32 are located on or mostly on the LBJ National Grasslands administered by the U.S. Forest Service and will be open to the public. The Forest Service will provide adequate sanitary facilities at some of these structure sites if the Forest Service determines that use warrants and funds are available. The sponsors do not plan to provide public accesa to any of the other floodwater retarding structures and will discourage landowners from using any waters created by the project for incidental recreation until sanitary facilities meeting local and state health requirements are installed.

There are no minorities that will be affected by the planned project, except by the indirect benefits available to all residents of the local area.

The reduction in floodwater, erosion, and sediment damages will result in new revenues in the local area. These revenues will result in an expansion of the local economy by an additional 330 new jobs. In addition, the expenditure of funds for the construction of the works of improvement will create approximately 364 man-years of employment.

FAVORABLE ENVIRONMENTAL IMPACTS

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

Conservation Land Treatment

1. Reduce gross annual erosion in the watershed from 1,410,000 to 892,000 tons annually.

2. Improve hydrologic cover and reduce the peak rate of runoff.

3. Increase soil productivity, biologic activity, and tilth.

4. Improve forage quality and quantity of both pastureland and rangeland resources.

5. Create watering areas for livestock through installation of ponds.

6. Improve wildlife habitat by:

   a. Leaving waste grain from crops for utilization by dove and quail.

   b. Providing improved food quality for dove and quail through the interspersion of crops.

   c. Increasing the plants useful for wildlife food through the improvement of rangeland vegetation.

   d. Supplying travel lanes for wildlife by the establishment of permanent vegetation on waterways, critical areas, and pasture and hayland.

   e. Providing areas which will serve as watering spots for wildlife and resting areas for waterfowl by the construction of ponds.

   f. Improving the quality of the aquatic environment in ponds and streams by the reduction of erosion and sediment.

Structural Measures (In combination with conservation land treatment measures)

1. Reduce cumulative average annual flooding from 28,770 acres to 20,541 acres.

2. Reduce area flooded by the largest storm in the 20-year evaluation period from 19,797 acres at the present time to 16,503 acres with all project measures installed.

3. Reduce annual flood plain scour damage by approximately 53 percent on 321 acres of flood plain.

4. Reduce annual sediment deposition in Eagle Mountain Lake and Amon G. Carter Lake by 106 acre-feet and 22 acre-feet, respectively.

5. Change 825 acres from eroding gullied land to grassland.

6. Reduce land loss by gullying from 16.4 acres to 5.0 acres annually.

7. Reduce depreciation and increase productivity of lands adjacent to the existing gully systems, and improve the overall appearance of the landscape.

8. Reduce the frequency of flooding on approximately 2,500 acres of flood plain to a level that they could be reclasaified as prime farmland.

9. lmprove water quality in the Trinity River by the reduction of the sediment load carried out of the watershed.

10. Reduce overbank deposition of sediment on 3,517 acres of land by 73 percent.

11. Benefit fish and wildlife by:

    a. Increasing growth of weeds in the detention pool areas of the floodwater retarding structures, and temporarily increasing the amount of annual weeds for food value for dove and quail on the areas disturbed during construction.

    b. Creating 923 acres of fish and wildlife habitat by the impoundment of water in the sediment pools of the structures.

    c. Reducing sediment deposition in the existing water areas.

12. Improve economic and social conditions by:

    a. Reducing the losses of direct income now being suffered by 420 farm and ranch operators and by the associated agricultural businesses.

    b. Providing greater agricultural efficiency and income stability for the farms in the area.

    c. Creating new sources of revenue for the area, thereby expanding the local economy by $2,113,434 annually and creating a need for about 330 new jobs.

    d. Creating 364 man-years of employment required for installing the remaining structural measures.

    e. Providing a potential public recreational resource at the five floodwater retarding structures located on the LBJ National Grasslands administered by the U.S. Forest Service.

f. Providing recrestional resources at the two floodwater retarding structures located on land owned by the Boy Scouts of America.

ADVERSE ENVIRONMENTAL IMPACTS

1. The area used for water impoundments of the 44 floodwater retarding structures will cause agricultural production to be lost on 928 acres which includes 60 acres of cropland, 61 acres of pastureland, 802 acres of rangeland and 5 acres of existing water areas in the watershed.

2. The installation of the dams and emergency spillways will change 15 acres of cropland, 67 acres of pastureland, and 191 acres of rangeland in the watershed to improved bermudagrass which will have limited grazing use.

3. There will be temporary inundation with occasional interruption of use of 248 acres of cropland, 272 acres of pastureland, and 2,254 acres of rangeland in the watershed when the structures function at the emergency spillway crest level.

4. The installation of the structural measures will commit the use of approximately 1,000 acres of prime farmland to the project.

5. Fish and wildlife resources will be affected by:

   a. Destruction or alteration of existing habitat on 0.41 percent (496 acres) of the open native grassland, 0.39 percent (177 acres) of the post oak-greenbrier, 0.82 percent (290 acres) of the riparian woodland, 0.31 percent (128 acres) of the pastureland, 0.09 percent (75 acres) of the cropland, and 0.39 percent (35 acres) of the brushy native grassland in the watershed for installation of dams, emergency spillways, sediment pools, and water areas.

   b. Destruction or alteration of 2.15 percent (21 miles) of the streams in the watershed with intermittent and ephemeral flow condition for dams and water areas and temporary inundation of another 2.36 percent (23 miles) in the detention pools.

   c. The 8,229 acres of reduction in cumulative average annual acres flooded will be available for more intensive agricultural use which will reduce its present wildlife habitat value.

   d. Removal or inundation of 5 acres of existing water impoundments (2 small lakes and 3 ponds) will occur in sediment pools. An additional 21 farm ponds will be subject to occasional inundation in detention pools.

6. Three poorly preserved archeological sites will be affected by the installation of the floodwater retarding structures.

7. The average annual runoff from the total watershed will be reduced 1.18 percent due to evaporation losses.

8. There will be a slight increase in air and water pollution during the construction process of the structural measures.

9. The destruction of existing vegetation during construction will leave the soil exposed to possible erosion.

ALTERNATIVES

Formulation of Alternative Plans

The alternatives that were considered during the planning process for the 1955 watershed plan included accelerated technical assistance and cost-share funds for the application of needed land treatment measures, independently and in conjunction with different combinations of floodwater retarding structure systems. Any alternative considered for completion of the plan must include the land treatment measures applied to date and the 13 floodwater retarding structures already installed. Approximately 75 percent of the goals for application of land treatment have been achieved.

Preliminary consideration was given to channel work as a means of reducing flood damages. This was dropped from detailed consideration due to the excessive costs associated with achieving a stable channel.

Studies were made to determine the feaaibility of including municipal and recreational water storage for the City of Bowie. Considering drainage area, watershed yield, and structure size, Site 22A is the only site identified in the watershed with the potential for development as a jointly sponsored multiple-purpose structure. The consulting engineer for the City of Bowie identified a problem of probable excessive seepage at this site. The City is considering other alternatives to meet their future water needs. Municipal and recreational water storage and water-based recreational development were not included in the plan.

Alternative Plans

The alternatives for completion of the project action, as supplemented, are described below. The costs, benefits, and other environmental, economic, and social factors of concern for decision making for each of the alternatives are presented in the Summary Comparison Table on page 59.

Alternative 1 - Alternative 1 consists of stopping all further action on the project. This includes foregoing the accelerated technical assistance and cost-share funds for application of land treatment and foregoing the installation of the grade stabilization structures, land stabilization measures, and floodwater retarding structures.

It is anticipated that the application of many of the needed land treatment measures would continue to be applied under the on-going programs.

However, the application of treatment measures in the severely gullied areas would not be accomplished because of the lack of availability of enough cost-share funds and technical assistance under the on-going programs.

This alternative is not acceptable to the sponsoring local organizations since it does not meet project objectives for reduction of floodwater, erosion, or sediment damages.

Alternative 2 - Alternative 2 consists of providing accelerated technical assistance and cost-share funds for applying critical area treatment and critical area stabilization measures and foregoing the installation of the grade stabilization measures, land stabilization measures, and floodwater retarding structures.

The application of additional land treatment would be accomplished on the smaller gully systems and the less severely gullied lands on which the individual landowners can apply needed stabilization and treatment measures with their own funds or with available cost-share assistance funds. Land treatment would not be achieved on land affected by extensive systems of deep gullies on which treatment costs exceed the financial abilities of the individual landowners.

This alternative is not acceptable to the sponsoring local organizations since it does not meet project objectives for the desired level of reduction of floodwater, erosion, and sediment damages.

Alternative 3 - Alternative 3 consists of providing accelerated technical assistance and cost-share funds for applying critical area treatment and critical area stabilization measures, 31 grade stabilization structures, and land stabilization measures and foregoing the installation of the remaining floodwater retarding structures.

This alternative is not acceptable to the sponsoring local organizations since it does not meet project objectives for desired level of reduction of floodwater, erosion, and sediment damages.

Alternative 4 - Alternative 4 is the selected plan and consists of applying the measures in the watershed plan as supplemented. This alternative consists of providing accelerated technical assistance and cost-share funds for applying critical area treatment and critical area stabilization measures, installing 31 grade stabilization structures, applying land stabilization measures on 825 acres, and installing 44 floodwater retarding structures.

The installation of the floodwater retarding structures would provide the level of protection needed for efficient use of the flood plain in its present capacity. Channel capacity in segments filled with sand bedload would be expected to be restored by natural stream degradation

SUMMARY COMPARISON TABLE
Big Sandy Creek Watershed, Texas

ENVIRONMENTAL, ECONOMIC AND SOCIAL INDICATORS	ALTERNATIVES			
	1	2	3	4
Total Installation Costs (dollar)[1/]	5,504,640	7,065,420	8,307,560	15,675,140
Local Share Installation Costs (dollar)[1/]	3,315,730	4,381,430	4,457,500	5,304,870
Annual O&M Cost (dollar)	3,003	3,003	5,638	17,500
Annual Cost (Excluding Land Treatment) (dollar)	26,166	26,166	70,884	325,100
Annual Benefits (Excluding Land Treatment) (dollar)	131,000	131,000	145,600	534,457
Land Committed by:				
Dams and Emergency Spillways (acre)	-	-	-	273
Sediment Pools (acre)	-	-	-	928
Detention Pools (acre)	-	-	-	2,774
Grade Stabilization Structures (acre)	-	-	303	303
Land Stabilization Measures (acre)	-	-	825	825
Land Voiding (acre/year)	25.4	18.4	11.1	9.8
Land Depreciation (acre/year)	1,128	I,028	230	230
Sedimentation Damage				
Flood Plain Overbank Deposition Reduction (percent)				
Amon G. Carter Lake (acre-foot)	3	4	50	55
Eagle Mountain Lake (acre-foot)	51	46	43	32
Flood Damage	235	212	200	145
25-Year Frequency Flood Plain Area (acre)				
Cumulative Average Annual (acre)	18,880	18,791	18,791	16,503
Flood Plain Scour Damage Reduction (percent)	25,776	25,749	25,749	20,541
Fishery Resources Created (acre)	Slight	Slight	Slight	53
Wildlife Resources (Woody vegetation Disturbed) (acre)	None	None	None	923
Cultural Resources Altered	None	None	None	467
	None	None	None	3 poorly preserved archeological sites diaturbed
Prime Farmland				
Enhanced (acre)	None	None	None	2,500
Committed (acre)	None	None	None	1,000
Threatened and Endangered Species Affected				
Relocations	No Impact	No Impact	No Impact	No Impact
Minorities Directly Affected	No Impact	No Impact	No Impact	No Impact
	No Impact	No Impact	No Impact	No Impact

1/ Includes cost of project measures installed to date.

processes as the upland sources of the sand are cut off and stabilized. Out-of-bank flows by release rates would occur within about a 4.4-mile segment of Big Sandy Creek that is filled with sand bedload.

This alternative is acceptable to the sponsoring organization since it provides a satisfactory level of reduction in floodwater, erosion, and sediment damages.

RELATIONSHIP TO LAND USE PLANS, POLICIES, AND CONTROLS

There is no urban development, buildup, or threat of future urban development on the flood plain in the watershed. All of the land is in agricultural use and none lies within the city limits of an incorporated or unincorporated municipality. The level of protection provided by the project will be adequate for efficient use of the land for the present agricultural need but not sufficient for urban development. Even though there is no threat of future urban development on the flood plain, the commissioners courts of the respective counties within which the watershed lies have the necessary powers to enact needed land management controls to prevent unwise development of these lands.

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

The project area lies within the Trinity River Basin upstream from the large metropolitan area of Dallas and Fort Worth. The total area of the Trinity Basin is 17,969 square miles. All of the basin lies within the state of Texas. It is somewhat fan-shaped with the wide part occurring in the upper or northern part adjoining the Red River Basin. The total length from point of origin in North Central Texas to Galveston Bay near the Gulf of Mexico is about 350 miles. The rainfall varies from 26 inches near the headwaters to 42 inches near Galveston Bay.

