Licking River, south fork watershed plan : environmental impact statement.

1981.

Watershed Plan and Environmental Impact Statement

For

SOUTH FORK LICKING RIVER WATERSHED

Licking, Perry and Fairfield Counties, Ohio

June 1980

ADDENDUM

South Fork Licking River Watershed Plan, Ohio

This addendum shows the project costs, benefits, and benefit-cost ratio based on 7 1/8 percent interest rate, 1979 installation costs, and current normalized prices for agricultural commodities. Annual project costs, benefits, and benefit-cost ratio are as follows:

1. Project costs are $949,965.

2. Project benefits are $1,064,363.

3. The project benefit-cost ratio is 1.12:1.

PREFACE

Enclosed are two documents -- the Watershed Plan and the Environmental Impact Statement for South Fork Licking River Watershed, Licking, Perry, and Fairfield Counties, Ohio.

The Watershed Plan has been developed by the South Licking Watershed Conservancy District with the assistance of the U.S. Department of Agriculture and is the basis for the authorization of federal assistance to implement the proposed project in accordance with the Watershed Protection and Flood Prevention Act, Public Law 83-566, as amended (16 USC 1001-1008).

The Environmental Impact Statement has been prepared by the U.S. Department of Agriculture in compliance with Section 102(2)(C) of the National Environmental Policy Act of 1969. Public Law 91-190, as amended (42 USC 4321 et seq).

The Environmental Impact Statement contains the detailed information on environmental setting, planned project, problems, impacts, and alternatives.

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WATERSHED PLAN
AND
ENVIRONMENTAL IMPACT STATEMENT

SOUTH FORK LICKING RIVER WATERSHED

Licking, Perry, and Fairfield Counties, Ohio

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

Prepared by:

South Licking Watershed Conservancy District
Licking County Soil and Water Conservation District
Fairfield County Soil and Water Conservation District
Perry County Soil and Water Conservation District
Licking County Commissioners
Fairfield County Commissioners
Perry County Commissioners
Newark Area Chamber of Commerce

U.S. DEPARTMENT OF AGRICULTURE:

Soil Conservation Service
U.S. Forest Service

SUMMARY AND DESCRIPTION

The South Fork Licking River Watershed is located in east-central Ohio. It consists of 180,364 acres (282 square miles) of which 161,180 acres are located in Licking County, 13,284 acres in Fairfield County, and 5,900 acres in Perry County. Headwaters of the main stem are in southwestern Licking County and it flows southeast to the vicinity of Buckeye Lake; thence generally northeast joining the North Fork of the Licking River in Newark. Raccoon Creek (102 square miles) is the largest tributary. It rises in northwest Licking County and flows southeast joining the main stem in Newark one mile upstream from its confluence with the North Fork.

Local sponsors of the project are Fairfield, Licking, and Perry Soil and Water Conservation Districts; the Fairfield, Licking, and Perry County Commissioners; South Licking Watershed Conservancy District; and the Newark Area Chamber of Commerce.

Problems due to flooding cause an estimated average annual damage of $101,149 to crops, pastures, and related agricultural properties. Direct damages to transportation facilities and urban properties are estimated to be $298,567. Approximately 8,355 acres, 449 dwellings, and 35 businesses are affected by flooding in the watershed.

The goals of the sponsors are:

1. Floodwater damage reduction for agricultural, commercial, industrial, and residential areas.
2. Erosion and sediment damage reduction.
3. Improved agricultural water management.
4. Recreation area development.
5. Improved appearance of the natural environment.

To obtain these goals the following measures are planned: Structural - five flood retarding reservoirs, one multipurpose flood retarding-recreation reservoir, two recreational developments, and a flood prevention dike and stream channel improvement; Nonstructural - one land acquisition and relocation in Granville.

The stream channel improvement consist of 3.3 miles of new flood bypass channel, 0.7 miles of channel enlargement, obstruction removal from 18.2 miles of channel and streambank stabilization along segments of 5.9 miles of channel.

The estimated total cost for the structural measures is $8,728,680. The PL-566 share is $6,346,192; the "other" share is $2,382,488. The "other" costs include land rights and contract administration. The annual operation and maintenance costs are $170,861. This includes $4,230 for the environmental quality component consisting of Heath critical area stabilization and Raccoon Creek obstruction removal.

The estimated cost of the nonstructural measure is $16,500. The "PL-566" share is $12,100 the "other" share is $4,400.

Land treatment measures are planned to adequately protect 14,230 acres; 9,530 acres will be treated through the ongoing program and 4,700 acres will be treated through the accelerated land treatment program. Total estimated installation cost is $2,687,900 of which $1,562,500 is through the ongoing program and $1,125,400 is through the accelerated program. Total acres benefited will be 21,452 of which 14,373 acres will be from ongoing program and 7,079 acres will be from the accelerated program. These measures include conservation cropping systems, forest land, pasture and hayland improvements, and related conservation measures. These are designed to reduce soil loss, increase water infiltration, and improve wildlife habitat and the surrounding environment. The total project cost is $11,579,345. The PL-566 share is $8,043,497 and the other share is $3,535,848.

The structural measures and land treatment are to be installed over an eight year period.

The South Licking Watershed Conservancy District will be responsible for administering the contracts for structural measures and for operation and maintenance.

Average annual benefits resulting from structural measures are $1,020,972. Average annual costs, based on a project life of 100 years and on an interest rate of 6 7/8 percent are $815,169. The benefit-cost ratio is 1.25:1.0. Additionally, average annual costs of $75,238 are allocated to environmental quality.

Reduction in erosion, sedimentation, urban and agricultural damage will result from project measures. Added recreational facilities will provide opportunities for an estimated additional 179,840 recreation visits annually. The 5.9 miles of channel will have critical area stabilization. Two houses will be relocated and portions of two rural roads will be closed. Construction will temporarily increase erosion, sedimentation, turbidity, dust, exhaust gases, noise, and inundate land in sediment and permanent pools and temporarily flood detention storage pools.

PLANNED PROJECT

The South Fork Licking River Watershed Plan consists of conservation land treatment measures for watershed protection and structural measures for flood prevention, recreational use, and environmental quality improvement.

Land Treatment

One hundred and twenty-eight conservation plans and 31 conservation plan revisions will be prepared with landowners for the conservation treatment and management of their land during the project period. The conservation treatment included in these plans is designed to reduce erosion and improve vegetative cover, enhance the visual resources, improve drainage and production. It will adequately protect 10,350 acres of cropland, 2,100 acres of pastureland, 1,420 acres of woodland, and 360 acres of other land. Seven thousand four hundred and seventy acres of cropland, 1,040 acres of pasture, 820 acres of forest land and 200 acres of other land will be treated through the ongoing program. The 2,880 acres of cropland, 1,060 acres of pastureland, 600 acres of forest land, and 160 acres of other land will be treated through the accelerated land treatment program.

The South Licking Watershed Conservancy District will obtain agreements from owners of not less than 50 percent of the land above each reservoir and floodwater retarding structure that they will carry out conservation farm or ranch plans on their land. In addition the South Licking Watershed Conservancy District will insure that 50 percent of the area above each reservoir is adequately protected.

Structural Measures

The structural measures are a combination of earthen dams, dikes, channel improvements, and recreation facilities. Six dams are planned for the project. Five are for floodwater retarding and one is for floodwater retarding and recreation use. A flood prevention dike is planned along .3 miles at the south edge of Hebron. The channel improvements consist of 0.7 miles of channel enlargement, 3.3 miles of new flood bypass channel, obstruction removal from 18.2 miles of channel and streambank stabilization along segments of 5.9 miles of channel. Recreation facilities are planned for two locations. The facilities at the Lobdell Creek Reservoir will provide for swimming, boating, fishing, hiking, camping, and picnicking use. The South Fork Licking River from U.S. 40 to Hoback Park in Heath will be developed for canoeing and picnicking.

Reservoir design information is summarized in Table 3 and channel design information is presented in Table 3A. Table 2B lists the recreational facilities and their estimated construction costs. Structural measure cost estimates are summarized in Tables 1, 2, and 2A. The project map, Appendix D of the Environmental Impact Statement (EIS), shows the location of structural measures. Figures E-5-1 and E-5-2 of the EIS depict features typical of the planned reservoirs and channel work. The recreational development maps (Appendix E and F of the EIS) show the general layouts of the planned recreational facilities. Further details of the planned measures, including design and construction features and techniques, are described in the EIS.

Nonstructural Measures

One nonstructural measure is included. It consists of one land acquisition and relocation in Granville.

Mitigation Plan

An interagency mitigation team was formed to provide acceptable mitigation measures for the South Fork of Licking River Watershed Project. The members consisted of biologists from the USDI, Fish and Wildlife Service (F&WS), Soil Conservation Service (SCS), and the Ohio Department of Natural Resources, Division of Wildlife and Water (ODNR). The following recommendations are a result of the team's effort and represent the recommendations completed to date. The mitigation recommendations have been tentatively agreed to by the F&WS, ODNR, and SCS for inclusion within the plan. The plan includes wildlife planting, fish and stream improvement structure recommendations. Field investigations of each site may cause variation in some individual recommendation but it is not anticipated significant alteration in the proposed mitigation plan will occur.

During the past four years much consultation has been held between the F&WS, SCS, and ODNR. On May 8, 1978 and again on August 18, 1978, the F&WS provided SCS with comments and recommendations for each individual site within the watershed. SCS responded on June 13, 1979 indicating their concurrence with most of the recommendations requested by the F&WS. The following proposed mitigation plan is a direct result of this interagency correspondence. ODNR was contacted concerning the fish and wildlife aspects within the proposed mitigation plan. They presented no significant adverse comment and provided their concurrence with the present mitigation plan.

Existing Conditions

Present land use and minimum land requirements for all floodwater retarding reservoirs are found in Table E-5-1, Page E-5-3 of this EIS. According to this table dams, spillways, and outflow areas will require 108 acres of land and 100 year deposition area will require 84 acres of land. The total amount of permanent land use change is 192 acres (cropland 42 acres, pasture 64 acres, forest 67 acres, and other 19 acres).

According to Table E-5-1, areas temporarily affected by construction of the floodwater retarding reservoirs are those periodically inundated (181 acres), flowage rights (58 acres), and construction and borrow areas (16 acres). Land use in these areas is cropland 91 acres, pasture 86 acres, forest 70 acres, and other 7 acres.

The Lobdell Creek recreation site and the South Fork channel will require 480 acres of land, and 370 acres of land, respectively (Table E-5-2).

Lobdell Creek recreation development will require 319 acres for the dam site, spillway, flowage rights and lake area. The remaining 161 acres will be developed into various public recreational uses (Appendix E).

Table E-5-3 of this EIS provides all the minimum land area requirements for channel work and dike work.

According to this table, 154 acres will be required for the new bypass channel adjacent to I-70. South Fork channel enlargement will require 20 acres of temporary land use change. The South Fork obstruction removal will require 29 acres for spoil placement and obstruction storage representing a temporary land use change.

Mitigation Plan for Channel Construction

In areas where cover is being cleared for channel construction, the channel side slope will be seeded with a perennial grass. The 15-foot maintenance berm and other disturbed areas except crop and pasturelands will be seeded with wildlife habitat meadow mixture. The seeding mixture will generally consist of bromegrass, alfalfa, red clover, timothy and orchard grass. Sweet clover and crown vetch may also be used. These grasses and legumes provide nesting cover and food for pheasants, quail, cottontail rabbits, and some songbirds.

To mitigate the disturbances of woody vegetation by channel work, shrubs will be planted at the rate of about 1,200 plants per acre, and trees will be planted at the rate of about 436 per acre.

The following types of shrubs and trees will be used to provide wildlife food and cover depending on availability and desires of landowners:

Pin Oak	Autumn Olive	Zumi Crabapple
Snowberry	Common Alder	White Mulberry
White Pine	Smooth Sumac	American Hazelnut
Scotch Pine	Gray Dogwood	Blackhaw Viburnam
Wild Cherry	Silky Dogwood	Sargent's Crabapple
Norway Spruce	American Plum	Tatarian Honeysuckle
Black Walnut	Austrian Pine	American Highbush
Silver Maple	Staghorn Sumac	Cranberry

In order to develop a more natural condition, the trees and shrubs will be scattered randomly throughout the areas rather than planted in rows. Clump plantings of mixed species of trees and shrubs of similar sizes and growth habits will be utilized at every opportunity.

The following construction techniques will be used to protect or mitigate damage to the fish, wildlife, and plant resources along the construction areas:

a. Construct the channel bottom in a manner that will concentrate low-flows and create scattered pools and riffles rather than have the flow spread too shallow for most aquatic life.

b. Construct fences to keep livestock away from areas of construction and permanent vegetative strips.

c. Mark the limits of the vegetative strip along cropland with durable posts or other suitable means where needed to preclude farming practices from damaging the vegetation.

d. Establish minimum clearing limits needed for construction and maintenance.

e. Seed disturbed areas, except channel slopes, to temporary or perennial vegetative cover at the end of each days work except where other construction is expected to take place sooner than the normal period of germination for the seed used. Seed channel slopes to perennial vegetative cover at the end of each days work.

f. Pile the spoil in wooded and brushy areas and spread in cropland and pasture areas.

g. Automotive barriers will be installed to prevent vehicular damage.

h. On construction reaches when winter shutdown is expected, the disturbed areas will be temporarily seeded and mulched. Upon completion of construction, the site will be permanently seeded.

i. Berms, diversions, and terraces will be constructed on banks and around spoil piles as necessary to provide stable banks and prevent erosion and subsequent sedimentation.

j. Debris and sediment basins will be constructed where conditions warrant to prevent sediment from reaching the streams.

k. Equipment parking areas, haul roads, and other construction areas will be managed to minimize erosion and sedimentation.

Approximately three-fourths of a mile of South Fork channel is scheduled for enlargement. The existing fisheries in the South Fork are of fair quality. The water quality is poor and will tend to curtail good population numbers of usable sport fish species.

The team agreed by placing at least five double wing deflectors within the channel enlargement section, needed diversity would be restored to this section. Large rocks should be placed in the pool area below each structure.

In accordance to the proposed plan obstruction removal along the South Fork has been scheduled. The interagency team should mark the trees for removal. Representatives from each agency and the respective conservancy districts should be requested to provide team members. The team will mark the trees for removal, inspect and concur with all obstruction removals and provide onsite recommendations for improvement of construction techniques to insure minimum disturbance during the operation.

The remaining newly constructed channel paralleling I-70 provides an area between I-70 and the new channel for a potential of approximately 20 acres of wildlife habitat development. No decision has been made concerning this area. Final habitat development design rests with the Ohio Department of Transportation.

Mitigation Plan for Structure Sites

Exact areas needed for construction will not be known until final design is completed. Where grass and cropland is needed for spoil disposal, the spoil can be spread and the land returned to its original use the following year. The wildlife

habitat value of the grassland and cropland taken for channel banks and berms is offset when these same areas are seeded to grass and wildlife meadow mixture. As final design is known, and before each contract is offered for bid, the location and areas needing woody planting for wildlife mitigation will be finalized.

