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ENVIRONMENTAL IMPACT STATEMENT

SOUTH FORK OF BLACKWATER RIVER WATERSHED

JOHNSON COUNTY, MISSOURI



MISSOURI



PREPARED BY: UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
COLUMBIA, MISSOURI



DECEMBER 1974

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South Fork of Blackwater River Watershed
Johnson County, Missouri

Final Environmental Impact Statement

J. Vernon Martin, State Conservationist
Soil Conservation Service

Sponsoring Local Organizations:

Soil and Water Conservation District of Johnson County
Warrensburg, Missouri 64093

South Fork of Blackwater River Watershed Subdistrict
Warrensburg, Missouri 64093

Johnson County Court
Warrensburg, Missouri 64093

City of Holden, Missouri 64040

Missouri Water Resources Board
Jefferson City, Missouri 65101

December, 1974

Prepared by:

U. S. Department of Agriculture
Soil Conservation Service
P.O. Box 459
Columbia, Missouri 65201

FORWARD

The South Fork of Blackwater River Watershed Project was authorized for installation in July 1962. The project area includes a portion of the drainage area of the East Branch of the South Fork of Blackwater, a Pilot watershed project completed in 1960. Twenty-one small stabilization and sediment control dams were constructed in the Pilot project. Four floodwater retarding structures and nine grade stabilization structures have been constructed to date in the South Fork of Blackwater River Watershed Project. The Revised Work Plan for the South Fork of Blackwater River Watershed includes conservation land treatment (of which 50% has already been installed), eleven (11) floodwater retarding structures (including the four (4) already constructed), one (1) multiple purpose structure (with storage capacity for recreation and municipal water), and ten (10) grade stabilization structures (nine (9) of which have already been constructed).

This environmental statement describes impacts which will result from installation of the conservation land treatment and the structural measures remaining to be installed.

460573

USDA ENVIRONMENTAL IMPACT STATEMENT
South Fork of Blackwater River Watershed Project
Johnson County, Missouri

Prepared in Accordance With
Sec. 102(2) (C) of P. L. 91-190

SUMMARY

- I. Final
- II. Soil Conservation Service
- III. Administrative
- IV. Description of Project Purpose and Action: The recommended plan of improvements consists of land treatment measures; seven floodwater retarding structures; one multiple-purpose structure for flood prevention, municipal and industrial water supply, and recreational development; and one grade stabilization structure. The project is located in northwest Johnson County, Missouri. Holden is the largest town in the watershed. Other towns are Kingsville and Pittsville.
- V. Summary of Environmental Impacts: The project will reduce flood damage on 5,382 acres in the watershed and 6,929 acres outside, for a total of 12,311 acres. Peak flows from a 100-year storm will be reduced 52 percent in Reach VII. Sediment yield will be reduced 55 percent. Installation of the project will change the land use of areas needed for dams, spillways, sediment storage, water supply storage, recreational storage, and for recreational development. Project installation will cause relocation of six farming operations.
- VI. List of Alternatives: 1. Land treatment only. 2. A system of six floodwater retarding structures, two multiple-purpose structures, 7.5 miles of channel improvement, and 14 grade stabilization structures. 3. Non-structural measures for minimizing flood losses. 4. No project.
- VII. Comments Received:

Department of the Army	Environmental Protection Agency
Department of Health, Education, and Welfare	Governor of Missouri
Department of the Interior	Missouri Water Resources Board
Department of Transportation	
- VIII. Draft statement transmitted to CEQ on April 17, 1974.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

USDA SOIL CONSERVATION SERVICE

FINAL ENVIRONMENTAL IMPACT STATEMENT

for

South Fork of Blackwater River Watershed

Johnson County, Missouri

Installation of this project constitutes an administrative action. Federal assistance will be provided under authority of Public Law 83-566, 83d Congress, 68 Stat. 666, as amended.

SPONSORING LOCAL ORGANIZATIONS

Soil and Water Conservation District of Johnson County

South Fork of Blackwater River Watershed Subdistrict

Johnson County Court

City of Holden, Missouri

Missouri Water Resources Board

C. PROJECT PURPOSES AND GOALS

The objectives for each project purpose are described as follows: 1/

1. Watershed Protection (Conservation Land Treatment)

The objectives agreed upon by the Sponsoring Local Organizations and the Soil Conservation Service for achieving adequate land treatment on watershed lands during the project installation period are listed below.

1. To install needed land treatment as the first increment of the project to adequately treat an additional 13,090 acres during the project period.
2. To reduce gully erosion and to furnish stable outlets for water management systems on 10,000 acres by stabilizing approximately 150 gully reaches.

2. Flood Prevention

The goal for flood prevention is to reduce flooding to permit sustained agricultural production and to protect investments in roads, bridges, and agricultural properties. Average annual damages, in dollars, without the project and with the project; the percent of reduction in damages; and the acres benefited by the combined program of land treatment and Public Law 566 floodwater retarding structures are shown by reach as follows:

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

Project Purposes and Goals

Average Annual Damages ^{1/}

Evaluation Reach	W/O Project (dollars)	W/Project (dollars)	Percent Reduction	Acres Benefited
I	6,830	6,830	0	0
II	21,319	9,650	55	338
III	20,860	17,460	16	540
IV	43,200	23,160	46	1,161
V	4,540	480	89	228
VI	910	10	98	266
VII	4,990	660	85	268
VIII	7,050	1,310	81	296
IX	<u>3,150</u>	<u>30</u>	<u>99</u>	<u>1,342</u>
	112,849	59,590	47	4,439

3. Fish, Wildlife and Recreation

The goals to preserve wildlife habitat agreed upon by the Sponsors and the Soil Conservation Service are: (1) to reduce damage to fish and wildlife resources by eliminating 7.45 miles of channel improvement shown in the original work plan; (2) to mitigate for losses incurred by the installation of structural measures; (3) to plan for the preservation and improvement of existing wildlife resources on 1,500 acres of wildlife habitat; and (4) to improve fishery and general environmental conditions by providing 577 surface acres of water. The goal for recreational development in this project is to provide storage and associated development as a part of multiple-purpose structure B-1 to help satisfy the recreational demand for a population of 765,000 within a 50-mile radius of Holden.

4. Municipal and Industrial Water Supply

The goal for municipal and industrial water supply is to provide 1.6 million gallons per day to serve a future population of 10,000 residing in Holden, Kingsville, and in rural water districts being organized in the surrounding communities.

^{1/} Damages reduced by four floodwater retarding structures already installed and not included in this table: Reach I, \$17,940; Reach II, \$7,896; benefiting 798 acres in Reach I and 145 acres in Reach II.

D. PLANNED PROJECT

1. Land Treatment Measures

Land treatment measures will be installed for both watershed protection and flood prevention. Generally, a combination of land treatment practices are required and must be tailored to fit the land, topography, use, soil properties and management ability of the land user.

During the 5-year installation period, land treatment practices will be installed throughout the watershed. Practices to be installed will include conservation cropping systems (rotations), grass waterways, terraces, grade stabilization structures, diversions, pasture and hayland management, prasture and hayland planting, and ponds. The land treatment measures to be installed will result in an additional 4,000 acres of cropland and 6,000 of grassland, 2,500 acres of other land, and 590 acres of forest land being adequately treated. 1/

Flood plain treatment will consist of drainage land grading, drainage field ditches, diversions, grade stabilization structures, and maintenance of fertility and organic levels.

Treatment of approximately 150 gully reaches is proposed. Comprehensive plans will be developed for each reach. A typical plan will include a combination of a minor stabilization structure and one or more of the following conservation practices: grass waterways, diversions, terraces, erosion control plantings, and fencing.

The practices to be applied are described below:

Conservation Cropping System

This practice is defined as growing crops in combination with needed cultural and management measures. Cropping systems include rotations that contain grasses and legumes as well as rotations in which the desired benefits are achieved without the use of such crops. Its purpose is to improve or maintain good physical condition of the soil; protect the soil during periods when erosion usually occurs; help control weeds, insects, and diseases; and meet the need and desire of farmers for an economic return. This practice is applicable on all cropland and certain recreation and wildlife land.

Grass Waterways or Outlets

This practice is defined as a natural or constructed waterway or outlet that is shaped or graded and established in vegetation suitable to safely dispose of runoff from a field, diversion, terrace or other

1/ Land adequately treated is land used within its capability, or land on which the needed conservation practices essential to its protection and planned improvement have been applied.

structure. Its purpose is to prevent excessive soil loss and the formation of gullies. It is applicable where concentrated runoff must be disposed of at safe velocities.

Terraces

A terrace is an earth embankment or a ridge and channel constructed across the slope at a suitable spacing. The three types of terraces used are gradient, level, and parallel. In this project either the gradient or parallel terrace system will be used or, in some cases, a combination of both. Parallel terraces are constructed parallel across the slope at a suitable spacing and with an acceptable grade and gradient terraces are constructed on the contour with gradient necessary to maintain flow. The purpose of a terrace or terrace system is to reduce erosion damage and pollution by intercepting runoff and conducting it to a stable outlet at a nonerosive velocity. Parallel terraces are used to provide a more farmable terrace system. Parallel gradient terraces normally are limited to cropland having a water erosion problem. Gradient or parallel gradient terraces may be used only where suitable outlets are or will be available. Terraces are not applicable to deep sand or in soils that are too stony, steep, or shallow to permit practical and economical installation and maintenance. Topography must be such that farmable terraces can be constructed.

Grade Stabilization Structures

This practice is defined as a structure to stabilize the grade or to control head cutting in natural or artificial channels. It does not include structures used in drainage and irrigation systems primarily for water control. Its purpose is to prevent the formation or advancement of gullies and reduce environmental and pollution hazards. These structures apply where the concentration and flow velocity of water are such that structures are required to stabilize the grade in channels or to control gully erosion. Special attention will be given to maintaining or improving habitat for fish and wildlife where applicable.

Diversion

This practice is sometimes referred to as a diversion terrace. It is a channel with a supporting ridge on the lower side constructed across the slope. The purpose is to divert water from areas, where it is in excess, to sites where it can be used or disposed of safely. It is used where: (1) Runoff from higher lying areas is damaging cropland, pastureland, farmsteads, or conservation practices such as terraces or strip cropping; (2) Surface and shallow subsurface flow is damaging sloping upland; (3) Runoff is available for diversion and use on nearby sites; and (4) Required as a part of a pollution abatement system or to control erosion and runoff of urban or developing areas and construction sites.

Diversions will not be substituted for terraces on land requiring terraces for erosion control. Usually diversions are not constructed below high sediment producing areas unless land treatment practices or structural measures (designed to prevent damaging accumulation of sediment in the channels) are installed concurrently or before the diversion.

Pasture and Hayland Management

This practice is defined as proper treatment and use of pastureland or hayland. The purpose of this practice is to prolong the life of desirable forage species, maintain or improve the quality and quantity of forage, protect the soil, and reduce water loss.

Pasture and Hayland Planting

This practice is establishing and re-establishing long-term stands of adapted species of perennial, biennial, or reseeding forage plants. It includes pasture and hayland renovation but does not include grass waterway or outlet on cropland. Its purpose is to reduce erosion, produce high quality forage, and adjust land use. It is applicable on existing pasture and hayland or on land that is converted from other uses.

Pond

This is defined as a water impoundment made by constructing a dam or embankment or by excavating a pit or dugout. Ponds are constructed to provide water for livestock, fish and wildlife, recreation, fire control, crop and orchard spraying, and other related uses. In this project the ponds constructed will be located in predominantly rural or agricultural areas where failure of the structures would not result in the loss of lives; damage to homes, commercial or industrial buildings, main highways or railroads; or in interruption of the use or service of public utilities. Generally, the distance between the lowest point of the natural ground along the centerline of the dam and the crest of the emergency spillway will not exceed 20 feet. Technical assistance by Soil Conservation Service personnel will be furnished to landowners to assure: (1) that site conditions, drainage area, and topography or soil of the site will permit water storage at a depth and volume that will insure a dependable water supply; (2) that the foundation for the dam is adequate; and (3) that in the reservoir area the soil is impervious enough to prevent excessive seepage losses or can be sealed.

Drainage Land Grading

This practice is reshaping the surface of land to be drained by grading to planned grades. It requires a detailed engineering survey and

layout. It does not include irrigation land leveling or recreation land grading and shaping. The purpose of this practice is to improve surface drainage, provide more effective utilization of rainfall, improve equipment operation and efficiency, facilitate the installation of a more workable drainage system, and reduce the incidence of mosquito infestation.

This practice applies on land where depressions, mounds, old terraces, turnrows and other surface irregularities prevent adequate surface drainage and where precision grading is practical.

Soil shall be of sufficient depth and suitable texture so that after the needed grading work is done an adequate root zone remains. This will permit planned land use with the application of proper conservation measures, soil amendments, and fertilizer as needed.

Drainage Field Ditch

This practice is defined as a graded ditch used to collect excess water in a field. This does not include drainage main or lateral, or grassed waterway or outlet. Its purpose is to drain surface depressions; collect or intercept excess surface water, such as sheet flow from natural and graded land surfaces or channel flow from furrows, for removal to an outlet; and collect or intercept excess subsurface water for removal to an outlet.

It is used on flat lands that have soils of low permeability or shallowness over barriers (such as rock or clay which hold or prevent ready percolation of water to a deep stratum), areas that have insufficient land slope for ready movement of excess runoff, and areas that require removal of excess irrigation water or control of the ground water table. It is necessary that this practice have adequate outlets available for disposal of drainage water by gravity flow or by pumping.

The following multiple use program has been developed from a study and reappraisal of the forest land situation, including current conditions; problems; and needs. This program was developed by the Missouri Department of Conservation's Division of Forestry and the U.S. Forest Service:

1. Tree Planting (50 acres - open land) Reforestation of appropriate open lands in private ownership is necessary to adjust land use to its capability, reduce storm runoff and soil erosion, and provide filter strips by developing a protective cover and an absorbent forest floor of litter and humus. Benefits will also accrue to wildlife.

2. Hydrologic Cultural Operations (240 acres - forest land) The objective of these silvicultural operations is to improve the hydrologic conditions of private forest lands by manipulation of stand composition. This will create favorable conditions for maximum production and protection of litter, humus forest cover, and wildlife. They include thinnings, weedings, improvement, salvage, intermediate and harvest cuttings, and supplemental plantings.
3. Protection from Grazing (65 acres - forest land - 5 miles of fence) The fencing out of domestic livestock prevents damage to the hydrologic conditions of forest land by reducing soil compaction and damage to tree roots, seedlings, and other ground cover. Preventing this damage allows a litter and humus layer to build up to a desirable level, thus providing optimum conditions for good infiltration and storage of water in the soil profile.
4. Skid Trail and Logging Road Erosion Control (35 acres - .9 mile) This measure will reduce runoff, erosion, and sedimentation by diverting water from eroding skid trails and logging roads. Simple waterbars (ditches with poles or earthen diversions), spaced at specified intervals, are the usual means used to slow and divert water. Ground cover will be established to reduce erosion and benefit wildlife.

To provide for the proper installation and maintenance of approved measures, individual multiple use management plans will be prepared for approximately 200 acres involving 10 forest landowners. This service, coupled with other technical assistance to landowners, insures that watershed values are not damaged or destroyed.

The accelerated application and continued maintenance of land treatment measures are important. Without them, the installation of other work plan features would not produce the expected benefits.

2. Structural Measures

The original work plan was formulated with 6 floodwater retarding structures, 2 multiple-purpose structures, 14 grade stabilization structures, and 7.45 miles of channel improvement. Four of the floodwater retarding structures and nine grade stabilization structures have been built. (A-1, A-2, A-3, F-2, A-20, A-21, A-24, A-26, A-27, E-21, E-24, E-26, and F-21).

The revised plan calls for 11 floodwater retarding structures (includes 4 built), 1 multiple-purpose structure, 10 grade stabilization structures (includes 9 built), and no channel improvement. The structures to be built in the revised work plan are floodwater retarding structures A-4, C-1, D-1, E-7, E-29, F-1, F-3, stabilization structure E-25a; and multiple-purpose structure B-1.

All structures are designed for a 50-year life and consist of an earth-fill dam with a principal spillway and a vegetated emergency spillway. All principal spillways are on yielding foundations. Depths to bedrock will range from 10 to 30 feet in the flood plain. Core trenches of moderate depths will bottom on bedrock or in a CL material. All structures in this revision are planned with concrete conduit principal spillways except stabilization structure E-25a, which will have a corrugated metal pipe principal spillway.

All structures are planned with a drawdown facility to drain the impoundment as needed. This device will permit drainage of the construction site and borrow areas during construction and control of water levels for maintenance and repairs. Incidental use will include regulation of water levels for aquatic weed control and plantings for wildlife.

Structure locations are shown on the project map. Typical sections of a flood water retarding structure are shown in the schematic drawing (figure 1). The three smaller single-purpose floodwater retarding structures will range in height from 27 to 31 feet, with sediment pools 6 to 13 acres in size and retarding pools 15 to 48 acres. The four remaining single-purpose structures will range in height from 35 to 47 feet. Sediment pools for these will range from 25 to 52 acres and retarding pools will range from 78 to 227 acres. The dam for multiple-purpose structure B-1 will be 60 feet high. The water supply pool will have a surface area of 360 acres and the flood detention pool will inundate 635 acres when full. Sediment pools in the seven floodwater retarding structures and one stabilization structure, and the permanent pool in multiple-purpose structure B-1 will initially add 532 surface acres of water to the area. The surface area of these reservoirs will gradually diminish in size as the pools accumulate sediment during the life of the project.

Emergency spillways of structures D-1 and F-1 will operate approximately two times and emergency spillways of structures A-4, C-1, E-7, E-29, and F-3 will operate approximately four times in a 100-year period. Sufficient detention storage is available to permit use of vegetated emergency spillways.

The flood water retarding structures, including those already built, those planned in this revision, and multiple-purpose structure B-1, will have a total floodwater detention capacity of 13,767 acre feet. Total drainage area controlled will be 57.38 square miles, which is 46 percent of the total watershed. This area includes East Branch of South Fork of Blackwater, a pilot watershed which is included in the drainage area of multiple-purpose structure B-1. Floodwater detention capacity of the four floodwater retarding structures already built is 940 acre feet. These structures control 7.2 square miles or 5.8 percent of the watershed. Geologic and soil conditions at structure sites appear satisfactory. Sufficient and suitable borrow material is available. Sediment storage was determined on the basis of a 50-year accumulation for all structures except B-1, which is based on a 100-year accumulation. The requirements as computed are considered adequate for final design purposes.

Multiple-purpose structure B-1 is planned for a 50-year life. It will be an earthfill dam with a reinforced concrete principal spillway riser and a reinforced concrete culvert through the dam. A vegetated earth emergency spillway is planned. The structure is designed to temporarily store 6,600 acre feet of floodwater, which is equivalent to 5.73 inches of runoff from the 21.58 square miles of drainage area above the structure. The frequency of emergency spillway operation is twice in a 100-year period. Sediment storage of 905 acre feet is planned for a 100-year life accumulation. In addition to sediment and floodwater, the structure will include storage for municipal water supply and recreational development. The normal surface area of this reservoir will be about 360 acres. Surface area of the recreation pool is 270 acres.

Recreation development of this project is planned for installation in two phases. The first phase will include all access roads and the water main for both phases. The balance of the development will include 65 picnic tables and grills, a boat launching ramp, parking area for 130 cars, hiking trails, areas for camping and picnicking, drinking fountains with hydrants, vault toilets, trash disposal facilities and access roads. These facilities are designed to accommodate 520 people at any one time for picnicking, camping, boating, fishing and hiking.