The Texas Water Plan (Summary) indicates that in 1968 there were 25 major reservoirs existing or under construction within the basin.

The Trinity River watershed authorized by the Flood Control Act of 1944 (Public Law 534) comprises the upper 72 percent (12,925 square miles) of the basin. There are 41 subwatersheds comprising 11,739 square miles of drainage area located in the Trinity River watershed on which watershed projects appear to be feasible for planning or on which projects have been installed or are in process of being installed. Twenty-seven watershed projects have been installed or are in process of being installed, 3 are authorized for planning, and 10 appear to be feasible for planning. Another 12 watershed projects are considered unfeasible because of rapid urban expansion. The total drainage area of the 27 watershed projects which are in the process of being installed or have been installed is 9,535 square miles. The drainage area of projects which appear to be feasible and those authorized for planning is 2,204 square miles.

A total of 845 floodwater retarding structures and 90.9 miles of channel work have been constructed or are presently under construction in the 27 watershed projects that have been installed or are in process of being installed. It is estimated that if all the remaining projects that appear feasible were implemented, a total of 1,072 floodwater retarding structures and 107 miles of channel work would be constructed in the watershed.

The dominant use of the land in the Big Sandy Creek watershed is for agricultural purposes. Slightly over 5 percent of the land is in nonagricultural uses such as towns, transportation, reservoirs, rock quarries, etc. Future urban growth is expected to continue to occur in the form of lake-front subdivisions around Lake Amon G. Carter in the upper portion of the watershed and near Eagle Mountain reservoir in the lower portion. There will also be an increase in the area affected by rock quarries for crushed stone and gravel products in the western part of the watershed.

The project will provide measures needed for the stabilization of the severely eroding gullied lands of the watershed. This will permit the establishment of a protective vegetative cover for reducing erosion and help restore this damaged resource. The project measures will help stabilize the unstable stream and soil conditions brought about by the deposition of the heavy loads of sandy sediment derived from the uplands.

It is anticipated that the works of improvement proposed in this project, along with the works of improvement in the projects authorized for construction, will have significant impacts in improving the quality of the human environment. The long-term cumulative impacts of the projects in the Trinity River Watershed and region are as follows:

The works of improvement, both land treatment and structural, will help contribute to conservation, development, and productive use of the soil, water, and related resources. The projects will allow the productivity of these resources to be sustained economically and indefinitely. The standard of living of the residents of the region will be improved through added income. The projects will restrict the use on the land needed for installation of the structural measures. The vegetation will be destroyed on the land used to impound water in the sediment pools until displaced by sediment and will be temporarily disturbed or altered on the land used to build the structural measures. This will adversely affect the wildlife in the immediate site areas. The overall habitat conditions will be favored by more dependable water supply and food supply associated with application of better management techniques. A total of 19,910 acres of surface water which can be used for lake fisheries, waterfowl resting areas, etc., has been created by the Trinity watershed project measures which have been installed or are presently under construction.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Installation of the 44 floodwater retarding structures will require a total of 3,975 acres of land. This acreage includes 323 acres of cropland, 400 acres of pastureland, and 3,252 acres of rangeland. Construction of the dams and emergency spillways will require 273 acres of the land committed. This includes 15 acres of cropland, 67 acres of pastureland, and 191 acres of rangeland. The sediment pools of the 44 floodwater retarding structures will require 928 acres which includes 60 acres of cropland, 61 acres of pastureland, 802 acres of rangeland and 5 acres of existing water areas. The floodwater retarding pools of the 44 structures will temporarily impound floodwater on 2,774 acres of land, which includes 248 acres of cropland, 272 acres of pastureland, and 2,254 acres of rangeland. Approximately 21 miles of stream is included in the area that will be inundated by water impounded in the sediment pools and 23 miles of stream is included in the area that will be temporarily inundated by floodwaters impounded in the detention pools.

Installation of the 31 grade stabilization structures will require 303 acres of gullied land. Land stabilization measures will be applied on 825 acres of eroded land.

Labor, materials, and energy will be committed for the construction and the operation, maintenance, and replacement of short-lived portions of the project.

Installation of the structures will affect three archeological sites, none of which are recommended for further study. One of these sites will be destroyed by installation of a dam and two will be affected by the sediment pool of a structure. None of these sites are considered eligible for nomination to the National Register of Historic Places.

CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

The development of the watershed plan for Big Sandy Creek watershed in 1955 was accomplished through a series of meetings with the public and with the sponsoring organizations.

The sponsors requested investigations be made for the purpose of determining the feasibility of increasing the level of protection from floodwater, erosion, and sediment damages, including storage for municipal and recreational water, and adding recreational development.

Meetings were held by the local sponsoring organizations to formulate project objectives prior to initiation of detailed investigations and during the planning process for supplementing the plan. Meetings were held at Decatur, Texas, on September 11, 1973, and again on February 26, 1976, to inform the public of the project and to solicit comments and inputs.

The U. S. Fish and Wildlife Service of the Department of the Interior, in cooperation with the Texas Game and Fish Commission (now the Texas Parks and Wildlife Department), made a study of the fish and wildlife resources during replanning of the watershed. A report of this study and recommendations for enhancing fish and wildlife resources were made August 2, 1968. These agencies made a followup review of the watershed and the plan on October 18 and 19, 1976. Other than noting that the original study included recommendations concerning possible channel work which was no longer applicable, the original report was considered as adequate for the project.

The planning of land treatment measures and structural measures on the federal land administered by the Forest Service was coordinated with the Forest Service during development of the supplement to the plan.

The planning of two floodwater retarding structures located on land owned by the Northwest Texas Council of the Boy Scouts of America (structures No. 8 which has been constructed and No. 8A which is planned) was coordinated with the Council.

Consultation of the National Register of Historic Places indicates that no historical sites listed on the register or nominated for listing on the register will be affected by the project measures.

A survey of the areas to be affected by the project structural measures was made by archeologists from the Archeology Research Program, Southern Methodist University, and Environmental Assessment, Inc. of Pauls Valley, Oklahoma, under funding by the Soil Conservation Service. No sites were found to be eligible for nomination to the National Register of Historic Places. The State Historic Preservation Officer has been contacted for concurrence in the findings of this survey. (A letter from the State Historic Preservation Officer will be included in the final environmental impact statement.)

The following agencies (and groups) were requested to review and submit comments and recommendations on the draft environmental impact statement:

Department of the Army
Department of Commerce
Department of Health, Education, and Welfare
Department of the Interior
Department of Transportation
Federal Power Commission
Office of Equal Opportunity, USDA
Division of Planning Coordination (State agency designated by Governor and State clearinghouse)
North Texas Council of Governments (Regional Clearinghouse)
Environmental Protection Agency
Trinity River Authority

Discussion and Disposition of Each Comment on Draft Environmental Impact Statement (EIS)

Not all of the above agencies requested to comment on the Draft EIS submitted comments. Formal comments were not received from the Department of Commerce and Federal Power Commission. The responding agencies' comments and the disposition of each are as follows:

Federal Agencies

U.S. Department of the Army

Comment: "We have reviewed the statement and the following comments are furnished:

a. The effects of the 44 remaining SCS floodwater retarding structures have been evaluated in conjunction with the Comprehensive Survey Report of the Trinity River and Tributaries for their effects on flood control, sedimentation and water resources.

b. It is noted on page 7 that the section 404 permit of PL 92-500 will not be required.

c. The proposed structural measures will not affect any existing or planned Corps of Engineers project."

Response: Noted.

U.S. Department of Health, Education, and Welfare

Comment: "Possible vector mosquito problems which could arise in association with any of the impoundments are not mentioned. A comment pertaining to mosquito control should be included in the Operations and Maintenance section and in the impact analysis."

Response: Page 7, 3rd complete paragraph states "Efforts will be made to avoid creating conditions which will increase populations of noxious vectors which affect public health conditions." A comment was not included in Operations and Maintenance section since investigation of sediment pools did not indicate any vector problems. The sponsors would take appropriate actions to correct any vectors if they became a problem.

U.S. Department of Transportation

Comment: "We have neither comments nor objections to offer regarding this project."

Response: Noted.

Office of Equal Opportunity, USDA

Comment: "There are no minorities that will be affected by the planned project."

Responae: Noted.

Forest Service - USDA

Comment: "We have reviewed the subject EIS and offer the following comments for inclusion in the next draft. These comments represent a concensus of the National Forests in Texas, Region 8, and the Southeastern area.

Page 9, Table of estimated obligations. Delete entire line for yesr 1977.

Page 53, last paragraph, lines 6-9. Change wording to:

Structure Nos. 14A, 24D, 25A, 29 and 32 are located on or mostly on the LBJ National Grasslands administered by the U.S. Forest Service and will be open to the public. The Forest Service will provide adequate sanitary facilities at some of these structure sites if the Forest Service determines that use warrants and funds are available.

Page 56, Item 12.e. Change wording to:

Providing a potential public recreational resource at the five floodwater retarding structures located on the LBJ National Grasslands administered by the U.S. Forest Service. This resource will be developed if the Forest Service determines that use warrants and funds are available."

Response: The above changes were made in the EIS in their appropriate places.

U.S. Department of Interior

General

Comment: "We believe the baseline information regarding the existing fish and wildlife resources of the project area to be adequate in both scope snd detail. The projected impacts of the project upon these resources however, are misleading in several instances. The attempt to combine the values of fish habitats and wildlife habitats into one value serves to mask the environmental trade-offs which would occur between these resources through project implementation. As an example, page ii states that 'Existing wildlife habitat will be reduced about one percent.' By reanalyzing the habitat values shown on Appendices G and H, however, we find that this estimate does not reflect accurately future habitat values. Appendix H attributes excessive habitat values to upland wildlife species as deer, quail, dove, and

fox squirrel. Granted, both the periphery of the pools and the distance to water are evaluation factors for these species relative to the pool areas but we do not believe they are as high as those in the appendices. Additional habitat values are claimed for waterfowl even though the use of the structures by transient waterfowl species is seasonal, temporary, and contributes only portions of the total habitat requirements necessary for these species.

We are pleased to note that some mitigation for terrestrial wildlife habitat losses will be afforded by the wildlife plantings on approximately 100 acrea near the structure sites.

We have previously commented that wildlife losses could be further mitigated and the aesthetics, water quality and recreational values of structures improved by eliminating grazing in the flood detention pools. In the past 'land rights' problems have served as the obstacle held responsible for the omission of such measures. With six structures located on Foreat Service Lands and two structures to be constructed on lands owned by the Boy Scouts of America, we believe that an ideal opportunity exista to improve upon the aforementioned environmental qualities by asauring that the vegetation of the detention pools will not be disturbed by domeatic grazing practices. Our Fish and Wildlife Service believes that much of the adverse impacts to wildlife habitat could be reduced by the inclusion of the minor project modification.

Response: We have attempted to clarify the effects to fish and wildlife habitat in the EIS to show that the reader will understand the trade-offs of aquatic habitat for terrestrial habitat.

The SCS and Forest Service discussed fencing on atructures located on the LBJ Graaslands. The Forest Service manages these areas for multiple use. It is recognized by biologists that planned grazing ia beneficial to plant ecosystems to maintain the climax vegetation. Therefore, both the Forest Service and SCS are of the opinion that fencing the detention pools would be of no added benefit to wildlife.

Comment: "Page ii, paragraph 5 - As previously stated, we believe that the loss of wildlife habitat baaed upon the Soil Conservation Service evaluation will be greater than 1 percent."

Response: The one percent loas refers to the overall effect of project installation on wildlife habitat in the waterahed. As atated on page 52 in the EIS, habitat will be decreased in the immediate structural site areas for the following species:

White-tailed Deer	-	22 percent
Furbearers	-	13 percent
Bobwhite Quail	-	17 percent
Mourning Dove	-	14 percent
Fox Squirrel	-	26 percent
Eastern Cottontail	-	29 percent

Comment: "Page 3, paragraph 6 - 'Land users are encouraged to consider many species of wildlife when applying brush management.' We believe that when public funds are used for such practice, and when the potential exists for the resultant loss of a public resource (wildlife habitat), that the expenditure of such public funds for this practice should 'require' the consideration of wildlife rather than simply 'encourage' such consideration. To do otherwise constitutes a permissive use of public funds which may not be in the best public interest."

Response: Public funds for land treatment such as brush management and pasture and hayland planting in this plan consist of providing technical assistance to land users on private land. The SCS technician provides technical assistance to land users by inventorying plant resources, developing and evaluating alternatives. Recommendations are made to encourage land users to enhance or improve wildlife habitat on their lands. The land user makes the final decision after considering all the facts and applies the selected alternative. Since the decision to apply land treatment on private land is made by the land user, the SCS can only "encourage" the land user to follow recommendations rather than "require" him to do so.