The Sponsors will obtain landrights for the acreage needed to mitigate wildlife habitat lost due to project construction.

The following actions will be taken during construction to minimize soil erosion as well as water, air, and noise pollution:

a. The clearing limits will include only the minimum areas necessary for construction and maintenance. Areas to be cleared will be delineated on the construction drawings and staked in the field prior to clearing operations.

b. All disturbed areas except channel slopes will be seeded to temporary vegetative cover at the end of each days work, except where other construction is expected to take place within three weeks. Channel slopes will be seeded to permanent types of vegetative cover at the end of each days work.

c. During installation, all applicable air and water quality and health regulations will be adhered to. The provisions of construction contracts will require compliance with all existing regulations. Required permits under Section 404 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) will be obtained. Contractors will be required to keep project work areas and access roads in an orderly condition. Upon completion of work, contractors will be required to remove any buildings, debris, unused material etc., from the areas as specified in the contracts. All debris removed from the areas of channel work will be disposed of in an acceptable manner as approved by the Ohio EPA. Any solid or liquid materials which might cause pollution will be handled in accordance with emergency response regulations of the Ohio EPA. Vector control, where necessary, will be accomplished through the use of local drainage and with approved insecticides. Contractors will be required to comply with the provisions of the Occupational Safety and Health Act of 1970 (PL 91-596) and the Safety and Health Regulations for construction of the U.S. Bureau of Reclamation.

Structures

The following recommendations are made for all structures except as noted. The team will formulate individual mitigation plans covering mitigation for fish and wildlife habitat development.

1. Replant all dams, spillways, and disturbed outflow areas with grasses of value to wildlife immediately following construction.

2. Replant all unavoidably cleared areas and disturbed flowage rights areas to grasses and shrubs of value to wildlife immediately following construction.

3. Leave vegetation in the permanent pool area to serve as fish and wildlife attractors.

4. Construct in disturbed areas fish habitat improvement structures in accordance with ODNR specifications (Approximately 6 per acre).

5. Obtain easements on periodically inundated land (189 acres) to insure its present wildlife values will be preserved or enhanced.

6. Kirkersville and Lobdell - Clean-up existing dump.

7. Kirkersville - Obtain an easement on high ground between the two forks of the impoundment.

8. Lobdell - Develop multi-use recreational resources which will maintain the lake in a natural state.

9. Lobdell - Stock fish in accordance with ODNR's recommendation (106 acre lake).

10. Lobdell - Develop recreation control to prevent erosion and destruction by overuse.

11. Develop wetlands along the edge and within the permanent pool area wherever possible.

12. Obtain additional easements, for wildlife habitat preservation or enhancement, surrounding the structure site whenever possible.

INSTALLATION COSTS - MONETARY

Land Treatment

Detailed installation costs of land treatment measures are shown in Table 1 and below:

Cropland - With practices such as grass waterways, diversions, contour stripcropping, mains and laterals, and tile drains - ongoing program land treatment costs $910,300. Accelerated land treatment costs $550,000.

Pasture - Including practices such as pasture management, pasture planting, and spring development. Ongoing program land treatment costs $317,900. Accelerated land treatment costs $315,000.

Forest - Including practices such as tree planting and woodland improvement. Ongoing program land treatment costs $24,000. Accelerated land treatment costs $9,200.

Other Land - Including practices such as critical area planting and wildlife upland habitat management. Ongoing program land treatment costs $69,900. Accelerated land treatment costs $75,300.

Structural and Nonstructural Measures

Construction costs (for labor, equipment, and materials) are the engineer's estimated costs which include allowances for contingencies. The estimates were made by applying appropriate unit costs to detailed quantity estimates. Unit costs, based on the most recent contract bid schedules and actual construction costs of similar projects in Ohio, were adjusted to the 1978 average price level. Cost allowances for contingencies, ranging from 11 to 18 percent were included to offset unknown conditions which may appear during design and construction.

Engineering costs are for design surveys, site investigation studies (borings, laboratory tests and analyses), designs, preparation and interpretation of drawings and specifications, and similar services.

Project administration costs associated with installation of structural measures are those of contract administration, review of engineering plans prepared by others, government representation for contracts, administering relocation payments, layout and inspection to assure construction in accordance with drawings and specifications, and overhead. Overhead includes costs of direct and indirect services of the Soil Conservation Service and the Sponsors in installing structural measures under PL-566. The Sponsors and the Service will each bear the costs they incur.

Landrights costs are for acquiring land and altering utilities. Acquisition costs include survey, appraisal, legal and other administrative costs of landrights. Land costs include fee simple, easement, and rights-of-way costs of land, mineral rights and improvements. Utility costs include costs of change or removal of existing power, telephone, and gas lines, roads, bridges, and other facilities (See Table 2 for detailed cost).

Land costs for the reservoirs are the unit costs determined by the Project Sponsors multiplied by the measured area needed for the dam and spillways, sediment storage, floodwater detention, recreation, mineral rights, borrow and construction. Landrights for the Lobdell Creek floodwater retarding and recreation reservoir includes costs for:

1. 260 acres for a dam, spillway, lake, and contiguous area to provide for public use and protection of the development.
2. 161 acres for recreational facilities. and
3. 42 acres of reservoir land subject to periodic flooding and lying outside other land required for the development.

Channel work costs include landrights for construction and maintenance of the works. Different unit rates were applied to land needed for channel enlargement, berms, and woody plantings than to land needed for work areas, spoil placement, and maintenance. Maintenance costs include the cost of maintaining the current flow capacity for 1.06 miles of the existing South Fork channel downstream from the beginning of the I-70 area by-pass even though no construction is planned for this segment of existing channel. About 370 acres are included in the costs for the South Fork channel recreational facilities, 55 acres of this total is existing channel.

The estimated total relocation payments for one family in the Lobdell Creek Reservoir is $15,500. Relocation payment for one family at Granville is estimated to be $10,500. Relocation payments reimburse displaced persons for expenses such as moving personal property, increased finance charges, and other added costs of acquiring comparable replacement housing that is decent, safe, and sanitary. Relocation payments are shared by the Service and the Sponsors in the ratio that PL-566 funds and other funds are to be used to install the project. The PL-566 share is $18,070 (69.5 percent), and the local share is $7,930 (30.5 percent).

The South Licking Watershed Conservancy District will provide relocation assistance advisory services to the displaced persons in order to minimize hardships in completing the relocation. The Sponsors' personnel will provide the services. Advisory services include:

1. Determining needs.
2. Obtaining and furnishing current pertinent information concerning available replacement housing, costs, etc.
3. Informing affected persons of benefits to which they may be entitled.
4. Other assistance in getting reestablished.

The relocation assistance advisory services will cost an estimated $500 which is an administrative cost not subject to PL-566 cost sharing.

Raccoon Creek obstruction removal and Heath critical area stabilization were included for environment quality. The costs allocated to EQ were based on the difference in net benefits of the selected plan and net benefits that would accrue if the plan elements for the environmental quality were excluded.

The Kiber Run, Simpson Run, and Lobdell Creek reservoirs form the Raccoon Creek evaluation unit, and structural measure costs for the unit were allocated to the purposes served: flood prevention and recreation. The "Separable Costs -

Remaining Benefits" method of cost allocation was used. Table 2A summarizes installation costs allocated to flood prevention and recreation purposes, and shows the sharing of these estimated costs between PL-566 and other funds. The Agreement for installing, operating, and maintaining the project shows detailed cost sharing percentages.

ECONOMIC BENEFITS

Installation of structural works of improvement and recreation facilities in the plan will produce average annual benefits of $1,020,972. Most of the benefits will result from the reduction in floodwater damages of agricultural and urban lands, more intensive use of agricultural land and recreational development.

Reduction in urban damages will occur at Buckeye Lake, Granville, Hebron, and Newark. Average annual benefits are estimated at $264,106.

Average annual benefits to reduce flooding of crop and pasture land are estimated at $54,640. More intensive use from reduced flood hazard on agricultural land will provide an estimated $141,050 in benefits to the watershed. Other agricultural benefits such as reduced damage to farm roads, fences, and bridges plus debris removal are estimated at $3,759.

Transportation benefits from reduced damages to public roads and bridges are estimated at $1,077. Reduction in delays along Interstate 70 from flooding will provide indirect average annual benefits of $11,792. Additional indirect benefits resulting from agricultural and urban damage of $51,997 will also be realized. Indirect damages may include traffic delays due to flooding, detours, possible evacuation from flood threats, interruption of services, and debris cleanup.

The recreational facilities at the Lobdell Creek reservoir and on South Fork will provide additional recreational opportunities for watershed residents. Average annual benefits of $447,960 are estimated.

Redevelopment benefits stemming from project installation are estimated at $44,591. These are a result of employment of unemployed and underemployed in the project area.

Total evaluated average annual benefit is $1,020,972. The average annual cost of the structural works of improvement to achieve these benefits is $815,169. The benefit cost ratio for the planned project is 1.25:1.0.

INSTALLATION AND FINANCING

This plan will be carried out as a joint venture of private, local, state, and federal agencies. The plan will be installed over an eight (8) year period.

Land treatment will proceed concurrently with structural measures. Table P-5-1 and P-5-2 shows the expected schedule of installation for structural (including mitigation) and nonstructural measures and land treatment measures.

Land Treatment

Owners and operators in the watershed will be encouraged to install land treatment measures in cooperation with their soil and water conservation districts. The Soil Conservation Service will provide technical assistance through the Licking, Perry, and Fairfield Soil and Water Conservation Districts. The Ohio Division of Forestry, in cooperation with the U.S. Forest Service, will provide technical assistance to landowners for installation of planned forestry measures.

The Licking, Perry, and Fairfield Soil and Water Conservation Districts will carry out a program to accelerate the installation of the land treatment measures contained in this plan. Table 1 shows the area of land to be adequately treated and the cost of technical assistance. Technical assistance will be $170,400 from PL-566 funds.

The Ohio Division of Forestry, in cooperation with the U.S. Forest Service and other agencies, will provide technical assistance to private and public owners in planning, developing, and managing forest land. The amount of assistance furnished will be determined and influenced by the needs and desires of the Sponsors, the community leaders, and the landowners.

Technical assistance for forest land treatment measures are estimated to be $31,400 from PL-566 funds. Technical assistance to forest landowners for the installation of forestry measures will be provided by the Ohio Department of Natural Resources, Division of Forestry through the Cooperative Forest Management Program, and in cooperation with the USDA, Forest Service through the PL-566 program.

Structural and Nonstructural Measures

The South Licking Watershed Conservancy District will enter into contracts for construction of structural measures and provide such inspection and similar services as they deem necessary.

The Soil Conservation Service will provide engineering and administrative services for structural and mitigation measures, construction, and installation. Engineering services include design surveys, geologic investigations, designs, preparation of construction drawings and specifications, and similar services. Project Administration services include preparation of construction contracts, government representation for contracts, construction surveys and inspection, and similar services for installation of structural measures. Engineering services for recreational facilities will be contracted to qualified private consulting firms.

Table P-5-1

Structural and Nonstructural Measure Installation Schedule

Installation Year	Structural Measures To Be Installed	PL-566	Other	Total
1	Do Assessment and Begin Landrights Acquisition			
2	Simpson Run	485,500	56,900	542,400
3	Obstruction Removal on Raccoon Creek; Heath Critical Area Stabilization	986,790	44,850	1,031,640
4	Big Hollow	356,700	72,700	429,400
5	Kirkersville; Etna	1,128,300	266,800	1,395,100
6	Kiber; Lobdell,	1,459,357	597,543	2,056,900
7	Channel Enlargment; Obstruction Removal South Fork; I-70 By-pass, Hebron Dike	2,165,515	536,440	2,701,955
8	Lobdell Recreation; South Fork Recreation	1,280,100	999,950	2,280,050
Nonstructural Measures				
2	Land Acquisition and Relocation House No. 44 at Granville	12,100	4,400	16,500

Table P-5-2

Land Treatment Installation Schedule

Installation Year	PL-566 Fund Land Treatment
1	10,600
2	10,600
3	21,300
4	21,300
5	21,300
6	21,300
7	32,000
8	32,000
Total	170,400

The South Licking Watershed Conservancy District will acquire all landrights for installation, operation, and maintenance of structural and nonstructural measures. Landrights shall be acquired by easement, purchase, or subordination of the affected items. This will include such items as land, buildings, utilities, roads, bridges and mineral rights. In addition construction permits required under PL-92-500 Section 404 will be obtained by the conservancy district. Provisions for obtaining funds shall be through the benefit and damage appraisal procedures as prescribed in the Conservancy Law. The conservancy district shall use all authorities provided through the state statutes, including the right of eminent domain, to secure the necessary landrights. The Conservancy District shall be financially responsible for the local share of the construction, operation and maintenance costs associated with the works of improvement.

"Prior to entering into agreements that obligate funds of SCS, the South Licking Watershed Conservancy District, will develop a code of conduct governing the performance of its officers, employees, or agents in contracting with or expending PL-566 funds; and a financial management system for control, accountability, and disclosure of PL566 funds received and for control and accountability for property and other assets purchased with PL-566 funds."

It is the responsibility of the South Licking Watershed Conservancy District to provide relocation assistance advisory services. These shall be done in accordance with the "Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970" (Public Law 91-646, 84 Stat., 1894). Assistance available under the act are:

1. Determine the need, if any, of displaced persons for relocation assistance;
2. Provide current and continuing information on the availability, prices, and rentals of comparable decent, safe, and sanitary sale and rental housing, and of comparable commercial properties and locations for displaced businesses and farm operations;
3. Prior to initiation of acquisition, provide persons from whom it is planned to acquire land a brochure or pamphlet outlining the benefits to which they may be entitled; and
4. Assure that, within a reasonable period of time prior to displacement, replacement dwellings will be available;
5. Assist a displaced person, displaced from his business or farm operation, in obtaining and becoming established in a suitable replacement location;

Other administrative assistance to be provided are:

1. Supply information concerning housing programs, disaster loan programs, and other federal or state programs offering assistance to displaced persons;
2. Provide other advisory services to displaced persons in order to minimize hardships to such persons in adjusting to relocations;
3. Advise displaced persons that they should notify the displacing agency before they move;
4. Provide each displaced person, business, or farming operation with written notice at least 90 days before they are to vacate.

There is one property in the Lobdell Creek site and one at Granville that will require relocation assistance. Any new dwellings or buildings that are built in the affected areas prior to landrights acquisition shall be given the same services as

outlined above. The South Licking Watershed Conservancy District has made a survey in the vicinity of Alexandria, Johnstown, and Granville and has determined that decent, safe, and sanitary dwellings are available.

Marine fossils have been identified in the outcropping siltstones in the watershed of the Simpson Run site. The geology and paleontology of these strata should be thoroughly studied and an extensive collection of fossil specimens made before this reservoir is built 1/.

Evaluation of archaeological, historical, and other cultural resources have found no other items of significance that would be encountered by project installation. If such resources are unexpectedly found during construction, SCS procedures for appropriate compliance with regulations and executive orders will be implemented to protect them.

1/ An assessment of the Archaeological and Historical Resources in portions of Raccoon Creek and South Fork Licking River Watershed, Licking and Fairfield Counties, Ohio, by James L. Murphy.