The second phase of recreation development will be installed not later than 10 years after the first development. This development, which will add a capacity for 720 more people and provide facilities for an additional 45,360 days of visitation, will include 180 parking spaces; 100 picnic tables; 8 shelter houses; 20 camp sites and 2 group camp areas, all with water; vault toilets; and trash disposal facilities. All facilities in which federal cost sharing is involved will be designed and constructed to assure accessibility and usability by physically handicapped people.

Land rights for the multiple-purpose structure will include approximately 90 acres for water supply and 1,056 acres for recreation facilities and structure B-1. The 1,146 acres will be purchased in fee simple title. Flood easements will be acquired on an additional 250 acres. This 250 acres will include approximately 3 acres of permanent pool in the north end of the reservoir isolated from the rest of the pool by a county road. A barrier will be placed across the channel at the road to prevent unauthorized access to the reservoir from above the county road.

Alterations of existing facilities for structure B-1 are: (1) moving powerline along road at dam location to below the dam; (2) closing of approximately 1-1/2 miles of county road between section 8 and 9, and sections 16 and 17, T46N, R28W; and (3) moving powerline between sections 8 and 9, and sections 16 and 17, T46N, R28W.

Relocations that will result from the acquisition of land rights will involve only multiple-purpose structure B-1. The estimated displacements involve 6 farm operations, which include 5 dwellings and 14 occupants. Two dwellings are occupied by tenants and three are occupied by farm owners. One farm operation is a grade A dairy operation while the balance are general farm grain and livestock operations.

The land required for dams, emergency spillways, and sediment and water supply pools is in private ownership except for county roads. Present land use is 244 acres in cropland, 112 acres pasture, and 198 acres forest. The 22 acres required for dams and spillways will be returned to grassland after construction. Quality of habitat is rated as 7 on a scale of 1 to 10. Mitigation for loss of wildlife cover is planned on approximately 330 acres adjacent to the north part of the B-1 reservoir site. Twenty-two, 37, 88, and 101 acres of this 330 acres will be affected by storage for 2, 5, 50, and 100-year storm frequencies respectively. The wildlife management plan, developed jointly by the sponsors, the Missouri Department of Conservation and the Soil Conservation Service, specifies trees and shrub plantings, brush piles, disked strips, and preservation of 1/2 mile of osageorange hedgerow. Useful trees, shrubs, and herbaceous plants will be planted. Woodland thinnings and clearings and selected disturbed areas will be used. Fire trails and roads will be constructed and edges planted to enhance vegetative variety. This area will be managed for wildlife for the life of the project. With special management, this area is expected to offset approximately 532 acres of the losses of wildlife cover sustained in the project. These lands are set aside primarily for mitigation. Only those recreation pursuits that are compatible with this purpose will be allowed.

Construction methods will be selected to minimize erosion and reduce sedimentation. Sediment basins, diversions, and selective borrowing will be used to control sediment. All disturbed areas will be disked, fertilized, seeded and mulched. Grasses to be used for revegetation of disturbed areas include fescue, reed canary grass, crown vetch,

switch grass, red top, and brome grass. Only minimal clearing will be required in the pool area of the grade stabilization structure. Some merchantable wood products are present on the 198 acres of forest land which will be cleared. Prior to construction landowners will be urged to market these products. After construction begins, the contractor will control the marketing of these products. All other vegetation will be disposed of in accordance with state law. Borrow areas will be graded for drainage, if they are not located within sediment pool areas.

Investigations indicate that installation of the project will not encroach on any known archeological values or historical sites. If artifacts or other items of archeological or historical significance are uncovered before and during construction, the Missouri State Liaison Officer and the National Park Service will be notified. Should detailed investigation, salvage, or mitigation be necessary, appropriate arrangements will be made between the sponsors, Soil Conservation Service, and the Department of the Interior, National Park Service. Provisions of the Reservoir Salvage Act will be followed.

No known populations of rare or endangered species of plants or animals listed on pages 17 and 18 will be affected by this project. Nature trails and facilities for the handicapped will be installed as part of the recreation measures. Recreational use in the wildlife management area will be limited to activities that will not compromise the primary wildlife purposes for the area. No intensive recreational use, such as development of camping or picnicking facilities will be allowed in this area.

Ponds to be inundated by the pool of structure B-1 will be treated and stocked with suitable species of fish. These fish will then be available for release to the major reservoir. The city of Holden will request assistance of the Missouri Department of Conservation in managing the reservoir and mitigation area.

Land Use Changes

Except for the land required for dams, emergency spillways, and reservoir pools, land use changes are those expected as a result of a continuation of the present trend of developing homesites on small acreages in parts of the watershed. Land use changes from cropland to grassland or forest land, or changes of grassland or forest land to cropland, are not expected.

3. Operation and Maintenance

Maintenance of land treatment measures will be the responsibility of the Soil and Water Conservation District of Johnson County. The district will develop a cooperative agreement with individual landowners for the maintenance of land treatment measures on individual farms. These measures will be installed with technical assistance from the Soil Conservation Service.

Installed forest land treatment measures will be maintained by the landowners with technical assistance furnished by the Missouri Department of Conservation, Division of Forestry, in cooperation with the U. S. Forest Service undergoing cooperative forestry programs.

The responsibility for operation and maintenance of single-purpose floodwater retarding structures and grade stabilization structures, identified as structural measures, will be assumed by South Fork of Blackwater River Watershed Subdistrict. Funds for paying maintenance cost will be obtained from taxes levied in the subdistrict. The operation and maintenance work will consist of such items as repairing all damage to structural embankments and spillways where necessary to control weeds, and removing debris from permanent pools.

Multiple-purpose structure B-1, including the intake tower, raw waterline, and recreational facilities, will be operated and maintained by the city of Holden. Funds for paying operation and maintenance costs will be provided from water department revenues and use fees for the recreational development. The operation and maintenance work for B-1 will consist of: (1) repairing all damage to the structural embankment, principal and emergency spillways, intake tower and raw waterline; (2) mowing embankments and spillways where necessary to control weeds; and (3) removing debris from the permanent pool.

Operation and maintenance of the recreational facilities and wildlife management area will include such items as labor, utilities, insurance, maintenance supplies, pumping out toilets, disease vector control, and repair or replacement of facilities. The estimated intervals for items needing periodic replacement are as follows: (1) trash can supports - 3 years; (2) road and parking lot repairs - 15 years; (3) signs, playground equipment, picnic tables and grills - 12 years; (4) picnic shelterhouses - 20 years; and (5) drinking fountains, hydrants, water mains and toilets - 15 years.

The city of Holden expects to charge admission or use fees sufficient to produce revenues needed to amortize their initial investment and to provide adequate operation and maintenance for the recreational development. Where private concessionaires are involved, the city will establish a schedule of maximum admission or use fees which may be charged to yield a reasonable profit to the concessionaire. The schedules of admission and use fees, together with other requirements for operation and maintenance of the recreational facilities, will be mutually agreed to by the city of Holden and the Soil Conservation Service and set forth in the operation and maintenance agreement.

The storage allocated to municipal and industrial water, including estimated allowances for evaporation and seepage, is 2,566 acre feet. The normal operating range for this purpose is from elevation 802.5 with a surface area of 360 acres, to elevation 794.6 with a surface area of 270 acres. The minimum elevation that municipal and industrial water may be drawn down to is 794.6. The allocation of water between Holden and the Water Resources Board is based on the proportion of

capacity that each is financing. Holden's share will be 59.1 percent and the Water Resources Board's share will be 40.9 percent. Water available in any one year may be more or less than capacity, depending on rainfall and losses through evaporation and seepage. The available water will be shared by Holden and the Missouri Water Resources Board.

Capacity provided for recreational uses is 1,899 acre feet, including evaporation and seepage losses. Elevation of the recreational pool is 794.6 with a surface area of 270 acres and elevation at the top of the 100-year sediment pool is 785.8 with a surface area of 160 acres.

Whenever the reservoir is operated below the specified ranges for municipal and industrial water supply, the city of Holden will notify the Soil Conservation Service through the state conservationist, and help determine whether there is a continuing need for use of the recreational storage for municipal or industrial purposes. The city of Holden will reimburse the federal government for all PL-566 funds used for public recreation costs associated with the reservoir (construction, engineering services, land and recreational facilities).

The city of Holden will operate and maintain the B-1 reservoir and related recreational development according to requirements of the Missouri Division of Health for water supply reservoirs.

The Soil Conservation Service and the sponsors will make a joint inspection annually after each severe flood and after the occurrence of any other unusual conditions which might adversely affect the structural measures. These inspections will continue for 3 years following the installation of each structure. Inspections after the third year will be made annually by the sponsors.

The inspection of the structural measures will include the condition of the principal spillways and appurtenances, the emergency spillways, vegetative measures, and other items installed as a part of the structures. The inspection of the recreation development will include the condition of recreational facilities and vegetative measures installed as a part of the project. Mitigation measures installed as part of the project will be included in each inspection. All maintenance and repair work needed for structures and mitigation measures will be carried out by the sponsors.

The sponsors will execute specific maintenance agreements prior to the issuance of invitations to bid on the construction of the structural measures.

4. Project Costs

Project installation costs are summarized in the following tabulation:

	Estimated Cost Dollars		
	PL-566	Other	Total
Land treatment	636,100	481,600	1,117,700
Structural measures <u>1/</u>	<u>2,377,562</u>	<u>1,780,542</u>	<u>4,158,104</u>
Total Project	3,013,662	2,262,142	5,275,804

Project construction cost estimates are as follows: 2/

	Estimated Cost Dollars		
	PL-566	Other	Total
	1,419,913	807,995	2,227,908

E. ENVIRONMENTAL SETTING

1. Physical Resources

The South Fork of Blackwater River is located in northwest Johnson County, west central Missouri. It is a headwater tributary of the Blackwater-Lamine River Basin of the lower Missouri River Region. The South Fork begins in the extreme northern part of the watershed, approximately 3 miles north of U. S. Highway 50. It flows southerly to the middle of the watershed, then northeasterly to the project boundary at the confluence of North and South Forks. The watershed contains 78,579 acres, or approximately 122 square miles. Included in the area is a pilot watershed project on the East Branch of the South Fork of the Blackwater River. There are approximately 14,000 acres or 22 square miles in the pilot project--a small portion of which is included in the 65,579-acre South Fork Watershed Project.

The drainage pattern is dendritic and well defined. Numerous gullies extend from the valley floor to the upland and vary from 5 to 25 feet deep. Flood plain width ranges from 1,000 feet to 3,300 feet. The natural stream channels are flat, shallow, and meandering. They overflow frequently, and drain long, narrow subwatersheds.

1/ Includes costs for structural measures already built (four flood-water retarding structures and nine grade stabilization structures, \$303,440) and seven floodwater retarding structures, one grade stabilization structure, and one multiple-purpose structure with recreational facilities to be built, \$3,397,179.

2/ Construction costs are a part of total installation costs. (Construction costs of structure built = \$241,190; of structures to be built = \$1,986,718).

Environmental Setting

Local people straightened approximately 6 miles of the main channel in the early 1900's. The channel degraded and enlarged from its original constructed size. All laterals and tributaries are degraded or eroding. In the straightened section, the channel is relatively straight and 30 to 40 feet deep.

The topography is moderately to steeply rolling. Slopes generally range from 3 to 10 percent, with a few areas up to 30 percent. The highest point in the watershed is 1071 feet msl (mean sea level) elevation near the Johnson-Lafayette County line. The elevation of the channel at the project lower boundary is 700 msl.

The watershed is within Land Resource Area 112, the Cherokee Prairies. 1/ The soils are derived from loess, limestone, sandstone, shale residuum, and alluvium. Grundy and Menden soils occur on the gently sloping broad ridges. They were developed under grass-type vegetation and are moderately well to somewhat poorly drained. Polo soils occur on more narrow ridges above limestone bedrock and were developed under a mixed vegetation of grass and trees. Sampsel and Mandeville soils were developed under mixed grass-forest vegetation. Blackoar, Colo, and Humeston soils occur on nearly level bottom land areas. These soils were developed under mixed grass and forest vegetation. They have moderate to high natural fertility and respond to good management.

The watershed geology is represented by Pennsylvania sedimentary formations characterized by sandstone, shale, limestone, and coal. Bedrock is represented by the Upper Des Moines formations of Marmaton and Cherokee in the lower part of the watershed and the lower Missouri series formations of Pleasanton and Kansas City in the upper.

The mineral resources include limestone and coal. A stone quarry and a coal mine are present; however, these were small operations and are now inactive or abandoned. Johnson County contains 528,640 acres and it is estimated that the coal reserves of the county contain 335 million short tons. Coal is available from the Croeburg and Tebo formations at depths ranging from 114 to 460 feet and sulfur content ranging from 4 to 6 percent. None of the coal can be mined economically by using present mining methods. 2/

The climate of the area is subhumid. The average annual precipitation is approximately 36.92 inches. Average annual runoff is approximately 8 inches.

1/ Morris E. Austin, "Land Resource Regions and Major Land Resource Areas", U. S. Department of Agriculture Handbook 296, 1965.

2/ Charles E. Robertson, "Evaluation of Missouri's Coal Resources" Report of Investigations No. 48, Missouri Geological Survey and Water Resources, 1971.

Environmental Setting

The typical storm that produces flooding is a 1-year frequency, approximately 2.70 inches of rain in 24 hours.

Other climatic information is as follows: 1/

Mean annual temperature	55.0 ⁰
Maximum temperature	115.0 ⁰
Minimum temperature	-26.0 ⁰
Last killing frost in spring (avg.)	April 12
First killing frost in fall (avg.)	October 20
Length of growing season	191 days
Average annual precipitation	36.92"

Distribution of precipitation is as follows: 1/

<u>Season</u>	<u>Months</u>	<u>Precipitation Inches</u>
Spring	March, April, May	10.69
Summer	June, July, August	12.00
Fall	September, October, November	9.42
Winter	December, January, February	4.81

The watershed is predominantly a rural area. Based on the 1970 census, Holden, with a population of 2,089, is the largest city and is the trade center for the area. Holden is approximately 30 miles southeast of Kansas City. Other towns in the watershed are Kingsville, population 284, and Pittsville, population 65. Warrensburg with a population of 13,125 is near the eastern watershed boundary.

Total land use for the watershed is: cropland, 60 percent; pasture, 21 percent; forest, 8 percent; and other, 11 percent. Land use in the bottom land is approximately 75 percent cropland, 12 percent pasture, and 6 percent forest land, with the balance in other uses. Bottom land capability subclasses are I or IIw. 2/

Wetlands, as defined in Department of Interior Circular C-39, exist as a few oxbow situations along the old stream regimes. Flooding of the agricultural lands in the flood plain is not important to wetland wildlife.

Classification of streams in the watershed is as follows: 6 miles of modified channel with intermittent flow (Reaches VI, IX, XI & XIII); 6 miles of natural channel with intermittent flow (Reaches II, IV, V,

1/ Data from United States Weather Bureau Station, Warrensburg, Missouri.

2/ See definition of capability classes in Appendix C.

Environmental Setting

VII, VIII and the lower portion of I and III); and 70 miles of natural channel with ephemeral flow (all other channels). Other bodies of water are the two Holden municipal water supply lakes with an approximate surface area of 12 and 13 acres, respectively, and a combined storage of 128 acre-feet.

The 21 structures constructed in the pilot watershed, East Branch of South Fork of Blackwater River, control 31 percent of the drainage area of structure B-1. The pilot structures trap sediment and associated pollutants and improve water quality within the structure B-1 watershed.

Water quality standards established by the Missouri Clean Water Commission are listed in Appendix B. Water quality analysis for the Blackwater River at Nelson, which is located approximately 50 miles downstream from this project, are also shown. The analysis records for the Nelson sampling station for a 4-year period, July 1968 to October 1972, with samples two to four times a year, show that the stream meets state water quality standards for all items. The B-1 multiple-purpose structure is located on an intermittent tributary of the South Fork of Blackwater River about 10 miles above the watershed outlet, or 60 miles above the sampling station at Nelson. The drainage area above this site is in agricultural use. There are no large, confined livestock feeding yards in the area above this site. The present livestock is dispersed in pastures and associated with the scattered farmsteads. The professional engineer assisting Holden on water supply needs, Mr. Mark B. Layne, of Layne-Riddle Engineers, Inc., Higginsville, Missouri, made the following statement in reply to an inquiry regarding the expected water quality at the B-1 site: "We have reservoirs which we estimate would have similar runoff in the reservoirs at Higginsville on Johnson Creek; Concordia on Peavine Creek; and at Odessa on East Fork of the Sni-A-Bar River; and runoff, in our opinion, would contain the same factors as in the Blackwater Watershed near Holden. There is no difficulty in meeting federal water quality standards at these installations, and we foresee none would be encountered in the area near Holden."

Water quality surveys will be made during the year prior to construction. These surveys will determine if abnormal impurities are present.

Holden is served by a sanitary sewer system with treatment at a city-owned plant. Approximately 20 percent of the city residents rely on septic tanks. Kingsville uses a single cell lagoon for sewage treatment. Plans have been prepared for comprehensive additions to the latter sewer system. These plans include extensions of existing lines, a lift station, and a secondary cell for the lagoon.

There are no significant areas of state or federal land. Principal highways are U. S. Highway 50, Missouri Highway 131 and 58; and a network of state and county secondary roads. These roads are an essential part of the economy. Rural residents rely on them for timely marketing of farm products and for commuting to work.

2. Plant and Animal Resources (Flora and Fauna)

The watershed area lies within the north central part of the West Prairie Zoogeographic region of west and southwest Missouri. Formerly this area was predominantly tall grass prairie interspersed with fingers of woody vegetation along the stream systems. Woody vegetation comprised 25 to 30 percent of the native vegetation. Only a few tracts of native prairie remain.

The existing interspersion of woodland, tame pastures, cropland, and idle fields provide good habitat conditions for farm game species of quail, rabbit, and mourning dove. Good furbearer populations of raccoon, fox, coyote, and skunk are present. Fair populations of deer and squirrel are supported by the existing woodlands. Waterfowl are limited to migratory uses of farm ponds or grain fields. Few ducks and geese are hunted.

Nongame animals present are characteristic of the above described conditions. Known or possibly occurring, rare or endangered plant and animal species are as follows: 1/

ANIMALS

COMMON NAME

Mammals

<u>Mustela frenata</u> Lichtenstein	Long-tailed weasel	Rare
<u>Perognathus flavescens</u> (Merriam)	Plains pocket mouse	Rare
<u>Lepus californicus</u> Gray	Black-tailed jack rabbit	Rare

Birds

<u>Bartramia longicauda</u> (Bechstein)	Upland plover	Endangered
<u>Tyrannus verticalis</u> Say	Western kingbird	Rare
<u>Tympanuchus cupido</u> (Linnaeus)	Greater prairie chicken	Endangered

PLANTS

Only species or varieties that are known from Johnson County or the two adjoining counties are listed. Species of unknown status have not been included.

1/ Unpublished manuscrope, produced by USDA - Soil Conservation Service, and Missouri Department of Conservation, 1972.

Environmental Setting

Bryophytes

Nolothylas orbicularis (Schwein.) Sull. Endangered

Angiosperms

Typhaceae

Typha angustifolia L. Narrow-leaved cat-tail Rare

Juncaeeae

Junus balticus Willd. Baltic-rush Rare
 Var. littoralis Engelm.