Comment: "Page 4, paragraph 3 - 'Plantings on critical areas may include plant species such as black locust, plum, autumn olive, and others which have food and cover value for wildlife.' To adequately evaluate the impacts of the project upon the environment the impact statement should state what <u>will</u> be included rather than what <u>may</u> be included."

Response: The final decision on the exact species to be used will be made by land users from recommendations by SCS technicians during the operations stage. SCS will encourage land users to use multiple-purpose species that will be of benefit for wildlife as well as control erosion.

Comment: "Page 6, paragraph 2 - 'Clearing of woody vegetation will be kept to a minimum within the sediment pools of the structure.' This statement appears to be in direct conflict with the statement on page 49, paragraph 5, which states: 'In addition, all large woody vegetation within the reservoir areas below the elevation of the lowest ungated outlet will be cleared.' The FES should clarify the degree of clearing."

Response: Changes were made on page 6, 2nd paragraph and page 49, 3rd paragraph to clarify them with the following: "During construction operations, the areas needed for construction of the dams and emergency spillways and the borrow areas will be cleared of all existing vegetation. Sediment pools may be cleared up to the elevation of the crest of the lowest ungated outlet. However, when it is desirable to leave selective standing woody vegetation in sediment pools to provide needed cover for fish, improve habitat for waterfowl, and locally influence wind velocities, less clearing will be done. In these cases, only that clearing necessary to insure proper functioning of the structures will be done. The need for this will be determined on a case by case basis during the planning or operation stage prior to construction by an interdisciplinary team."

Comment: "Page 22 - A reasonably well-defined relationship is indicated between specific conductance and total dissolved solids. However, this relationship for sample 6 indicates that the concentration of total dissolved solids greatly exceeds its comparable value of specific conductance. This anomalous condition should be explained."

Response: Results from sample 6 do not fall within the normal range as indicated on page 21, paragraph 3. The results of low hardness, chloride, and alkalinity readings would indicate that the conductivity should be low as is ahown in the table. The concentrations of total dissolved solids could possibly be caused by a high amount of dissolved organic material occurring from runoff rather than dissolved inorganic material. Since the 68 umhos/cm of specific conductance could not be verified as being correct, it was replaced with a dash in the table.

Comment: "The possibility of effects from water-table fluctuations in the vicinity of the impoundments and downstream from them should be included in the assessment."

Response: The effects from water-table fluctuations in the vicinity of the impoundments and downstream will be insignificant. Therefore, a discussion of impacts waa not included in the EIS.

Comment: "Page 23, paragraph 3 - 'Approximately 5,597 acres of Type 1 wetlands (seasonally flooded basins) are found within the wide flood plains of the West Fork of the Trinity River and portions of Big Sandy Creek.' It is noted on page ii that flood plain damages will be reduced from 28,770 acres to 20,541 acres, a reduction of 8,229 acres. While we assume that the acreage where flooding will be reduced includes all or a portion of the Type 1 wetlands, we can find no discussion of the environmental impacts upon fish and wildlife resources within these areas. This issue should be clarified."

Response: Inserted on page 52 before last paragraph in EIS - "The 5,597 acres of Type 1 wetlands that occur along the West Fork of the Trinity River and portions of Big Sandy Creek lie within the 20,541 acres annually flooded. These wetlands will undergo reduced depths of floodwaters but will not suffer reduced frequencies of flooding. This lessening will not affect the existing wetland vegetation."

Comment: "Page 39, paragraph 4 and 5 - Since improved bermudagrass is generally considered to be of low wildlife habitat value, these two paragraphs are contradictory in nature and should be revised to more clearly reflect the impacts which these changes and trends are producing."

Response: The EIS changed to read, "Rangeland that is producing low amounts of forage and is infested with a dense canopy of brushy and woody vegetation is being cleared and planted to improved bermudagrass where maximum forage production is desired.

There is a trend toward the application of specific management practices that will benefit wildlife as a secondary land use. This trend is expected to continue as the demand for hunting increases."

Comment: "Pages 41, 33, and Appendix A - Secondary wildlife impacts resulting from the more intensive land use anticipated with the project should be discussed under the impact section."

Reaponse: Statements were added to page 50, 2nd complete paragraph and page 56 under 5.c. stating that more intensive use of the flood plain would reduce the wildlife habitat value.

Comment: "Page 45, Plant and Animal Problems - An additional problem associated with wildlife populations should be added to this section as follows:

> Land treatment measures, such as brush control, with no consideration for wildlife, have resulted in losses to the wildlife resources in the watershed."

Response: It is agreed that brush control with no consideration for wildlife has resulted in losses to wildlife resources in the past. Under current policy the land user will consider wildlife, future land values, esthetics and other related values when assisted by the SCS in applying the practice of brush management.

Comment: "Page 46 and 47 - Environmental Impacts - The following statement should be included:

Land treatment measures such as pasture and hayland planting and brush control without consideration for wildlife will continue to degrade wildlife resources."

Response: Consideration for plant, animal, soil, and water resources is provided when the SCS personnel assist land users to apply land treatment practices, when in most cases, wildlife is not the primary land use. This is current policy under the SCS conservation operations program.

Comment: "Page 48, paragraph 3 - The more common forms of brush management are, more often than not, severly damaging to wildlife habitats. As this document represents a statement of the environmental impacts of the proposed action, the techniques that will be applied should be referred to rather than the techniques that can be applied.

Response: Page 48, 3rd paragraph - First sentence changed to read, "Brush management when applied with SCS assistance encourages the land user to consider the wildlife resource. These techniques include retaining..."

Comment: Page 49, paragraph 5 - See comment of page 6.

Response: Refer to response on page 6.

Comment: "Page 52, paragraph 3 - The conversion to water area will reduce existing terrestrial wildlife habitat in the flood plain greater than the 'less than one' percent as stated. See additional comments in General Comments section."

Response: Refer to comment on page ii, paragraph 5.

Comment: "Page 53, paragraph 5 - The pools and surrounding areas are expected to have good incidental recreation potential (page 53). With the project, $5,902,280 of Federal funds would be expended upon construction of structures to which public access would not be provided. We believe that public access rather than incidental (private) access to structure sites for recreation purposes would be in the best public interest. If public access is impossible to accomplish, the reasons for this should be stated."

Response: The purpose of the remaining single-purpose structures are for sediment control and floodwater retardation, land rights for these floodwater retarding structures will not be required for recreational purposes. Public access will be provided at the five floodwater retarding structures located on the LBJ National Grassland administered by the U.S. Forest Service.

Comment: "Page 57, Item 5.c. - Consideration should be given to the removal of 5 impoundments (2 small lakes and 3 farm ponds) and the inundation of 21 farm ponds within the detention pools at structure sites."

Response: Refer to the EIS on page ii, paragraph 6 and page 51, paragraph 3. A statement was added on page 56 under 5.d. stating "removal or inundation of 5 acres of existing water impoundments (2 small lakes and 3 ponds) will occur in sediment pools. An Additional 21 farm ponds will be subject to occasional inundation in detention pools."

Summary

Comment: "To adequately assess the impacts and trade-offs involved, we recommend that Appendices G and H be separated into the respective fish habitat and wildlife habitat components. This change should then be reflected in the information presented in other sections of the statement.

To offset project impacts to terrestrial wildlife habitats, we believe that the final plan should, at a minimum, include wildlife plantings and vegetative protection for the floodwater detention pools on those structurea located upon Federal lands. This would represent only minor costs and no associated land rights problems as livestock watering facilities could be provided downstream from the structures. The benefits of such action include mitigation of wildlife losses, improved water quality, fisheries and recreational values, and should clearly outweigh any associated project costs."

Response: Modifications were made to clarify Appendices G and H. Approximately 100 acres of wildlife plantings will be made on odd areas which will be fenced. Federal lands managed by the Forest Service are managed for multiple use. Refer to general comment and response on page 66 about fencing these areas.

U.S. Environmental Protection Agency

Comment: "We classify your draft Environmental Impact Statement as LO-1. Specifically, we have no objections to the project as it relates to Environmental Protection Agency's (EPA) legislative mandates. The statement contained sufficient information to evaluate adequately the possible environmental impacts which could result from project implementation. Our clasaification will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions, under Section 309 of the Clean Air Act."

Response: Noted.

State and Local Agencies

Budget and Planning Office

Comment: "The Draft Environmental Impact Statement for the Proposed Big Sandy Creek Watershed of the Trinity River Watershed, Texas,

has been reviewed by the Budget and Planning Office and interested state agencies."

Response: Noted.

Texas Department of Health

Comment: "The subject Draft Environmental Impact Statement addresses the impacts expected to result from the completion of the project. Garbage disposal facilities indicated on Page 7 of the Draft Environmental Impact Statement should be state-permitted facilities in accordance with the State of Texas 'Solid Waste Disposal Act.' "

Response: Noted. It is the intent of the EIS on page 7, 3rd complete paragraph that all state and federal laws will be conformed with pertaining to these facilities.

Texas State Soil and Water Conservation Board

Comment: "We have received a copy of the draft environmental impact statement for the Big Sandy Creek Watershed and offer no comment on this draft statement."

Response: Noted.

Texas Air Control Board

Comment: "We have no comments on the above cited document."

Response: Noted.

State Department of Highways and Public Transportation

Comment: "There is no apparent conflict with existing or proposed highway facilities."

Response: Noted.

Texas Department of Water Resources

Comment: "TDWR offers the following review comments:

1. The DEIS provides firm justification that the proposed project will provide an acceptable level of protection to the watershed for reduction in floodwater and sediment damages to the flood plain lands (page 5).

2. The DEIS provides adequate assurances that all inlets of the floodwater retarding structures will be ungated and will operate automatically. Further, all structures will

be designed to pass the 100-year frequency storm without overtopping and will have appurtenances to permit the release of impounded water in order to perform protective maintenance and to avoid encroachment upon downstream water rights (page 5).

3. The DEIS contains adequate assurances that contractors will be required to adhere to strict contractual, site-specific guidelines designed to minimize soil erosion and water pollution during construction (page 6). In addition, after project completion project sponsors will operate and maintain structures in accordance with specific operation and maintenance agreements, including protection of project areas and contiguous areas and water courses from soil erosion and water pollution (pages 7 and 21).

4. The estimated 1.49-percent initial reduction in average annual runoff on Big Sandy Creek due to evaporation and seepage from sediment pools of the 44 floodwater retarding structures, and the estimated 1.18-percent runoff reduction from the total project drainage areas, as computed by the USDA, SCS, appears to be reasonable and acceptable insofar as assuring that no serious impairments to downstream water rights will ensue from the total project operation.

5. TDWR foresees no conflicts between the proposed project and TDWR's statutory statewide current and future activities and functions insofar as water resources planning, development and regulation are concerned."

Response: Noted.

State Clearinghouse

Comment: "The draft environmental impact statement for the Big Sandy Watershed of the Trinity River apparently identifies a beneficial effect on the environment. Floodwater retarding structures have proven to be an economical means of reducing damage and erosion caused by flooding. The Department supports implementation of the project."

Response: Noted.

General Land Office

Comment: "Members of the General Land Office have reviewed the report on 'Big Sandy Creek Watershed of the Trinity River Watershed in Clay, Jack, Montague, Tarrant, and Wise Counties' and we have no objection to the proposed plans."

Response: Noted.

Nortex Regional Planning Commission

Comment: "After reviewing the draft Environmental Impact Statement for the Big Sandy Creek Watershed in Clay, Jack, Montague, Tarrant, and Wise Counties, Texas, the committee commented favorably upon said statement."

Response: Noted.

North Central Texas Council of Governments

Comment: "It is recommended that the Draft Environmental Impact Statement be amended to provide additional analysis concerning (1) the potential impact of the planned structures on existing downstream reservoirs, especially those used for water supply and (2) the environmental, economic and/or social costs and benefits of the alternatives which were not selected and elaboration on the basis for their rejection."

Response: The effects of installing the remaining floodwater retarding structures on Eagle Mountain Reservoir yields are expressed as a percent in the following table.

Year	Without Project	With Project	Ratio of the Yield in % w/wo/Project
1968	40,823 ac. ft.	40,823 ac. ft.	100%
1977	38,128 ac. ft.	36,719 ac. ft.	96%
2040	32,731 ac. ft.	34,180	104%

Initially, there will be a four percent decrease in yield. However, by the year 2040 there will be a four percent increase in yield. The environmental, economic and social costs and benefits for the different alternatives are displayed in Summary Comparison Table on page 59 in the EIS. A reexamination of the EIS and alternatives section indicates that the data provided is adequate. The other alternatives were not acceptable to the sponsors since they did not provide the desired level of reduction of floodwater, erosion, and sediment damages.