OPERATION, MAINTENANCE AND REPLACEMENT

Landowners and operators will operate and maintain conservation land treatment measures on their lands. Technical assistance will be available for operation and maintenance from the Fairfield, Licking and Perry Soil and Water Conservation Districts, the Soil Conservation Service, the Ohio Department of Natural Resources, and Division of Forestry in cooperation with the U.S. Forest Service. The project sponsors will encourage landowners and operators to operate and maintain the measure to protect and improve the watershed's resources.

The South Licking Watershed Conservancy District will operate and maintain structural project measures upon acceptance of construction work from the contractors. The tract of land acquired in Granville under the nonstructural measure shall be managed for the public benefit. Funds for the work will be obtained by the South Licking Watershed Conservancy District through the procedures of Ohio's Conservancy District Law. The South Licking Watershed Conservancy District will use its staff, equipment, and materials or other means satisfactory to the Soil Conservation Service to do the work. The recreational facilities, custodial, policing, sanitation, safety, and other operational services will be provided by the South Licking Watershed Conservancy District or other organizations it may enlist.

Public and private bridges, other road facilities, and public utilities which have been modified to accommodate the project will be maintained by their respective owners with expenditures from their normal maintenance funds.

The Soil Conservation Service and the South Licking Watershed Conservancy District will complete an operation and maintenance agreement for each structural measure before signing a landrights, relocation, or project construction agreement. The agreements will provide for establishment periods, inspections, and reports. They will include specific provisions for retention and disposal of real and personal property acquired or improved with PL-566 funds. The agreements will be in accordance with the Ohio Watersheds Operation and Maintenance Handbook published by the Soil Conservation Service and will document the responsibilities of the South Licking Watershed Conservancy District and the Soil Conservation Service. An operation and maintenance plan will be prepared for each structural measure.

The planned flood prevention structural measures are designed to function without routine operational activities. The recreational facilities will be operated in accordance with requirements of the Ohio Department of Health and local health authorities, as provided in the operation and maintenance plans. The Lobdell Creek recreational facilities will require daily or continuous operational work such as refuse removal, sanitary facilities cleanup, and safety monitoring during heavy use seasons and frequent attention all year. The South Fork recreation area will require frequent attention to maintain safety and cleanliness.

Any incidental public recreation use that may be allowed in single-purpose flood prevention reservoir areas is contingent upon the South Licking Watershed Conservancy District providing adequate sanitary facilities in accordance with state regulations and upon its developing, promulgating, and enforcing rules for the use of reservoir areas. The District will take actions necessary to prevent public access and use of the reservoirs if sanitary facilities are not provided.

Maintenance work will be done to keep the structural measures in good condition for proper functioning during the project life. The reservoirs and channel work have design lives equal to the 100-year economic evaluation period. Some of the recreational facilities and channel appurtenances will have useful lives of less than 100-years and will be replaced when they become unserviceable.

To assure an effective maintenance program at minimum cost, inspections of the reservoirs and channel work areas will be made annually, after unusually severe storms, and whenever other unusual conditions may adversely affect the measures. In addition, reservoirs shall be inspected after the initial filling. Recreation facilities will be inspected annually and as often as necessary to assure safe, sanitary, attractive, and efficient operations. The Soil Conservation Service and the South Licking Watershed Conservancy District will jointly conduct these inspections. A qualified SCS engineer will assist in the inspections on the initial filling for dams, annually during the first three years, after major storms, and once every 5 years after the initial three year period. Authorized persons will have free access for inspections at any reasonable time.

The inspection will determine if conditions of the structural measures are favorable for their proper functioning. Written inspection reports will describe needed maintenance work and will include cost estimates for the work.

Typical inspection items for reservoirs include the following: drainage systems, relief wells and outlets; evidence of slope instability such as slides, slumps or cracking; condition of vegetation; evidence of rodent or erosion damage; and the condition of riprap, concrete and metal work, and hazard classification as it relates to downstream developments.

Typical inspection items for channel areas include the following: the condition of and around drain pipe outlets, concrete water inlets and retaining walls, and channel lining materials; evidence of excessive erosion, deposition or rodent damage; condition of vegetation and maintenance travelways; and the quality of wildlife habitat areas that were established to mitigate habitat losses from the project's construction.

Typical inspection items for recreational facilities include the following: effectiveness of groundskeeping, refuse disposal and sanitary facility cleaning; records of water supply testing; conditions of diving platforms, swimming area markers and safety equipment; and the state of repair for roads, docks, tables, buildings, and equipment.

The South Licking Watershed Conservancy District will maintain records of continuing and completed maintenance work and will furnish reports of these activities to the Soil Conservation Service and the Division of Water, Ohio Department of Natural Resources. Periodic reports will continue until all deficiencies described in inspection reports are satisfactorily corrected.

The South Licking Watershed Conservancy District will protect the permanent vegetation from farming activities or their encroachment by prompt, timely enforcement of landrights instruments. Where vegetation is damaged by maintenance work or natural forces, it will be restored to comparable quality and quantity.

Vegetative growth established for erosion control in reservoir, recreation, and stream construction areas will be maintained in a vigorous condition by fertilizing, reseeding, and other means as necessary. Unwanted vegetation will be controlled by mowing or other means. Mowing will be delayed until after July 1 to minimize disturbances to nesting and young wildlife. During the establishment period, earlier mowing will be used, if needed, to control competition from annual plants.

Wildlife habitat quality will be maintained on areas planted as part of the project measures and mitigation plans by replanting or by management of natural plant successions.

Erosion damage will be repaired promptly and rodents controlled where necessary. Debris and sediment accumulations that create flow restrictions in channel work reaches will be removed. Concrete and metal work will be maintained in good functional order by painting, repairing, or replacing as necessary.

For complex or unusually difficult or extensive maintenance work, the Soil Conservation Service may provide technical assistance upon request of the South Licking Watershed Conservancy District and within the limits of available resources. Drawings, specifications, layout, advice on techniques, and similar services may be provided.

The South Licking Watershed Conservancy District will prohibit installation of facilities or appurtenances that would interfere with the operation and maintenance of the structural measures. The District will obtain Soil Conservation Service approval of any drawings and specifications for altering or repairing a structural measure. The estimated total average annual operation, maintenance, and replacement costs shown in Table 4 are $170,861. This includes $16,919 for channel work, $4,130 for the reservoirs, $145,482 for the recreational facilities of which $34,811 is for replacement, $100 for dikes, and $4,230 for the environmental quality component consisting of Heath critical area stabilization and Raccoon Creek obstruction removal.

Funds needed for the works of improvement will be raised by the District through normal legal procedures. User fees for the Lobdell Creek recreational facilities will help to defray operation, maintenance, and replacement costs. Fee schedules will be based on the type and diversity of available facilities and will be commensurate with customary charges at similar facilities. The South Licking Watershed Conservancy District will be responsible for funds needed to operate the South Fork channel recreational facility and the Lobdell Creek recreational facility.

AGREEMENT

WATERSHED PLAN AGREEMENT
Between The
South Licking Watershed Conservancy District
Licking County Soil and Water Conservation District
Fairfield County Soil and Water Conservation District
Perry County Soil and Water Conservation District
Licking County Commissioners
Fairfield County Commissioners
Perry County Commissioners
Newark Area Chamber of Commerce
(Hereinafter referred to as the Sponsors)

State of Ohio
and the
Soil Conservation Service
United States Department of Agriculture
(Hereinafter referred to as SCS)

Whereas, application has heretofore been made to the Secretary of Agriculture by local organization(s) for assistance in preparing a plan for works of improvement for the South Fork of Licking River Watershed, State of Ohio, under the authority of the Watershed Protection and Flood Prevention Act (16 U.S.C. 1001-1008); and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to the Soil Conservation Service (SCS); and

Whereas, there has been developed through the cooperative efforts of local organizations and SCS this plan for works of improvement for the South Fork of Licking River Watershed, State of Ohio:

Now, therefore, in view of the foregoing considerations, the Secretary of Agriculture through the Soil Conservation Service and the Sponsors, hereby agree on this plan and that the works of improvement for this project will be installed, operated, and maintained in accordance with the terms, conditions, and stipulations provided for in this watershed plan and including the following:

1. The South Licking Watershed Conservancy District will acquire such landrights as will be needed in connection with the works of improvement. The percentages of this cost to be borne by the Sponsors and the SCS are as follows:

Works of Improvement	South Licking Watershed Conservancy District (Percent)	SCS (Percent)	Estimated Landrights Cost
Multiple-purpose Str. Lobdell and Recreational Facilities			
Payment to landowners for about 548 acres.	50	50	523,800

Works of Improvement	South Licking Watershed Conservancy District (Percent)	SCS (Percent)	Estimated Landrights Cost
Land Appraisal Fees	50	50	6,000
Legal Fees, Survey Costs, Flowage Easements, and Other	100	0	27,720
South Fork Channel Recreation Area			
Payment to landowners for about 370 acres	50	50	289,700
Land Appraisal Fees	50	50	4,000
Legal Fees, Survey Costs, Flowage Easements, and Other	100	0	3,000
All Other Structural Measures	100	0	$ 958,680
Nonstructural Measures	20	80	6,000

2. The South Licking Watershed Conservancy District assure that comparable replacement dwellings will be available for individuals and persons displaced from dwellings, and will provide relocation assistance advisory services and relocation assistance, make the relocation payments to displaced persons, and otherwise comply with the real property acquisition policies contained in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894) effective as of January 2, 1971 and the Regulations issued by the Secretary of Agriculture pursuant thereto. The costs of relocation payments will be shared by the Sponsors and SCS as follows:

	South Licking Watershed Conservancy District (Percent)	SCS (Percent)	Estimated Relocation Payment Costs (Dollars)
Relocation Payments	30.5	69.5	$ 26,000

3. The South Licking Watershed Conservancy District will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to state law as may be needed in the installation and operation of the works of improvement.

4. The percentages of construction costs to be paid by the South Licking Watershed Conservancy District and by SCS are as follows:

Works of Improvement	South Licking Watershed Conservancy District (Percent)	SCS (Percent)	Estimated Construction Cost (Dollars)
Multiple-Purpose Str. Lobdell	29.5	71.5	856,200
Recreational Facilities	50	50	1,206,070
South Fork Channel Recreation Area	50	50	148,980
South Fork Obstruction Removal and Canoe Trail	5	95	40,300
All Other Structural Measures	0	100	4,206,355

5. The percentages of the engineering costs to be borne by the South Licking Watershed Conservancy District and SCS are as follows:

Works of Improvement	South Licking Watershed Conservancy District (Percent)	SCS (Percent)	Estimated Engineering Cost (Dollars)
Multiple-Purpose Str. Lobdell	0	100	64,000
Recreational Facilities (Lobdell) (A&E Contract)	50	50	83,000
South Fork Channel Recreation Area (A&E Contract)	50	50	13,200
All Other Structural Measures	0	100	282,795

6. The South Licking Conservancy District and SCS will each bear the costs of Project Administration which it incurs, estimated to be $193,960 and $1,514,805, respectively.

7. The South Licking Conservancy District will obtain agreements from owners of not less than 50 percent of the land above each reservoir and floodwater retarding structure that they will carry out conservation farm or ranch plans on their land.

8. The South Licking Watershed Conservancy District will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed plan.

9. The South Licking Watershed Conservancy District will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.

10. The South Licking Watershed Conservancy District will be responsible for the operation, maintenance, and replacement of the works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.

11. The costs shown in this plan represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.

12. This agreement is not a fund obligating document. Financial and other assistance to be furnished by SCS in carrying out the plan is contingent upon the fullfillment of applicable laws and regulations and the availability of appropriations for this purpose.

13. A separate agreement will be entered into between SCS and South Licking Watershed Conservancy District before either party initiates work involving funds of the other party. Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

14. This plan may be amended, revised, or terminated only by mutual agreement of the parties hereto except that SCS may terminate financial and other assistance in whole, or in part, at any time it determines that the South Licking Watershed Conservancy District has failed to comply with the conditions of this agreement. In this case, SCS shall promptly notify the South Licking Watershed Conservancy District in writing of the determination and the reasons for the termination, together with the effective date. Payments made to the South Licking Watershed Conservancy District or recoveries by SCS under projects terminated shall be in accord with the legal rights and liabilities of the parties.

15. No member of or delegate to Congress or resident commissioner, shall be admitted to any share or part of this plan, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

16. The program conducted will be in compliance with all requirements respecting nondiscrimination as contained in the Civil Rights Act of 1964, as amended, and the regulations of the Secretary of Agriculture (7 CFR 15.1-15.12), which provide that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any activity receiving federal financial assistance.

South Licking Watershed
Conservancy District
c/o Palmer Jones
17 Spring Hill
Granville, Ohio 43023

By: John E. Hankinson

Title: Chairman

Date: June 18, 1980

The signing of this plan was authorized by a resolution of the governing body of the South Licking Watershed Conservancy District adopted at a meeting held on June 18, 1980.

Gordon C. Pettle
Secretary

799 Hebron Road
Newark, Ohio 43055
Address Zip Code

Date: June 18, 1980

Licking County Soil and
Water Conservation District
799 Hebron Road
Newark, Ohio 43055

By: Willis Lees

Title: Chairman

Date: June 9, 1980

The signing of this plan was authorized by a resolution of the governing body of the Licking County Soil and Water Conservation District adopted at a meeting held on June 9, 1980.

Albert O. Rehbock
Secretary

Newark, Ohio 43055
Address Zip Code

Date: June 9, 1980

Fairfield County Soil and
Water Conservation District
P.O. Box 279
1109 E. Main Street
Lancaster, Ohio 43130

By: Marvin Eyman

Title: Chairman

Date: June 25, 1980

The signing of this plan was authorized by a resolution of the governing body of the Fairfield County Soil and Water Conservation District adopted at a meeting held on May 27, 1980.

John T. Richetta
Secretary

1109 E. Main Street
Lancaster, Ohio 43130
Address Zip Code

Date: June 25, 1980

Perry County Soil and Water
Conservation District
East Gay Street, P.O. Box 337
Somerset, Ohio 43783

By: James H. Young
Title: Chairman
Date: June 2, 1980

The signing of this plan was authorized by a resolution of the governing body of the Perry County Soil and Water Conservation District adopted at a meeting held on June 2, 1980.

David L Vermillion
Secretary

Somerset, Ohio 43783
Address Zip Code

Date: June 2, 1980

Licking County Commissioners
County Administration Building
Newark, Ohio 43055

By: Marc D. Guthrie
Title: President
Date: May 29, 1980

The signing of this plan was authorized by a resolution of the governing body of the Licking County Commissioners adopted at a meeting held on May 29, 1980.

Glen K Porter
Secretary

Newark, Ohio 43055
Address Zip Code

Date: May 29, 1980

Fairfield County Commissioners
Courthouse
Lancaster, Ohio 43130

By: Charlotte Deeds
Title: Ch Co Commissioner
Date: June 17, 1980

The signing of this plan was authorized by a resolution of the governing body of the Fairfield County Commissioners adopted at a meeting held on June 17, 1980.