Polygonaceae

Polygonum bicornne Raf. Knotweed, smartweed Rare

Nyctaginaceae

Mirabilis linearis (Pursh) Heimerl Four-o'clock Rare

Lamiaceae (Labiatae)

Lyropus asper Greene Bugleweed Rare

Asteraceae (Compositae)

Xanthium speciosum Kearney Rare

Agoseris cuspidata (Pursh) Raf. Rare

There are no large lakes or reservoirs in the watershed. Five hundred and sixty-six farm ponds have been constructed. One hundred and sixty-two surface acres of water have been created by the construction of 13 stabilization and floodwater retarding structures as authorized in the original work plan. A significant number of these waters have been stocked by the Missouri Department of Conservation. These impoundments provide most of the local fishing.

Tributary streams in the project do not support a stable fishery. The deeper pools in South Fork of Blackwater River support some populations of bullheads, channel catfish, various sunfish, carp, and minor species mostly of the minnow family.

3. Economic Resources

For many years the economy of the Show-Me Regional Planning Area, (which includes Lafayette, Pettis, and Johnson Counties), has been based on agriculture. During the past 30 years there has been a state-wide trend toward farms of larger acreages. In Johnson County, however, the average farm size is declining and, at present is approximately the same as the state average. The average value of farmland has nearly doubled during the past 10 years.

Between 1940 and 1950 the population of Johnson County decreased 4.2 percent. The population increased 39.9 percent between 1950 and 1960 and 17.9 percent between 1960 and 1970. There has been a constant increase in the proportionate amount of the population dwelling in the unincorporated areas. These trends point to the urban growth of the area. The proximity of Johnson County to the metropolitan Kansas City area and the existing Highway 50 are factors which favor the growth of the area. With the increased influx of new residents, the dependence within the region on agricultural and forest products will diminish over the coming decades. While agriculture is still the principal supporting base of the area's economy, it is predicted that increases in manufacturing, construction, and wholesale and retail trade will soon surpass agricultural products in relative importance. The number of persons employed in agriculture has dropped sharply in recent years, with increased employment in other sectors of the area's economy. At present there are approximately 410 farms within the watershed. The average-size farm is about 160 acres, with about 90 percent owner-operated. Approximately one-half of the landowners work off the farm in Warrensburg, Holden, Kingsville, or in the Kansas City area. Most of the full-time farms are family-oriented enterprises. Less than 4 percent employ more than one and one-half man-years of hired labor. Diversified or mixed livestock products account for approximately 77 percent of all farm income. The area has had a considerable number of dairy farms but the number has declined in recent years. Major crops grown are corn, soybeans, wheat, and hay. Most of the feed grains produced are marketed through livestock. The average gross farm income is \$9,450. Upland agricultural land prices range from \$500 to \$750 per acre. Urban growth from the Kansas City Metropolitan Area has exerted an upward influence on land prices in recent years. Some sales are reported as high as \$1,000 per acre for small acreages, particularly along major highways.

Population within a 50-mile radius of Holden is 765,000. A population of 46,500 resides within a 25-mile radius. The proximity of the Show-Me Region to the eastern fringe of the metropolitan Kansas City area is responsible for the influx of new residents and businesses. With the improved highway network and quality of roads, this trend is expected to continue to increase at a progressively higher rate. Areas which indicate future economic development are the non-metallic mining industry and various service-oriented industries.

4. Recreation Resources

Recreation facilities in the watershed are largely dependent upon small impoundments and farm ponds. Recreation facilities within a 30-mile radius having public access are Knob Noster State Park, Lake Latawana, Lake Jacomo and the James A. Reed Wildlife Area.

Knob Noster Park contains 3,441 acres. It is heavily wooded, has many miles of nature trails for hiking and nature study, small lakes for fishing and swimming, and other facilities for picnicking and camping.

Lake Latawana, a private development, is located adjacent to Kansas City and is fully developed for fishing, camping, and swimming.

Lake Jacomo and Prairie Lee Lake, have a combined surface area of 1,124 acres. They are owned and operated by Jackson County and are located in the metropolitan Kansas City area. Lake Jacomo has facilities for sailboats and fishing boats. Prairie Lee Lake is for power boating and water skiing.

The Lake of the Ozarks located about 100 miles southeast, is highly commercialized and developed with public access points at various places. A state park is also located near Bagnell Dam on the Lake.

The Harry S. Truman Dam and Reservoir is under construction on the Osage River approximately 45 miles southeast of Holden. It is expected that completion and recreational development of this reservoir will provide a major opportunity for recreation.

The James A. Reed Wildlife Area, operated by the Missouri Department of Conservation, is located near the southeastern corner of metropolitan Kansas City. The facilities in this area include a fishing lake, recreation and picnic areas, and areas for small game hunting.

5. Archeological and Historical Resources

Little systematic archeological survey or reconnaissance has been accomplished in the area. Numerous archeological sites are known and recorded but it is expected that many remain to be discovered and recorded. Most of the known sites occur along the banks, on terraces of the water drainages, and on the tops of hills and bluffs bordering the streams. 1/

The state historic preservation officer was contacted regarding the location of historic places. No historic or archeological sites listed in the National Register of Historic Places have been identified in

1/ A Review of the Archeological Resources in the Blackwater-Lamine River Basin, D. R. Evans, 1974.

the watershed. There are no other known areas of archeological or historical value or that have unique scenic attraction within the construction area of the project.

6. Soil, Water and Plant Management Status

The watershed is served by the Soil Conservation Service field office at Warrensburg, Missouri. This office provides technical assistance to the Soil and Water Conservation District of Johnson County. There are 318 cooperators' agreements with the soil and water conservation district. These represent approximately 85 percent of the watershed area. Of these cooperators, 278 have developed resource conservation plans which represent 71 percent of the watershed area. Practices applied are as follows:

<u>Treatment Measure</u>	<u>Unit</u>	<u>Amount Applied as of July 1972</u>
Waterways	AC	330
Terraces	MI	424
Grade Stabilization Structures	NO	86
Diversions	MI	24
Drainage Ditches	MI	30
Ponds	NO	566
Pasture and Hayland Management	AC	10,110
Pasture and Hayland Planting	AC	5,800
Tile Drain	FT	24,140
Tree Planting	AC	39
Hydrologic Cultural OPN	AC	127
Grazing Control (Forest Land)	AC	378

Present land use studies indicate that 59 percent of the upland is cropland. Approximately 34 percent of this area is protected from erosion by mechanical practices. An additional 20 percent of the upland cropland requires no mechanical practices for protection. Upland land capability classes range from IIe to VIe. 1/ Slope gradients range from 3 to 10 percent. 2/ Approximately 22 percent of the upland is pasture and about 20 percent of this is poorly managed. Eight percent of the upland is in forest cover, which is generally in poor hydrologic condition due to fires, grazing, and lack of proper management. The remaining 11 percent is in other uses.

Present forest stands occupying the watershed area are evenly divided between the oak and oak-hickory types. A trend toward developing walnut orchards is emerging. Existing stands vary from sapling to

1/ See Appendix C

2/ Unpublished conservation plans and soil survey maps prepared by USDA, Soil Conservation Service, Missouri.

Environmental Setting

pole in size, with relatively few stands of saw timber size, and range from poorly to moderately stocked. There are some sales of saw and veneer logs in the area, but the lumber market is relatively inactive. The forest land is all in private ownership.

Twenty-one small stabilization and sediment control dams were constructed as a part of the East Branch of the South Fork of the Blackwater River Pilot Watershed Project. Nineteen of these structures have provisions for temporary flood storage amounting to 844 acre-feet; two structures contain only stabilization features. The initial sediment storage provided in all structures was 598 acre-feet. This project was begun in 1954 and completed in 1960.

The original watershed work plan for this project was authorized for construction in July 1962. Four floodwater retarding structures and nine grade stabilization structures have been constructed to date. The initial surface area of the sediment pools in these 13 structures was 57 acres and the sediment storage capacity was 219 acre-feet. These structures give good flood protection in Reach I; however, their effects in other reaches are significantly reduced since they control only 5.8 percent of the watershed.

F. WATER AND RELATED LAND RESOURCE PROBLEMS

Projected population increases, potentials for increased industrial development, and continuing land and space competition make it important that resource problems be anticipated and that people have authorities to deal with them. Short and long-range comprehensive planning is needed to identify, protect, and enhance important values. Land use planning is needed especially for vulnerable areas such as the protected flood plain of this watershed project.

The problems described below are those remaining after installation of four floodwater retarding structures, nine grade stabilization structures and 50 percent of the needed land treatment:

1. Land and Water Management

Sheet erosion in the upland is excessive. Unwise land use and poor management are allowing the soil resource to deteriorate. Average yearly losses from sheet erosion (tons per acre per year) are:

Land Use

Cropland	11.7
Idle	2.7
Pastureland	2.7
Forest Land	1.3
Other	2.0
Average Total Sheet Erosion	7.5
Total Watershed Erosion	10.0

Approximately 46 percent of the upland cropland needs protection from erosion and approximately 20 percent of the upland pasture is poorly managed. In some cases, pasturelands need diversion terraces, grade stabilization structures, and waterways for gully control. The upland forest cover is generally in poor hydrologic condition due to fires, grazing, and the lack of proper management.

Sediment currently delivered to the mouth of the watershed is estimated to be 65,040 tons per year. This sediment is the principal carrier of chemicals, nutrients, and pathogenic bacteria that degrade water quality.

2. Floodwater Damage

Flooding is a major problem in the watershed affecting 4,584 acres. Average annual acres flooded total 2,719. Damages were evaluated on an additional 6,929 acres downstream from the project boundary (see figure 2). All or part of 104 farms are in the flood hazard area. Fifty-three farms located in the reaches studied downstream are subject to flood damage. Approximately 6.5 miles of roads and 25 bridges are in the flood hazard area. Floods have occurred during 14 of the last 15 years with four of these being of major significance. Ninety-two percent of the flooding occurs during the growing season. The most damaging flood of recent years occurred in 1965 when approximately 3,800 acres were flooded, causing an estimated damage of \$95,000. The frequency of recurrence for this flood is approximately 12 years. Other significant floods occurred in 1960, 1961, and 1967. Flood plain reaches used in the studies and their locations are shown on figure 2.

The most severe flooding exists in Reaches II, III, IV and VII. Flooding in these reaches may occur twice a year or more, but less frequently in the balance of the flood plain. As a result of the increased channel size due to degradation in Reaches VI, IX, and XI, flooding occurs at approximately a 5-year frequency. The reduced channel capacity in the Blackwater River below Missouri Highway 13 increases the floodwater problem in Reaches XIII and XIV.

Water and Related
Land Resource Problems

Total direct agricultural and nonagricultural damages were studied for floods up to and including the 100-year frequency. Average annual damages by category are as follows:

Crop and Pasture	\$64,940
Other Agricultural	15,163
Nonagricultural	<u>7,499</u>
TOTAL <u>1/</u>	\$87,602

Damages evaluated outside the project area in Reaches XI, XIII, and XIV are:

Crop and Pasture	\$129,580
Other Agricultural	11,410
Nonagricultural	<u>2,860</u>
TOTAL <u>1/</u>	\$143,850

Proper drainage in the flood plain is essential in order to realize full returns consistent with the potential productivity of the land. Most landowners are hesitant to apply the needed land treatment measures due to excessive maintenance cost caused by frequent flooding.

Mosquitoes and other disease vectors are most prevalent after each flood. People living in or traveling through the watershed are affected by floods which interrupt travel, restrict mail and school bus service, cause work delays, and other similar problems.

Three lives were lost on July 2, 1965, in a flash flood when two men and one child were drowned. This occurred 4 miles north of Holden near State Highway 131.

3. Erosion Damage

Flood plain erosion affects 9 percent of the flood plain. Scour channels are cut across the flood plain and numerous irregular areas are eroded 1 to 6 inches deep annually. Often, the area scoured one year may receive deposition the following year. Scour channels trap surface runoff. These scoured areas are farmable but crops planted in them are frequently drowned out.

Gullies are prevalent in this watershed. Unwise land use has resulted in increased runoff which has accelerated gully erosion. Sediment yield from roadsides and gullies is estimated to equal 15 percent of

1/ Average annual damages remaining with four floodwater retarding structures in original work plan installed.

the total sediment produced by sheet erosion. Upland cropland is being dissected and many land treatment structures are in jeopardy due to instability of downstream channels. The most recent cycle of gully erosion was initiated by the straightening of the main Blackwater River channel in the early 1900's. The shortening of this channel and the resulting higher velocities caused it to degrade and enlarge from its original constructed size of 30 ft. top width, 12 ft. depth, and 3 ft. bottom width to top widths of 70 to 210 ft., bottom widths from 25 to 75 ft., and depths of 15 to 35 ft. Erosion of the main channel has advanced to the lower reaches of tributaries which are in various stages of degradation. Some tributaries have reached a stable grade, some are stabilized by rock outcrops, and some have overfalls progressing upstream. The degradation of the main channel has advanced to a degree that precludes its use as an outlet for drainage ditches without expensive drop structures. Small field ditches that outlet into the main channel are creating large active gullies. The land-owners in the bottom land have been unable to control this kind of erosion and are reluctant to construct drainage ditches because of the lack of safe outlets. The cost of maintaining cables of the U.S. Air Force Missile Communications System is increased by gully erosion. Gullies in the upper reaches of most subwatersheds are deeply entrenched. These gullies have numerous side laterals that are cutting into productive land and causing extensive damage. Many terrace outlets for water management systems discharge into active gullies. These cannot be stabilized except by mechanical means.

Average annual erosion damages are summarized in the following tabulation:

Flood Plain Scour	\$12,923
Gullies <u>1/</u>	<u>1,410</u>
Subtotal	\$14,333
Flood Plain Scour	
Outside the Project <u>2/</u>	<u>7,170</u>
TOTAL <u>3/</u>	\$21,503

1/ Reflects only the evaluated areas in the project.

2/ Damages evaluated downstream in Reaches XI, XIII, and XIV. Unpublished flood plain damage survey data developed by USDA, Soil Conservation Service, Missouri.

3/ Average annual erosion damages remaining with four floodwater retarding structures in original plan installed.

4. Sediment Damage

Principal sediment damage is the burial of newly seeded or immature crops. Areas of alternate scour and deposition are prevalent on limited areas on the inundated flood plain, resulting in spotty stands and reduced crop yields. Field and road ditches receive sediment and debris from each overflow. Some road surfaces downstream of the watershed area receive sediment deposition from every flood. Areas affected by deposition of sediment are located in Reaches II, III, IV, VIII, IX (see reach map attached - Figure 2). The sediment yield at the mouth of the watershed is an estimated 85,273 tons annually. This adds to the sediment burden of the Missouri River. Sediment composed of fine sand and clay is damaging areas of the flood plain. The build up of natural levees is causing swamping on 31 acres of land in Reaches I and VIII (see reach map - Figure 2 - back of this statement).

Average annual sediment damages are summarized in the following tabulation:

Overbank deposition	\$1,837	66 Ac.
Swamping	<u>130</u>	<u>7</u> Ac.
Subtotal	\$1,967	73 Ac.
Overbank deposition		
Outside the Project <u>1/</u>	<u>9,608</u>	<u>585</u> Ac.
Total <u>2/</u>	\$11,575	658 Ac.

5. Municipal and Industrial Water Problems

Groundwater supplies are limited in the watershed. In the bedrock aquifers it is necessary to go to a depth of approximately 400 feet to obtain water. Average yields range from 1-15 gallons per minute. At greater depths only salty or sulfurous waters are present.

The city of Holden obtains its water supply from two reservoirs which have lost a major portion of their capacities by sediment accumulation. The present rate of accumulation is an estimated 3 acre-feet per year. The reservoirs have a capacity of approximately 128 acre-feet at the present time. These reservoirs are supplemented by a deep well, which was the only source of supply during the summer of 1963 when drought conditions reduced the reservoir supply to a few days use. This well has not been a dependable source of supply since 1965 when

1/ Damages evaluated downstream in Reaches XI, XIII, and XIV. Unpublished flood plain damage survey data developed by USDA, Soil Conservation Service, Missouri.

2/ Average annual sediment damages remaining with four floodwater retarding structures in original plan installed.

the water level dropped in excess of 40 feet. Present annual usage is approximately 218 acre-feet for a population of 2,089. Holden's needs for the year 2000 are estimated at 1,250 acre-feet annually.

The inadequate water supply has endangered the fire insurance rating in the city of Holden. Loss of the present rating could substantially increase fire insurance premiums.

Holden has potential for additional industrial and suburban residential development when an adequate and dependable water supply is available. Presently, industry is reluctant to locate in Holden because of the limited water supply.

Kingsville has an expected average demand of 125 acre-feet of water by the year 2000. A public water supply is also needed for the rural residents--most use shallow wells or cisterns which have limited capacity and are consequently depleted during drier years. Drilled wells have the same problem with mineralization as Holden and Kingsville. The rural water district would have a probable use by 500 families.

6. Recreation Problems

The demand for water-based recreation exceeds the facilities available locally and in nearby Kansas City. The sponsors and local civic groups are concerned with a lack of adequate water-based recreational facilities in the immediate area. Existing facilities are small city water supply reservoirs, farm ponds, and county lakes. Projections for population by the year 2000 are an increase from 46,500 to 78,600 in the area within a 25-mile radius of Holden, and from 765,000 to 1,292,000 persons within the 50-mile radius.

7. Plant and Animal Problems

Competition for land uses has resulted in wildlife habitat losses. The continuing development of roads, highways, missile sites, dams, and residential areas contribute to this problem. Hunting access and landowner-sportsman relationships is a perennial problem that will become more acute as competition for lands increase. The highest fishing pressure in the area is on artificial impoundments. The State of Missouri Outdoor Recreation Plan shows a need in Johnson County for an additional 1,513 acres of fishing waters in 1970 and 2,353 acres in 1980. Public hunting lands are needed (11,161 acres in 1970 and 15,580 acres in 1980).

8. Water Quality Problems

Holden's water supply problem is complicated by the high mineral content of the well water. Extensive treatment is required to make

Water and Related
Land Resource Problems

it suitable for use. The area around Holden is also in need of quality water. Kingsville, located 5 miles west, has a population of 225 with an expected increase to 500 by the year 2000, and has about the same water quality problem as Holden. Only two-thirds of Kingsville is presently connected to the municipal water system because the current water supply is of very low quality. Of the communities in the area, Kingsville has the greatest need for a dependable water supply. Problems of public health and possible contamination could arise because of the prevalent use of shallow wells.

IV. RELATIONSHIP TO LAND USE PLANS, POLICIES AND CONTROLS

There are no existing controls or land use policies for the area. Measures proposed by this plan are expected to be compatible with most which would be enacted in the future.

V. ENVIRONMENTAL IMPACT

The impacts which are discussed in this section are confined to those resulting from accelerated land treatment and from the installation of the remaining seven floodwater retarding structures, one grade stabilization structure and one multiple-purpose structure.

A. CONSERVATION LAND TREATMENT

Land treatment measures will reduce runoff, erosion, sedimentation, and conserve water. Hydrologic conditions will be improved in the woodland areas by installation of forest land treatment measures. The installation of minor structures and other features of the proposed land treatment, together with the installation of the one grade stabilization structural measure, will provide grade control for approximately 10,000 acres of eroding uplands. Proper management, protection from grazing, and continued fire protection will increase the resource productivity of the forest land and provide increased wildlife and recreation benefits. Long term effects of land treatment will be stabilization of the basic resource.