Comment: "The Fort Worth Wster Department views with alarm the Soil Conservation Service proposal to impound 35,000 ac. ft. of water in floodwater storage in the Big Sandy Creek Watershed, a major tributary to the City's West Fork Reservoir System. Depending on the proposed method of operation of these proposed 44 'floodwater retarding structures', such an impound could be expected to have a singnificantly adverse effect on the City's water supply reservoirs on the West Fork of the Trinity River.

If it is proposed to impound the 35,000 acre-feet of water in 'floodwater storage' only until the affected drainageways can safely accommodate discharge of the stored water at controlled rates to the West Fork, with the entire 'floodwater storage' to be so discharged in a reasonably short time after the flood threat is passed, such a method of operation would largely overcome any objections by the City of Fort Worth. However, if this is the proposed method of operation of these 'floodwater storage' facilities, it should be spelled out in the subject EIS in detail. If it is proposed to impound the 35,000 acre-feet of water in 'floodwater storage' for an indefinite period of time, this is considered to be inimical to the best interests of the City of Fort Worth and in contravention of the water rights enjoyed by the City of Fort Worth through its contract with the Tarrant County Water Control and Improvement District No. 1 and the City of Fort Worth is vigoriously opposed to such an operational concept.'

Response: The first method of operation discussed is correct in that the 35,000 acre-feet are for temporary storage of floodwater which will be released over a period of two weeks or less.

Trinity River Authority of Texas

Comment: "I would like to request that you send an additional copy for review to Mr. James Straum, the Assistant General Manager of Development for the Tarrant County Water Control and Improvement District No. 1."

Response: A copy was mailed to Mr. Straum.

Texas Parks and Wildlife Department

Comment: "The statement on page ii (paragraph 5) that existing wildlife habitat will be reduced about one percent is false. According to figures in Appendix Tables G and H, roughly a 22 percent loss will occur even considering improved bermudagrass on the dam and spillway to be comparable in wildlife value to other terrestrial types. Discounting the dam and spillway brings the losses in wildlife habitat to approximately 30 percent. This loss even includes a tremendous trade-off of 928 acres converted to aquatic habitat."

Response: Approximately 3,975 acres or one percent reduction of wildlife habitat refers to the overall effect of project installation on wildlife habitat in the watershed. As stated on page 52 in the EIS, habitat will be decreased in the immediate structural site areas for the following species:

White-tailed Deer	-	22 percent
Furbearers	-	13 percent
Bobwhite Quail	-	17 percent
Mourning Dove	-	14 percent
Fox Squirrel	-	26 percent
Eastern Cottontail	-	29 percent

Comments: "Elimination of grazing within the detention pool would improve habitat, as would clearing of the sediment pool only. A statement on page 6 (paragraph 2) indicates clearing of the sediment pool would be kept to a minimum. However, this position is reversed by a statement on page 49 (paragraph 5) which states: 'In addition, all large woody vegetation within the reservoir areas below the elevation of the ungated outlet will be cleared.'"

Response: Changes were made on page 6, 2nd paragraph and page 49, 3rd paragraph to clarify them with the following: "During construction operations the area needed for conatruction of the dams and emergency spillways and the borrow areas will be cleared of all existing vegetation. Sediment pools may be cleared up to the elevation of the crest of the lowest ungated outlet. However, when it is desirable to leave selective standing woody vegetation in sediment pools to provide needed cover for fish, improve habitat for waterfowl, and locally influence wind velocities, less clearing will be done. In these cases, only that clearing necessary to insure proper functioning of the structures will be done. The need for this will be determined on a case by case basis during the planning or operation stage prior to construction by an interdisciplinary team."

Comment: "There is no evidence of a discussion of impacts on fish and wildlife associated with the destruction of wetlands in the project area. Approximately 5,597 acres of Type 1 wetlands are found in the project area. A reduction of 8,229 acres of flood plain will undoubtedly result in loss of at least a portion of the Type 1 wetlands. This should be clarified with losses quantified."

Response: The 5,597 acres of Type 1 wetlands that occur along the West Fork of the Trinity River and portions of Big Sandy Creek lie within the 20,541 acres annually flooded. These wetlands will undergo reduced depths of floodwaters but will not have reduced frequencies of flooding. This lessening will not affect the existing wetland vegetation or wildlife.

Comment: "It should also be pointed out that land treatment measures such as brush control and pssture and hayland planting, with no consideration for wildlife, will continue to degrade wildlife resources. An appropriate discussion should be provided on pages 46-48."

Response: Consideration for plant, animal, soil, and water resources is provided when the SCS technicians assist land users to apply land treatment practices, when in most cases, wildlife is not the primary land use. This is current policy under the SCS Conservation Operations program.

Comment: "To adequately portray the trade-offs associated with this project, Appendix Tables G and H should be restructured to segregate fisheries habitat from wildlife habitat. Consideration should also be given to the presence of the 5 impoundments (2 small lakes and 3 farm ponds) which presently provide fisheries habitat and which will be removed and the 21 farm ponds which will be inundated by detention pools. It appears that the fisheries benefits counted would be lessened by the loss of these impoundments."

Response: Modifications were made to clarify Appendices G and H in regard to fish and wildlife habitat. Consideration was given to the existing impoundments that would be inundated by project installation; therefore, the assessment is correct.

Comment: "Additionally, the maintenance of conservation pool levels of structures 1, 1A, 1B, 1C, 1D and 3 could appreciably reduce flow into Lake Amon G. Carter. This action will directly impact the fishery of Lake Carter. These losses should be counted against the project."

Response: Hydrologic studies show that the installation of floodwater retarding structures has little or no significant impact on downstream water yield. Peak flood flows will be reduced and stream flows will be prolonged. The reduction in sediment deposited downstream in Lake Carter should offset any adverse impacts.

Comment: "Although the Texas Outdoor Recreation Plan indicates a need for additional recreational facilities for this region, the construction of the floodwater retarding structures on private property will not satisfy this need (reference page 53, paragraph 5)."

Response: Noted. However, structures 14A, 24D, 25A, 29 and 32 are located on the LBJ National Grasslands administered by the U.S. Forest Service and will be open to the public and will help to meet some of the recreational needs.

Comment: "In summary, we believe the impacts associated with the project have not been adequately addressed. The incorporation of the above comments in the environmental impact statement will provide a better decisionmaking document which will more adequately portray the project-related impacts."

Response: Appropriate changes were made to the EIS in light of the comments to make the EIS a better decisionmaking document.

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LIST OF APPENDICES

APPENDIX A

COMPARISON OF BENEFITS AND COSTS

Big Sandy Creek Watershed, Texas
(Trinity River Watershed)

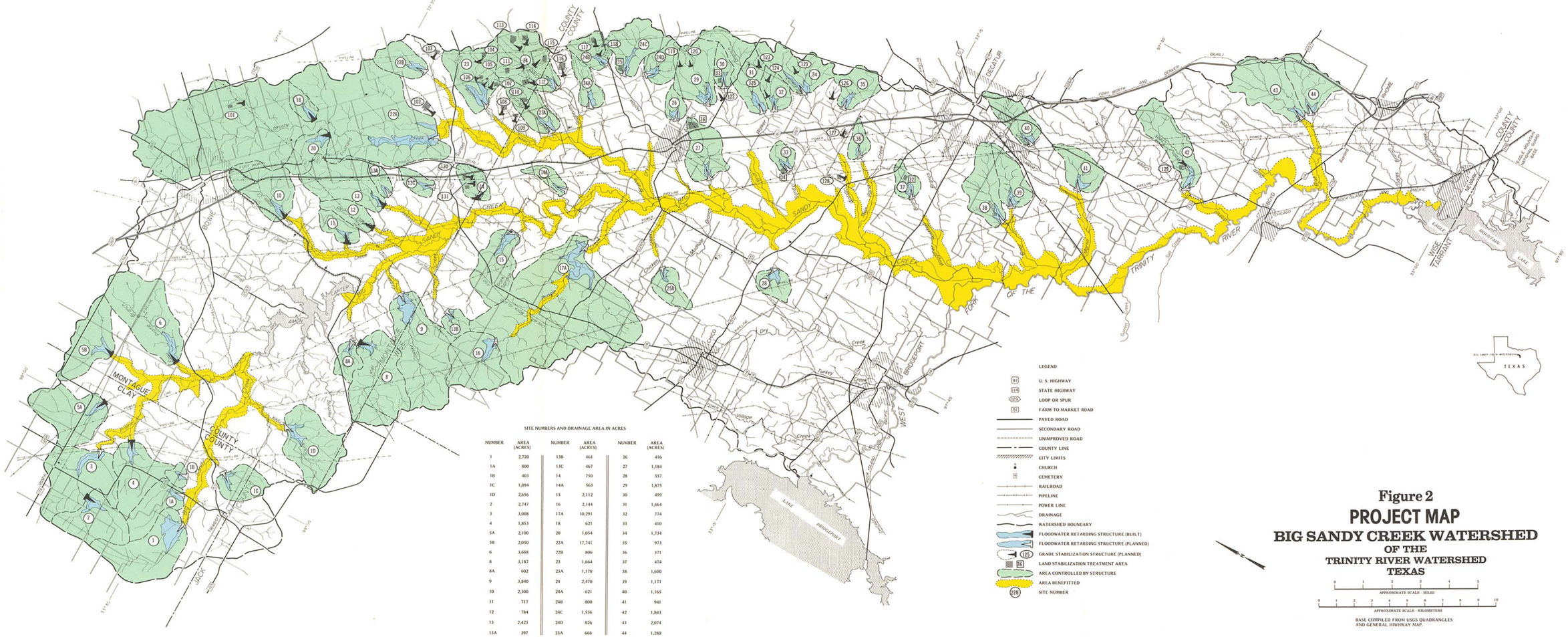
(Dollars)

Evaluation Unit	AVERAGE ANNUAL BENEFITS 1/			Average Annual Cost	Benefit-Cost Ratio
	Damage Reduction	More Intensive Land Use	Total		
57 floodwater retarding structures; 31 grade stabilization structures; and critical area stabilization	367,188	167,269	534,457	283,440	1.9:1.0
Project Administration	-	-	-	41,660	-
GRAND TOTAL	367,188	167,269	534,457	325,100	1.6:1.0

1/ Price Base: Current normalized prices (November 1975) for cropland and pasture; 1975 prices for all other.

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE



SITE NUMBERS AND DRAINAGE AREA IN ACRES

NUMBER	AREA (ACRES)	NUMBER	AREA (ACRES)	NUMBER	AREA (ACRES)
1	2,720	13B	461	26	416
1A	800	13C	467	27	1,184
1B	403	14	750	28	557
1C	1,094	14A	563	29	1,875
1D	2,656	15	2,112	30	499
2	2,747	16	2,144	31	1,664
3	3,008	17A	10,291	32	774
4	1,853	18	621	33	410
5A	2,100	20	1,054	34	1,734
5B	2,050	22A	17,741	35	973
6	3,668	22B	806	36	371
8	3,187	23	1,664	37	474
8A	602	23A	1,178	38	1,600
9	3,840	24	2,470	39	1,171
10	2,300	24A	621	40	1,165
11	717	24B	800	41	941
12	784	24C	1,536	42	1,843
13	2,423	24D	826	43	2,074
13A	397	25A	666	44	1,280

LEGEND

- U. S. HIGHWAY
- STATE HIGHWAY
- LOOP OR SPUR
- FARM TO MARKET ROAD
- PAVED ROAD
- SECONDARY ROAD
- UNIMPROVED ROAD
- COUNTY LINE
- CITY LIMITS
- CHURCH
- CEMETERY
- RAILROAD
- PIPELINE
- POWER LINE
- DRAINAGE
- WATERSHED BOUNDARY
- FLOODWATER RETARDING STRUCTURE (BUILT)
- FLOODWATER RETARDING STRUCTURE (PLANNED)
- GRADE STABILIZATION STRUCTURE (PLANNED)
- LAND STABILIZATION TREATMENT AREA
- AREA CONTROLLED BY STRUCTURE
- AREA BENEFITTED
- SITE NUMBER

Figure 2

PROJECT MAP

BIG SANDY CREEK WATERSHED OF THE TRINITY RIVER WATERSHED TEXAS

APPROXIMATE SCALE - MILES

APPROXIMATE SCALE - KILOMETERS

BASE COMPILED FROM USGS QUADRANGLES AND GENERAL HIWAY MAP.

JULY 1978 4-R-10226

REVISED JULY 1978 BASE 4-R-7638

USDA SCS FORT WORTH, TEXAS 1978

APPENDIX C

LETTERS OF COMMENT RECEIVED ON DRAFT ENVIRONMENTAL IMPACT STATEMENT

DEPARTMENT OF THE ARMY
FORT WORTH DISTRICT, CORPS OF ENGINEERS
P. O. BOX 17300
FORT WORTH, TEXAS 76102

REPLY TO
ATTENTION OF:

SWFED-PR

18 December 1978

Mr. George C. Marks
State Conservationist
USDA, Soil Conservation Service
PO Box 648
Temple, Texas 76501

Dear Mr. Marks:

Copies of your draft environmental impact statement for the Big Sandy Creek Watershed in the Trinity River Basin, Texas, have been forwarded to this office by the Chief of Engineers, Washington, D.C.