Mary Belle Snyder
Secretary

Lancaster, Ohio 43130
Address Zip Code

Date: June 17, 1980

Perry County Commissioners
Box 248
New Lexington, Ohio 43764

By: Andrew J. McMillen

Title: Chairman

Date: June 19, 1980

The signing of this plan was authorized by a resolution of the governing body of the Perry County Commissioners adopted at a meeting held on June 19, 1980.

Judy Sauder
Secretary

New Lexington, Ohio 43764
Address Zip Code

Date: June 19, 1980

Newark Area Chamber
of Commerce
Box 702
Newark, Ohio 43055

By: Charles J. Pierson

Title: President-Elect

Date: June 23, 1980

The signing of this plan was authorized by a resolution of the governing body of the Newark Area Chamber of Commerce adopted at a meeting held on June 23, 1980.

Secretary

Newark, Ohio 43055
Address Zip Code

Date: June 23, 1980

Appropriate and careful consideration has been given to the environmental impact statement prepared for this project and to the environmental aspects thereof.

Soil Conservation Service

United States Department of Agriculture

Approved by:

Robert R. Shaw
State Conservationist

Date

TABLE 1 - ESTIMATED INSTALLATION COST
South Fork Licking River Watershed, Ohio

Item	Unit	Number	Estimated Cost (Dollars) 1/ PL-566 Funds SCS 3/	PL-566 Funds FS 3/	PL-566 Funds Total	Other Funds SCS 3/	Other Funds FS 3/	Other Funds Total	Total Installation Cost
LAND TREATMENT - GOING PROGRAM									
Cropland	Acres to	7,470				910,300		910,300	910,300
Pasture	be Adequately	1,040				317,900		317,900	317,900
Forest	Protected2/	820					24,000	24,000	24,000
Other		200				69,900		69,900	69,900
Technical Assistance						230,200	10,200	240,400	240,400
SUBTOTAL	Acres 2/	9,530				1,528,300	34,200	1,562,500	1,562,500
LAND TREATMENT - ACCELERATED									
Cropland	Acres to	2,880				550,000		550,000	550,000
Pasture	be Adequately	1,060				315,000		315,000	315,000
Forest	Protected2/	600					9,200	9,200	9,200
Other		160				75,300		75,300	75,300
Technical Assistance			139,000	31,400	170,400		5,500	5,500	175,900
SUBTOTAL	Acres 2/	4,700	139,000	31,400	170,400	940,300	14,700	955,000	1,125,400
TOTAL LAND TREATMENT	Acres 2/	14,230	139,000	31,400	170,400	2,468,600	48,900	2,517,500	2,687,900
NONSTRUCTURAL MEASURES									
Land Acquisition House No. 44 at Granville	Each	1	12,100		12,100	4,400		4,400	16,500
SUBTOTAL Nonstructural Costs			12,100		12,100	4,400		4,400	16,500
STRUCTURAL MEASURES									
Floodwater Retarding Reservoirs	No.	5	1,836,700		1,836,700	438,750		438,750	2,275,450
Lobdell Multiple-Purpose Res.	No.	1	854,457		854,457	461,743		461,743	1,316,200
Lobdell Creek Recreational Facilities	No.	1	733,085		733,085	733,085		733,085	1,466,170
Channel Work - (M) 4/	Miles	0.7	202,100		202,100	11,100		11,100	213,200
- (N) 4/	Miles	11.2	40,505		40,505	8,315		8,315	48,820
- (O) 4/	Miles	3.3	1,628,655		1,628,655	476,130		476,130	2,104,785
South Fork Channel Recreational Facilities	No.	1	226,965		226,965	226,965		226,965	453,930
Heath Critical Area Stabilization	Miles	5.9	777,900		777,900	17,100		17,100	795,000

TABLE 1 - ESTIMATED INSTALLATION COST
South Fork Licking River Watershed, Ohio

Item	Unit	Number	Estimated Cost (Dollars) 1/ PL-566 Funds SCS 3/	PL-566 Funds FS 3/	PL-566 Funds Total	Other Funds SCS 3/	Other Funds FS 3/	Other Funds Total	Total Installation Cost
Raccoon Creek Obstruction Removal	Miles	7.0	12,430		12,430	3,300		3,300	15,730
Flood Prevention Dikes - Hebron	Miles	0.3	33,395		33,395	6,000		6,000	39,395
SUBTOTAL - Structural Costs			6,346,192		6,346,192	2,382,488		2,382,488	8,728,680
PROJECT ADMINISTRATION									
Construction Inspection			1,103,635		1,103,635				1,103,635
Relocation Assistance Advisory Service						500		500	500
Other			411,170		411,170	193,460		193,460	604,630
SUBTOTAL - Project Administration			1,514,805		1,514,805	193,960		193,960	1,708,765
Total Project Costs 5/			8,012,097	31,400	8,043,497	3,521,148	14,700	3,535,848	11,579,345
TOTAL ALL COSTS			8,012,097	31,400	8,043,497	5,049,448	48,900	5,098,348	13,141,845

1/ Price base 1978.

2/ Includes only estimated acres to be adequately protected during the project installation period. Dollar amounts apply to all watershed land receiving conservation treatment rather than to only the land that will become adequately protected during the project installation period.

3/ Federal agency responsible for assisting in installation of project measures.

4/ Type of channel before project: (M) - a manmade or previously modified channel; (N) - an unmodified, well-drained natural channel; (O) - none or practically no defined channel.

5/ Excludes ongoing program conservation land treatment.

March 1979

TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT
(At Time of Plan Preparation)
South Fork Licking River Watershed, Ohio

Measure	Unit	Applied To Date	Installation Cost (Dollars 1/)
CONSERVATION LAND TREATMENT 2/			
Brush Management	Ac.	30	1,600
Conservation Cropping System	Ac.	55,160	55,200
Contour Farming	Ac.	140	30
Critical Area Planting	Ac.	340	103,500
Diversion	Ft.	101,640	71,100
Farmstead and Feedlot Windbreak	Ac.	1	100
Fish Pond Management	No.	109	21,800
Grassed Waterway or Outlet	Ac.	90	172,000
Minimum Tillage	Ac.	18,360	0
Pasture and Hayland Management	Ac.	3,810	190,500
Pasture and Hayland Planting	Ac.	2,110	211,300
Pond	No.	363	1,089,000
Recreation Area Improvement	Ac.	1	30
Spring Development	No.	17	11,900
Stripcropping (Contour)	Ac.	1,450	14,500
Subsurface Drain	Ft.	2,436,800	1,340,200
Surface Drainage	Ft.	216,680	223,900
Tree Planting	Ac.	1,570	78,500
Trough or Tank	No.	35	5,300
Wildlife Upland Habitat Management	Ac.	1,060	53,200
Wildlife Watering Facility	No.	7	2,100
Woodland Improvement	Ac.	650	29,250
Subtotal			3,675,010
STRUCTURAL MEASURES 3/			
Buckeye Lake Channels 4/	Mi.	3.4	40,100
South Fork Channel 5/	Mi.	1.5	20,600
Subtotal			60,700
NONSTRUCTURAL MEASURES 3/			
Zoning Regulations			12,500
Flood Insurance 6/			13,000
Subtotal			25,500
TOTAL			3,761,210
LAND ADEQUATELY PROTECTED	Ac.	60,370	0

1/ Price base 1977.
2/ Total in the watershed.
3/ Installed 1967-77.
4/ Clearing and debris removal on reservoir feeder channel from Interstate 70 to Twp. Rd. 110 and on lake outlet channel from Buckeye Lake to South Fork.
5/ Removal of major log jams at various locations.
6/ Preliminary flood prone area maps.

TABLE 2 - ESTIMATED COST DISTRIBUTION
South Fork Licking River Watershed, Ohio
(Dollars) 1/

Item	Installation Cost - P.L. 566					Installation Cost - Other					Total Installation Cost
	Construction	Engineering	Land Rights	Relocation Payments	Total PL-566	Construction	Engineering	Land Rights	Relocation Payments	Total Other	
STRUCTURAL MEASURES											
Floodwater Retarding Reservoirs											
Big Hollow	262,500	20,200			282,700			62,800		62,800	345,500
Etna	397,000	25,600			422,600			111,200		111,200	533,800
Kiber Run	281,800	21,400			303,200			95,250		95,250	398,450
Kirkersville	411,800	34,900			446,700			124,600		124,600	571,300
Simpson Run	358,500	23,000			381,500	(1,000) 2/		44,900		44,900	426,400
Floodwater Retarding and Recreational Reservoir											
Lobdell Creek	603,297	64,000	176,390	10,770	854,457	252,903		204,110	4,730	461,743	1,316,200
Recreational Facilities	603,035	41,500	88,550		733,085	603,035	41,500	88,550		733,085	1,466,170
Flood Prevention Channel Work - South Fork											
Bypass Near I-70 (O)4/	1,537,955	90,700			1,628,655			476,130	3/	476,130	2,104,785
1687+00 to 1810+00 (M)4/	191,300	10,800			202,100			11,100		11,100	213,200
1810+00 to 2317+45 (N)4/	38,285	2,220			40,505	2,015		6,300		8,315	48,820
Heath Critical Area Stabilization	727,100	50,800			777,900			17,100		17,100	795,000
Flood Prevention Dikes - Hebron	30,920	2,475			33,395			6,000		6,000	39,395
Channel Recreation Development											
South Fork Recreational Facilities	72,365	6,600	148,000		226,965	72,365	6,600	148,000		226,965	453,930
Raccoon Creek Obstr. Removal	11,730	700			12,430			3,300		3,300	15,730
SUBTOTAL - Structural Measures	5,527,587	394,895	412,940	10,770	6,346,192	930,318	48,100	1,399,340	5/ 4,730	2,382,488	8,728,680
NONSTRUCTURAL MEASURES - Land Acquisition											
House No. 44 at Granville			4,800	7,300	12,100			1,200	3,200	4,400	16,500
SUBTOTAL - Nonstructural			4,800	7,300	12,100			1,200	3,200	4,400	16,500
PROJECT ADMINISTRATION					1,514,805					193,960	1,708,765
GRAND TOTAL	5,527,587	394,895	417,740	18,070	7,873,097	930,318	48,100	1,400,540	7,930	2,580,848	10,453,945

1/ Price base 1978.
2/ Nonproject cost of marine fossil salvage.
3/ Includes $364,630 for pipeline changes and new bridges.
4/ Type of channel before project: M - A manmade or previously modified channel; N - An unmodified well-defined natural channel; 0 - None or practically no defined channel.
5/ Includes $72,000 appraisals, legal, survey and other costs.

March 1979

TABLE 2A - COST ALLOCATION AND COST SHARING SUMMARY
South Fork Licking River Watershed, Ohio
(Dollars) 1/

Item	COST ALLOCATION			COST SHARING					
	Purpose			P.L. 566			Other		
	Flood Prevention	Recreation	Total	Flood Prevention	Recreation	Total	Flood Prevention	Recreation	Total
STRUCTURAL MEASURES									
Single Purpose Floodwater Retarding Structures (5)	2,275,450		2,275,450	1,836,700		1,836,700	438,750		438,750
Multipurpose Structure (1)									
Lobdell Reservoir	408,852	907,348	1,316,200	379,229	475,308	854,537	29,623	432,040	461,663
Lobdell Recreational Facilities		1,466,170	1,466,170		733,085	733,085		733,085	733,085
South Fork Channel Recreation		453,930	453,930		226,965	226,965		226,965	226,965
Channel Work	2,362,775	4,030	2,366,805	1,869,245	2,015	1,871,260	493,530	2,015	495,545
Heath Critical Area Stabilization	795,000		795,000	777,900		777,900	17,100		17,100
Raccoon Obstruction Removal	15,730		15,730	12,430		12,430	3,300		3,300
Flood Prevention Dike - Hebron	39,395		39,395	33,395		33,395	6,000		6,000
NONSTRUCTURAL MEASURES									
Land Acquisition House No. 44 at Granville	16,500		16,500	12,100		12,100	4,400		4,400
GRAND TOTAL	5,913,702	2,831,478	8,745,180	4,920,999	1,437,373	6,358,372	992,703	1,394,105	2,386,808

1/ Price Base 1978.

March 1979

TABLE 2B - RECREATIONAL FACILITIES
ESTIMATED CONSTRUCTION COSTS
South Fork Licking River Watershed, Ohio
(Dollars) 1/

Item	Number or Size 2/	Estimated Unit Cost	Total Construction Cost
LOBDELL CREEK RECREATIONAL DEVELOPMENT			
Beach Area			
Bathhouse and Change Booths (with 10 showers)	700 Sq. Ft.	61	42,700
Toilets-Vault Type	2	18,150	36,300
Beach - Sand Area	26,000 Sq. Ft.	0.36	9,360
- Grass Area	1 Acre	850	850
Life Guard Chairs	2	300	600
Diving Platforms	2	1,210	2,420
Swimming Area Markers	1 Set	1,886	1,886
Safety Equipment	1 Set	610	610
Well and Electric Pump	1	3,630	3,630
Water Line	500 Ft.	7	3,500
Water Fountains	3	610	1,830
Refuse Container Stands	20	88	1,760
Paved Road 3/	1,500 Ft.	36	54,000
Concrete Curbs	500 Ft.	7	3,500
Paved Parking	100 Cars	180	18,000
Grassed Parking	150 Cars	61	9,150
Boating			
Docks	15 Boats	830	12,450
Boating Access Ramp	300 Ft.	60	18,000
Paved Road	100 Ft.	36	3,600
Paved Parking	10 Cars and Trailers	420	4,200
Security Lights	2	240	480
Signs	5	33	170
Primitive Camping			
Toilet-Vault Type	1	11,000	11,000
Well and Hand Pump	1	1,820	1,820
Refuse Container Stands	20	88	1760
Gravel Road	4,000 Ft.	20	80,000
Gravel Parking	20 Cars	88	1,760
Fence and Gate	2,500 Ft.	8	20,000
Signs	5	33	170
Waste Drains	8	88	704
Boat Docks	5	830	4,150

Item	Number or Size2/	Estimated Unit Cost	Total Construction Cost
Family Camping - Class A and B			
Campsites with Pads & Barriers	75	425	31,880
Grills and Fire Rings	75	170	12,750
Tables	75	180	13,500
Refuse Container Stands	75	88	6,600
Electrical Outlets	75	121	9,080
Waste Drains	75	88	6,600
Toilets - Vault Type	4	12,100	48,400
Trailer Dump Station	1	18,150	18,150
Playground Equipment	1 Set	2,750	2,750
Wells with Hand Pumps	3	1,815	5,450
Electric Lines	2,500 Ft.	5.50	13,750
Security Lights	4	240	960
Paved Road	2,000 Ft.	39	78,000
Landscaping - Trees	1,500	55	82,500
- Shrubs	620	7	4,340
- Shaping & Seeding	35 Acres	850	29,750
Signs	20	33	660
Group Camping			
Group Grill	1	3,030	3,030
Tables	6	190	1,140
Refuse Container Stands	3	88	260
Toilet - Vault Type	1	12,100	12,100
Electric Line	500 Ft.	5.50	2,750
Security Light	1	240	240
Paved Road with Gate	500 Ft.	40	20,000
Shaping and Seeding	2 Acres	850	1,700
Signs	5	33	170
Well and Hand Pump	2	1,815	3,630
Picnic and Playground Area			
Grills and Fire Rings	100	165	16,500
Tables	200	180	36,000
Refuse Container Stands	70	88	6,160
Group Shelters	4	12,100	48,400
Toilets - Vault Type	10	11,000	110,000
Playground Equipment	3 sets	2,420	7,260
Wells with Hand Pumps	3	1,815	5,450
Electric Line - Underground	5,000 Ft.	5.50	27,500
Security Lights	25	240	6,000
Paved Road 3/	1,500 Ft.	36	54,000
Paved Parking	20 Cars	180	3,600
Landscaping - Trees	200	55	11,000
- Shrubs and Vines	1,200	7	8,400
- Shaping and Seeding	15 Acres	850	12,750

Item	Number or Size2/	Estimated Unit Cost	Total Construction Cost
Signs	50	33	1,650
TRAILS			
Lake Trail	26,400 Ft.	1.80	47,570
Nature Trail	10,560 Ft.	1.80	19,000
Other Facilities			
Entrance Control Building	1	18,150	18,150
Security Lights	2	240	480
Entrance Area Landscaping of Trees and Shrubs	3,000 Ft.	3.30	9,900
Total Lobdell Creek			1,206,070
SOUTH FORK CHANNEL RECREATIONAL DEVELOPMENT			
Grills and Fire Rings	35	165	5,780
Tables	70	180	12,600
Refuse Container Stands	24	88	2,110
Waste Drains	3	88	260
Toilets - Flood Proof Vault Type	3	11,000	33,000
Stream Access Ramps	3	1,820	5,460
Paved Parking - 3 Acres	105 Cars	190	19,950
Trail	39,300 Ft.	1.65	64,850
Security Lights	3	240	720
Total South Fork			144,730
GRAND TOTAL			1,350,800

1/ Price Base 1978.