Land treatment to be completed during the project installation period will reduce watershed erosion as follows:

	<u>Without Project</u>	<u>With Project</u>	<u>% Reduction</u>
Average Total Sheet	7.5 tons/acre/year	3.8 tons/acre/year	49
Gully and Roadside Erosion	1.2	0.6	54
Total Watershed Erosion	10.0	5.6	44

Environmental Impacts

The preceding estimates are based on 75 percent of the land being adequately treated by the end of the project period. At present, 50 percent of the watershed lands are adequately treated. An additional 25 percent of the area will receive adequate treatment during the project period. Past experience shows that the remaining 25 percent will also receive some treatment.

Increases in agricultural activity will likely include greater use of fertilizer and farm chemicals. It is important that directions for application be closely followed to avoid pollution.

After project installation is complete, sediment delivered to the mouth of the watershed is estimated to be 38,480 tons annually. This reduction in sediment yield (38%) will greatly enhance water quality, as sediment borne chemicals, nutrients, and pathogenic bacteria will be reduced.

B. STRUCTURAL MEASURES

The degree of flood protection provided by the project is summarized in the following tables:

<u>Reaches</u>	<u>Area Benefited Acres</u>	<u>Average Degree of Protection</u> (Frequency of Flooding-Years)
II <u>1/</u>	338	1
III <u>2/</u>	540	1
IV	1,161	1
V	228	10

<u>Reaches</u>	<u>Area Benefited Acres</u>	<u>Average Degree of Protection</u> (Frequency of Flooding-Years)
VI	266	50
VII	268	5
VIII	296	5
IX	1,342	50
Total Watershed	<u>4,439</u>	
Total Outside Watershed	<u>6,929</u>	
Total Area	11,368	

1/ Thirty percent of this reach is controlled by four floodwater retarding structures already built which benefit an additional 145 acres.

2/ Four percent of this tributary is controlled by floodwater retarding structures.

Environmental Impacts

Examples of flood reductions provided by the project are shown as follows:

<u>Reach</u>	<u>Frequency (Yr.)</u>	<u>Percent Reduction in Peak Discharge</u>	<u>Reduction in Depth of Flow (Feet)</u>	<u>Reduction in Areas Flooded</u>
II	100	66	3.0	92
	10	62	2.5	141
	2	52	3.0	207
VII	100	52	2.1	101
	10	52	2.4	179
	2	55	3.2	72

The remaining flood hazard will be fairly severe at the upper end of the South Fork (Reaches II and IV) and in Pin Oak Creek (Reach III). Use of this area should be limited to crops that will withstand periodic flooding or that can be planted after the usual flood season passes.

Flood plain area damaged within the watershed by a storm similar to the 1965 flood would be reduced from 3,800 acres to 2,400 acres with the installation of the project. This is a 47 percent reduction in area flooded and a reduction in depth of approximately 1 foot. The frequency of recurrence for this flood is approximately 12 years. The evaluated flood plain area damaged outside the watershed for a storm of this magnitude would be reduced from 6,200 acres to 4,800 acres-- a reduction of 23 percent.

The installation of the floodwater retarding structures will directly protect 44 farms from flood damages in the 4,439-acre flood plain. In addition, 53 farms in the 6,929-acre flood plain below the watershed boundary will be protected from flooding.

Land damaged by deposition will be reduced from 66 to 55 acres. The planned structures will trap essentially all coarse sediment and debris originating upstream. Lower peak discharges will help maintain lower velocities, thus reducing the amount of flood plain scour and deposition. Flood plain scour within the watershed will be reduced from 329 to 175 acres. The yield of sediment at the mouth of the watershed will be reduced from 62,541 tons to 38,480 tons annually, a reduction of 38 percent.

Corn, the most important crop grown in the flood plain, will increase yields as a result of the reduction of floodwater. More intensive land use of present cropland will occur on an estimated 3,436 acres of flood plain. Change in land use or areas restored to former productivity is not anticipated with the project.

Environmental Impacts

Damages to roads and bridges will be reduced by 74 percent. These nonagricultural benefits amount to \$7,250 annually. The project will result in a 58 percent annual reduction in agricultural damages to growing crops, pasture, and fences. This is estimated \$71,930 annually.

Less flooding of agricultural land will reduce the possibility of pollution by agricultural chemical and fertilizers from these lands. Flood prevention will raise the intensity of agriculture in these areas. Improper use of chemicals could increase water pollution.

Although not planned and designed for fish production, the installation of 531 acres of water will substantially increase the warm water fishing potential. Sixty acres of water in these pools will be less than 2 feet deep. This condition is desirable to feed and rest migrating waterfowl.

Multiple-purpose structure B-1 will provide a needed water supply for Holden and surrounding communities. It is estimated that the facility will serve 5,000 people in Holden, 1,500 in Kingsville, and 1,500 people in rural areas by the year 2020. The water will be used for domestic purposes as well as to maintain and expand industrial operations in Holden and Kingsville. The expansion of population and industry due to the improved water supply will result in an increase in rural housing or urbanization, which, in turn will require construction of more roads, power lines, water lines, hospitals, schools, and related services.

A reservoir operation study, based on historical records and anticipated demands by the year 2020, shows that the reservoir will provide the full amount of water allocated to water supply for 19 years out of 20. Approximately one-third of the anticipated demand will be available during the 1 year out of 20 when the supply is expected to be short. Use of the reservoir for water supply is expected to cause a drawdown of the pool during certain periods of the year. The periods of subfull reservoir conditions will largely occur between August and February. The highest reservoir drawdown will normally be during December and January. Based on rainfall records of the past 30 years and the projected use rate, the expected drawdown during December-January will be 2.3 feet with a maximum in any 5-year period being 6.9 feet. During the vacation months (May through September) the typical drawdown is 0.5 foot in 25 out of 30 years, with a maximum of 5.9 feet over the worst 5-year period. Overall, the average drawdown is 1.4 feet. Reduction of the pool area associated with these drawdown amounts is as follows:

Environmental Impacts

<u>Drawdown</u>	<u>Acres Remaining</u>
0	360
0.5	350
1.4	340
2.3	335
5.9	300
6.9	285

A total of 32,760 recreation visits are estimated for the primary recreation season extending from Memorial Day to Labor Day. About 6,300 recreation visits will be provided during the remainder of the year when recreation activity will be primarily for fishing. Estimated total annual visitation is 39,060.

The seasonal increase of population using the recreation facility is expected to increase the need for emergency medical care at local health facilities.

It is expected that waterfowl will make use of the lakes during spring and fall migrations, thereby adding to the esthetic value of the area for recreation.

Acquisition of land rights for structure site B-1 will significantly affect six farming operations. Five farmsteads are above the flood pool and normal easement line; however, to carry on farming operations on their existing scale, landowners and tenants will need to acquire other land to offset the areas lost. The five farmsteads will have potential for other uses after development of the lake. The remaining farmstead will be in the flood retarding pool. This will be replaced by a dwelling meeting decent, safe and sanitary standards, as set forth in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

Some immediate effects will be present as a result of construction work on the project. Soil disturbance in the construction zones will temporarily increase the sediment yield and diminish water quality. With proper care, this will be held to a minimum as planned in the project. Proper treatment in the post-construction period, which includes establishment of grass or legume cover on the exposed soil areas, will reduce the sediment yield.

Construction activities will introduce heavy equipment and truck traffic on rural roads. The operation of these vehicles will cause additional dust, noise, and exhaust fumes.

Recreational activity will cause an increase in vehicular traffic with associated exhaust fumes, noise, and dust. In addition, the esthetics of the rural area will be reduced by littering, generally caused by extensive recreation usage.

The seven floodwater retarding structures, one grade stabilization structure, and one multiple-purpose structure remaining to be built will involve approximately 554 acres. The land use of this area is 244 acres of cropland, 112 acres of grassland, and 198 acres of forest land in the dams, emergency spillways, and sediment and water supply-recreation pools. Three hundred and seventy-seven of the 554 acres are in the B-1 dam, emergency spillway, and permanent pool.

Flood pools will temporarily inundate an additional 754 acres. Land use in this area is 219 acres cropland, 143 acres grassland, and 392 acres of forest land. The area expected to be inundated during a 2-year flood is approximately 227 acres.

The area of the flood plain inundated by a 50-year frequency flood under present conditions is approximately 12,311 acres. Project measures will reduce the area to 9,148 acres, a reduction of 26 percent. The area of the flood plain inundated by a 2-year frequency flood under present conditions is 6,598 acres. Installation of project measures will reduce the area to 4,041 acres, a reduction of 39 percent.

Some smaller woodland tracts in the flood plain will be cleared, but the ratio of 75 percent cropland, 12 percent pasture, 7 percent woodland, and 6 percent other use is expected to remain throughout the flood plain.

Deep, thin (0-24" thick, 114'-460' deep) coal resources will be unrecoverable during project life. These mineral resources are not considered reserves, as sufficient exploration has not been made to confirm their existence. Resources committed by subordination agreements are estimated at 240,000 tons. Resources which underlie all project affected areas have been estimated at 8 million tons. 1/

The impoundments will stabilize the water supply and the land treatment will enhance water quality by reducing sheet erosion. More water will be evaporated because of the increased water surface area.

Mosquitoes and other disease vectors may increase due to shallow water in impoundments and the recreation facility. Operation and maintenance of the recreation facility is expected to control problems that may arise in that area. Insect control may be necessary to alleviate problems due to shallow water.

C. NONSTRUCTURAL MEASURES

Nature trails and the wildlife management area at multiple-purpose structure B-1 will be useful as an outdoor classroom for local schools.

Facilities for the handicapped installed as a part of the recreational measures will make the development usable by handicapped persons.

The treating of ponds in the B-1 reservoir area, to kill the existing fish and then restocking it with suitable species of fish, will start the reservoir with a supply of fish when it fills and inundates these ponds. This will give a good start on reservoir stocking and will provide fishing sooner than is normally possible in a new impoundment.

1/ United States Department of the Interior, letter correspondence ER-74/581.

D. ECONOMIC AND SOCIAL

The planned improvements will increase farm profits, provide agricultural and nonagricultural jobs, stabilize incomes, and improve living conditions in the watershed. The local economy will be stimulated by recreation development. Local business enterprises will provide services and sell merchandise to persons engaged in recreation activities. Impoundments planned for the project will attract buyers from Kansas City. Some of the adjacent lands will be developed for homesites.

The forest land treatment measures will contribute substantially to the beautification, esthetic appeal, environmental quality, and subsequent use of the water resource values.

Installation of the project will provide two permanent seasonal semi-skilled jobs, 1/ two permanent semi-skilled jobs, and nine semi-skilled jobs for a five year period. As a result of land taken out of agricultural production, two permanent semi-skilled jobs will be lost.

Acquisition of land rights will affect six farming operations including one farmstead that will require relocation. The small number of relocations involved will not adversely affect schools, churches, and other neighborhood groups.

The removal of property from private ownership and resulting loss from the tax rolls will be offset by in-migration, development of new home sites, expansion of business in the area, and new investments attracted to the area as a result of the water supply and recreation facilities. The increased migration to the area will require more investment in schools, churches, roads, medical facilities, and utilities.

Flood protection of roads and bridges will reduce the interruption of transportation for area residents. The project will allow about \$8,000 annually, now spent on road and bridge repairs, to be used on other priorities.

Easements required for construction of the remaining dams will delay mining of an estimated 291,000 tons of coal from the Croweburg and Tebo beds during the project life. Some additional coal resources may be restricted by the reservoir pools. Some low grade stone will also be committed during the project life. The coal is thinner than minimums now needed for shaft or strip mining and has greater overburden than can be economically removed. Surface restoration costs for strip mined lands are high. The land surface is valuable for agriculture and urban development. As a result project impact on coal resources is not expected to be significant.

1/ A permanent seasonal job is one which is performed during a few months each year.

A safe water supply will reduce the possibility of contaminated water from shallow wells. Approximately 8,000 area residents will have a safe dependable water supply for both domestic use and for emergencies in case of fire. Local residents will have available water and associated recreational facilities for their use and enjoyment.

The influx of visitors to the recreation facility will modify the tranquility of the rural area. Mosquitoes and other disease vectors which normally follow periods of flooding will be diminished.

Construction of the reservoir and recreation area will promote growth. It is recognized that these uses will result in more roads, power lines, water supply facilities, sewage facilities, noise, litter, off-road vehicle use, and property trespass. Good plans and adequate zoning controls need to be implemented to guide the growth of this area, and minimize impacts.

Archeological surveys prior to construction, and possibly salvage will be required to identify and protect archeological resources.

E. FAVORABLE ENVIRONMENTAL EFFECTS

- a. Protect the soil resource by applying land treatment measures to 4,000 acres of cropland, 6,000 acres of grassland, 590 acres of forest land, 2,500 acres of other land, and stabilizing 150 gully reaches.
- b. Improve land use in upland areas by developing resource conservation plans and applying conservation practices to adequately treat 55 percent of the upland areas.
- c. Reduce sediment delivered to the mouth of the watershed by 38 percent.
- d. Reduce flooding on agricultural land in the flood plain by 31 percent within the watershed and 23 percent outside the watershed.
- e. Reduce sediment deposition by 17 percent.
- f. Reduce flood plain scour by 47 percent.
- g. Reduce the amount of direct runoff by improving hydrologic conditions in the watershed.
- h. Reduce flood damage of roads and bridges by 74 percent and fences and the accumulation of debris by 52 percent.
- i. Reduce health hazards due to flooding.
- j. Improve water quality.

- k. Provide an additional 1,516 acre-feet of water for municipal and industrial water supply for Holden and Kingsville.
- l. Provide an additional 1,050 acre-feet of water supply for rural residents.
- m. Provide 532 acres of additional surface water areas for recreation and increased waterfowl habitat.
- n. Increase fishing and recreational facilities for the area.
- o. Improve economy of the area by installing a recreational development with facilities for a capacity for an annual visitation of 39,060 days in the initial development and an additional 45,360 days in a second phase development.

F. ADVERSE ENVIRONMENTAL EFFECTS

- a. Reduce agricultural and forestry production and wildlife habitat on the 554 acres to be occupied by dams, spillways, sediment pools, water supply, and recreation pools.
- b. Limit agriculture, wildlife, and forestry production on 754 acres in the retarding pools by periodic flooding.
- c. Relocate six farming operations.
- d. Increase sediment yield from construction areas and lower water quality during and immediately following construction.
- e. Increase temporary flooding of some existing roads presently located in proposed storage areas.
- f. Increase littering and the effects of noise, dust, smoke, and exhaust in area due to more urban development, vehicular traffic, and recreationn visitations.
- g. Improper use of fertilizers and agricultural chemicals could increase water pollution.
- h. Shallow water areas in reservoirs may increase the numbers of mosquitos and other disease vectors present.
- i. Inundation of 227 acres of flood pool area, by a 2-year frequency storm will be detrimental to wildlife in that area.
- j. Deep, thin, coal seams, having low potential for future mining will be committed by project measure installation.

VI. ALTERNATIVES

The land treatment alternative, to alleviate the water and related land resource problems, is accelerated installation of the conservation land treatment measures in this revised watershed work plan without the multiple-purpose structure, floodwater retarding structures, and grade stabilization structure. Land use decisions made within land capability limits will keep soil losses compatible with long-term productivity goals. Such measures as conservation cropping systems, terracing, grassed waterways, contour farming, pasture and hayland management, tree planting and related conservation measures would be used in this alternative. Stabilization of gully reaches by minor grade stabilization structures and related land treatment measures would be included. Water quality would be improved by reduced sediment production.

Land and other resources would not be required for structural measures with this alternative.

Flood plain agriculture would not intensify and project related damages would not occur. Agriculture could not be expected to increase its contribution to the economy.

Flooding could continue to be severe since damages would be reduced only 7 percent by this alternative. Most of those damages associated with flooding would continue. These include damage to the flood plain due to erosion and deposition, interruption of travel due to flooded area roads, and continued damage to crops or other values situated in flood prone areas. Land treatment to increase the level of land adequately treated from 50 percent to 75 percent is estimated to cost \$1,117,700.

The alternative proposed by the original plan of works of improvement included 6 floodwater retarding structures, 2 multiple-purpose structures, 7.5 miles of channel work, and 14 grade stabilization structures. This alternative would provide approximately a 5-year level of flood protection. The 14 grade stabilization structures would provide protection from voiding and depreciation of 1,628 acres during the next 50 years and would protect the remaining 4,261 acres which complete the drainage areas of these structures. It would provide for municipal water supply in two reservoirs. This alternative would result in the destruction of wildlife habitat on approximately 260 acres in disturbed areas along the channel. Land use changes would be necessary on approximately 300 acres required for dams, emergency spillways, and sediment pools and 780 acres in flood retarding pools. The estimated cost of this alternative is \$3,387,000.

The alternative of public land management would be implemented by purchasing the average area flooded by an event occurring once in two years. This area, when placed in public ownership, could be used for purposes little affected by frequent flooding such as parks, open and green space, or wildlife corridors. It is estimated that the area involved would include 1,910 acres, and the purchase is expected to cost \$955,000. Additional costs with this alternative are those associated with removal of the tract from the tax base and loss of agricultural production from the area. Flood associated damages such as scour, deposition, and swamping would persist.

The no-project alternative would allow flood damage to continue. Soils would erode, slowed only by the application of control practices under the existing federal cost-sharing programs. Sheet and gully erosion would continue to destroy land. Agricultural production would be marginal and the trend to urbanization in the rural area would continue. The needs for additional recreational facilities and the need for additional fishing waters would not be met.

VII. SHORT-TERM VERSUS LONG-TERM USE OF RESOURCES

Watershed protection and structural measures have been constructed in the East Branch of the South Fork of the Blackwater River Pilot Project and the South Fork of Blackwater River Watershed Project. No other water resource projects are under construction or completed in the Blackwater-Lamine River Basin.

The project is not expected to correct any environmental problems on a short-term basis. Pollution due to sediment, dust, and smoke is likely to occur during construction; but will cease upon completion of the project.

Johnson, Lafayette, and Pettis Counties comprise the Show-Me Planning Region. A comprehensive water-sewer plan was completed for this region in 1969. This plan proposes additions to water and sewer installations and suggests that the population of Johnson County will increase 37 percent between 1970 and 1990. This plan is expected to be installed in a short-term period.

No changes in land use which will significantly restrict options for future use or limit productivity are proposed. Structures, reservoirs, and borrow areas will preclude optional use of 554 acres of the watershed area. On the remaining 65,025 acres, opportunities for productive use will be maintained or enhanced. Agriculture is expected to remain an important segment of the economy in the central and downstream areas of the watershed for the foreseeable future. Almost 28 percent of the farms have been classified as part-time operations. This type of operation will probably increase as the Kansas City urban area expands. The acreage per unit will probably decrease for the part-time farms, with the full-time units becoming larger and more efficient.

This plan provides a level of protection consistent with the needs and objectives of present and anticipated use of the flood plain lands. It provides protection to some of the most productive and easily managed land in the watershed. This plan will aid in the orderly development of the natural resources of the area, giving consideration to conservation and environmental measures to preserve the lands for use by future generations. The structural measures are evaluated for a 50-year period. All have storage provided for a 50-year accumulation of sediment, except multiple-purpose structure B-1 which is planned for storage of a 100-year accumulation of sediment. At the end of this period the multiple-purpose structure will continue to provide the designed level of flood protection; however, the municipal water supply storage available is expected to decrease as the sediment accumulates in the reservoir.