We have reviewed the statement and the following comments are furnished:

a. The effects of the 44 remaining SCS floodwater retarding structures have been evaluated in conjunction with the Comprehensive Survey Report of the Trinity River and Tributaries for their effects on flood control, sedimentation and water resources.

b. It is noted on page 7 that the Section 404 permit of PL 92-500 will not be required.

c. The proposed structural measures will not affect any existing or planned Corps of Engineers project.

Thank you for the opportunity to present our comments.

Sincerely yours,

ARTHUR D. DENYS
Chief, Engineering Division

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333
TELEPHONE: (404) 633-3311

December 12, 1978

Mr. George C. Marks
State Conservationist
U. S. Department of Agriculture
Soil Conservation Service
P. O. Box 648
Temple, Texas 76501

Dear Mr. Marks:

We have reviewed the draft environmental impact statement on Big Sandy Creek Watershed of the Trinity River Watershed, Clay, Jack, Montague, Tarrant and Wise Counties, Texas. We are responding on behalf of the Public Health Service.

We reviewed the subject environmental impact statement for potential vectorborne disease impacts. Possible vector mosquito problems which could arise in association with any of the impoundments are not mentioned. A comment pertaining to mosquito control should be included in the Operations and Maintenance Section and in the impact analysis.

Thank you for the opportunity of reviewing this statement. We would appreciate receiving a copy of the final statement when it is issued.

Sincerely yours,

Frank S. Lisella

Frank S. Lisella, Ph.D.
Chief, Environmental Affairs Group
Environmental Health Services Division
Bureau of State Services

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
U.S. COAST GUARD (G-WEP_7/73
WASHINGTON, D.C. 20590
PHONE: 202-426-3300

16476/7.b 519

Mr. George C. Marks
State Conservationist
U. S. Department of Agriculture
Soil Conservation Service
Temple, Texas 76501

Dear Mr. Marks:

On behalf of the U. S. Department of Transportation the concerned operating administrations and staff of the U. S. Coast Guard have reviewed the Draft Environmental Statement for Big Sandy Creek Watershed. We have neither comments nor objections to offer regarding this project.

The opportunity to review the Draft Environmental Statement for Big Sandy Creek Watershed is greatly appreciated.

Sincerely,

Dan A. W. Dunlap

By direction

UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20250

OFFICE OF EQUAL OPPORTUNITY

NOV 13 1978

IN REPLY REFER TO: 8140 Supplement 8

SUBJECT: Draft Environmental Impact Statement, Big Sandy Creek Watershed, Texas

TO: George C. Marks
State Conservationist

THRU: Verne M. Bathurst, Deputy Administrator
for Management, Soil Conservation Service

We have reviewed the Draft Statement with primary interest in your assessment of the impacts the proposed actions may have on minority populations in or near the affected area.

The Draft Statement indicates, at p.54, that "there are no minorities that will be affected by the planned project." Thank you for including this aspect in your assessment.

JAMES FRAZIER
Director

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

SA

REPLY TO: 3530 Flood Prevention Program
(PL 534)

January 5, 1979

SUBJECT: October 1978 Draft Environmental Impact Statement
Big Sandy Creek Subwatershed, Trinity River, TX

TO: George C. Marks
State Conservationist
Soil Conservation Service
P. O. Box 648
Temple, Texas 76501

We have reviewed the subject EIS and offer the following comments for inclusion in the next draft. These comments represent a concensus of the National Forests in Texas, Region 8, and the Southeastern Area.

Page 9, Table of estimated obligations. Delete entire line for year 1977.

Page 53, last paragraph, lines 6-9. Change wording to:

> Structure Nos. 14A, 24D, 25A, 29 and 32 are located on or mostly on the LBJ National Grasslands administered by the U.S. Forest Service and will be open to the public. The Forest Service will provide adequate sanitary facilities at some of these structure sites if the Forest Service determines that use warrants and funds are available.

Page 56, Item 12.e. Change wording to:

> Providing a potential public recreational resource at the five flood water retarding structures located on the LBJ National Grasslands administered by the U.S. Forest Service. This resource will be developed if the Forest Service determines that use warrants and funds are available.

M. W. KAGEORGE
Assistant Area Director

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

PEP ER 78/1058

JAN 17 1979

Mr. George C. Marks
State Conservationist
Soil Conservation Service
Department of Agriculture
Post Office Box 648
Temple, Texas 76501

Dear Mr. Marks:

We have reviewed the draft environmental statement for Big Sandy Creek Watershed, Texas, as requested in your letter dated October 23, 1978, and offer the following comments.

General Comments

We believe the baseline information regarding the existing fish and wildlife resources of the project area to be adequate in both scope and detail. The projected impacts of the project upon these resources however, are misleading in several instances. The attempt to combine the values of fish habitats and wildlife habitats into one value serves to mask the environmental trade-offs which would occur between these resources through project implementation. As an example, page ii states that "Existing wildlife habitat will be reduced about one percent." By reanalyzing the habitat values shown on Appendices G and H, however, we find that this estimate does not reflect accurately future habitat values. Appendix H attributes excessive habitat values to upland wildlife species as deer, quail, dove, and fox squirrel. Granted, both the periphery of the pools and the distance to water are evaluation factors for these species relative to the pool areas but we do not believe they are as high as those in the appendixes. Additional habitat values are claimed for waterfowl even though the use of the structures by transient waterfowl species is seasonal, temporary, and contributes only portions of the total habitat requirements necessary for these species.

We are pleased to note that some mitigation for terrestrial wildlife habitat losses will be afforded by the wildlife plantings on approximately 100 acres near the structure sites.

We have previously commented that wildlife losses could be further mitigated and the sesthetics, wster quality, and recreational values of structures improved by eliminating grazing in the flood detention pools. In the past "land rights" problems have served as the obstscle held responsible for the omission of such measures. With six structures located on Forest Service Lands and two structures to be constructed on lands owned by the Boy Scouts of America, we believe that an ideal opportunity exists to improve upon the aforementioned environmental qualities by assuring that the vegetation of the detention pools will not be disturbed by domestic grazing practices. Our Fish and Wildlife Service believes that much of the adverse impacts to wildlife habitat could be reduced by the inclusion of the minor project modification.

Specific Comments

Page ii, Paragraph 5 - As previously stated, we believe that the loss of wildlife habitat based upon the Soil Conservation Service evaluation will be greater than 1 percent.

Psge 3, Paragraph 6 - "Land users are encouraged to consider many species of wildlife when applying brush management." We believe thst when public funds are used for such practice, and when the potential exists for the resultant loss of a public resource (wildlife habitat), that the expenditure of such public funds for this practice should "require" the consideration of wildlife rather than simply "encourage" such consideration. To do otherwise constitutes a permissive use of public funds which may not be in the best public interest.

Page 4, Paragraph 3 - To adequately evaluate the impacts of the project upon the environment, the impact statement should state what will be included rather than what may be included.

Page 6, Paragraph 2 - "Clearing of woody vegetation will be kept to a minimum within the sediment pools of the structure." This statement sppears to be in direct conflict with the statement on page 49, paragraph 5, which states: "In addition, all large woody vegetation within the reservoir areas below the elevation of the lowest ungated outlet will be cleared." The FES should clarify the degree of clearing.

Page 22 - A reasonsbly well-defined relationship is indicated between specific conductance and total dissolved solids. However, this relationship for sample 6 indicates that the concentration of total dissolved solids greatly exceeds its comparable

value of specific conductance. This anomalous condition should be explained.

The possibility of effects from water-table fluctuations in the vicinity of the impoundments and downstream from them should be included in the assessment.

Psge 23, Paragraph 3 - "Approximately 5597 acres of Type 1 wetlands (seasonally flooded basins) are found within the wide flood plains of the West Fork of the Trinity River and portions of Big Sandy Creek." It is noted on page ii that flood-plain damages will be reduced from 28,770 acres to 20,541 acres, a reduction of 8,220 acres. While we assume that the acreage where flooding will be reduced includes all or a portion of the Type 1 wetlands, we can find no discussion of the environmental impacts upon fish and wildlife resources within these areas. This issue should be clarified.

Page 39, Paragraphs 4 and 5 - Since improved bermudagrass is generally considered to be of low wildlife habitat value, these two paragraphs are contradictory in nature and should be revised to more clearly reflect the impacts which these changes and trends are producing.

Pages 41, 33 and Appendix A - Secondary wildlife impacts resulting from the more intensive land use anticipated with the project should be discussed under the impact section.

Page 45, Plant and Animal Problems - An additional problem associated with wildlife populations should be added to this section as follows:

> Land treatment measures, such as brush control, with no consideration for wildlife, have resulted in losses to the wildlife resources in the watershed.

Pages 46 - 47 - Environmental Impacts - The following statement should be included:

> Land treatment measures such as pasture and hayland planting, and brush control without consideration of wildlife, will continue to degrade wildlife resources.

Page 48, Paragraph 3 - The more common forms of brush management are, more often than not, severely damaging to wildlife habitats. As this document represents a statement of the environmental

impacts of the proposed action, the techniques that will be applied should be referred to rather than the techniques that can be applied.

Page 49, Paragraph 5 - See comment of Page 6.

Page 52, Paragraph 3 - The conversion to water area will reduce existing terrestrial wildlife habitat in the floodplain greater than the "less than one" percent as stated. See comments in General Comments section.

Page 53, Paragraph 5 - The pools and surrounding areas are expected to have good incidental recreation potential. With the project, $5,902,280 of Federal funds would be expended upon construction of structures to which public access would not be provided. We believe that public access rather than incidental (private) access to structure sites for recreation purposes would be in the best public interest. If public access is impossible to accomplish, the reasons for this should be stated.

Page 57, Item 5.c. - Consideration should be given to the removal of 5 impoundments (2 small lakes and 3 farm ponds) and the inundation of 21 farm ponds within the detention pools at structure sites.

Summary

To adequately assess the impacts and trade-offs involved, we recommend that Appendices G and H be separated into the respective fish habitat and wildlife habitat components. This change should then be reflected in the information presented in other sections of the statement.

To offset project impacts to terrestrial wildlife habitats, we believe that the final plan should, at a minimum, include wildlife plantings and vegetative protection for the floodwater detention pools on those structures located upon Federal lands. This would represent only minor costs and no associated land rights problems as livestock watering facilities could be provided downstream from the structures. The benefits of such action include mitigation of wildlife losses, improved water quality, fisheries and recreational values, and should clearly outweigh any associated project costs.

We appreciate the opportunity to review and comment on the draft environmental statement.

Sincerely,

Larry E. Meierotto
SECRETARY

United States
Environmental Protection
Agency

Region 6
1201 Elm Street
Dallas TX 75270

Arkansas, Louisiana,
Oklahoma, Texas,
New Mexico

EPA

December 19, 1978

Mr. George C. Marks
State Conservationist
USDA-Soil Conservation Service
P.O. Box 648
Temple, Texas 76501

Dear Mr. Marks:

We have reviewed the Draft Environmental Impact Statement (EIS) on the proposed Big Sandy Creek Watershed Project of the Trinity River Watershed Project located in Clay, Jack, Montague, Tarrant and Wise Counties, Texas. This watershed project is being carried out by the sponsoring local organizations with assistance from the USDA Soil Conservation Service under the authority of the Soil Conservation Act of 1935 and the Flood Control Act of 1944, as amended and supplemented, for the purpose of watershed protection and flood prevention. This plan provides for the application of land treatment measures on I85,464 acres of agricultural land for watershed protection and the installation of 26 floodwater retarding structures for flood protection in the downstream reaches of Big Sandy Creek Watershed. The plan has been supplemented to include 57 floodwater retarding structures, 31 grade stabilization structures, land treatment measures on upland soils, land stabilization measures on 825 acres of privately owned eroded upland soils, critical area stabilization measures on 1,455 acres of the LBJ National Grasslands administered by the U.S. Forest Service, and critical area treatment measures on 2,100 acres of privately owned land. Thirteen floodwater retarding structures have been constructed and approximately 75 percent of the land treatment measures have been applied.

We classify your Oraft Environmental Impact Statement as LO-1. Specifically, we have no objections to the project as it relates to Environmental Protection Agency's (EPA) legislative mandates. The statement contained sufficient information to evaluate adequately the possible environmental impacts which could result from project implementation. Our classification will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions, under Section 309 of the Clean Air Act.

Definitions of the categories are provided on the enclosure. Our procedure is to categorize the EIS on both the environmental consequences of the proposed action and on the adequacy of the Impact Statement at the draft stage, whenever possible.