2/ Estimated quantity, subject to minor variation at time of detailed planning.

3/ With gravel parking along side (estimated 68 cars per 1,500 feet per side).

March 1979

TABLE 3 - STRUCTURAL DATA
DAMS WITH PLANNED STORAGE CAPACITY
South Fork Licking River Watershed, Ohio

Item	Unit	Big Hollow	Etna Reservoir	Kiber Run	Kirkersville Reservoir	Lobdell Creek	Simpson Run	Total
Class of Structure		c	c	b	b	c	c	
Total Drainage Area	Sq.Mi.	2.07	1.49	3.22	4.4	17.73	2.34	31.25
Controlled	Sq.Mi.	-	-	-	-	-	-	-
Runoff Curve No. (1-day; AMC II)	-	81	83	82	80	80	78	-
Top of Dam Elevation	Feet	1087.8	1022.1	1094.2	976.2	1036.4	1019.7	-
Emergency Spillway Crest Elevation	Feet	1080.4	1015.0	1088.7	970.8	1026.0	1008.5	-
High Stage Inlet Crest Elevation	Feet	1072.0	1011.3	1081.6	961.5	0	1000.1	-
Low Stage Inlet Crest Elevation	Feet	1069.3	1007.4	1078.6	953.8	1007.0	992.4	-
Maximum Dam Height	Feet	31.4	25.8	28.2	31.7	75.5	42.0	-
Fill Volume	Cu.Yd.	68,700	106,000	55,600	127,200	245,800	77,900	681,200
Total Capacity 1/	Ac.Ft.	398	272	530	817	4,459	342	6,818
Sediment, Submerged	Ac.Ft.	70	54	92	86	378	55	735
Sediment, Aerated	Ac.Ft.	6	4	8	7	32	5	62
Recreation	Ac.Ft.	-	-	-	-	1,110	-	1,110
Floodwater Retarding	Ac.Ft.	322	218	430	724	2,939	282	4,915
Between High and Low Stage	Ac.Ft.	(55)	(84)	(86)	(195)	-	(104)	(524)
Surface Area								
Sediment Pool	Acres	17	17	23	17	(42) 2/	10	126
Recreation Pool	Acres	-	-	-	-	106	-	106
Floodwater Retarding Pool 1/	Acres	40	44	72	83	208	26	473
Equivalent Rainfall Vol. (1-day)	Inches	5.2	5.0	4.8	5.0	5.3	5.5	-
Equivalent Rainfall Vol. (10-day)	Inches	10.7	10.2	9.8	10.3	10.9	11.3	-
Principal Spillway Design								
Runoff Volume (1-day)	Inches	3.2	3.2	2.9	2.9	3.2	3.2	-
Runoff Volume (10-day)	Inches	6.3	6.3	5.8	5.8	6.3	6.3	-
Capacity of Low Stage (Max.)	cfs	11	27	19	39	306	39	-
Capacity of High Stage (Max.)	cfs	144	53	108	67	-	165	-
Diameter of Conduit	Inches	36	24	30	24	42	36	-
Emergency Spillway Design								
Frequency of Operation	% Chance	1	1	2	2	1	1	-
Rainfall Volume (ESH)	Inches	9.48	9.5	6.5	6.5	9.5	9.5	-
Runoff Volume (ESH)	Inches	7.15	7.4	4.5	4.2	7.2	6.8	-
Storm Duration	Hours	6	6	6	6	6	6	-
Type	-	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	-
Bottom Width	Feet	200	140	150	160	400	120	-
Max. Exit Channel Velocity	Ft./Sec.	6.7	2.5	5.3	4.6	8.9	8.7	-
Exit Channel Slope	Ft./Ft.	0.015	0.010	0.014	0.035	0.025	0.020	-
Max. Reservoir Water Surface Elev.	Feet	1083.1	1017.7	1090.7	972.2	1030.4	1012.8	-
Freeboard Design								
Rainfall Volume (FH)	Inches	25.36	25.40	12.8	12.8	25.4	25.4	-
Runoff Volume (FH)	Inches	22.75	23.10	10.5	10.2	23.2	22.3	-
Storm Duration	Hours	6	6	6	6	6	6	-

TABLE 3 - STRUCTURAL DATA
DAMS WITH PLANNED STORAGE CAPACITY
South Fork Licking River Watershed, Ohio

Item	Unit	Big Hollow	Etna Reservoir	Kiber Run	Kirkersville Reservoir	Lobdell Creek	Simpson Run	Total
Max. Reservoir Water Surface Elev.	Feet	1087.3	1022.1	1094.2	976.2	1036.4	1019.7	-
Total Emergency Spillway Outflow	Ac.Ft.	2047	1543	1230	1535	18083	2340	-
Capacity Equivalents								
Sediment Volume	Inches	0.69	0.73	0.58	0.40	0.43	0.48	-
Flood Retarding Volume	Inches	2.92	2.74	2.50	3.09	3.11	2.26	-
Recreation Volume	Inches	-	-	-	-	1.18	-	-

1/ At emergency spillway crest elevation.

2/ Normal Pool = 106 acres.

March 1979

TABLE 3A - STRUCTURAL DATA
CHANNEL WORK
South Fork Licking River Watershed, Ohio

Station	Drainage Area Sq.Mi.	100-Yr. Frequency Design Discharge cfs	Water Surface Elevation Feet msl	Average Hydraulic Gradient ft/ft	Channel Bottom Dimensions 1/ Gradient ft/ft	Width Feet	Elevation Feet msl	"n" Value Aged	"n" Value As Built	Average Velocity fps Aged	Average Velocity fps As Built	Excavation Volume Cu.Yd.	Type of Work 2/	Existing Channel Type 3/	Present Flow Condition 4/
SOUTH FORK BY-PASS NEAR INTERSTATE 70 (3.3 miles)															
93+00	59.3		891.7				881.0								
		3870		.0007	.0007	50		.030	.023	4.8	5.7	241,200	I	0	-
164+00	63.0		886.8				876.1								
		3870 6/		.00034	.0007	50		.030	.023	5.1	6.6	315,400	I	0	-
268+00 5/	65.1		883.1				868.6								
17,500 feet total by-pass length.															
												556,600 Cu.Yd. total Excavation.			
SOUTH FORK FROM DOWNSTREAM END OF BY-PASS TO JUNCTION WITH BUCKEYE LAKE OUTLET CHANNEL (0.7 mile)															
1690 5/	72.7		883.1				868.6								
		4940 7/		.00006	.0004	80		.025	.020	1.4	1.8	63,000	II	M(1925)	P
1724+85	72.2		881.9				867.2								
3,485 feet total South Fork enlargement length.															
												63,000 Total South Fork Volume			
SOUTH FORK FROM BUCKEYE LAKE OUTLET CHANNEL TO JUNCTION WITH RACCOON CREEK (11.2 miles)															
1724+85	116.7							0.57 8/	.050 9/	1.1 8/	1.2 9/		IVA	M(1925)	P
1810+00	118.7							.052 8/	.045 9/	2.7 8/	2.9 9/		IVA	N	P
2317+45	184.1														
59,160 feet total South Fork obstruction															
RACCOON CREEK FROM COUNTY ROAD 91 TO STATE ROUTE 16 (7.0 miles)															
880+70	33.71														
								.055 8/	.050 9/	2.9 8/	3.2 9/		IVA	N	P
1071+50	75.0														
								.060 8/	.055 9/	2.2 8/	2.4 9/		IVA	N	P
1253+60	81.8														
37,290 feet total Raccoon Creek obstruction removal length.															
CRITICAL AREA STABILIZATION THROUGH THE CITY OF HEATH															
455+90 to 563+30 Ramp Creek (4) segments to be stabilized													V	M(1967)	P
2092+45 to 2298+45 South Fork (6) segments to be stabilized													V	N	P

TABLE 3A - STRUCTURAL DATA
CHANNEL WORK
South Fork Licking River Watershed, Ohio

Station	Drainage Area Sq.Mi.	100-Yr. Frequency Design Discharge cfs	Water Surface Elevation Feet msl	Average Hydraulic Gradient ft/ft	Channel Bottom Dimensions 1/ Gradient ft/ft	Width Feet	Elevation Feet msl	"n" Value Aged	"n" Value As Built	Average Velocity fps Aged	Average Velocity fps As Built	Excavation Volume Cu.Yd.	Type of Work 2/	Existing Channel Type 3/	Present Flow Condition 4/
117,535 feet total channel work length (does not include Heath Critical Area Stabilization)												810,700 Cu.Yd. total excavation volume			

	Length	100-Year Freq. Elev.	Top of Dike Elev.	Dike Dimensions Top Width 10/	Side Slope 10/	Avg. Height	Fill Volume
HEBRON FLOOD PREVENTION DIKE							
	1800'	883.2	885.2	8-10'	3:1-6:1	5'	9300 cu.yds.

1/ Side slopes 2:1 in type I and II work areas.
2/ I - Establishment of new channel including necessary stabilization measures.
II - Enlargment of existing channel.
IVA - Removal of flow obstructions within the channel flow area.
V - Stabilization as primary purpose (by continuous treatment or localized problem areas -- present capacity adequate).
3/ M () - Previously modified channel with approximate date of original major construction shown in parentheses.
N - An unmodified, well-defined channel.
O - None or practically no defined channel.
4/ P (perennial) - Flows at all times except during extreme drought.
5/ By-pass station 268+00 equals South Fork station 1690+00.
6/ Average flow within bank is 2,400 cfs.
7/ Average flow within bank is 1,200 cfs.
8/ Average before obstruction removal.
9/ Average after obstruction removal.
10/ Varies with topography.

March 1979

TABLE 4 - ANNUAL COST
South Fork Licking River Watershed, Ohio
(Dollars) 1/

Evaluation Unit	Amortization of Installation Cost 2/	Operation, Maintenance, And Replacement Cost	Total
South Fork	296,708 (54,720) 5/	53,179 3/ (3680) 5/	349,887 (58,400) 5/
Raccoon Creek	249,420 (1083) 6/	113,452 4/ (550) 6/	362,872 (1,633) 6/
Project Administration	102,410 (15,205) 5/6/	0 0	102,410 (15,205) 5/6/
Grand Total	648,538	166,631	815,169

1/ Price Base 1978

2/ Amortized at 6 7/8 percent interest rate for 100-years.

3/ Includes $34,300 for operation, maintenance, and replacement for the South Fork recreational development.

4/ Includes $111,182 for operation, maintenance, and replacement for the Lobdell recreational development.

5/ Heath critical area stabilization on South Fork and Ramp Creek (allocated to environmental quality).

6/ Obstruction removal on Raccoon Creek (allocated to environmental quality).

March 1979

TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS
South Fork Licking River Watershed, Ohio
(Dollars) 1/

Item	Estimated Average Annual Damage		Damage Reduction Benefit 2/
	Without Project	With Project	
Floodwater			
Crop and Pasture	94,311	39,671	54,640
Other Agricultural	6,838	3,079	3,759
Nonagricultural			
Transportation	2,574	1,497	1,077
Urban	295,993	31,887	264,106
Subtotal	399,716	76,134	323,582
Indirect	84,917	21,128	63,789 3/
Total	484,633	97,262	387,371

1/ Price Base: 1978 current normalized prices for agricultural damages and benefits and 1978 prices for all others.

2/ There is no damage reduction benefit from accelerated land treatment measures.

3/ Includes $11,792 traffic delay benefits on Interstate 70.

March 1979

TABLE 6 - COMPARISON OF BENEFITS AND COSTS
South Fork Licking River Watershed, Ohio
(Dollars)

Evaluation Unit	Average Annual Benefits 1/					Average 3/ Annual Cost	Benefit Cost Ratio
	Damage 2/ Reduction	More Intensive Land Use	Recreation	Redevelop-ment	Total		
South Fork	242,062	125,639	67,860	23,519	459,080	349,887	1.31:1.0
Raccoon Creek	145,309	15,411	380,100	21,072	561,892	362,872	1.55:1.0
Project Administration						102,410	
Total	387,371	141,050	447,960	44,591	1,020,972	815,169	1.25:1.0

1/ Price Base 1978.

2/ From Table 5.

3/ From Table 4. March 1979

ENVIRONMENTAL IMPACT STATEMENT

SOUTH FORK LICKING RIVER WATERSHED

LICKING, PERRY, AND FAIRFIELD COUNTIES, OHIO

USDA-SCS-EIS-WS-(ADM)-79-1-(F)-OH
SOUTH FORK LICKING RIVER WATERSHED
Licking, Perry, and Fairfield Counties, Ohio

FINAL ENVIRONMENTAL IMPACT STATEMENT

Robert R. Shaw, State Conservationist
Soil Conservation Service

SPONSORING LOCAL ORGANIZATIONS

South Licking Watershed Conservancy District
c/o Palmer Jones
17 Spring Hill
Granville, Ohio 43023

Licking County Soil and Water Conservation District
799 Hebron Road
Newark, Ohio 43055

Fairfield County Soil and Water Conservation District
Room 40, Federal Building
1109 East Main Street
P.O. Box 279
Lancaster, Ohio 43130

Perry County Soil and Water Conservation District
East Gay Street
P.O. Box 337
Somerset, Ohio 43783

Licking County Commissioners
County Administration Building
Newark, Ohio 43055

Fairfield County Commissioners
Courthouse
Lancaster, Ohio 43130

Perry County Commissioners
Box 248
New Lexington, Ohio 43764

Newark Area Chamber of Commerce
Box 702
Newark, Ohio 43055

PREPARED BY:
UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
Columbus, Ohio 43215

June 1980

USDA, ENVIRONMENTAL IMPACT STATEMENT

South Fork Licking River Watershed
Licking, Perry, and Fairfield Counties, Ohio

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

A project for watershed protection, flood prevention, and recreation in Licking, Perry, and Fairfield Counties, Ohio to be implemented under authority of the Watershed Protection and Flood Prevention Act (PL 566, 83d Congress, 68 Stat. 666) as amended. The planned works of improvement include conservation land treatment, five flood retarding reservoirs, one flood retarding-recreation reservoir, two recreational developments, approximately 22.2 miles of stream channel work, 0.3 miles of flood prevention dikes, 5.9 miles of streambank stabilization, and land acquisition.