Short-Term Versus Long-Term Use of Resources

Due to its proximity to the Kansas City metropolitan area, it is expected that areas adjacent to existing roads will be developed for residential and commercial use as the metropolitan area expands. Measures in this project will provide the basis for additional soil and water conservation measures that may be needed from time to time.

The project stabilization measures will be effective indefinitely with proper maintenance.

The effectiveness of the floodwater structures beyond the designed life will be slightly impaired as sediment encroaches upon the floodwater storage provided.

In the adjoining watershed, North Fork-Honey Creek, a watershed work plan is being developed. A Type IV River Basin Study 1/ is being made on the Blackwater-Lamine River Basin, of which this watershed is a part. Eleven unplanned and two planned watersheds were identified. Ten of these are potential watershed work plans.

The report identifies a major need of a PL-566 project on Post Oak Creek, and North Fork Blackwater River. PL-566 projects on these two tributaries along with the South Fork of Blackwater would significantly reduce sediment contributed to the Blackwater River. The combined projects would also provide major flood reduction benefits in the basin above Sweet Springs, Missouri. The South Fork Blackwater Project as formulated is compatible with basin needs as identified in the Type IV study.

A Type I 1/ study has been completed on the Missouri River Basin. The report was published in December 1971. The plans and effects of the Blackwater-Lamine River Basin Study will be compatible with the published study.

1/ Type I studies develop a general, comprehensive plan and serve as guides for future detailed planning. The studies are made by an interagency group of federal agencies and concerned states. Type IV studies identify potential watershed projects and provide information for the state water plan. These studies are sponsored by the state and one or more federal agency can participate.

VIII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Agricultural and incidental wildlife use will be eliminated from about 554 acres committed to dams, spillways, and sediment pool areas (seven single-purpose structures, one multiple-purpose structure, and one grade stabilization structure). Flooding of 754 acres in flood retarding pools will periodically interrupt agricultural and incidental wildlife use for limited periods. Land use is 44 percent cropland, 20 percent pasture, and 36 percent forest on the areas that will be in dams, emergency spillways and sediment pools; and 29 percent, 19 percent, and 52 percent respectively on the areas in flood retarding pools. Land use on 769 acres outside the dam, spillway, and reservoir at structure B-1 will be changed from agriculture and incidental wildlife to recreation development on 439 acres and to wildlife management on 330 acres. Present land use is 282 acres (37 percent) in cropland, 414 acres (54 percent) in pasture, and 73 acres (9 percent) in forest.

The existing channels to be inundated by sediment, recreation, and water supply pools are tributaries which frequently become dry in the summer months. The length of channels to be inundated are as follows:

<u>Feature</u>	<u>Natural Channel Length Inundated (Feet)</u>
Sediment Pool	8,600
Recreation Pool	5,080
Water Supply Pool	3,320

The areas listed above are committed to dams, spillways, and lakes by the project, but they will also be used for fish, wildlife, and additional recreation purposes during and after the life of the project. Retarding pool areas can be used for pasture, woodland, wildlife, or limited crop production.

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

1. General

The planning of this watershed began when the sponsors filed an application in March 1960. Planning was authorized in August 1960. Several meetings and a large volume of correspondence were used in the development of the original plan. Twelve meetings brought together the sponsors and representatives of several private, state, and federal agencies or groups. Representatives of federal and state wildlife agencies reviewed project proposals and gave advice on effects of the project. This work plan was approved by congressional subcommittees in July 1962 and construction began in April of 1964. The plan was supplemented in November 1964, to reflect changes in required water storage in the multiple-purpose site F-1. A second supplement was developed in December 1965, by exchange of correspondence.

In January 1968, the sponsors requested that the plan be reformulated due to changed conditions that occurred after authorization of the project.

The sponsors have held approximately 20 meetings since then. Several public meetings and hearings were held to explain project proposals and effects, and to answer questions or discuss issues raised. Participants included representatives of the Show-Me Regional Planning Commission, Missouri Department of Conservation, Missouri Water Resources Board, Farmers Home Administration, United States Forest Service, and the Soil Conservation Service. Other local groups and a consulting engineer participated in the development of the revised plan.

2. Discussion and Disposition of Each Comment on Draft Environmental Statement

Comments were requested from the following federal and state agencies: Department of the Army; Department of Commerce; Department of Health, Education, and Welfare; Department of the Interior; Department of Transportation, Advisory Council on Historic Preservation; Environmental Protection Agency; Federal Power Commission; Governor of Missouri; Department of Community Affairs (State clearinghouse); Show-Me Regional Planning Commission.

Comments were received from the following agencies: Department of the Army; Environmental Protection Agency; Governor of Missouri; Department of Health, Education, and Welfare; Department of the Interior; Department of Transportation; Missouri Water Resources Board.

Action taken on comments made by each agency is as follows:

Consultation and Review

DEPARTMENT OF THE ARMY

Comment: The statement would be easier to read if more subheadings were used and if each were given a numerical designation to follow the main headings.

Response: Headings and numbering have been revised to fit the current guidelines for Department of Agriculture, Soil Conservation Service, Environmental Impact Statements.

Comment: Who is to prepare the wildlife management plan? Page 10, paragraph 4.

Response: Additional information has been added to the planned project section.

Comment: Where possible, wood products should not be wasted. Will the 198 acres in question be made available for public sale or disposal. Page 10.

Response: Additional information has been added to the planned project section.

Comment: The discussion of benefits would be easier to follow if damages were cumulative. Page 26 and 27.

Response: The discussion of damages are done separately to allow evaluation of the importance of each category.

Comment: Sediment reduction would seem to be 38 percent according to the figures on page 33. Page 31, paragraph 3.

Response: Agreed, the figure has been changed to 38 percent.

Comment: It would be helpful to express water usage in acre-feet. Page 34.

Response: This table was developed to show the effect of drawdown on the value of the area for recreation, therefore, surface area available, not volume, was shown.

Comment: Clarify the position of a permanent seasonal employee. Page 36, paragraph 3.

Response: A footnote has been added to clarify the employee's status.

Comment: If all of the programs in the first paragraph are carried out, then how can agriculture not increase in value. Page 39, paragraph 3.

Response: The installation of the land treatment alternative will reduce the intensity of agricultural use of the upland. Even the complete land treatment proposed would have only a minimum effect on flood peaks and thus would not induce significant intensification of agriculture on flood prone lands.

Comment: Please explain what the various "Types" mean. Page 42, paragraphs 4, 5, and 6.

Response: A description of types has been added.

ENVIRONMENTAL PROTECTION AGENCY

Comment: The addendum to the revised project work plan establishes the annual benefit at \$347,499 and the annual cost at \$188,673 (page 1). The draft statement gives an annual benefit figure of \$286,276 and an annual cost figure of \$174,039 (Appendix A). These discrepancies should be resolved in the final statement.

Response: Since the costs and benefits in the environmental statement represent the values for that part of the project which remains to be installed they do not agree with the costs or benefits for the total project.

Comment: The draft statement indicates that 554 acres of land are to be taken for the seven flood retarding structures and the average farm consists of 160 acres with an average annual income of \$9,450. Using these figures it would appear that at least \$33,000 in annual agricultural income will be lost due to the project. The final statement should indicate if this loss in agricultural productivity is included in the cost of the project.

Response: The net economic loss which occurs from loss of production from land to be occupied by project features is equal to or exceeded by purchase or value of lands and thus are included as project costs.

Comment: The elevation of the top of the B-1 dam will be 821.8 ft. msl with the maximum height of the dam being 60 ft. The Municipal and industrial water supply may be drawn down to 794.6 ft. msl. This would create a pool depth in excess of 30 ft. which is sufficient for temperature stratification to occur in the lake. If this condition should arise with the outlet works drawing from the bottom of the pool, the water quality downstream from the reservoir could be degraded. This problem and preventive measures should be addressed in the final statement.

Response: Releases to the stream will be thru a conventional drop inlet riser and thus will not generally be from the reservoir bottom.

Comment: The water quality data on the project area is inadequate, particularly with respect to the B-1 recreation-water supply reservoir. A full spectrum of water quality analyses should be done throughout the watershed at various times of the year. Of particular concern is the possible eutrophication of the B-1 reservoir. The watershed above this facility is in agricultural use and runoff from this area may carry large quantities of fertilizer to the lake. If the water quality data indicates that such a problem might occur measures for reducing eutrophication should be identified. This reservoir could also receive large quantities of herbicides and insecticides in the runoff from the watershed. These problems and possible preventive measures should be addressed.

Response: Due to the short time frame, a water quality study of some reliability could not be made. However, approximately one year prior to the construction of structure B-1 a study will be made. The study will include sampling at appropriate locations and frequencies.

Comment: The water quality analysis records for the Nelson sampling station referred to on page 16 of the draft statement were not included in Appendix B as indicated. These records should be included in the final statement.

Response: The Nelson station records are included with the final statement.

Comment: The project is expected to reduce flood damage on a total of 12,311 acres. This reduction in flooding may result in the increase of agricultural production which could have additional impacts. The statement should discuss the increased use of fertilizers, herbicides and insecticides, and increased soil erosion which may result from increased farming activity.

Response: Since flood damages are on flood plain areas, increased agricultural activity is not expected to increase erosion. Installation of the complete project will protect 12,311 acres. Measures yet to be installed, will protect 11,368 acres. Additions to the Impact section, pages 30, 33, and 38 further explain effects of fertilizers and agricultural chemicals.

Comment: The project is expected to result in expanded home site construction, industrial operations, and recreation development. It is recognized that these uses will result in more roads, power lines, water supply facilities, sewage facilities, noise, litter, off-road vehicle use, property trespass, etc. The final statement should discuss the adverse impacts which may result from these developments.

Response: The expected impacts resulting from the recreational activity and providing an additional water supply for the area are discussed on pages 33 through 37.

Comment: The statement indicates that borrow areas will be graded for drainage. The consideration of these areas should include the location of the sites and proposed reclamation measures.

Response: Most borrow areas are located so they will be inundated by the pool created by the dam. Where this is not possible, Service policy prescribes the areas will be graded for drainage and vegetated in an environmentally acceptable manner.

Comment: It is indicated that 338 acres will be set aside in wildlife habitat mitigation for the 554 acres lost directly to the proposed project. This may or may not be adequate for the area consumed by the project alone, however, it will not mitigate the loss of habitat due to the secondary residential, industrial, and recreational development expected in the area as a result of the project. It would appear that a more complete study should be done to assess the total estimated loss of habitat.

Response: Wildlife effects caused by increased residential development can be described in two ways. One is habitat effects on quality or quantity. The other is making use of the resource. In areas of congested development or in immediate areas of residential buildings a direct loss of habitat quality and quantity can be expected. Where smaller farms, mini-farms, or part-time farms are increased, usually farm game and small non-game species have improved habitat condition. Larger species i.e. deer probably have less habitat. The important effect caused by small farm residential development is the increase in landowner-sportsman relations problems and increased limitations of hunting privileges on private lands. A decrease in access will decrease effective use and harvest distribution of this usable public resource.

Some development and the above described situations are presently taking place in the project area. Proposed projects can be expected to increase the above described situation. Measuring the extent of project caused residential development above that presently taking place is not feasible.

Mitigation of described conditions on wildlife would have to come from other authorities i.e. planning and zoning. Efforts are needed in this respect with or without implementation of this project.

Consultation and Review

- Comment: The statement should address the control of mosquitos and other disease vectors which may become a problem in the proposed impoundments.
- Response: See additions in the Planned Project and Impact sections, pages 12 and 35.
- Comment: The revised work plan should be included as part of the final environmental impact statement. If this is not done, much of the data in the work plan should be included in the final statement.
- Response: Copies of the work plan are available for all who wish more detail on the project.

GOVERNOR OF MISSOURI

- Comment: In general, the statement appears to dwell more on project justification than on a disclosure of the probable environmental impacts. This tendency is exemplified in the summary of effects on pages 37 and 38, wherein the number of "favorable effects" outnumberes the "adverse effects". The enumeration of favorable effects is overly optimistic in several respects. For example, the conservation practices mentioned under favorable effects may, depending on the practice's nature and situation be construed as adverse to wildlife habitat. In similar fashion, adverse effects have been attenuated to some degree. For example, 567 acres of productive wildlife habitat will be permanently inundated, not reduced and 908 acres of land will have limited wildlife value during those periods when the flood pools are covered with water.
- Response: Additions and revisions have been made in the Impact section.
- Comment: The narrative pertaining to mitigation on page 10 needs some rewording for accuracy. Mitigation for the loss of wildlife habitat will only be partially satisfied by the development of habitat on 330 acres. It should also be noted that the management practices described will be performed by the sponsors under consultation with the Missouri Department of Conservation. The third paragraph on page 11 should emphasize that these lands are set aside primarily for mitigation and that only those recreational pursuits that are compatible with this purpose would be allowed. The section should also mention that mitigation measures are considered the same as structural measures in terms of maintenance and operation.
- Response: Additions and revisions have been made in the Planned Project and Impact sections, pages 11 and 12.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Comment: We note that the statement does not address the matter of Vector Control in the development of the recreation areas. Since some diseases are transmitted through insects and rodents, you may wish to give some consideration to safeguards, both to the permanent residents as well as the transient and temporary population using the recreational area.

Response: Additional information has been added to the Planned Project and Impact sections pages 12 and 35.

Comment: We further note that it is anticipated that there will be an estimated total annual visitation of 39,060 to the area with the majority of 32,760 visiting between the months of June and September. Since this will be a sizable increase to the transient population and will impact the existing health facilities and resources within the area on an emergency basis, you may wish to give this further consideration in developing your overall plans.

Response: Additional information has been added to the Impact section, page 36.

DEPARTMENT OF THE INTERIOR

Comment: Mineral resources, which include stone (limestone) and coal (bituminous), are described in the work plan (page 3) and in the environmental statement (page 14). Effects of the project on such resources are noted on pages 3 and 32 of the work plan. Mineral rights (subordination agreements or fee simple title) will be secured to prevent removal of coal from under the area within 450 feet from the base of each dam. The Comprehensive Report by Robertson, Evaluation of Missouri's Coal Resources, (Missouri Geological Survey, R148, 1971) is cited and forms the basis of the remarks concerning coal. The abstracted remarks are essentially correct but they are somewhat misleading and incomplete.

According to Robertson, the Croweburg and Tebo seams are thin but persistent coalbeds in the watershed. Mined to the southeast in Johnson County, they lie under more than 100 feet of cover in the watershed because of the northeast regional dip. Several drill holes intersected one or both beds in the vicinity of project measures at depth between 114 and 460 feet; the thickness of each coal seam ranges from zero to 24 inches, but these dimensions are only rough estimates. The Tebo lies about 50-100 feet below

the Croweburg. Robertson has rated areas in Missouri according to favorability for mining or prospecting for each important coalbed - most favorable, favorable, least favorable, and favorable. The watershed is rated a favorable area for the Tebo and for the Croweburg. By Robertson's scheme, the coal would be classified as thin to very thin, and, on the basis of reliability of data, it would constitute a weakly inferred resource.

Our review indicates that coal resources, but no known coal reserves, would be committed by project measures. Assuming that the coal in the two beds is continuous and each is at least 12 inches thick (1,800 tons per acre-foot), about 240,000 tons of coal would be committed under the nine sites yet to be built. Assuming that coal mining would not be permitted under all land required for project structural measures and related uses (2,244 acres), about 8 million tons of coal would be committed. Coal as thin as 18 inches has been mined in Missouri by underground methods, and coal at least that thick was reported at several drill holes in the area.

The fourth paragraph on page 32 of the work plan contains a bit of illogical reasoning and concludes ". . . future mining of coal and other natural resources is not expected to be affected by this project." In fact, it seems more correct to say that coal resources underlying the area within 450 feet of the base of each dam would be committed for the life of the project. Would not that coal (perhaps 8 million tons) under lands required for project structures and related uses (2,244 acres) be committed as well?

Compared with total original coal resources of 3,453 million tons and remaining coal reserves of 434 million tons in Johnson County, coal resources committed by this project are small. However, we recommend that the reports describe this commitment.

Response: This information has been added to the Planned Project and Environmental Setting sections, page 35 and 15.

Comment: Several oil and gas pipelines cross the watershed. If these would be displaced by project measures, this should be mentioned also.

Response: Oil and gas pipelines will not be affected by project measures.

Comment: Since 1964, when coal production was last reported from Johnson County, stone has been the only mineral commodity produced; because this region does not have plentiful amounts of readily accessible stone, the commitment of stone might be significant and it, too, should be considered.

- Response: Stone resources are available throughout the watershed at locations equally favorable to those which will be occupied by project measures.
- Comment: The second paragraph on page 22 should be expanded to explain who will be responsible for the management of the wildlife area.
- Response: The city of Holden will manage the mitigation area as shown on page 11.
- Comment: The third paragraph on page 30, which states that no change in land use is anticipated with the project, does not agree with the statement on page 28 that the close proximity to Kansas City will cause an attraction toward the purchase of land around these impoundments. Future residential development will most likely occur in these areas and the impoundments will most likely accelerate the development, especially at site B-1.
- Response: The impacts of development have been described in the Environmental Setting and Impact sections, pages 20 and 37.
- Comment: On page 32 it states that reduction of flooding of bottom lands will reduce damage to wildlife during nesting seasons. This will be partially offset by the flooding in the flood control pools.
- Response: Agreed; these effects are described on pages 37 and 38.
- Comment: On page 58 of the work plan, in the "Hydrology" section, the figure of 2 c.s.m. shown for "base flow to structures" may be somewhat optimistic. An examination of low-flow data from gaging stations in the Blackwater River Basin shows that the highest 7-day 2-year low flow is 0.002 ft.³/s/mi². Thus, it is unlikely that "baseflow" can be defined in such a way as to approach a figure of 2 ft.³/s/mi².
- Response: The "base flow to structures" referred to on page 58 of the work plan is a "quick return" flow which is used in the design of structures in the watershed. It does not pertain solely to "base flow" as calculated from stream gaging stations.
- Comment: In general, the statement covers the impact of the project on fish and wildlife resources. Mitigation for loss of 554 acres of habitat in sediment and multiple-purpose pools is to be accomplished by special management on 330 acres of land adjacent to the north part of B-1 reservoir site. Part of this acreage is in the flood control pool and would be subject to periodic inundation which would lessen the effectiveness of this area in mitigating losses. This has not been addressed in the statement. Bridal paths are

part of the plan of development for this wildlife area, but their impact on wildlife was not assessed in the statement. The activity would interfere with the main purposes of the area, to mitigate wildlife habitat losses and permit nature observations by hikers using these same trails. The necessity for the development of bridle paths within the wildlife area and why this purpose could not be satisfied outside the wildlife area on other project lands should be more fully discussed.

Response: Additional information regarding the mitigation measures has been added to the Planned Project section, pages 10 and 11.

Comment: Significant adverse environmental impacts related to the geology of the area of the project is not anticipated.

Response: Agreed.

Comment: We recommend that Mr. David R. Evans (Director, Missouri Archeological Survey, 15 Switzler Hall, University of Missouri, Columbia, Missouri 65201) be consulted for information and recommendations pertaining to archeological remains in the project area. It may be necessary to conduct a professional archeological survey of the proposed project area to locate and assess presently unrecorded archeological resources. The final statement should detail arrangements that have been made to provide for such a survey and mitigation, if necessary.

Response: Excerpts of an archeological evaluation and assessment report of the Blackwater-Lamine River Basin, prepared by Mr. Evans has been included in the Environmental Setting section, page 21.