We appreciated the opportunity to review the Draft Environmental Impact Statement. Please send our office two copies of the Final Environmental Impact Statement at the same time it is sent to the Office of Federal Activities, U.S. Environmental Protection Agency, Washington, D.C.

Sincerely,

Ed Graham for

Adlene Harrison
Regional Administrator (6A)

Enclosure

ENVIRONMENTAL IMPACT OF THE ACTION

O - Lack of Objections

EPA has no objections to the proposed action as described in the draft impact statement; or suggests only minor changes in the proposed action.

R - Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating Federal agency to re-assess these aspects.

U - Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

ADEQUACY OF THE IMPACT STATEMENT

ategory 1 - Adequate

The draft impact statement adequately sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

ategory 2 - Insufficient Information

EPA believes the draft impact statement does not contain sufficient information to assess fully the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft statement.

ategory 3 - Inadequate

EPA believes that the draft impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement. If a draft statement is assigned a Category 3, no rating will be made of the project or action, since a basis does not generally exist on which to make a determination.

OFFICE OF THE GOVERNOR

DLPH BRISCOE
GOVERNOR

December 21, 1978

Mr. George C. Marks
State Conservationist
U.S. Department of Agriculture
Soil Conservation Service
P.O. Box 648
Temple, Texas 76501

Dear Mr. Marks:

The Draft Environmental Impact Statement for the Proposed Big Sandy Creek Watershed of the Trinity River Watershed, Texas, has been reviewed by the Budget and Planning Office and interested State agencies.

The comments of the reviewing agencies are enclosed for your use in the preparation of the final environmental impact statement. If this Office can be of further assistance, please contact us.

Sincerely,

Roy Hogan

Roy Hogan, Assistant Director
Budget and Planning Office

Enclosures

DEC 2 0 1978

Mr. Ward C. Goessling, Jr., Coordinator
Natural Resources Section
Governor's Budget and Planning Office
Executive Office Building
411 West 13th Street
Austin, Texas 78701

Re: Draft Environmental Impact Statement - Big Sandy Creek Watershed of the Trinity River Watershed--Clay, Jack, Montague, Tarrant and Wise Counties, Texas (EIS 8-010-028)

Dear Mr. Goessling:

This agency has reviewed the referenced project document and offers the following comments.

The statement on page ii (paragraph 5) that existing wildlife habitat will be reduced about one percent is false. According to figures in Appendix Tables G and H, roughly a 22 percent loss will occur, even considering improved bermuda grass on the dam and spillway to be comparable in wildlife value to other terrestrial types. Discounting the dam and spillway brings the losses in wildlife habitat to approximately 30 percent. This loss even includes a tremendous trade-off of 928 acres converted to aquatic habitat.

Elimination of grazing within the detention pool would improve habitat, as would clearing of the sediment pool only. A statement on page 6 (paragraph 2) indicates clearing of the sediment pool would be kept to a minimum. However, this position is reversed by a statement on page 40 (paragraph 5) which states: "In addition, all large woody vegetation within the reservoir areas below the elevation of the ungated outlet will be cleared" (emphasis added).

There is no evidence of a discussion of impacts on fish and wildlife associated with the destruction of wetlands in the project area.

DEC 2 0 1978

ND DISPATCHED: _____ 19____

Rev. 2/78)

FC 6000

Approximately 5,597 acres of Type 1 wetlands are found in the project area. A reduction of 8,229 acres of floodplain will undoubtedly result in loss of at least a portion of the Type 1 wetlands. This should be clarified with losses quantified.

It should also be pointed out that land treatment measures such as brush control and pasture and hayland planting, with no consideration for wildlife, will continue to degrade wildlife resources. An appropriate discussion should be provided on pages 46-48.

To adequately portray the trade-offs associated with this project, Appendix Tables G and H should be restructured to segregate fisheries habitat from wildlife habitat. Consideration should also be given to the presence of the 5 impoundments (2 small lakes and 3 farm ponds) which presently provide fisheries habitat and which will be removed and the 21 farm ponds which will be inundated by detention pools. It appears that the fisheries benefits counted would be lessened by the loss of these impoundments.

Additionally, the maintenance of conservation pool levels of structures 1, 1A, 1B, 1C, 1D and 3 could appreciably reduce flow into Lake Amon G. Carter. This action will directly impact the fishery of Lake Carter. These losses should be counted against the project.

Although the Texas Outdoor Recreation Plan indicates a need for additional recreational facilities for this region, the construction of the flood-water retarding structures on private property will not satisfy this need (reference page 53, paragraph 5).

In summary, we believe the impacts associated with the project have not been adequately addressed. The incorporation of the above comments in the environmental impact statement will provide a better decision-making document which will more adequately portray the project-related impacts.

Thank you for the opportunity to review and comment on this document. If we can be of further service, please contact us.

Sincerely,

HENRY B. BURKETT
Executive Director

HBB:MM:mg

Texas Department of Health

Fratis L. Duff, M.D., Dr.P.H.
Commissioner

Raymond T. Moore, M.D.
Deputy Commissioner

1100 West 49th Street
Austin, Texas 78756
458-7111

December 7, 1978

Mr. Ward C. Goessling, Jr., Coordinator
Natural Resources Section
Governor's Budget and Planning Office
Executive Office Building
411 West 13th Street
Austin, Texas 78701

SUBJECT: Big Sandy Creek Watershed Plan
(Trinity River)
Clay, Jack, Montague, Tarrant and
Wise Counties, Texas
Draft Environmental Impact Statement

Dear Mr. Goessling:

The Draft Environmental Impact Statement for the Big Sandy Creek Watershed of the Trinity River Watershed has been reviewed for its public and environmental health implications. The Plan was prepared by the U.S. Department of Agriculture, Soil Conservation Service; it is dated October, 1978.

The Watershed Plan covers portions of Clay, Jack, Montague, Tarrant and Wise Counties. The original Watershed Plan for Big Sandy Creek was approved in 1956. As supplemented, the Plan will provide for the installation of 57 floodwater retarding structures, 31 grade stabilization structures, and critical area stabilization measures. Currently, approximately 75% of the land treatment has been applied and 13 floodwater retarding structures have been installed. The subject Draft Environmental Impact Statement addresses the impacts expected to result from the completion of the project.

Garbage disposal facilities indicated on Page 7 of the Draft Environmental Impact Statement should be State-permitted facilities in accordance with the State of Texas "Solid Waste Disposal Act."

No adverse public or environmental health conditions are expected to result from the implementation of the Plan.

We appreciate the opportunity to review and comment on the Big Sandy Creek Watershed Plan.

Sincerely,

G. R. Herzik, Jr., P.E.
Deputy Commissioner for Environmental
and Consumer Health Protection

DLH/rab

ccs: Bureau of State Health Planning
and Resource Development, TDH
Division of Solid Waste Management, TDH
Public Health Region 5, TDH

TEXAS STATE SOIL AND WATER CONSERVATION BOARD
1002 First National Building
P. O. Box 658
Temple, Texas 76501
Area Code 817, 773-2250

December 5, 1978

Mr. Ward C. Goessling, Jr., Coordinator
Natural Resources Section
Budget and Planning Office
Office of the Governor
411 West 13th Street
Austin, Texas 78701

Dear Mr. Goessling:

We have received a copy of a draft environmental impact statement for the Big Sandy Creek Watershed of the Trinity River Watershed in Clay, Jack, Montague, Tarrent and Wise Counties, Texas.

We offer no comment on this draft statement.

Sincerely yours,

A.C. Spencer
Executive Director

ACS/md/js

TEXAS AIR CONTROL BOARD

8520 SHOAL CREEK BOULEVARD
AUSTIN, TEXAS 78758
512/451-5711

November 27, 1978

Mr. Ward C. Goessling, Jr.
Natural Resources Section
Budget and Planning Office
Office of the Governor
Executive Office Building
411 West 13th Street
Austin, Texas 78701

Subject: Draft Environmental Impact Statement: Big Sandy Creek Watershed of the Trinity River Watershed: Clay, Jack, Montague, Tarrant and Wise Counties, Texas (EIS 8-010-028)

Dear Mr. Goessling:

We have no comments on the above cited document.

Sincerely,

Roger R. Wallis, Deputy Director
Standards and Regulations Program

cc: Mr. Greg Short, P.E., Regional Supervisor, Abilene
Mr. Melvin Lewis, Regional Supervisor, Fort Worth

STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION
AUSTIN, TEXAS 78701

November 16, 1978

IN REPLY REFER TO FILE NO.

D8-E 854

Draft Environmental Statement
Big Sandy Creek Watershed
of the Trinity River Watershed

Clay, Jack, Montague, Tarrant and Wise Counties

Mr. Ward C. Goessling, Jr., Coordinator
Natural Resources Section
Governor's Budget and Planning Office
411 West 13th Street
Austin, Texas 78701

Dear Sir:

Reference is made to your memorandum dated October 31, 1978 transmitting the above captioned draft environmental statement for review and comments.

There is no apparent conflict with existing or proposed highway facilities.

Sincerely yours,

B. L. DeBerry
Engineer-Director

By [signature]
For
R. L. Lewis, Chief Engineer
of Highway Design

TEXAS DEPARTMENT OF WATER RESOURCES
1700 N. Congress Avenue
Austin, Texas

TEXAS WATER DEVELOPMENT BOARD
A. L. Black, Chairman
W. O. Bankston
Milton T. Potts
John H. Garrett
George W. McCleskey
Glen E. Roney

Harvey Davis
Executive Director

TEXAS WATER COMMISSION
Felix McDonald, Chairman
Dorsey B. Hardeman
Joe R. Carroll

November 14, 1978

Mr. Charles D. Travis, Director
Governor's Budget & Planning Office
700 Executive Office Building
411 West 13th Street
Austin, Texas 78701

Dear Mr. Travis:

Subject: U. S. Department of Agriculture, Soil Conservation Service -- Draft Environmental Impact Statement (DEIS) -- Big Sandy Creek Watershed of the Trinity River Watershed, Clay, Jack, Montague, Tarrant, and Wise Counties, Texas. (USDA-SCS-EIS-WS[ADM]78-4[D]-Tx) October 1978

In response to your October 31, 1978, memorandum, the Texas Department of Water Resources (TDWR) has reviewed the subject DEIS pertaining to the federally-assisted Big Sandy Creek Watershed Protection and Flood Prevention Project. The project involves the construction of a system of 57 floodwater retarding structures and 31 grade-stabilization structures;and, the installation of land stabilization measures on about 825 acres of critically-eroding private lands, stabilization measures on about 1,455 acres of critical sediment-source areas in the LBJ National Grasslands, and critical-area treatment measures on about 2,100 acres of privately-owned critical sediment source areas. (Approximately 75 percent of the land treatment measures have been installed, and 13 floodwater retarding structures have been constructed. The estimated total project cost is approximately $15.7 million, with a benefit-cost ratio of 1.6 to 1.D.

From the standpoint of its statutory, State-wide functions relative to water resources development and water quality management, TDWR offers the following review comments:

1. The DEIS provides firm justification that the proposed project will provide an acceptable level of protection to the watershed for reduction in floodwater and sediment damages to the flood plain lands (page 5).

2. The DEIS provides adequate assurances that all inlets of the floodwater retarding structures will be ungated and will operate automatically. Further, all structures will be designed to pass the 100-year frequency storm without overtopping and will have appurtenances to permit the release of impounded water in order to perform protective maintenance and, to avoid encroachment upon downstream water rights (page 5).

3. The DEIS contains adequate assurances that contractors will be required to adhere to strict contractual, site-specific guidelines designed to minimize soil erosion and water pollution during construction (page 6). In addition, after project completion, project sponsors will operate and maintain structures in accordance with specific operation and maintenance agreements, including protection of project areas and contiguous areas and watercourses from soil erosion and water pollution (pages 7 and 21).

4. The estimated 1.49-percent initial reduction in average annual runoff on Big Sandy Creek due to evaporation and seepage from sediment pools of the 44 floodwater retarding structures, and the estimated 1.18-percent runoff reduction from the total project drainage area, as computed by the USDA SCS, appear to be reasonable and acceptable insofar as assuring that no serious impairments to downstream water rights will ensue from the total project operation.

5. TDWR foresees no conflicts between the proposed project and TDWR's statutory State-wide current and future activities and functions insofar as water resources planning, development, and regulation are concerned.

We appreciated the opportunity to review the subject DEIS. Please advise if we can be of further assistance.

Sincerely yours,

Harvey Davis

Harvey Davis
Executive Director

OFFICE OF THE GOVERNOR

BUDGET AND PLANNING OFFICE

Executive Office Building — 411 West 13th Street — Austin, Texas 78701

STATE CLEARINGHOUSE

APPLICANT: DEIS Big Sandy Watershed of the Trinity River SAI NUMBER: 8-010-D28

BUDGET AND PLANNING OFFICE CONTACT: _____ PHONE: 512-475-_____

COMMENTS

The draft environmental impact statement for the Big Sandy Watershed of the Trinity River apparently identifies a beneficial effect on the environment. Flood water retarding structures have proven to be an economical means of reducing damage and erosion caused by flooding. The Department supports implementation of the project.