The channel work will involve 3.3 miles of new channel, 0.7 miles of channel enlargement and 18.2 miles of obstruction removal. Recreation is planned for one reservoir and a 6.6 mile segment along the channel with 179,840 recreation visits anticipated annually.

The watershed is 79 percent cropland and grassland. Both the railroad and interstate transportation systems make the area advantageous to small industry and urban growth.

V. Summary of Impacts

Conservation land treatment measures will reduce erosion on 10,350 acres of cropland, 2,100 acres of pastureland, 1,420 acres of forest land, and 360 acres of other lands by an estimated 14,000 tons per year. Sediment yield at the mouth of South Fork will be reduced 5000 tons per year. Improved farming efficiency, improve timber stands and forest management, and improved water management and cover conditions will occur.

Structural measures (dams) will reduce sediment yield at the mouth of the South Fork Licking River by an estimated 10,000 tons annually. Combined with the sediment reduction attributable to land treatment measures, the total project will reduce annual sediment yield at the mouth of South Fork by over 15,000 tons. Structural measures will reduce the area flooded from 4,479 acres to 2,371 acres from the 2.22 year frequency flood event and from 8,355 acres to about 6,841 acres from the 100-year frequency flood event. This will result in the reduction of agricultural damages by 56 percent, transportation damages by 42 percent, and urban damages to 449 homes and 35 businesses by 89.3 percent. Structural measures will provide for more intensive use of approximately 4,680 acres of agricultural land and more fully utilized flood plain land. Economic growth will be

encouraged and increased employment opportunities will take place from project construction and development of the recreational facilities.

Structural measures will inundate 190 acres of land and alter present land uses. Temporary disturbance to terrestrial wildlife will occur by periodically flooding 285 acres. Approximately 4.4 miles of natural streams will be permanently underwater and about 3.0 miles periodically flooded. Nearly two acres of bottomland hardwoods will be removed along South Fork. Populations of fish, amphibians, aquatic invertebrates, and other aquatic life will be reduced in the construction areas until these areas return to more natural conditions. Two residences will require relocation and portions of two rural roads will be flooded. A temporary increase of dust, exhaust gases, and noise will occur during construction. Visual impacts will occur when structural measures are located near major travel routes and residential areas.

Stabilization of approximately 5.9 miles of channel along Ramp Creek and South Fork to reduce erosion and sedimentation will take place.

An estimated 179,840 annual recreation visits will occur at the Lobdell and South Fork recreation sites. The two sites will provide, boating, fishing, swimming, hiking, camping, and picnicking opportunities.

VI. List of Alternatives

1. No Project
2. Accelerated Land Treatment
3. Flood Insurance Program
4. Accelerated Land Treatment, Flood Proofing, and Flood Warning System
5. Accelerated Land Treatment and Flood Plain Purchase
6. Accelerated Land Treatment, Two Reservoirs, Recreational Facilities, Flood Prevention Dike, and Land Acquisition
7. Accelerated Land Treatment, Six Reservoirs, Recreational Facilities, Bell-Beaver Bypass Channel, Flood Prevention Dike, and Land Acquisition
8. Accelerated Land Treatment, Six Reservoirs, Recreational Facilities, Channel Enlargement on South Fork, Flood Prevention Dike, and Land Acquisition.
9. Accelerated Land Treatment, Six Reservoirs, Recreational Facilities, Area Bypass Channel, Raccoon Creek Dikes, Flood Prevention Dike, and Land Acquisition
10. Emphasizing Environmental Quality
11. Accelerated Land Treatment, Six Reservoirs, I-70 Area Bypass Channel Recreational Facilities, Flood Prevention Dike, and Land Acquisition.

VII. Federal, State, and Local Agencies from Which Written Comment Were Received

Department of the Army
Department of Health, Education, and Welfare
Department of the Interior
Department of Transportation
U.S. Environmental Protection Agency
Office of the Secretary, (Office of Equal Opportunity), USDA
Federal Energy Regulatory Commission
Forest Service, USDA
Office of the Governor (Ohio), State Clearinghouse

USDA, SOIL CONSERVATION SERVICE
FINAL ENVIRONMENTAL IMPACT STATEMENT

FOR

South Fork Licking River Watershed, Ohio

AUTHORITY

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

South Licking Watershed Conservancy District
Licking County Soil and Water Conservation District
Fairfield County Soil and Water Conservation District
Perry County Soil and Water Conservation District
Licking County Commissioners
Fairfield County Commissioners
Perry County Commissioners
Newark Area Chamber of Commerce

PROJECT PURPOSES AND GOALS

The project Sponsors, in applying for planning assistance under PL-566, have established the following water and related land resource goals for the watershed:

1. Floodwater damage reduction for agricultural, commercial, industrial, and residential areas.
2. Erosion and sediment damage reduction.
3. Improved agricultural water management (on-farm drainage systems).
4. Recreation area development.
5. Improved appearance of the natural environment (critical area stabilization and obstruction removal).

Watershed Protection (Conservation Land Treatment)

Watershed protection will be achieved through the application of resource management systems for cropland, pastureland, forest land, and other land. These resource management systems include needed conservation practices to achieve quality in the natural resource base for sustained use. Many landowners have chosen to apply additional practices that will improve quality in the environment as well as quality in the standard of living.

Goals have been established to achieve this quality through the application of the following:

Soil and Water Conservation District Cooperators - 230 on 29,183 acres
Conservation Plans - 128 covering 16,900 acres
Revised Conservation Plans - 30 covering 3,335 acres
Conservation Cropping System -10,352 acres
Critical Area Planting - 152 acres
Diversion Management - 5,300 feet
Ponds - 96
Contour Stripcropping - 318 acres
Contour Farming - 349 acres
Field Windbreaks - 800 feet
Fishpond Managment - 46
Grass Waterway - 32 acres
Livestock Exclusion - 120 acres
Minimum Tillage - 2,600 acres
Mains and Laterals - 93,000 feet
Pasture and Hayland Management - 2,100 acres
Pasture and Hayland Planting - 1,225 acres
Spring Development - 14
Tile Drains - 1,931,500 feet
Tree Planting - 100 acres
Forest Land Improvement - 300 acres
Upland Wildlife Habitat Mgt. - 1, 085 acres
Land Adequately Treated - 38,599 acres

When these land treatment goals have been carried out by district cooperators 65,510 acres of cropland, 9,247 acres of pasture, 2,529 acres of forest land, and 2,128 acres of other land will be adequately protected.

Recreation

Recreation area development goals are addressed by the following:

A multipurpose flood control, recreation development is planned on Lobdell Creek north of Alexandria. This site, when fully developed, will provide fishing, boating, swimming, picnicking, and camping. A strip-park is planned for the west bank of the Licking River from U.S. Highway 40 north to Hoback Park in Heath, Ohio which will provide canoeing, picnicking, and hiking.

Flood Prevention

The goals are to reduce floodwater damage to a practical level considering costs and benefits achieved. Work of improvements were to be formulated so as to concentrate on higher effectiveness where damages are most significant.

Environmental Improvement

Goals are to stabilize critical streambank erosion and to improve landscape resources. This will be achieved by removing channel obstructions that are directing flows into banks causing bank scouring and slumping. These areas will then be seeded to provide further erosion control.

PLANNED PROJECT

Land Treatment Measures

Land treatment measures included in this project are necessary for the conservation, development, and improvement of the agricultural land. The measures will be planned and applied in cooperation with the Licking, Fairfield, and Perry Soil and Water Conservation Districts. Technical assistance for planning and installing these measures for individual landowners will be provided by the Soil Conservation Service. The Ohio Division of Forestry, in cooperation with the U.S. Forest Service, will provide technical assistance for installing the forestry practices. Project soil and water conservation practices are planned to adequately protect an additional 14,230 acres of the 180,364 acres in the project. Four thousand seven hundred acres are through the accelerated program (See Table 1 of Watershed Plan for ongoing and accelerated programs).

Cropland - There are 94,576 acres of cropland in the project. Fifty-five thousand one hundred and sixty acres are adequately protected. Two thousand eight hundred and eighty additional acres of cropland are planned to be adequately protected with PL 566 accelerated land treatment funds during the project period. Practices on cropland that are adequately treated may include contour stripcropping, crop residue management, drainage field ditches, conservation tillage, structures for water control, and tile drains.

Pasture and Hayland - There are 46,679 acres used for pasture and hayland. Conservation practices planned will provide excellent cover for areas subject to erosion, good forage, production for livestock, and water distribution for livestock use. The conservation practices planned where needed include pasture and hayland plantings, and pasture and hayland management. One thousand and sixty acres will be adequately protected by accelerated land treatment.

Forest Land - There are 21,647 acres used for forest land. Conservation practices planned will provide protection for areas subject to erosion. Conservation practices include tree plantings, woodland improvement and livestock exclusion. Six hundred acres of forest land will be protected by accelerated land treatment.

Miscellaneous Land - The 17,462 acres of miscellaneous land includes farmsteads, railroads, rural homesteads, urban areas, roads, recreation and water areas, and odd areas. Soil conservation practices planned where needed on this land include critical area planting, ponds, wildlife upland habitat management, fish pond management, and recreation area improvement. One hundred and sixty acres of this type of land will be protected by accelerated land treatment.

When these conservation practices have been applied by the soil and water conservation district cooperators in the 180, 364 acre project area, the soil loss for 65,550 acres of cropland will be three tons or less per acre per year. The soil loss for the pasture and hayland, forest land, and the miscellaneous land will vary from a trace to less than one ton per acre per year.

With this level of management the resource base for 70 percent of the cropland, and over 90 percent of the pasture, forest land, and miscellaneous land will be adequately protected.

Structural Measures

The structural measures are a combination of earthen dams, dikes, channel improvements, and recreation facilities. Six dams are planned for the project, five are for floodwater retarding and one is for floodwater retarding-recreation use. A flood prevention dike is planned along 0.3 miles at the south edge of Hebron. The channel improvements consist of 0.7 miles of channel enlargement, 3.3 miles of new flood bypass channel, obstruction removal from 18.2 miles of channel and streambank stabilization along segments of 5.9 miles of channel. The locations of the planned measures are shown on the project map in Appendix D. Figures E-5-1 and E-5-1A show features typical of the planned reservoirs, and Figure E-5-2 show a typical cross section of the modified channel. Figures E-5-3 and E-5-4 show typical channel appurtenances. Appendix H shows channel profiles indicating bottom widths and depths of modified channels and flood elevations with and without the project.

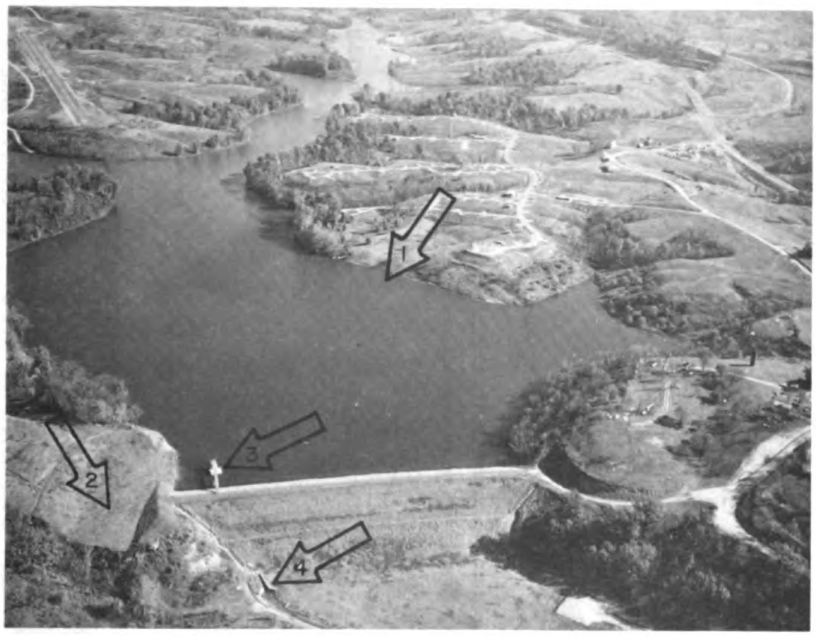
The structural measures will be designed, constructed, and maintained to function for 100 years and will contain design features to help minimize or counteract disturbances to the existing environment. The South Licking Watershed Conservancy District will enter into contracts for installing structural measures and provide the inspection and similar services that the district considers necessary to protect its interests. The Soil Conservation Service will provide engineering and administrative services, including a share of relocation payments for persons displaced by the Lobdell Creek Reservoir. The conservancy district will use its dominant rights of eminent domain when needed to acquire landrights for installation, operation, and maintenance of structural measures. Appraisals will be obtained as a prerequisite to securing land rights in accordance with provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (PL 91-646). Land requirements for floodwater retarding reservoirs are shown in Table E-5-1. Table E-5-2 shows recreational development land requirements. Channel land requirements for construction and maintenance are shown in Table E-5-3.

Existing improvements affected by project measures are shown in Table E-5-4. Three road closings are planned in the Lobdell Creek Reservoir area. None of the closings will cutoff existing land access, nor will any residents be isolated. However, travel distances to many destinations in the reservoir area will be increased. The South Licking Watershed Conservancy District will acquire rights to close the roads by written permission or court order as provided by Section 6101.77 of the Ohio Revised Code.

One house will be removed from the Lobdell Reservoir. The residents will be relocated in housing considered decent, safe, and sanitary according to the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (PL 91-646). Adequate housing is available locally for this purpose. The family will receive the necessary relocation assistance and advisory services to help assure an orderly relocation with minimal hardships.