Comment: On page 9, paragraph 3 (now page 10, paragraph 4), the 330 acres identified as being for mitigation purposes should be broken down into acreages in and above the flood pool. The area within the flood pool will be limited in its usefulness in mitigating wildlife losses due to the frequency of inundation and this should be brought out in the statement.

Response: Appropriate additions have been made on page 10.

Comment: The first paragraph on page 10, (now the third paragraph on page 11), discusses the mitigation to compensate for the loss of 554 acres of wildlife cover through special management of 330 acres adjacent to the B-1 site. We believe the inclusion of the bridle paths in the wildlife area will

interfere with the basic purposes of the mitigation effort and its inclusion in the study plan needs further evaluation with respect to its retention in a mitigation area.

Response: Prior to installation and planting all measures in the mitigation plan will be reviewed for compatibility.

Comment: On page 31, second paragraph (now page 35, first paragraph), we suggest identifying the acreage of the flood control pools.

Response: Areas have been added as suggested.

Comment: We also suggest that the section identifying the favorable environmental effects, page 32 (now page 37), be expanded to include reduced flooding of downstream wildlife habitat as a beneficial effect.

Response: Additions have been made on page 35 which display the flood plain area now inundated by 2-year and 50-year frequency floods. The area subject to inundation by a 2-year flood probably has maximum effect on wildlife habitat. Benefits to wildlife habitat are shown on page 37 for that area of the 2-year flood to be protected by the project installation.

Comment: On page 33 (now page 38), Adverse Environmental Effects, subsection b should indicate that wildlife will also be adversely affected by periodic flooding in the 908 acres in the retarding pools. Ground nesting of species of birds and mammals will be affected if the flooding occurs during their breeding seasons. Fossorial species would also be adversely affected by rapid inundation of their habitat.

Response: The acreage required to store a 2-year storm has been added to adverse effects on page 38. See response to above comments also.

X. LIST OF APPENDICES

- Appendix A - Comparison of Benefits and Costs for Structural Measures.
- Appendix B - Water Quality Criteria and Records.
- Appendix C - Figure 1 Typical Earth Dam
- Appendix D - Figure 2 Watershed Reach Map
- Appendix E - Figure 3 Recreation Sketch Map
- Appendix F - Figure 4 Mitigation Sketch Map
- Appendix G - Project Map
- Appendix H - Letters of Comment Received on the Draft Environmental Statement

XI.

Approved by _____
J. Vernon Martin, State Conservationist

Date _____

COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES 4/

South Fork of Blackwater River Watershed, Missouri
(Dollars)

Evaluation Unit	AVERAGE ANNUAL BENEFITS 1/					Average Annual Cost 3/	Ratio
	Damage Reduction	Flood Prevention More Intensive Land Use	Recreation	Water Supply	Secondary Water Management		
Total Project	107,090 ^{2/}	29,800	67,960	68,390	25,740	170,040	1.8:1.0
Project Administration	--	--	--	--	--	18,633	--
GRAND TOTAL	107,090	29,800	67,960	68,390	25,740	188,673	1.6:1.0

1/ Adjusted Normalized Prices for benefits.

2/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of \$9,990.

3/ Cost amortized for 50 years at 3¼ percent includes \$19,319 for operation, maintenance, and replacement.

4/ This table includes all measures built and remaining to be built.

IV. WATER QUALITY CRITERIA ^{1/}

General Criteria

1. All tributary streams and all municipal, industrial, agricultural, and mining effluents shall not create conditions in the stream which will adversely affect the present water uses or the future water uses as they become current.

2. Minimum water quality conditions applicable to all waters of the State include: (1) low flow streams which are defined as any stream with a flow 0.1 cfs or less for an average of seven consecutive days which average flow is expected to recur once every two years or less; (2) any streams for which an exception to the water quality criteria has been granted due to low flow conditions or other reasons; and (3) any other streams for which criteria have not been specifically established.

- a. Substances attributable to municipal, industrial, agricultural, mining, or other effluents shall not cause the formation of putrescent or otherwise objectionable sludge deposits on the streambed.
- b. The stream shall be free from floating debris, oil, scum and other floating materials attributable to municipal, industrial, agricultural, mining, or other effluents in amounts sufficient to be unsightly or deleterious.
- c. The stream shall be free from materials attributable to municipal, industrial, agricultural, mining or other effluents producing color, odor or other conditions in such degree as to create a nuisance.
- d. Substances attributable to municipal, industrial, agricultural, mining, or other effluents shall not have a harmful effect on human or animal life.

3. The Missouri Water Pollution Board will require all necessary and reasonable measures to prevent the water quality of all waters of the State from being less than these minimum standards.

Water Quality Standards - Lamine and Moreau River Basins - Intrastate Streams Designates streams that presently or in the future are or may be used for drinking water supplies.

^{1/} Water Quality Standards, Missouri Water Pollution Board

1. Blackwater River # (Zone 1 - From Route E to Sweet Springs Water Intake), Lamine River, Moreau River, and North Moreau River.

Designates streams that presently are in the future or that may be used for drinking water supplies.

- a. pH

The pH shall be between 7.0 and 8.5 in the stream. A pH above 8.5 in the stream shall not be due to effluents or surface runoff.

- b. Dissolved Oxygen

The dissolved oxygen in the stream shall not be less than 5 mg/l at any time due to effluents or surface runoff.

- c. Temperature

Effluents shall not elevate or depress the average cross sectional temperature of the stream more than 5° F. The stream temperature shall not exceed 90° F due to effluents.

- d. Substances Potentially Toxic or Detrimental

Substances toxic to humans, fish and wildlife, or detrimental to agricultural, mining, industrial, recreational, or other legitimate uses shall be limited to non-toxic or non-detrimental concentrations in the stream.

- e. Bacteria

The fecal coliform, in waters designated for whole body water contact recreation, shall not exceed a geometric mean of 200/100 ml (either MPN or MF count) nor shall more than 10% of total samples during any 30-day period exceed 400/100 ml (either MPN or MF count). The above criteria shall not be applicable when the stream is affected by storm water runoff.

- f. Taste and Odor Producing Substances 1/

Taste and odor producing substances discharged shall be limited to concentrations in the stream that will not impart unpalatable flavor to food fish, or result in noticeable offensive odors in the vicinity of the water, or otherwise interfere with legitimate use of the water.

- 1/ Taste and Odor Producing Substances

In waters designated for drinking water supply, taste and odor producing substances discharged shall be limited to concentrations in the stream that will not interfere with the production of potable water by reasonable water treatment processes.

g. Turbidity

There shall be no turbidity of other than natural origin that will cause substantial visible contrast with the natural appearance of the stream or interfere with any of its legitimate uses.

h. Color

There shall be no color of other than natural origin that will cause substantial visible contrast with the natural appearance of the stream or interfere with any of its legitimate uses.

i. Oil and Grease

The stream shall be virtually free of oil and grease. Emulsified oil and grease concentrations shall be kept below levels which will interfere with beneficial uses of the stream.

j. Solids

There shall be no noticeable manmade deposits of solids either organic or inorganic in nature, on the streambed. The stream shall be free of floating debris, scum, and other floating materials attributable to municipal, industrial, or other waste disposal practices in amounts sufficient to be unsightly or deleterious.

k. Radioactive Materials (Applies to waters designated for drinking water supply).

The dissolved radium 226 and strontium 90 shall not exceed 3 and 10 picocuries/liter (pc/l) respectively in the stream due to effluents or surface runoff. In the absence of strontium 90 and alpha emitters, the gross beta concentration shall not exceed 1,000 pc/l in the stream due to effluents or surface runoff.

l. Fluorides (Applies to waters designated for drinking water supply).

The soluble fluoride concentration in the stream shall not exceed 1.2 mg/l due to effluents or surface runoff.

2. Blackwater River (Zone 2 - From Sweet Springs Water Intake to Mouth), and Davis Creek.

a. pH

The pH shall be between 7.0 and 8.5 in the stream. A pH above 8.5 in the stream shall not be due to effluents or surface runoff.

b. Dissolved Oxygen

The dissolved oxygen in the stream shall not be less than 4 mg/l at any time due to effluents or surface runoff.

c. Temperature

Effluents shall not elevate or depress the average cross sectional temperature of the stream more than 5° F. The stream temperature shall not exceed 90° F due to effluents.

d. Substances Potentially Toxic or Detrimental

Substances toxic to humans, fish and wildlife, or detrimental to agricultural, mining, industrial, recreational, or other legitimate uses shall be limited to non-toxic or non-detrimental concentrations in the stream.

e. Bacteria

The fecal coliform, in waters designated for drinking water supply, boating and canoeing, and/or fishing, shall not exceed 2,000/100 ml. (either MPN or MF count) except in specified mixing zones adjacent to or downstream from waste outfalls. The above criteria shall not be applicable when the stream is affected by storm water runoff.

f. Taste and Odor Producing Substances

Taste and odor producing substances discharged shall be limited to concentrations in the stream that will not impart unpalatable flavor to food fish, or result in noticeable offensive odors in the vicinity of the water, or otherwise interfere with legitimate use of the water.

g. Turbidity

There shall be no turbidity of other than natural origin that will cause substantial visible contrast with the natural appearance of the stream or interfere with any of its legitimate uses.

h. Color

There shall be no color of other than natural origin that will cause substantial visible contrast with the natural appearance of the stream or interfere with any of its legitimate uses.

i. Oil and Grease

The stream shall be virtually free of oil and grease. Emulsified oil and grease concentrations shall be kept below levels which will interfere with beneficial uses of the stream.

j. Solids

There shall be no noticeable manmade deposits of solids either organic or inorganic in nature, on the streambed. The stream shall be free of floating debris, scum, and other waste disposal practices in amounts sufficient to be unsightly or deleterious.

WATER QUALITY ANALYSES

MISSOURI CLEAN WATER COMMISSION
 BOX 154,
 JEFFERSON CITY, MISSOURI 65101

APPENDIX B

SAMPLE No.	DATE	TIME OF GRAB SAMPLE (8, 12...24 hr.) C	FLOW (CFS)	TURBIDITY VALUE (Jackson Units)	COLOR VALUE (Pt-Co Units)	PHOSPHORUS (mg/l)		NITROGEN (mg/l)			CHEMICAL OXYGEN DEMAND (mg/l)	BIOCHEMICAL OXYGEN DEMAND, 5-DAY (mg/l)	TEMPERATURE (°C)	DISSOLVED OXYGEN (mg/l)	% SATURATION	pH VALUE	ALKALINITY (mg/l)	
						ORTHO-P	TOTAL-P	ORGANIC AMMONIA-N	AMMONIA-N	NITRATE-N							CARBONATE as CaCO ₃	BICARBONATE as CaCO ₃
07-24-67		64.3	95			0.20	0.39	1.2	0.9	0.9	28	6.5	82	7.8	0	158		
09-26-67		360				0.78	2.12	2.8	0.6	0.6	23	5.7	65	7.3	0	69		
11-28-67		10				0.39	0.65	0.8	1.2	1.2	5	12.6	98	8.1	0	162		
05-06-68		145	24			0.39	0.52	0.9	0.8	0.8	20	10.2	110	8.1	0	150		
10-29-68		28.2	140			0.03	0.10	1.6	0.5	0.5	9	7.9	68	7.3	0	128		
06-12-69		390	400			0.26	0.36	0.4	3.0	3.0	24	6.9	81	7.9	0	125		
09-10-69		1170	600	100		0.26	0.29	0.2	1.0	1.0	22	4.2	47	7.6	0	62		
03-16-70		66.8	<10	16		0.23	0.33	<0.1	0.4	0.4	5	15.4	120	8.5	10	198		
05-13-70		1720	1500	92		0.29	0.46	0.2	2.4	20.7	21	5.5	61	7.7	0	84		
09-08-70		26.8	70	10		0.13	0.13	0.4	0.9	8.3	27	6.9	85	7.9	0	136		
11-16-70		281	10	18		0.13	0.20	0.3	2.0	10	6	11.5	92	8.1	0	150		
03-15-71		1140	520	20		0.20	1A	0.3	0.5	13	17	9.8	85	7.8	0	110		
05-03-71		94.6	100	18		0.20	0.30	0.2	1.3	19	13	9.5	89	7.2	0	104		
03-20-72		78.3	174	20		0.20	0.40	0.2	1.9	19	28	4.8	60	7.4	0	196		
07-25-72		20.6	88	20		0.25	1.25	0.3	0.1	27	12	8.6	79	7.5	0	116		
10-30-72		22	190	54		0.40	0.65	0.5	1.1	27	12	8.6	79	7.5	0	116		

At River Mile 6

At River Mile 10

WATER QUALITY ANALYSES
 MISSOURI CLEAN WATER COMMISSION
 BOX 154
 JEFFERSON CITY, MISSOURI 65101

APPENDIX B

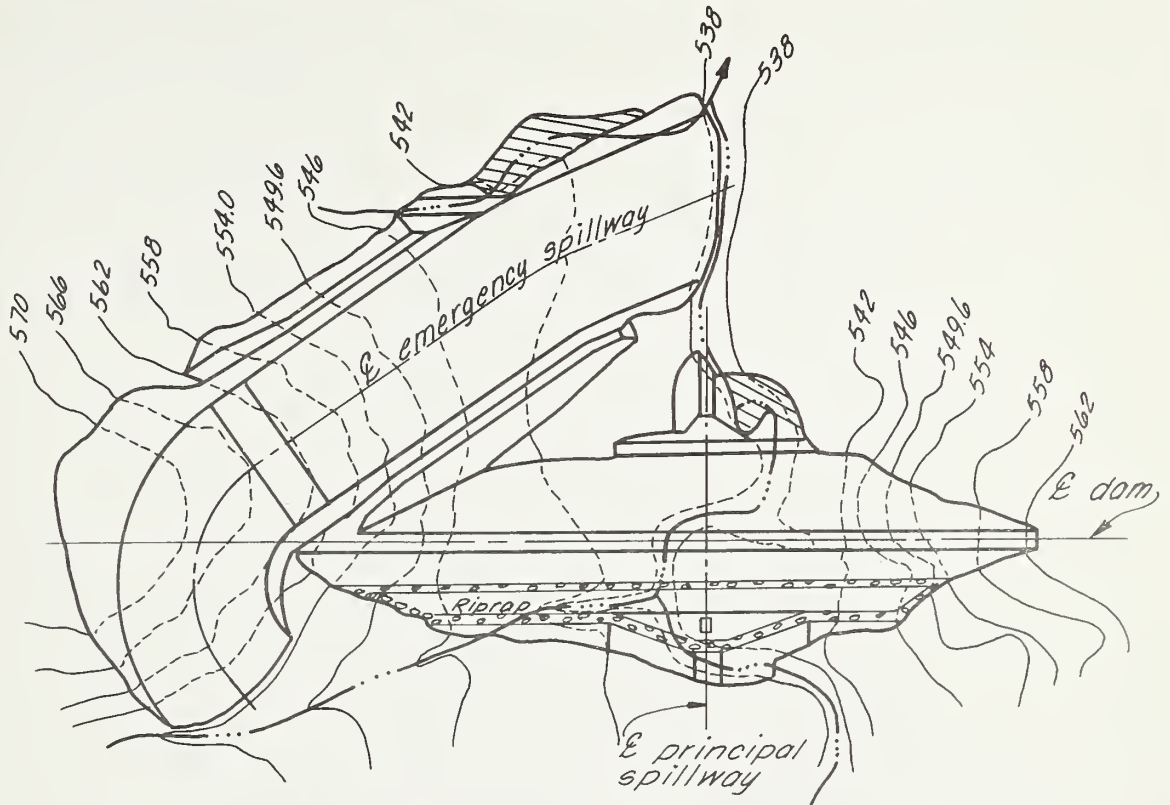
SPECIFIC CONDUCTANCE-25°C (micromhos/cm)	TOTAL HARDNESS (mg/l as CaCO ₃)	SILICA (mg/l - SiO ₂)	IRON (µg/l - Fe)	MANGANESE (µg/l - Mn)	CALCIUM (mg/l - Ca)	MAGNESIUM (mg/l - Mg)	SODIUM (mg/l - Na)	POTASSIUM (mg/l - K)	SULFATE (mg/l - SO ₄)	CHLORIDE (mg/l - Cl)	FLUORIDE (mg/l - F)	BACTERIA			REMARKS	SAMPLE No.	
												FECAL COLIFORM (per 100 ml)	FECAL STREPTOCOCCUS (per 100 ml)	FECAL (per 100 ml)			
900	255		2100		77	15											
340	100		2500		26	8											
725	261		200		70	21											
650	247		600		75	14											
600	198		700		55	14											
400	194		400		52	15	22.0	2.8	48	66.2			10,000	2,100			
190	90		2300		21	9	7.0	6.6	15	0.9	<0.1		22,000	2,700			
950	314		300		88	23	78.5	5.4	90	110	0.2		10	10			
240	144		1200		35	13	13.0	5.2	35	13	<0.1		40,000	26,000			
900	254		100	800	73	17	112.5	8.4	50	220	<0.1		1,700	1,600			
550	216	19	300	<500	62	15	32.5	4.2	55	42	<0.1		1,000	3,000			
390	198	28	1000	<50	58	13	14.9	1.4	50	20	<0.1		LA	16,000			
800	308	12	200	800	84	24	48.0	6.8	70	92	<0.1		1,400	4,800			
490	194		<100	1500	52	15	21.5	4.1	90	22.0	<0.1		100	<100			
1700	268	10	600	1500	100	28	200	18.6	53	47.5	0.3		840	7,500			
650	202		1000	1000	58	14	48	0.5	67	47.7	0.1						

At River Mile 6
76 213

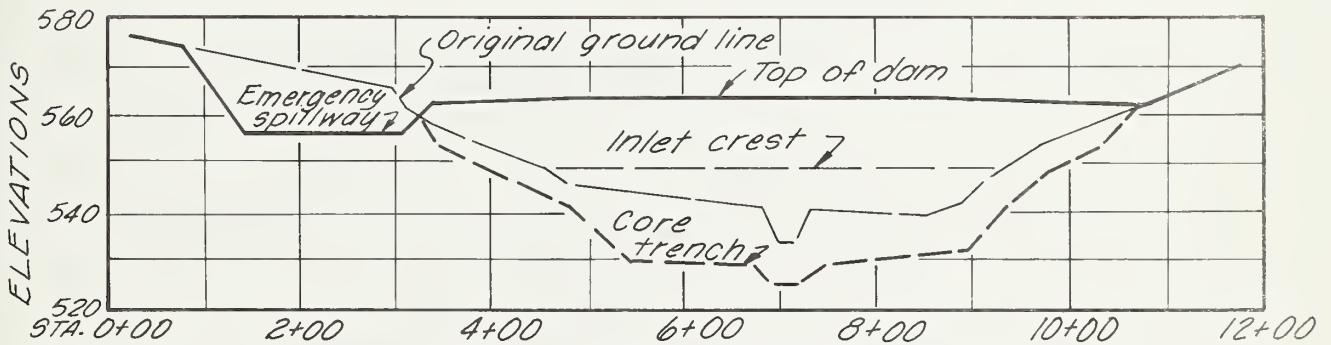
At River Mile 10
76

Blackwater River STA. No. LB-10
 Missouri
 Lower Missouri
 SOURCE MAJOR BASIN
 MINOR BASIN
 SUB-BASIN
 DRAINAGE AREA
 BASIN No.