RECEIVED
NOV 16 1978

on Conducting Review (Signature) Larry Crumpton Title Deputy Director

ncy Texas Department of Community Affairs Date November 15, 1978

General Land Office
AUSTIN, TEXAS 78701
BOB ARMSTRONG, COMMISSIONER

ENVIRONMENTAL MANAGEMENT
1700 North Congress
Austin, Texas 78701

(512) 475-1539

November 10, 1978

Mr. Franklin H. Douglas, Jr.
Natural Resources Section
Budget and Planning Office
411 West 13th
Austin, Texas 78711

Dear Mr. Douglas:

Members of the General Land Office have reviewed the report on, "Big Sandy Creek Watershed of the Trinity River Watershed in Clay, Jack, Montague, Tarrant, and Wise Counties" and we have no objection to the proposed plans.

We appreciate the opportunity to submit our comments.

Cordially,

A. J. Bishop

A. J. Bishop
Coordinator

Nortex
Regional Planning Commission

2101 Kemp Blvd.
Wichita Falls, Texas 76309
Area 817 - 322-5281

CHAIRMAN
Mayor E. J. Johnson
City of Nocona

VICE CHAIRMAN
Judge John Lindsey
Jack County

SECRETARY
Alderwoman Carol Russell
City of Wichita Falls

EXECUTIVE DIRECTOR
Edwin B. Daniel

November 8, 1978

Mr. George C. Marks
State Conservationist
U.S. Department of Agriculture
Soil Conservation Service
P.O. Box 648
Temple, Texas 76501

Dear Mr. Marks:

The Environmental Assessment Advisory Committee of Nortex Regional Planning Commission met on November 8, 1978. After reviewing the draft Environmental Impact Statement for the Big Sandy Creek Watershed in Clay, Jack, Montague, Tarrant and Wise Counties, Texas, the Committee commented favorably upon said statement.

As a means of providing information, in addition to the Committee minutes from the meeting, we would like to include a copy of the following publications for your information to be used in the final assessment. Included are 1) Employment/Population Element and 2) Resource Data Book for the North Texas Planning Region. These publications should prove helpful in deriving population figures for the North Texas Planning Region which are compatible with those of our organization.

Thank you for giving us the opportunity to respond to this matter.

Sincerely,

Tom Merritt
Physical Planning
Division Manager

TM/vs

Enclosures (3)

P. O. Drawer COG Arlington, Texas 76011

December 1, 1978

Mr. J. Lynn Futch
State Director
Department of Agriculture
3910 South General Bruce Drive
Temple, Texas 76501

RE: SAI #8-11-04047
Draft Environmental Impact Statement
on the Big Sandy Creek Watershed

Dear Mr. Futch:

This letter is intended to communicate the official action of the North Central Texas Council of Governments in response to your request for review and comment on the above referenced project by our agency as required by OMB Circular A-95. This letter may be used by you to inform appropriate agencies of our action and to document your compliance with required A-95 areawide clearinghouse procedures.

As required of us by Circular A-95, our review process included the notification of potentially affected local governments including Tarrant and Wise Counties; the Cities of Bridgeport, Dallas, Decatur, Fort Worth, and Rhome; Benbrook Water and Sewer Authority; Tarrant County Water Control and Improvement District #1; and the Trinity River Authority. These local governments were invited to comment on the local impact of the proposal, and a reply received from NCTCOG's notification is attached to this letter.

In addition, the project was reviewed for appropriate areawide concerns. This review process included consideration by the Government Applications Review Committee on November 15, and by the NCTCOG Executive Board on November 30. On the basis of this review process, the Board adopted the following areawide position:

> It is recommended that the Draft Environmental Impact Statement be amended to provide additional analysis concerning (1) the potential impact of the planned structures on existing downstream reservoirs, especially those used for water supply; and (2) the environmental, economic and/or social costs and benefits of the alternatives which were not selected and elaboration on the basis for their rejection.

We sincerely thank you and your staff for your kind cooperation in this matter, and if we can be of further service or assistance, please feel free to call upon us.

Sincerely,

William J. Pitstick
Executive Director

WJP:ldh

cc: George C. Marks, State Conservationist, Soil Conservation Service
Malcolm Baldwin, Senior Staff Member, Council on Environmental Quality
J. L. Robinson, Director, Fort Worth Water Department
Gary Gwyn, Assistant City Manager, City of Fort Worth

FORT WORTH WATER DEPARTMENT

P.O. BOX 870 1000 THROCKMORTON
FORT WORTH, TEXAS 76101

ADMINISTRATION DIVISION
(817) 870-8220

November 29, 1978

Mr. Jeff Harkinson
Director of Regional Services
North Central Texas Council of Governments
P. O. Drawer COG
Arlington, Texas 76011

Dear Mr. Harkinson:

COMMENTS ON USDA DRAFT EIS
ON BIG SANDY CREEK WATERSHED
PROJECT NO. 8-11-04047

The Fort Worth Water Department views with alarm the Soil Conservation Service proposal to impound 35,000 ac. ft. of water in floodwater storage in the Big Sandy Creek Watershed, a major tributary to the City's West Fork Reservoir System. Depending on the proposed method of operation of these proposed 44 "floodwater retarding structures," such an impound could be expected to have a significantly adverse effect on the City's water supply reservoirs on the West Fork of the Trinity River.

If it is proposed to impound the 35,000 ac. ft. of water in "floodwater storage" only until the affected drainageways can safely accommodate discharge of the stored water at controlled rates to the West Fork, with the entire "floodwater storage" to be so discharged in a reasonably short time after the flood threat is passed, such a method of operation would largely overcome any objections by the City of Fort Worth. However, if this is the proposed method of operation of these "floodwater storage" facilities, it should be spelled out in the subject EIS in detail.

If it is proposed to impound the 35,000 ac. ft. of water in "floodwater storage" for an indefinite period of time, this is considered to be inimical to the best interests of the City of Fort Worth and in contravention of the water rights enjoyed by the City of Fort Worth through its contract with the Tarrant County Water Control and Improvement District No. 1, and the City of Fort Worth is vigorously opposed to such an operational concept.

Thank you for the opportunity to comment upon this matter of vital interest to the City of Fort Worth Water Department.

Yours very truly,

J. L. Robinson, Director
Fort Worth Water Department

JLR/JBM:hm

cc: Mr. Gary Gwyn, Assistant City Manager
Mr. Ben Hickey, Manager, T.C.W.C.I.D. #1

TRINITY RIVER AUTHORITY OF TEXAS

PLANNING AND ENVIRONMENTAL MANAGEMENT DIVISION

817 GATEWAY PLAZA • 2727 AVENUE E EAST
P. O. BOX 5768
ARLINGTON, TEXAS 76011
TELEPHONE: 1AREA CODE 8171 461-3151

November 1, 1978

Mr. George C. Morks
Stote Conservotionist
USDA - Soil Conservation Service
P.O. Box 648
Temple, TX 76501

Dear Mr. Morks:

Thank you very much for the draft copy of the EIS for the Big Sondy Creek Wotershed.

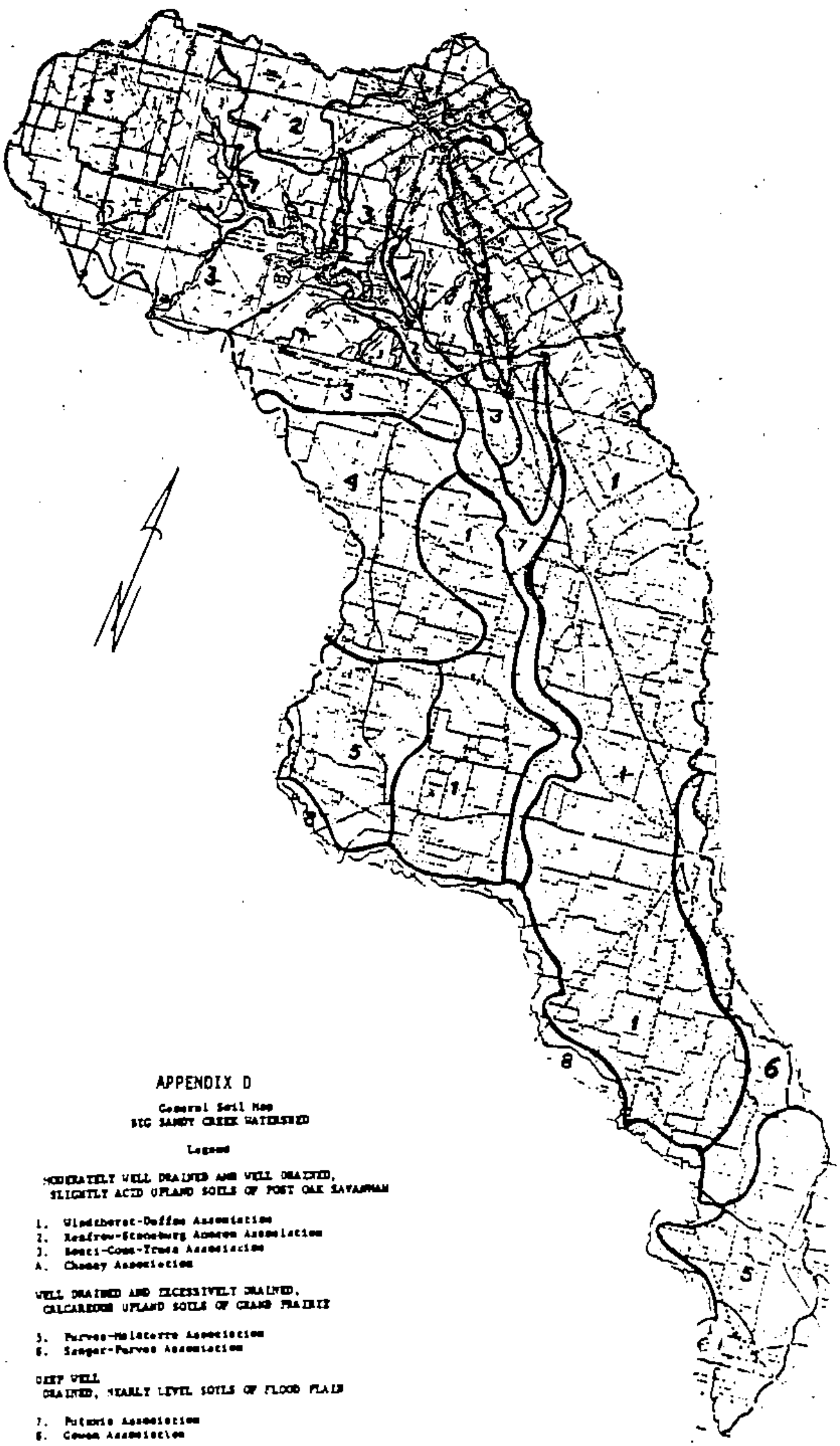
I would like to request that you send an additional copy for review to Mr. Jomes Strawn, the Assistant General Manager of Develapment for the Torrant County Water Control and Improvement District No. 1. His oddress is P.O. Box 4508, Fort Worth, Texas , 76106.