During project construction, repair, replacement, and maintenance operations, all applicable health and air and water quality regulations will be observed. The provisions of construction contracts will require compliance with existing regulations. Required permits under Section 404 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) will be obtained. Contractors will be

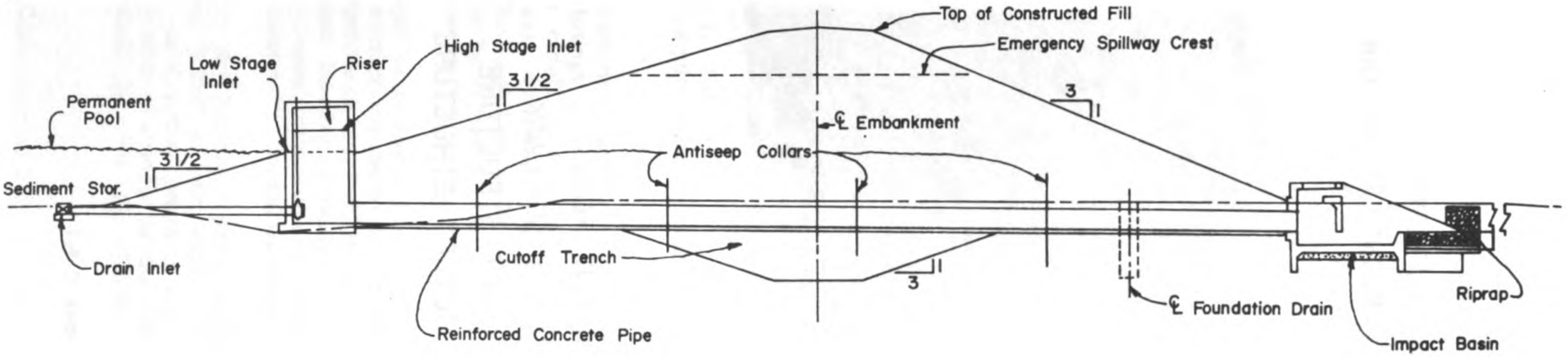
TYPICAL FEATURES OF
FLOOD RETARDING RESERVOIR



1. PERMANENT POOL
2. EMERGENCY SPILLWAY
3. LAKE INLET STRUCTURE
4. LAKE OUTLET STRUCTURE

Figure E-5-1

Fig. E-5-1A



TYPICAL CROSS SECTION OF FLOOD RETARDING STRUCTURE

DETAIL OF MOUNDED SPOIL
BETWEEN INTERSTATE AND CHANNEL

*0.5ft. below grade at ℄, and 0.5ft. above grade at toe.

TYPICAL SECTION
I-70 BY-PASS

Figure E-5-2

TYPICAL STRAIGHT DROP SPILLWAY
CUTAWAY PERSPECTIVE VIEW

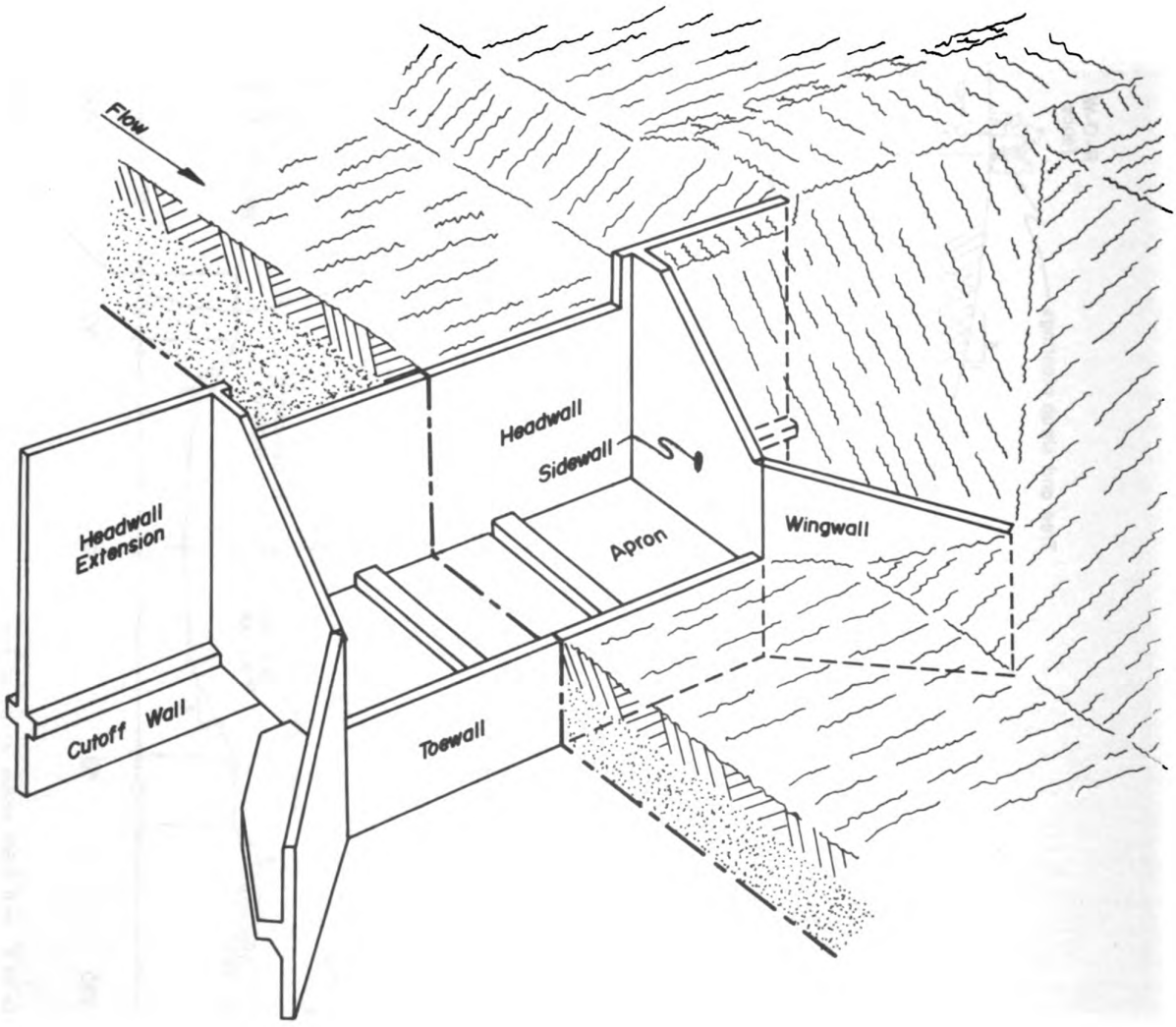
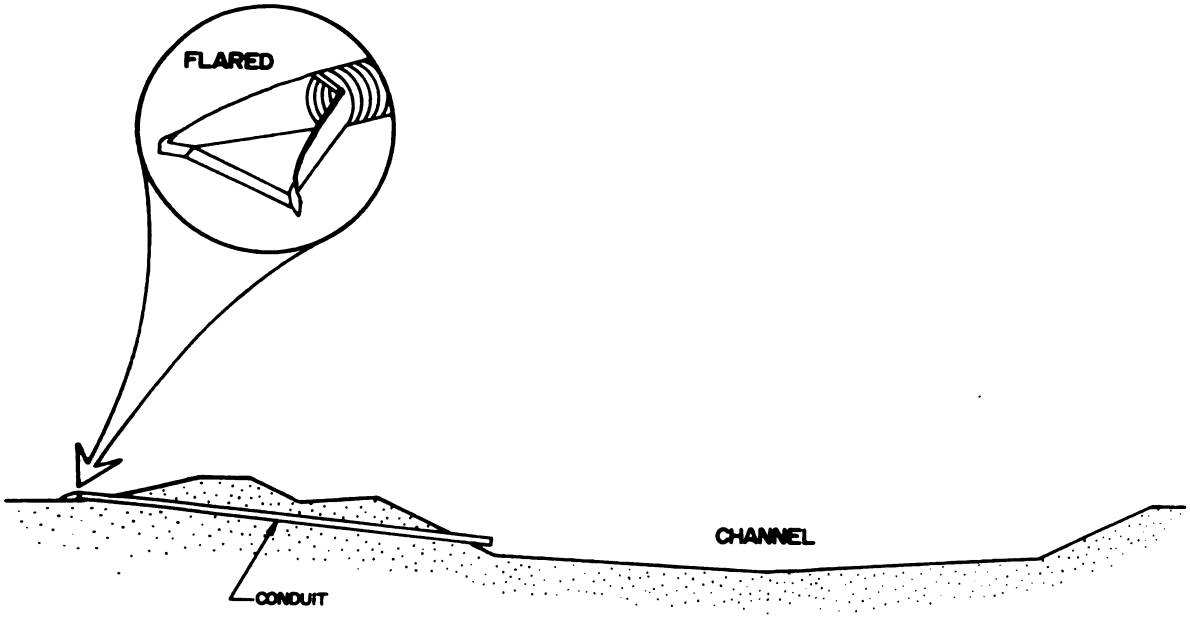
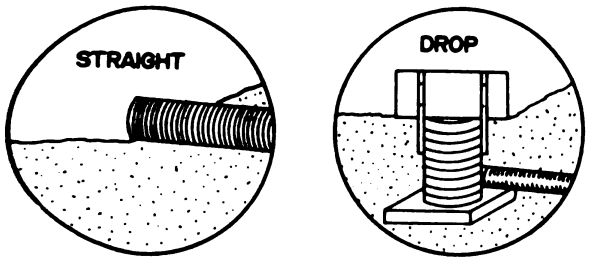


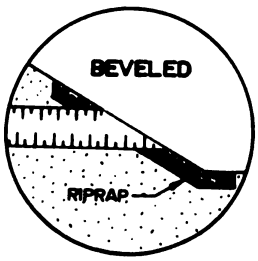
Figure E-5-3

SURFACE WATER INLETS





OTHER SUITABLE INLETS



OTHER SUITABLE OUTLET

Figure E-5-4

Table E-5-1

Present Land Use and Minimum Land Rights Requirements
for Floodwater Retarding Reservoirs

Reservoir Use Description	Present Land Use	Reservoir Name and Acreage Requirements: Big Hollow	Etna Reservoir	Kiber Run	Kirkersville Reservoir	Simpson Run	Total
Permanent Surface Use a/							
Dam, Spillways, and Outflow Area							
	Cropland	0	19	4	4	4	31
	Pasture	0	0	0	35	8	43
	Forest	12	1	8	5	3	29
	Other	0	0	4	1	0	5
	Total	12	20	16	45	15	108
100-year Sediment Desposition Area							
	Cropland	0	10	0	0	1	11
	Pasture	2	5	0	8	6	21
	Forest	12	2	12	9	3	38
	Other	3	0	11	0	0	14
	Total	17	17	23	17	10	84
Periodically Inundated Area b/							
	Cropland	0	24	14	20	2	60
	Pasture	11	3	10	36	9	69
	Forest	11	0	20	10	5	46
	Other	1	0	5	0	0	6
	Total	23	27	49	66	16	181
Flowage Rights Area c/							
	Cropland	0	13	4	4	1	22
	Pasture	5	0	2	6	1	14
	Forest	4	1	11	2	3	21
	Other	1	0	0	0	0	1
	Total	10	14	17	12	5	58
Grand Total		62	78	105	140	46	431

Reservoir Use Description	Present Land Use	Reservoir Name and Acreage Requirements: Big Hollow	Etna Reservoir	Kiber Run	Kirkersville Reservoir	Simpson Run	Total
Temporary Surface Use a/							
Construction and Borrow							
	Cropland	0	4	2	0	3	9
	Pasture	0	0	0	4	0	4
	Forest	2	0	0	1	0	3
	Other	0	0	0	0	0	0
	Total	2	4	2	5	3	16

a/ The area shown for each use category is the area not overlapped by another surface use. For example, the sediment area does not include the area of the upstream portion of the dam (embankment) that is expected to be covered with sediment.

b/ Surface area lying between the sediment deposition area and the elevation contour of beginning emergency spillway flow.

c/ Surface area lying between the water surface at the beginning of emergency spillway flow and the design high water.

Table E-5-2

Present Land Use and Minimum Land Rights Requirements for Recreational Developments

Project Use Description	Present Land Use	Development Name and Acreage Requirements: Lobdell Creek	South Fork Channel	Total
Lake Area a/		277		277
Flowage Rights Area b/		42		42
Recreational Facilities		161	370	531
Total	Cropland	80	2	82
	Pasture	162	5	167
	Forest	230	308	538
	Other	8	55 c/	63
	Total	480	370	850

a/ Lake and area needed for public use, dam, and spillways. Water surface area is approximately 106 acres and periodically inundated areas of 97 acres.

b/ Surface area lying outside of the lake and recreational facilities area but below design high water elevation.

c/ Area occupied by existing streams.

Table E-5-3

Minimum Land Area Requirements for Channel and Dike Work

Modified Channel Segment	Existing Land Use	Minimum Land Requirements (Acres) 1/ Channel Enlargement Berms, Dikes and Woody Plantings	Spoil Placement and Construction	Total
New Channel Bypass Along I-70	Cropland	53	80	133
	Pasture	0	0	0
	Forest	0	0	0
	Other	14	7	21
	Total	67	87	154
South Fork Channel Enlargement	Cropland	5	6	11
	Pasture	0	0	0
	Forest	2	1	3
	Other	3	3	6
	Total	10	10	20
South Fork Obstruction Removal	Cropland	0	4	4
	Pasture	0	0	0
	Forest	0	24	24
	Other	0	1	1
	Total	0	29	29
Flood Prevention Dike	Cropland	1	1	2
	Pasture	0	0	0
	Forest	0	0	0
	Other	1	1	2
	Total	2	2	4
Grand Total		79	128	207

1/ Excludes area occupied by existing channel.

Table E-5-4

Changes to Existing Improvements

Structural Measure	Existing Improvement	Location	Type of Change
Lobdell Creek Reservoir	St. Albins Township Roads 114, 115, 116	Reservoir Area	Road Closing
I-70 Area Bypass Channel	Ohio Route 37	Station 136	Bridge Construction
	Consolidate Gas Supply Corp. TL400	Station 168	Approximately 250 feet of pipeline lowering.
	Union Township Road 171	Station 195	Bridge Construction

required to keep project work areas and access roads in an orderly condition. Upon completion of work, contractors will be required to remove any buildings, debris, unused material, etc., from the areas as specified in the contracts. All debris removed from reservoir and channel work areas will be disposed of in an acceptable manner as approved by the Ohio EPA. Any solid or liquid materials which might cause pollution will be handled according to the emergency response regulations of the Ohio EPA. Used lubricating oils and other construction wastes will be disposed of properly.

Contractors will be required to comply with the provisions of the Occupational Safety and Health Act of 1970 (PL 91-596) and the Safety and Health Regulations for Construction of the U.S. Bureau of Reclamation.

Construction contractors will be required to use methods that minimize erosion and sedimentation and that safeguard air quality. Borrow areas will be stripped of vegetation and topsoil only as needed. Prior stripping of borrow areas will be limited to fill material requirements for about two weeks work. The steepness of cut slopes in borrow areas will be limited to reduce erosion. Generally, finished slopes will not be steeper than 25 percent. The borrow areas will be graded to prevent ponding. Haul roads will be watered if necessary to minimize dust.

Stripping, clearing, and other disturbances will be limited to areas necessary for efficient construction operations. Woody vegetation will be cleared from reservoir, borrow, dam, spillway, and a portion of the sediment deposition areas as well as spoil disposal areas along the channel except where designated in the mitigation plan.

Construction contractors will be required to limit concentrations of sediments and other pollutants in waters flowing from construction areas. Equipment parking areas, haul roads, and other construction areas will be managed to minimize erosion and sedimentation. Debris basins or other measures will be used as necessary.