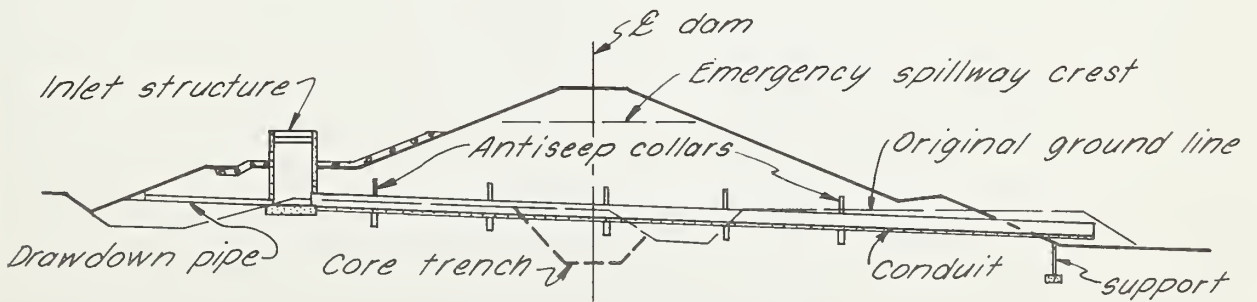
TYPICAL EARTH DAM WITH PIPE DROP INLET



PLAN OF EMBANKMENT AND SPILLWAY

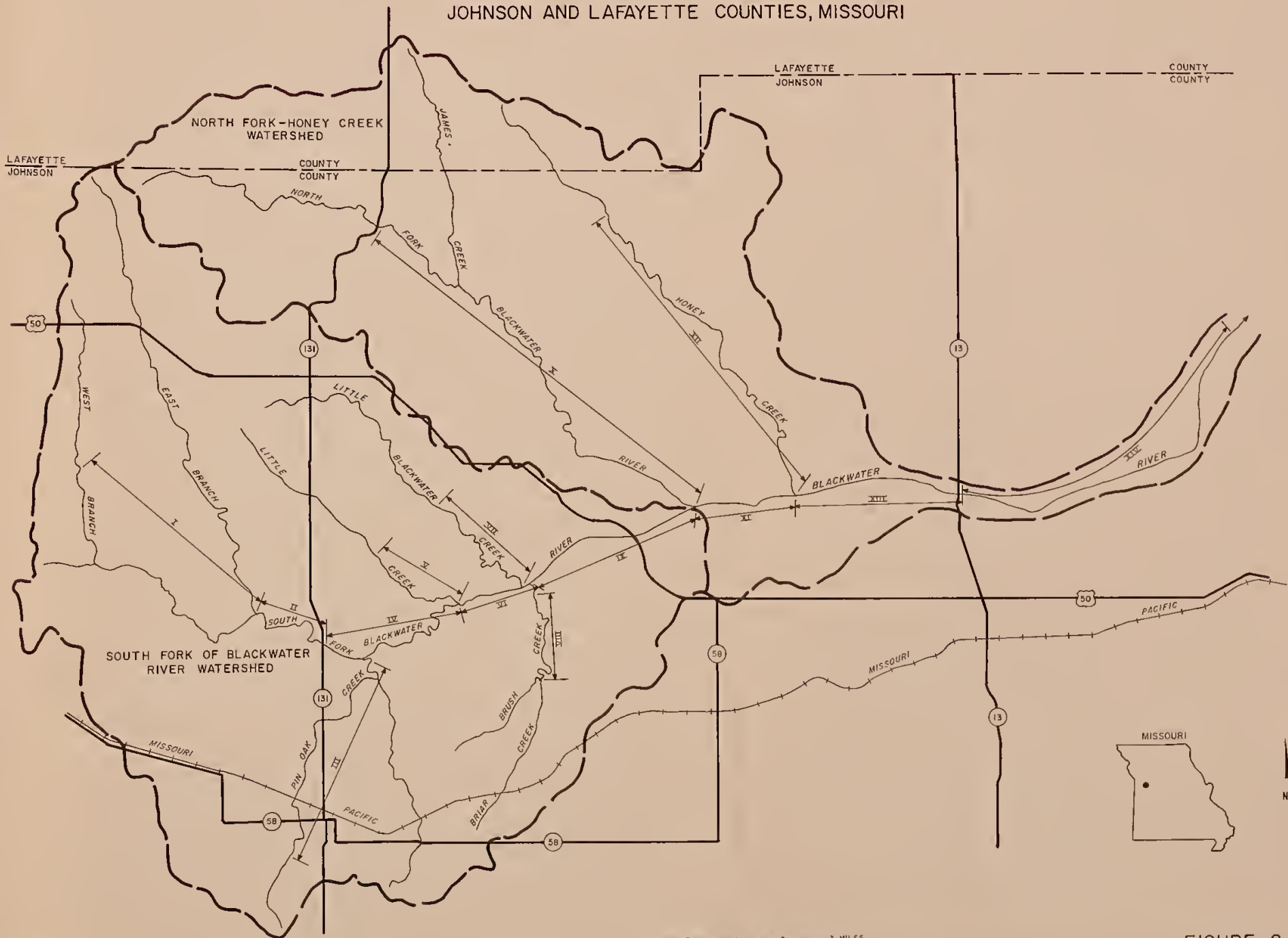


PROFILE ON CENTERLINE OF DAM



CROSS SECTION OF DAM ON CENTERLINE OF PRINCIPAL SPILLWAY

REACH MAP
NORTH FORK-HONEY CREEK
and
SOUTH FORK OF BLACKWATER RIVER
WATERSHEDS
JOHNSON AND LAFAYETTE COUNTIES, MISSOURI



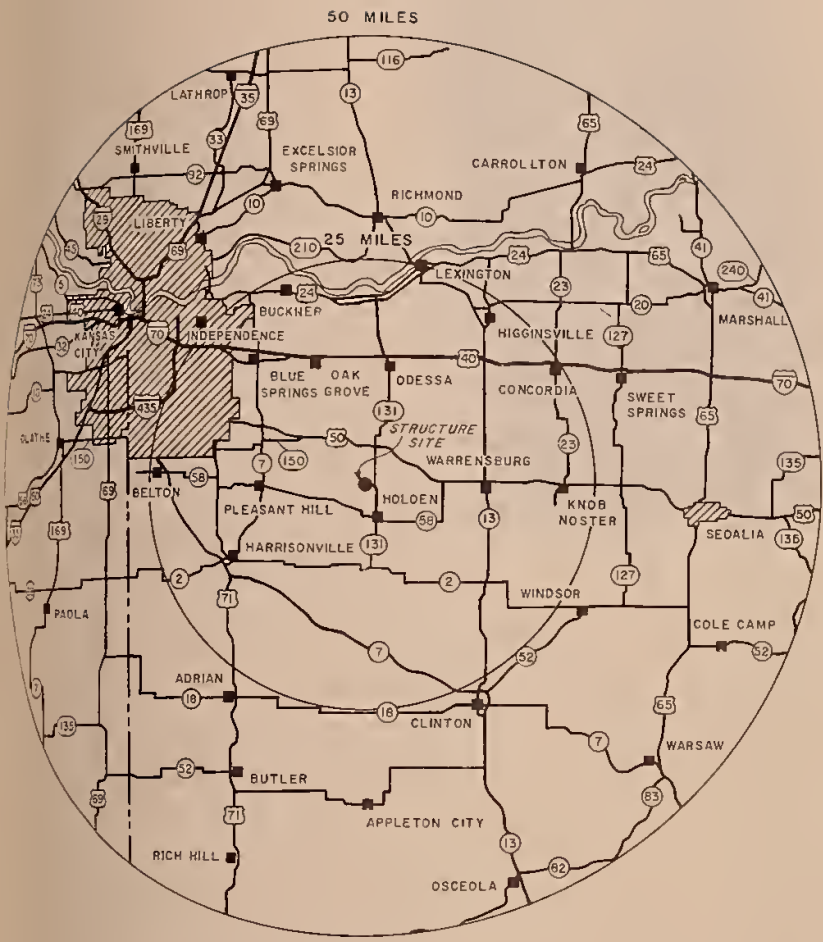
SCALE 1 0 1 2 3 MILES
SCALE 1/150,000

FIGURE 2

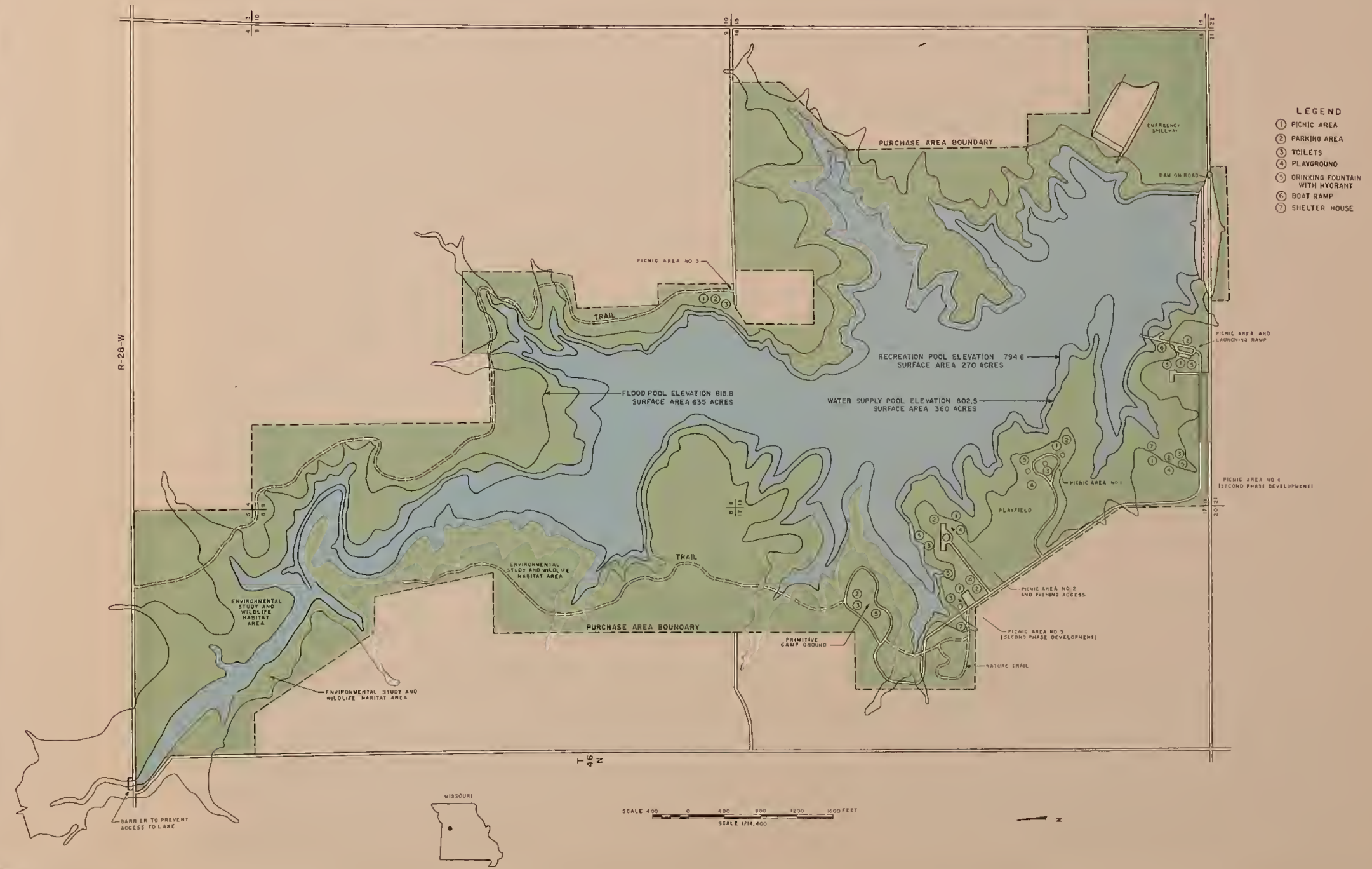
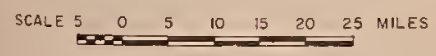
SOURCE:
COUNTY HIGHWAY MAP AND DATA
FURNISHED BY FIELD TECHNICIANS
USDA-SCS-LINCOLN, NEBR. 1972

(POLYCONIC PROJECTION)

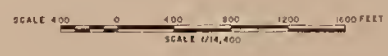
FIGURE 3
SOUTH FORK BLACKWATER RIVER WATERSHED
JOHNSON COUNTY, MISSOURI
STRUCTURE B-1
RECREATION SKETCH MAP



POPULATION CENTERS AND HIGHWAYS
WITHIN 50 MILE RADIUS

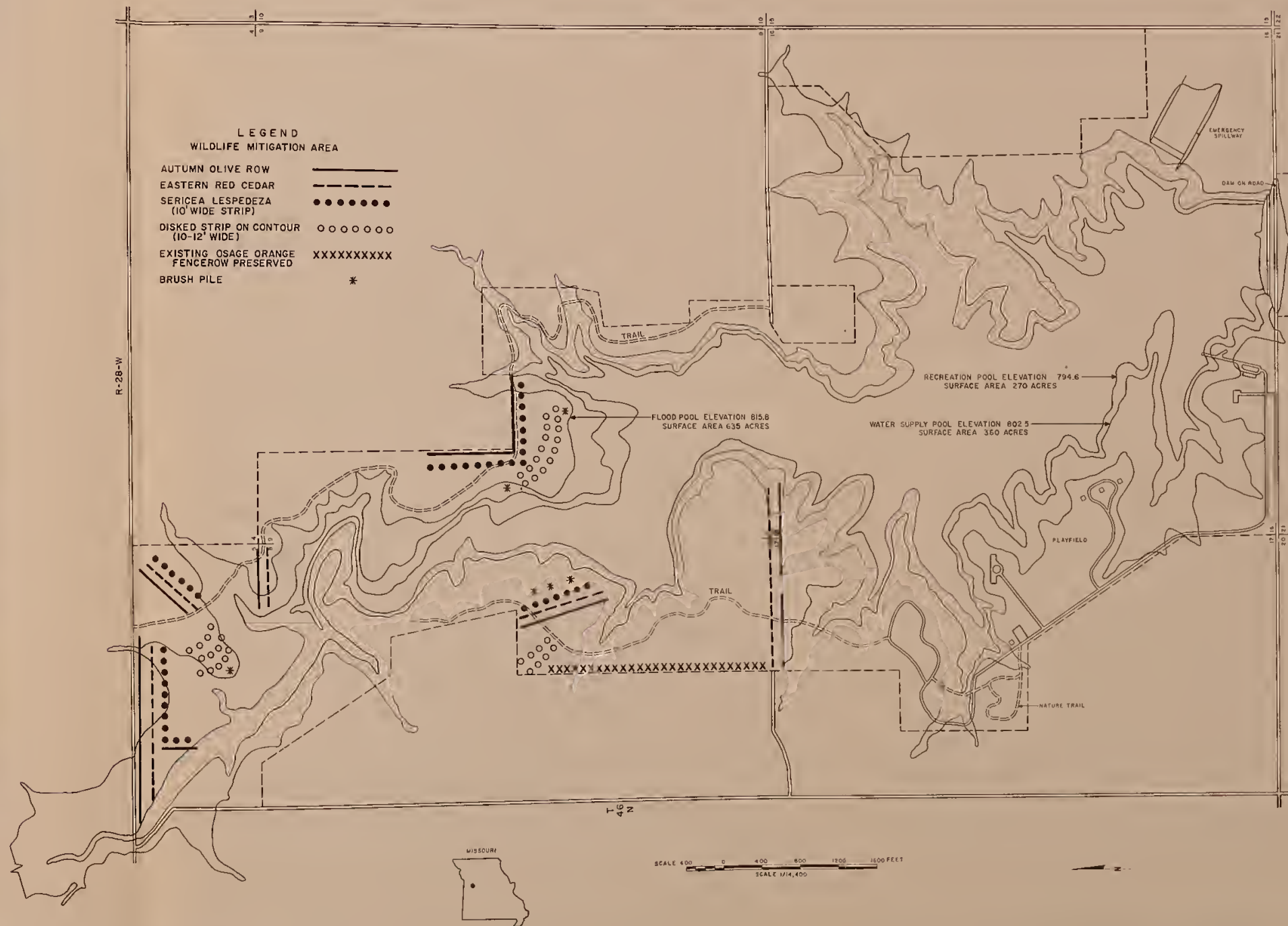


- LEGEND
- ① PICNIC AREA
 - ② PARKING AREA
 - ③ TOILETS
 - ④ PLAYGROUND
 - ⑤ DRINKING FOUNTAIN WITH HYDRANT
 - ⑥ BOAT RAMP
 - ⑦ SHELTER HOUSE


















SOURCE:
INFORMATION FURNISHED BY
FIELD TECHNICIANS

FIGURE 4
SOUTH FORK BLACKWATER RIVER WATERSHED
JOHNSON COUNTY, MISSOURI
STRUCTURE B-1
SKETCH MAP OF MITIGATION PLAN



SOURCE:
SCS BASE 5,5-28,524 AND DATA
FURNISHED BY FIELD TECHNICIANS

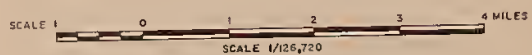
LEGEND

- WATERSHEO BOUNDARY 
- SUBWATERSHEO BOUNDARY 
- STABILIZATION STRUCTURE BUILT 
- STABILIZATION STRUCTURE 
- FLOODWATER RETARNOING STRUCTURE BUILT 
- FLOODWATER RETARNOING STRUCTURE 
- WATER SUPPLY AND FLOODWATER RETARNOING STRUCTURE 
- REACH 
- AREA BENEFITED 
- EROSION OAMAGE AREA, STRUCTURE BUILT 
- EROSION OAMAGE AREA 
- ORAINAGE AREA CONTROLLED BY STRUCTURE 
- ORAINAGE AREA CONTROLLED BY STRUCTURE ALREADY BUILT 
- EAST BRANCH SOUTH FORK BLACKWATER PILOT WATERSHEO 
- PORTION OF PILOT WATERSHEO NOW IN PL-566 PROJECT 

DRAINAGE AREA ACRES

STR. NO.	ACRES
A-1	1677
A-2	698
A-3	1139
A-4	2585
B-1	13811
C-1	2963
D-1	6105
E-7	730
E-29	774
F-1	2714
F-2	1094
F-3	493

PROJECT MAP
SOUTH FORK
BLACKWATER RIVER WATERSHED
JOHNSON COUNTY
MISSOURI



SOURCE:
GENERAL HIGHWAY MAP, JOHNSON COUNTY 1967;
AND INFORMATION FROM FIELD TECHNICIANS. POLYCONIC PROJECTION
DATA SOURCE: USGS, 1974

REV. 4/4/74
5,P-30,657



APPENDIX H

LETTERS OF COMMENT RECEIVED FROM
DEPARTMENT OF THE ARMY
ENVIRONMENTAL PROTECTION AGENCY
GOVERNOR OF MISSOURI
DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
DEPARTMENT OF THE INTERIOR
DEPARTMENT OF TRANSPORTATION
MISSOURI WATER RESOURCES BOARD



DEPARTMENT OF THE ARMY
WASHINGTON, D.C. 20310

APPENDIX H

Honorable Robert W. Long
Assistant Secretary of Agriculture
Washington, D. C. 20250

Dear Mr. Long:

In compliance with the provisions of Section 5 of Public Law 566, 83rd Congress, the Administrator of the Soil Conservation Service, by letter of 17 April 1974, requested the views of the Secretary of the Army on the work plan and draft environmental statement for the South Fork of Backwater River Watershed, Missouri.