Sincerely,

RICHARD M. BROWNING
Division Manager

RMB/sp

cc: James Strown



APPENDIX D

General Soil Map
BIG SANDY CREEK WATERSHED

Legend

MODERATELY WELL DRAINED AND WELL DRAINED,
SLIGHTLY ACID UPLAND SOILS OF POST OAK SAVANNAH

1. Windthorst-Duffau Association
2. Renfrow-Stoneburg Anocon Association
3. Bonti-Cona-Truce Association
4. Chaney Association

WELL DRAINED AND EXCESSIVELY DRAINED,
CALCAREOUS UPLAND SOILS OF GRAND PRAIRIE

5. Purves-Maloterre Association
6. Sanger-Purves Association

DEEP WELL
DRAINED, NEARLY LEVEL SOILS OF FLOOD PLAIN

7. Pulexas Association
8. Gowen Association

BIG SANDY CREEK

Vegetative List of Common and Scientific Names Observed

Grasses

Common Name	Scientific Name
little bluestem	Andropogon scoparius
indiangrass	Sorghastrum nutans
switchgrass	Panicum virgatum
canada wildrye	Elymus canadensis
sideoats grama	Bouteloua curtipendula
texas wintergrass	Stipa leucotricha
red lovegrass	Eragrostis oxylepis
purpletop tridens	Tridens flavus
meadow dropseed	Sporobolus asper var. hookeri
virginia wildrye	Elymus virginicus
silver bluestem	Andropogon saccharoides
johnsongrass	Sorghum halepense
bermudagrass	Cynodon dactylon
sand dropseed	Sporobolus cryptandrus
scribner panicum	Panicum oligosanthes var. scribnerianum
slim tridens	Tridens muticus var. muticus
texas grama	Bouteloua rigidiseta
red grama	Bouteloua trifida
tumble windmillgrass	Chloris verticillata
red threeawn	Aristida longiseta
rescuegrass	Bromus catharticus
japanese brome	Bromus japonicus
fringeleaf paspalum	Paspalum ciliatifolium
threeawn	Aristida sp.
dallisgrass	Paspalum dilatatum
crabgrass	Digitaria sp.
white tridens	Tridens albescens
knotroot bristlegrass	Setaria geniculata
florida paspalum	Paspalum floridanum
tumblegrass	Schedonnardus paniculatus
broomsedge bluestem	Andropogon virginicus
coast sandbur	Cenchrus incertus
buffalograss	Buchloe dactyloides
vine-mesquite	Panicum obtusum
beaked panicum	Panicum anceps
big bluestem	Andropogon gerardi
broadleaf uniola	Uniola latifolia
sand lovegrass	Eragrostis trichodes
hairy grama	Bouteloua hirsuta
broadleaf signalgrass	Brachiaria platyphylla
little barley	Hordeum pusillum
sixweek fescue	Festuca octoflora glauca
texas cupgrass	Eriochloa sericea
hooded windmillgrass	Chloris cucullata

BIG SANDY CREEK

Forbs

Common Name	Scientific Name
tickclover	Desmondium sp.
western ragweed	Ambrosia psilostachya
lambsquarter	Chenopodium album
ironweed	Vernonia sp.
lespedeza	Lespedeza sp.
aster	Aster sp.
sedge	Carex sp.
curlycup gumweed	Grindelia squarrosa
cocklebur	Xanthium sp.
common broomweed	Gutierrezia dracunculoides
falseguara	Stenosiphon linifolium
common sunflower	Helianthus annuus
woollywhite	Hymenopappus sp.
silverleaf nightshade	Solanum elaegnifolium
wild strawberry	Fragaria virginiana
coffeebean	Sesbania macrocarpa
narrowleaf cattail	Typha angustifolia
rush	Juncus sp.
fleabane	Erigeron sp.
black medic	Medicago lupulina
beebalm	Monarda sp.
maximilian sunflower	Helianthus maximiliani
gayfeather	Liatris sp.
white avens	Geum canadense
sanicle	Sanicula
woodsorrel	Oxalis dillenii
snoutbean	Rhynchosia minima
catclaw sensitivebrier	Schrankia uncinata
engelmanndaisy	Engelmannia pinnatifida
prickly poppy	Argemone sp.
texas bullnettle	Cnidoscolus texanus
crotons	Croton sp.
yellow neptunia	Neptunia lutea
illinois bundleflower	Desmanthus illinoensis
gaura	Gaura sp.
scouringrush	Equisetum hyemale
penstemons	Penstemon sp.
queensdelight	Stillingia sylvatica
skullcap	Scutellaria sp.
orange zexmenia	Zexmenia hispida
snow-on-the-prairie	Euphorbia bicolor
halfshrub sundrop	Oenothera serrulata
prairie senna	Cassia fasciculata

BIG SANDY CREEK

Trees, Shrubs, and Vines

Common Name	Scientific Name
american elm	Ulmus americana
pecan	Carya illinoensis
black walnut	Juglans nigra
sugar hackberry	Celtis laevigata
possumhaw	Ilex decidua
winged elm	Ulmus alata
greenbrier	Smilax sp.
black willow	Salix nigra
virginia creeper	Parthenocissus quinquefolia
post oak	Quercus stellata
blackjack oak	Quercus marilandica
plum	Prunus sp.
dewberry	Rubus sp.
sumac	Rhus sp.
texas oak	Quercus shumardii var. texana
cottonwood	Populus sp.
grape	Vitis sp.
osageorange	Maclura pomifera
hawthorn	Crataegus sp.
carolina snailseed	Cocculus carolinus
western soapberry	Sapindus drummondii
coralberry	Symphoricarpos orbiculatus
cedar elm	Ulmus crasaifolia
honeylocust	Gleditisia triancanthos
ash	Fraxinus sp.
black locust	Robinia pseudo-acacia
woollybucket bumelia	Bumelia lanuginosa
boxelder	Acer negundo
poisonivy	Rhus toxicodendron
eastern redcedar	Juniperus virginiana
texas redbud	Cercis canadensis texensis
skunkbush sumac	Rhus trilobata
herculesclub prickash	Zanthoxylum clava-herculis
ivy treebine	Cissus incisa
live oak	Quercus virginiana
chinaberry	Melia azedarach
trumpetcreeper	Campsis radicans
smooth swallowwart	Cynanchum laeve

ESTIMATED EFFECTS OF FLOODWATER RETARDING STRUCTURES ON STREAMFLOW
AT EAGLE MOUNTAIN RESERVOIR (DA 1,920 Sq. Mi.) AND
BELOW BRIDGEPORT RESERVOIR (DA 1,111 Sq. Mi.)

Watershed Data	Unit	1988 (Rainfall Conditions) Dry	Average	Wet
Contributing Drainage Area	Sq. Mi.	859	859	859
Average Annual Precipitation	Inch	21.7	31.0	40.3
Average Annual Runoff	Ac. Ft.	54,120	1/ 120,260	240,520
Portion of On-Site Reaching Gage	Ratio	0.50	0.65	0.88
EFFECTS OF FLOODWATER RETARDING STRUCTURES				
Total Surface Area in Sediment Pool Without Sediment	Acre	957	957	957
Sediment Pool Percent of Total	Percent	94	94	94
Total Surface Area Sediment Pool With Sediment	Acre	900	900	900
Average Sediment Pool Surface Area (Percent of Total)	Percent	48	62	71
Average Sediment Pool Surface Area With Sediment	Acre	432	588	639
Net Evaporation Rate	Ft./Yr.	4.7	3.8	2.9
Average Annual Evaporation Depletion	Ac. Ft.	2,030	2,234	1,853
Average Annual Depletion at Gage	Ac. Ft.	1,015	1,452	1,631
Average Annual Depletion at Gage	Percent	1.88	1.21	0.68

1/ Average annual runoff derived by transposition of gage records from Big Sandy Creek gage (DA 333 Sq. Mi.).

EXISTING WILDLIFE HABITAT VALUE RATING
Big Sandy Creek Watershed

Species	Habitat Type: RW* 620 Ac. Rating1/	RW* 620 Ac. Value Rating2/	ONG* 1,697 Ac. Rating	ONG* 1,697 Ac. Value Rating	POGA* 809 Ac. Rating	POGA* 809 Ac. Value Rating	P* 400 Ac. Rating	P* 400 Ac. Value Rating	C* 323 Ac. Rating	C* 323 Ac. Value Rating	BNG* 105 Ac. Rating	BNG* 105 Ac. Value Rating	WA* 21 Ac. Rating	WA* 21 Ac. Value Rating	Total Value Rating
Deer	6	3,720	3	5,091	5	4,045	2	800	3	969	4	420	3	63	15,108
Quail	2	1,240	6	10,180	3	2,427	3	1,200							
Quail	2	1,240	6	10,180	3	2,427	3	1,200	3	969	6	630	2	42	16,690
Dove	3	1,860	7	11,879	4	3,236	2	800	5	1,615	4	420	5	105	19,915
Fox Squirrel	8	4,960	3	1,697	6	4,854	1	400	1	323	1	105	2	42	12,381
Fur Bearer	6	3,720	3	5,091	5	4,045	2	800	3	969	3	315	3	63	15,003
Cottontail Rabbit	5	3,100	4	6,788	8	6,472	3	1,200	3	969	5	525	3	63	19,117
Fish	0	0	0	0	0	0	0	0	0	0	0	0	7	147	147
Waterfowl	1	620	0	0	0	0	0	0	0	0	0	0	6	126	746
TOTAL		19,220		40,728		25,079		5,200		5,814		2,415		651	99,107

1/ Rating factors are defined as follows:
- 0-1 - Habitat is nonexistent or of no significant value for a particular species.
- 2-3 - Low value habitat is habitat which lacks adequate food, cover, or other essential elements to support a significant population of a particular species.
- 4-7 - Moderate value habitat is habitat which has the needed elements to support a particular species but at population levels below the optimum.
- 8-10 - High value habitat is habitat which has all necessary habitat elements to support an optimum population of a particular species.

2/ Value ratings are derived by multiplying the habitat rating factor by the acreage of habitat type.

* Habitat types defined as follows:
- RW - Riparian Woodland
- ONG - Open Native Grassland
- POGA - Post Oak-Greenbrier Assemblage
- P - Pastureland
- C - Cropland
- BNG - Brushy Native Grassland
- WA - Water Area

PROJECTED WILDLIFE HABITAT VALUE RATING

Big Sandy Creek Watershed, Texas

Species	Habitat Type: RW* 330 Ac. Rating	RW* 330 Ac. Value Rating 1/ 2/	ONG* 1,214 Ac. Rating	ONG* 1,214 Ac. Value Rating	POGA* 640 Ac. Rating	POGA* 640 Ac. Value Rating	BNG* 70 Ac. Rating	BNG* 70 Ac. Value Rating	C* 248 Ac. Rating	C* 248 Ac. Value Rating	P* 272 Ac. Rating	P* 272 Ac. Value Rating	WA* 928 Ac. Rating	WA* 928 Ac. Value Rating	D&ESIB* 273 Ac. Rating	D&ESIB* 273 Ac. Value Rating	Total Value Rating
Deer	7	2,310	4	4,856	6	3,840	5	350	2	496	2	544	1	928	2	546	13,870
Quail	3	990	7	8,498	3	1,920	6	420	3	744	4	1,088	2	1,856	2	546	16,056
Dove	3	990	7	8,498	3	1,920	4	280	5	1,240	2	544	4	3,712	3	819	18,003
Fox Squirrel	9	2,970	1	1,214	7	4,480	1	70	1	248	1	272	1	928	1	273	10,455
Furbearer	7	2,310	3	3,642	6	3,840	3	210	3	744	2	544	2	1,856	4	1,096	14,242
Cottontail Rabbit	5	1,650	4	4,856	7	4,480	5	350	3	744	3	816	2	1,856	2	546	15,298
Fish	0	0	0	0	0	0	0	0	0	0	0	0	7	6,496	0	0	6,496
Waterfowl	0	0	0	0	1	640	0	0	3	744	0	0	6	5,568	0	0	6,952
TOTAL		11,220		31,564		21,120		1,680		4,960		3,808		23,194		3,826	101,372

1/ Rating factors are defined as follows:

0-1 - Habitat is nonexistent or of no significant value for a particular species.

2-3 - Low value habitat is habitat which lacks adequate food, cover, or other essential elements to support a significant population of a particular species.

4-7 - Moderate value habitat is habitat which has the needed elements to support a particular species but at population levels below the optimum.

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RW - Riparian Woodland
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POGA - Post Oak-Greenbrier Assemblage
BNG - Brushy Native Grassland
C - Cropland
P - Pastureland
WA - Water Area
D&ESIB - Dam and Emergency Spillway Improved Bermuda

TEXAS WATER QUALITY STANDARDS

FRESH AND TIDAL WATERS

TRINITY RIVER BASIN		WATER USES DEEMED DESIRABLE				CRITERIA						
SEGMENT NUMBER	SEGMENT DESCRIPTION	CONTACT RECREATION	NONCONTACT RECREATION	PROPAGATION OF FISH & WILDLIFE	DOMESTIC RAW WATER SUPPLY	CHLORIDE (mg/l) avg. not to exceed	SULFATE (mg/l) avg. not to exceed	TOTAL DISSOLVED SOLIDS (mg/l) avg. not to exceed	DISSOLVED OXYGEN (mg/l) not less than	pH RANGE	COLIFORM FECAL/ (100ml) - log. avg. not more than (see Gen. Statement)	TEMPERATURE °F (see Gen. Statement)
0808	West Fork Trinity River - Lake Worth headwater to Eagle Mountain Dam	X	X	X	X	100	100	500	5.0	6.5-8.5	200	91
0809	Eagle Mountain Reservoir	X	X	X	X	75	75	300	5.0	7.0-9.0	200	94
0810	West Fork Trinity River - Eagle Mountain Lake headwater to Bridgeport Dam	X	X	X	X	100	100	500	5.0	6.5-8.5	200	90
0811	Lake Bridgeport	X	X	X	X	75	75	300	5.0	7.0-9.0	200	90
0834	Lake Amon G. Carter	X	X	X	X	150	150	400	5.0	6.5-9.0	200	93

Source: Texas Water Quality Standards, Texas Water Quality Board, Austin, Texas 78711, February 1976

APPENDIX I