We have reviewed this work plan and foresee no conflict with any projects or current proposals of this Department. The draft environmental statement satisfies the requirements of Public Law 91-190, 91st Congress, insofar as this Department is concerned. Specific comments on the environmental statement are inclosed for your consideration.

Sincerely,

A handwritten signature in cursive script, reading "Charles R. Ford".

Charles R. Ford
Chief
Office of Civil Functions

1 Incl
As stated

APPENDIX H

Comments on Draft EIS South Fork of Backwater River Watershed, Missouri

1. General Comment. The statement would be easier to read if more subheadings were used and if each were given a numerical designation to follow the main headings.

2. Specific Comments.

a. Page 9, 3rd paragraph. Who is to prepare the wildlife management plan?

b. Page 9, 4th paragraph. Where possible, wood products should not be wasted. Will the 198 acres in question be made available for public sale or disposal?

c. Pages 24 and 25. The discussion of benefits would be easier to follow if damages were cumulative.

d. Page 27, 3rd paragraph. Sediment reduction would seem to be 38 percent according to the figures on page 29.

e. Page 30, 1st paragraph. It would be helpful to express water usage in acre-feet.

f. Page 31, last paragraph. Clarify the position of a permanent seasonal employee.

g. Page 32.c. See our comment d above.

h. Page 34, 3rd paragraph. If all of the programs in the 1st paragraph are carried out, then how can agriculture not increase in value?

i. Page 36, 4th, 5th, and 6th paragraphs. Please explain what the various "Types" mean.

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Washington, D. C. 20250

APPENDIX H

July 26, 1974

SUBJECT: WS-PL-566 - South Fork of Blackwater River Watershed

TO: J. Vernon Martin
State Conservationist, SCS
Columbia, Missouri

Attached are comments we received on the draft environmental statement for South Fork of Blackwater River Watershed.

J. Michael Nethery

J. Michael Nethery
Director
Watershed Operations Division

Attachment

cc:
K. F. Myers, SCS, Lincoln, Nebraska
E. D. Butler, SCS, Lincoln, Nebraska







DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGION VII
FEDERAL BUILDING
601 EAST 12TH STREET
KANSAS CITY, MISSOURI 64106
July 23, 1974

OFFICE OF
THE REGIONAL DIRECTOR

APPENDIX H

Mr. Kenneth E. Grant
Administrator
Soil Conservation Service
U. S. Department of Agriculture
Washington, D.C. 20250

RE: Draft Environmental Impact Statement
South Fork of Blackwater River
Watershed, Johnson County, Missouri

Dear Mr. Grant:

We have reviewed the above referenced document and appreciate the opportunity to comment on its impact on Department of Health, Education, and Welfare programs.

We were pleased to note that consideration and planning was being given to the provision of facilities and recreation for physically handicapped individuals in the development of the Watershed Plan. Our program people in Vocational Rehabilitation and in special disabilities would be happy to work with you in further developing these plans.

We note that the statement does not address the matter of Vector Control in the development of the recreation areas. Since some diseases are transmitted through insects and rodents, you may wish to give some consideration to safeguards, both to the permanent residents as well as the transient and temporary population using the recreational area.

We further note that it is anticipated that there will be an estimated total annual visitation of 39,060 to the area with the majority of 32,760 visiting between the months of June and September. Since this will be a sizable increase to the transient population and will impact the existing health facilities and resources within the area on an emergency basis, you may wish to give this further consideration in developing your overall plans.

Sincerely

A handwritten signature in cursive script that reads "William H. Henderson".

William H. Henderson
Acting Regional Environmental
Officer

cc: Phyllis Hayes (1)
Warren Muir (2)



United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

APPENDIX H

ER-74/581

Dear Mr. Grant:

Thank you for the letter of April 17, 1974, requesting our views and comments on a revised work plan and draft environmental statement for the South Fork of the Blackwater River Watershed, Johnson County, Missouri.

We have completed our review of the work plan and draft statement and submit the following comments for your consideration and use.

Work Plan

Mineral resources, which include stone (limestone) and coal (bituminous), are described in the work plan (page 3) and in the environmental statement (page 14). Effects of the project on such resources are noted on pages 3 and 32 of the work plan. Mineral rights (subordination agreements or fee simple title) will be secured to prevent removal of coal from under the area within 450 feet from the base of each dam. The Comprehensive Report by Robertson, Evaluation of Missouri's Coal Resources, (Missouri Geological Survey, R148, 1971) is cited and forms the basis of the remarks concerning coal. The abstracted remarks are essentially correct but they are somewhat misleading and incomplete.

According to Robertson, the Croweburg and Tebo seams are thin but persistent coldbeds in the watershed. Mined to the southeast in Johnson County, they lie under more than 100 feet of cover in the watershed because of the northeast regional dip. Several drill holes intersected one or both beds in the vicinity of project measures at depth between 114 and 460 feet; the thickness of each coal seam ranges from zero to 24 inches, but these dimensions are only rough estimates. The Tebo lies about 50-100 feet below the Croweburg. Robertson has rated areas in Missouri according to favorability for mining or prospecting for



each important coalbed - most favorable, favorable, least favorable, and favorable. The watershed is rated a favorable area for the Tebo and for the Croweburg. By Robertson's scheme, the coal would be classified as thin to very thin, and, on the basis of reliability of data, it would constitute a weakly inferred resource.

Our review indicates that coal resources, but no known coal reserves, would be committed by project measures. Assuming that the coal in the two beds is continuous and each is at least 12 inches thick (1,800 tons per acre-foot), about 240,000 tons of coal would be committed under the nine sites yet to be built. Assuming that coal mining would not be permitted under all land required for project structural measures and related uses (2,244 acres), about 8 million tons of coal would be committed. Coal as thin as 18 inches has been mined in Missouri by underground methods, and coal at least that thick was reported at several drill holes in the area.

The fourth paragraph on page 32 of the work plan contains a bit of illogical reasoning and concludes ". . . future mining of coal and other natural resources is not expected to be affected by this project." In fact, it seems more correct to say that coal resources underlying the area within 450 feet of the base of each dam would be committed for the life of the project. Would not that coal (perhaps 8 million tons) under lands required for project structures and related uses (2,244 acres) be committed as well?

Compared with total original coal resources of 3,453 million tons and remaining coal reserves of 434 million tons in Johnson County, coal resources committed by this project are small. However, we recommend that the reports describe this commitment.

Several oil and gas pipelines cross the watershed. If these would be displaced by project measures, this should be mentioned also.

Since 1964, when coal production was last reported from Johnson County, stone has been the only mineral commodity

produced; because this region does not have plentiful amounts of readily accessible stone, the commitment of stone might be significant and it, too, should be considered.

The second paragraph on page 22 should be expanded to explain who will be responsible for the management of the wildlife area.

The third paragraph on page 30, which states that no change in land use is anticipated with the project, does not agree with the statement on page 28 that the close proximity to Kansas City will cause an attraction toward the purchase of land around these impoundments. Future residential development will most likely occur in these areas and the impoundments will most likely accelerate the development, especially at site B-1.

On page 32 it states that reduction of flooding of bottomlands will reduce damage to wildlife during nesting seasons. This will be partially offset by the flooding in the flood control pools.

On page 58 of the work plan, in the "Hydrology" section, the figure of 2 csm shown for "base flow to structures" may be somewhat optimistic. An examination of low-flow data from gaging stations in the Blackwater River Basin shows that the highest 7-day 2-year low flow is $0.002 \text{ ft.}^3/\text{s}/\text{mi}^2$. Thus, it is unlikely that "baseflow" can be defined in such a way as to approach a figure of $2 \text{ ft.}^3/\text{s}/\text{mi}^2$.

Draft Environmental Statement

General Comments

In general, the statement covers the impact of the project on fish and wildlife resources. Mitigation for loss of 554 acres of habitat in sediment and multipurpose pools is to be accomplished by special management on 330 acres of land adjacent to the north part of B-1 reservoir site. Part of this acreage is in the flood control pool and would be subject to periodic inundation which would lessen the effectiveness of this area in mitigating losses. This has not been addressed in the statement. Bridal paths are part of the

plan of development for this wildlife area, but their impact on wildlife was not assessed in the statement. The activity would interfere with the main purposes of the area, to mitigate wildlife habitat losses and permit nature observations by hikers using these same trails. The necessity for the development of bridal paths within the wildlife area and why this purpose could not be satisfied outside the wildlife area on other project lands should be more fully discussed.

Significant adverse environmental impact related to the geology of the area of the proposed project is not anticipated.

We recommend that Mr. David R. Evans (Director, Missouri Archaeological Survey, 15 Switzler Hall, University of Missouri, Columbia, Missouri 65201) be consulted for information and recommendations pertaining to archeological remains in the project area. It may be necessary to conduct a professional archeological survey of the proposed project area to locate and assess presently unrecorded archeological resources. The final statement should detail arrangements that have been made to provide for such a survey and mitigation, if necessary.

Specific Comments

On page 9, paragraph 3, the 330 acres identified as being for mitigation purposes should be broken down into acreages in and above the flood pool. The area within the flood pool will be limited in its usefulness in mitigating wildlife losses due to the frequency of inundation and this should be brought out in the statement.

The first paragraph on page 10 discusses the mitigation to compensate for the loss of 554 acres of wildlife cover through special management of 330 acres adjacent to the B-1 site. We believe the inclusion of bridal paths in the wildlife area will interfere with the basic purpose of the mitigation effort and its inclusion in the study plan needs further evaluation with respect to its retention in a mitigation area.

On page 31, second paragraph, we suggest identifying the acreage of the flood control pools.

We also suggest that the section identifying the favorable environmental effects, page 32, be expanded to include reduced flooding of downstream wildlife habitat as a beneficial effect.

On page 33, Adverse Environmental Effects, subsection b should indicate that wildlife will also be adversely affected by periodic flooding in the 908 acres in the retarding pools. Ground nesting of species of birds and mammals will be affected if the flooding occurs during their breeding seasons. Fossorial species would also be adversely affected by rapid inundation of their habitat.

We trust the foregoing comments of the work plan and draft environmental statement will be of assistance in processing this report to the Congress.

Sincerely yours,



Deputy Assistant Secretary of the Interior

Mr. Kenneth E. Grant
Administrator
U.S. Department of Agriculture
Soil Conservation Service
Washington, D. C. 20250

J. V. Martin, SCS, Columbia, Missouri ✓

Agency Administrator for
Water Resources

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
U.S. COAST GUARD (G-WS/73)
420 SEVENTH STREET SW
WASHINGTON D.C. 20530
PHONE: (202) 426-2263



APPENDIX H

Mr. Kenneth E. Grant
Administrator
Soil Conservation Service
Washington, D. C. 20250

Dear Mr. Grant:

This is in response to your letter of 17 April 1974 addressed to Admiral Bender concerning the draft environmental impact statement for the South Fork of Blackwater River Watershed, Missouri.

The Department of Transportation has reviewed the material submitted. We have no comments to offer nor do we have any objection to the project.

The opportunity to review this draft statement is appreciated.

Sincerely,

A handwritten signature in cursive script, appearing to read "R. I. Price".

R. I. PRICE
Rear Admiral, U. S. Coast Guard
Chief, Office of Marine Environment
and Systems



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
1735 BALTIMORE - ROOM 249
KANSAS CITY, MISSOURI 64108

July 15, 1974

APPENDIX H

Mr. J. Vernon Martin
State Conservationist
U.S.D.A., Soil Conservation Service
P.O. Box 459
Columbia, Missouri 65201

Dear Mr. Martin:

Subject: South Fork of Blackwater River Watershed
Johnson County, Missouri

We have reviewed the Draft Environmental Impact Statement for the project identified above. The project and statement are rated LO-2 indicating we have no significant objections to the project and we request the following comments be addressed in the final environmental impact statement:

The addendum to the revised project work plan establishes the annual benefit at \$347,499 and the annual cost at \$188,673 (page 1). The draft statement gives an annual benefit figure of \$286,276 and an annual cost figure of \$174,039 (Appendix A). These discrepancies should be resolved in the final statement.

The draft statement indicates that 554 acres of land are to be taken for the seven flood retarding structures and the average farm consists of 160 acres with an average annual income of \$9,450. Using these figures it would appear that at least \$33,000 in annual agricultural income will be lost due to the project. The final statement should indicate if this loss in agricultural productivity is included in the cost of the project.

The elevation of the top of the B-1 dam will be 821.8 ft. msl with the maximum height of the dam being 60 ft. The municipal and industrial water supply may be drawn down to 794.6 ft. msl. This would create a pool depth in excess of 30 ft. which is sufficient for temperature stratification to occur in the lake. If this condition should arise with the outlet works drawing from the bottom of the pool, the water quality downstream from the reservoir could be degraded. This problem and preventive measures should be addressed in the final statement.

The water quality data on the project area is inadequate, particularly with respect to the B-1 recreation-water supply reservoir. A full spectrum of water quality analyses should be done throughout the watershed at various times of the year. Of particular concern is the possible eutrophication of the B-1 reservoir. The watershed above this facility is in agricultural use and runoff from this area may carry large quantities of fertilizer to the lake. If the water quality data indicates that such a problem might occur measures for reducing eutrophication should be identified. This reservoir could also receive large quantities of herbicides and insecticides in the runoff from the watershed. These problems and possible preventive measures should be addressed.

The water quality analysis records for the Nelson sampling station referred to on page 16 of the draft statement were not included in Appendix B as indicated. These records should be included in the final statement.

The project is expected to reduce flood damage on a total of 12,311 acres. This reduction in flooding may result in the increase of agricultural production which could have additional impacts. The statement should discuss the increased use of fertilizers, herbicides and insecticides, and increased soil erosion which may result from increased farming activity.

The project is expected to result in expanded home site construction, industrial operations and recreation development. It is recognized that these uses will result in more roads, power lines, water supply facilities, sewage facilities, noise, litter, off-road vehicle use, property trespass, etc. The final statement should discuss the adverse impacts which may result from these developments.

The statement indicates that borrow areas will be graded for drainage. The consideration of these areas should include the location of the sites and proposed reclamation measures.

It is indicated that 338 acres will be set aside in wildlife habitat mitigation for the 554 acres lost directly to the proposed project. This may or may not be adequate for the area consumed by the project alone, however, it will not mitigate the loss of habitat due to the secondary residential, industrial and recreational development expected in the area as a result of the project. It would appear that a more complete study should be done to assess the total estimated loss of habitat.

The statement should address the control of mosquitoes and other disease vectors which may become a problem in the proposed impoundments.

The revised work plan should be included as part of the final environmental impact statement. If this is not done much of the data in the work plan should be included in the final statement.

We appreciate the opportunity to review this draft statement. Please provide this office with a copy of the final environmental impact statement when it is submitted to the Council on Environmental Quality.

Very truly yours,

Edward C. Vest

Edward C. Vest
Environmental Impact
Statement Coordinator

EXECUTIVE OFFICE
STATE OF MISSOURI
JEFFERSON CITY

CHRISTOPHER S. BOND
GOVERNOR

July 22, 1974

Mr. J. Vernon Martin
State Conservationist
U. S. Department of Agriculture
Soil Conservation Service
P. O. Box 459
Columbia, Missouri 65201


Dear Mr. Martin:

The draft Environmental Impact Statement of the South Fork of the Blackwater River Watershed, in Johnson County, has been reviewed by the state. I understand this draft covers portions of the project not completed under the original work plan.

The comments from the Department of Conservation are attached, for your additional information.

Considering the current and projected needs and desires of the people in the immediate area and region, I agree with your conclusion that this project is needed and urge early completion.

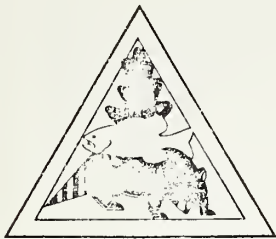
Sincerely,



GOVERNOR

CSB:1bm

Enclosure



MISSOURI DEPARTMENT OF CONSERVATION

2901 North Ten Mile Drive - Jefferson City , Missouri 65101

P. O. Box 180 - Telephone 314 751 4115

CARL R. NOREN, Director

June 12, 1974

APPENDIX H

Mr. Terry Rehma
Clearinghouse Coordinator
Department of Community Affairs
505 Missouri Boulevard
Jefferson City, Missouri 65101

Re: No. 74050043

Dear Mr. Rehma:

Department of Conservation review of the draft environmental impact statement for the South Fork of Blackwater River Watershed received 7 June 1974 has been completed. Our review was facilitated by our knowledge of the project based on several years of involvement with the Soil Conservation Service and the project's sponsors.

In general, the statement appears to dwell more on project justification than on a disclosure of the probable environmental impacts. This tendency is exemplified in the summary of effects on pages 32 and 33, wherein the number of "favorable effects" outnumbers the "adverse effects". The enumeration of favorable effects is overly optimistic in several respects. For example, the conservation practices mentioned under favorable effects may, depending on the practice's nature and situation be construed as adverse to wildlife habitat. In similar fashion, adverse effects have been attenuated to some degree. For example, 567 acres of productive wildlife habitat will be permanently inundated, not reduced and 908 acres of land will have limited wildlife value during those periods when the flood pools are covered with water.

The narrative pertaining to mitigation on page 9 needs some rewording for accuracy. Mitigation for the loss of wildlife habitat will only be partially satisfied by the development of habitat on 330 acres. It should also be noted that the management practices described will be performed by the sponsors under consultation with this Department. The first paragraph on page 10 should emphasize that these lands are set aside primarily for mitigation and that only those recreational pursuits that are compatible with this purpose would be allowed. The section should also mention that mitigation measures are considered the same as structural measures in terms of maintenance and operation.

-84-

COMMISSION

JIM TOM BLAIR
St. Louis

ROBERT G. DELANEY
Charleston

HARRY MILLS
Clinton

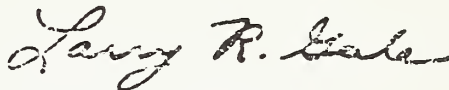
G. ANDY RUNGE
Mexico

Mr. Terry Rehma
June 12, 1974
Page Two

APPENDIX H

We appreciate the opportunity for this review.

Sincerely,



LARRY R. GALE
ASSOCIATE DIRECTOR

cc: U. S. Fish and Wildlife Service
Kansas City, Missouri

Soil Conservation Service
Columbia, Missouri

THE STATE



OF MISSOURI

Water Resources Board

308 East High Street
JEFFERSON CITY, MISSOURI 65101

P. O. Box 271
Telephone
(314) 751-4252

Executive Director

June 20, 1974

Mr. Kenneth E. Grant
Acting Administrator
U. S. Department of Agriculture
Soil Conservation Service
Washington, D. C. 20250

Dear Mr. Grant:

The revised workplan for watershed protection and flood prevention in the South Fork of the Blackwater River Watershed has been reviewed.

The proposals contained in the workplan are compatible with the water resource development program of the State of Missouri and take into consideration the local interests of the people in the watershed.

The Water Resources Board recommends early approval and operation of the South Fork of the Blackwater River Watershed.

Sincerely,

A handwritten signature in cursive script that reads "Charles P. Michael".

Charles P. Michael
Research Analyst

CPM:pt

-86-

Chairman
HAYSLER A. POAGUE
Clinton

EARL R. SCHULTZ
1512 Kurze Lane

Vice-Chairman
JOSEPH R. SNYDER
Gallatin

VANCE C. LISCHER
Route 2

ORGE E. SMITH
424 Clark Hall
Columbia