Floodwater Retarding Dams - The floodwater retarding reservoirs will have storage volumes reserved for sediment, floodwater, and safety. The volume reserved for sediment will be equivalent to the expected accumulation in 100-years. The dams will be designed to impound water in the space reserved for sediment.

Sediment pools in the floodwater retarding reservoirs are likely to be attractive to recreation seekers. The project sponsors will publish regulations, erect signs, or use other measures to prevent public use of the pools unless sanitary facilities are provided. Any sanitary facilities used will meet state and local requirements. Hunting in reservoir areas will be at the discretion of the sponsors and landowners, and will be in accordance with game laws.

The estimated area to be cleared of woody vegetation at each reservoir site is shown below:

Reservoir Site	Clearing Area (Acres)
Big Hollow	8
Etna Reservoir	2
Kiber Run	11
Kirkersville Reservoir	12
Lobdell Creek	37
Simpson Run	5
Total	75

Disturbed areas will be seeded to permanent vegetation as soon as practicable after other construction activities are completed. Any areas subject to construction delays greater than about three weeks will be temporarily seeded. When prolonged weather conditions become unfavorable for successful seedings, construction will be stopped or exposed areas will be mulched.

The volume reserved for floodwater will provide control for the expected runoff from a combination of severe runoff producing conditions, including saturated soil moisture levels and prolonged storms. The design runoff for determining floodwater storage capacity ranges from 5.8 to 6.3 inches. The emergency spillways are designed to safely discharge the flow volumes produced by the design storms. An economical combination of bottom width, length, and elevation is used for each spillway design. The emergency spillway excavations will expose unconsolidated earth materials which will be vegetated. A large portion of the fill will be excavated from the emergency spillways, including all of the fill for the Lobdell Creek dam. Additional height is added to each dam as freeboard to safeguard the embankment during unusual storm events.

The principal spillways will be precast reinforced concrete conduits, concrete risers and energy-dissipating outlets. The risers will rest on earth foundations unless final investigations reveal conditions not encountered in preliminary geologic investigations. The Lobdell Creek Reservoir riser will rest on earth or rock depending on final design layout. A typical cross section and aerial view of a reservoir is shown on Figure E-5-1 and Figure E-5-1A.

The embankment will generally have zoned fill designs, with coarser fill materials placed in the outer portions and finer materials placed in inner portions of the embankments. Proportions and placement of fill materials will be determined by final investigations, analyses, and designs.

Grasses will be established on the dams and emergency spillways. Borrow and other areas disturbed by construction will be planted to vegetation for erosion control and wildlife habitat. Project sponsors will determine the uses of land in the detention pool and flowage areas to be compatible with the floodwater retarding purpose of the reservoirs. Much of the land surrounding the pools is expected to provide high quality wildlife habitat.

The public recreation developments will provide about 161 acres of water and about 531 acres of land for recreation use (Table E-5-2).

Recreation Development, Lobdell - The recreation facilities (Appendix E) at the Lobdell Creek development will include 106 acres of permanent water for fishing, boating, and swimming, and 161 acres for picnicking, beach, camping, and hiking with parking for cars and boat trailers, boat ramps, and docks. Water requirements will be supplied by wells, and toilets will be vault type. The vault type latrines will be pumped as needed and the effluent will be disposed of at approved offsite locations by private haulers. The gray water will be treated by approved methods such as sand filtration and chlorination. All wastes will be handled by methods approved by the State Health Department to protect the public's health. A functional planting design will be done in the recreation area to improve landscape resources and environmental quality.

The sponsors have agreed to take steps necessary to secure or maintain water quality at levels acceptable to meet county health regulations prior to construction of the multipurpose reservoir.

The picnic area will consist of four group shelters and 200 single tables, with necessary sanitary, playground, and parking facilities. The swimming development will consist of beach, marked-supervised swimming area, bathhouses with showers, and the necessary parking and sanitary facilities.

Camping areas will be developed in three locations. One for Classes A and B; one for primitive; and one for group. Parking and sanitary facilities will be provided as necessary to meet county and state health requirements.

A boat ramp and docking facility with necessary parking and sanitary facilities will be constructed as indicated in Appendix E.

Approximately seven miles of trails including a five mile lake trail and a two mile nature trail will be constructed.

Recreation Development, South Fork Canoe Trail - The South Fork of Licking River from U.S. 40 to Hoback Park in Heath will be developed for canoeing, picnicking, and hiking (Appendix F). Approximately seven miles of river will be improved for flood prevention and recreation.

Recreation facilities will consist of three canoe put-in and take-out ramps, two 35 table picnic grounds, three 35 car parking lots, seven mile hiking trail, and the necessary sanitary facilities. Sanitary facilities will be designed to be protected when the river is at flood stage.

Annual recreation visits for the planned developments are estimated to be 150,840 for the Lobdell site and 29,000 for the South Fork Licking River site.

Each recreation area is readily accessible by public roads. The location and layout of facilities for each development is shown in Appendix E and F. The types of facilities, estimated number of each and the costs, are shown in Table 2B of the watershed Plan.

The South Licking Watershed Conservancy District will be responsible for the design and installation of the recreation facilities. All recreation developments will be designed to provide access to the physically handicapped.

Channel Improvement, Channel Bypass - A new bypass channel is plannned for 3.3 miles through cropland north of Interstate Route 70 (Figure E-5-5 and Project Map Appendix D). At the upstream end (west) of the bypass channel, base flows will follow the existing channel route. Flood flows will separate with the bypass channel carrying what is out of bank under existing conditions. The bypass channel will intercept Bell Run and Koontz Ditch and thus will carry some base flow downstream from its junction with Bell Run. Woody plantings will be made between the new channel and highway to reduce visual impacts. Special attention will be given at major road crossings by minimizing clearing or adding woody vegetation to reduce visual impacts of construction.

PLANNED CHANNEL WORK ALONG INTERSTATE 70. LOOKING WEST FROM THE OHIO 79 INTERSECTION, JANUARY 22, 1959.

Fig. E-5-5

Photograph by: The Ohio Department of Transportation

Immediately downstream from the entrance to the bypass channel, a 1.06 mile segment of existing channel will be maintained in its present condition. This will maintain the existing channel capacity so that flows will divide as designed at the bypass channel entrance. No construction is planned for this existing channel segment.

The bypass channel designs are being coordinated with the Ohio Department of Transportation and will comply with current highway design and safety standards. Drainage appurtenances from I-70 will be altered to work with the new channel.

Channel Improvement, Enlargement - Channel enlargement is planned for 0.74 mile of South Fork immediately downstream from the new channel where trees line most of the present channel (Figure E-5-6). The planned channel will follow the existing alignment in this previously modified segment. The enlarged channel segment will be built using one-sided construction methods. Five double wing deflector structures will be placed in this area.

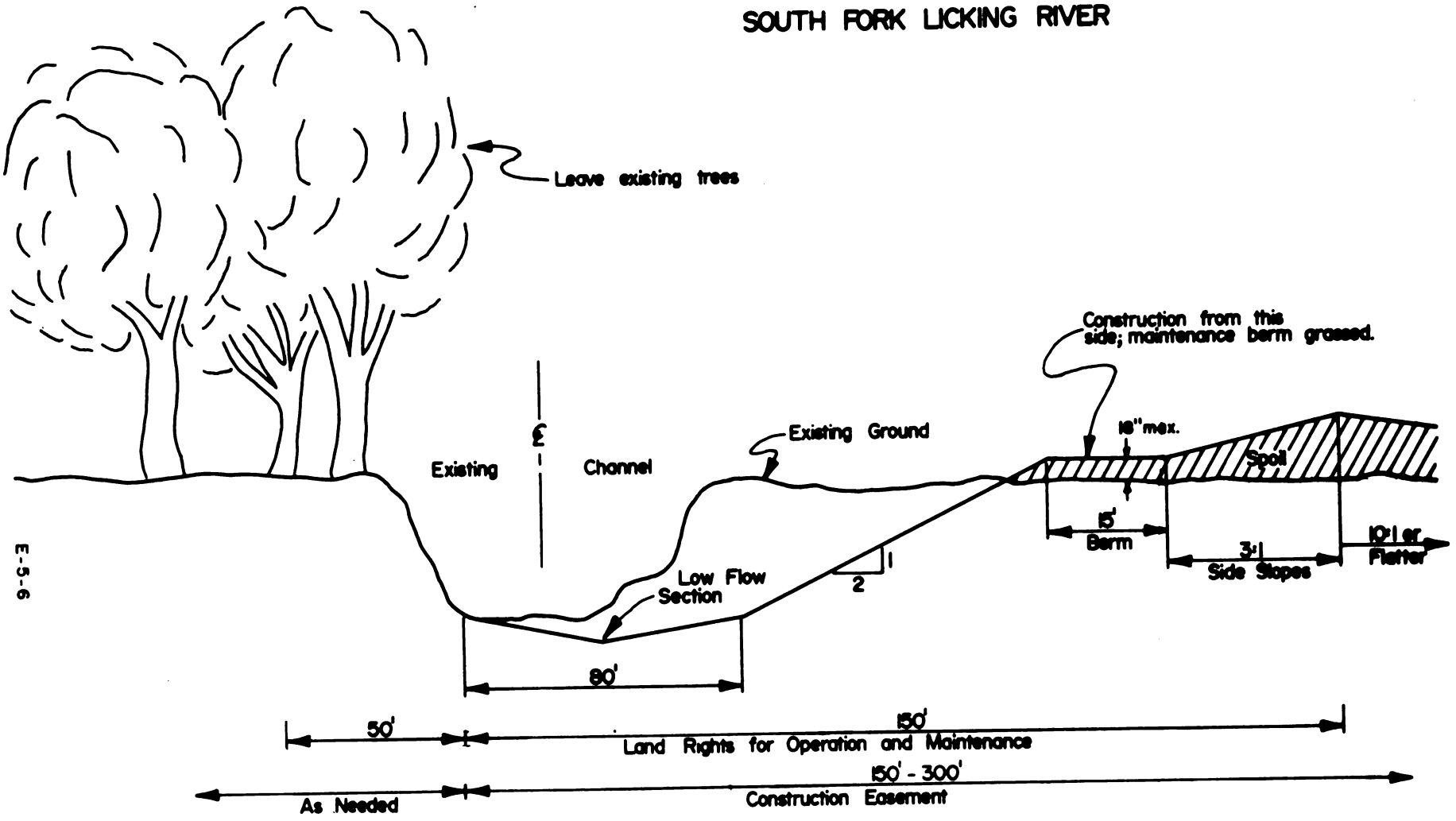
The deflectors will provide pools and riffles to improve the fish habitat (Figure E-5-9).

The new and enlarged channel segment will have trapezoidal cross section with modified "V" bottoms (Figures E-5-2 and E-5-6). The "V" shape of the channel bottoms will help concentrate flows in one area of the cross section during low flow periods. The constructed side slope will be two feet horizontal to one foot vertical. Rock riprap will be used at the bypass inlet and outlet, and at the junction of Bell Run and Koontz Ditch. An armor lining of number one aggregate (maximum size 4 inch) is planned for the channel bottom and four feet vertically on the slopes. This is needed to ensure the channel stability.

Earth materials in channel work areas range from nonplastic silty sands to clays with plasticity indexes greater than 20. With plasticity indexes greater than 20, topsoil will be removed from the channel excavation and spoil spreading area and stockpiled prior to excavation. The topsoil will then be spread on top of the excavated material to provide a good seedbed for crop production. Spoil materials are expected to be generally suitable for spreading on cropland. The channels are designed to withstand the expected erosive forces without appreciable degradation, aggradation or bank erosion. Bank erosion is not expected to appreciably change channel cross sections, and excessive sediment bars are not expected. Bridges and culverts are to be protected from erosion. Debris or sediment basins will be constructed to reduce the sediment reaching the stream during construction. Surface water will be controlled by graded berms and surface water inlets (Figure E-5-4). Tile water discharge will be controlled by outlet pipes. The new and enlarged channel segments are not near wetlands (except type 1) or bottomland hardwood habitat that could be drained.

Channel side slopes will be seeded with perennial grass. Maintenance travelways will be seeded with wildlife habitat meadow mixtures. Typical plant materials used will be bromegrass, timothy, orchard grass, alfalfa, red clover, sweet clover, and crown vetch. Barriers will be installed where needed at roads and other locations to prevent vehicular damage to the maintenance travelways and other channel works.

SOUTH FORK LICKING RIVER



E-5-6

TYPICAL SECTION OF CHANNEL ENLARGEMENT
USING ONE SIDED CONSTRUCTION

Clearing will be limited to that necessary for construction and maintenance. Spoil will be piled rather than spread where this practice will minimize clearing requirements. About three acres of clearing is required.

Channel Improvement, Obstruction Removal - Obstruction removal is planned for 18.2 miles along two segments of the channel in the project area. One segment begins at U.S. 40 and continues for 11.2 miles downstream on the South Fork Licking River. About 1.6 miles of this channel segment was modified in 1920. The other segment is 7 miles long on Raccoon Creek from County Road 93 near Alexandria to State Route 16 near Granville.

The work on the South Fork Licking River is needed to improve the flow capacity of the stream. The additional capacity is needed to prevent any greater flooding than is occurring under existing conditions.

The work on Raccoon Creek is planned to reduce streambank erosion by reducing stream meandering. The work consists of removing loose or woody debris, metal and rubber refuse, and other significant obstructions within the channel flow area (Figure E-5-7).

An interagency team of engineers and biologists from SCS, F&WS, and ODNR will review the stream prior to construction and will agree on the obstructions to be removed. No clearing is planned in the obstruction removal area except for occasional trimming and tree removal for equipment operation.

Flood Prevention Dike at Hebron - A flood prevention dike is planned along the south side of Hebron (Figure E-5-8). This will begin west of State Route 79 and proceed for 1800 feet along the edge of the residences and provide a 100-year level of protection.

The side slopes will vary (from 3:1 to 6:1) to blend in with the topography. The average height is five feet. A thorough discussion with the landowners, local sponsors and SCS is recommended to explore the different alignments and to incorporate the wishes of the public as much as possible. This will be a highly visible area to the landowner and the design should make the dike an attractive addition to the area.

Heath Critical Area Stabilization - Eleven areas along Ramp Creek and South Fork of Licking River through the city of Heath were identified to have severe streambank erosion. Some of the areas endanger building foundations and highways. Rock riprap protection is planned for the banks to prevent further erosion. It is recommended that the riprap be keyed into the banks and channel bottom to prevent the stream from under cutting. This work is planned to reduce erosion and improve the appearance of the stream through Heath.

Historical and Archaeological - The Simpson Run Reservoir area contains marine fossils that may be worthy of salvage (See the Archaeological and Historical Resources section). The Secretary of the Interior will be notified in accordance with Federal historical and archaeological preservation requirements (PL 93-291).

Evaluation of archaeological, historical, and other cultural resources have found no other items of significance that would be encountered by project installation. If such resources are unexpectedly found during construction, SCS procedures for appropriate compliance with regulations and executive orders will be implemented to protect them.

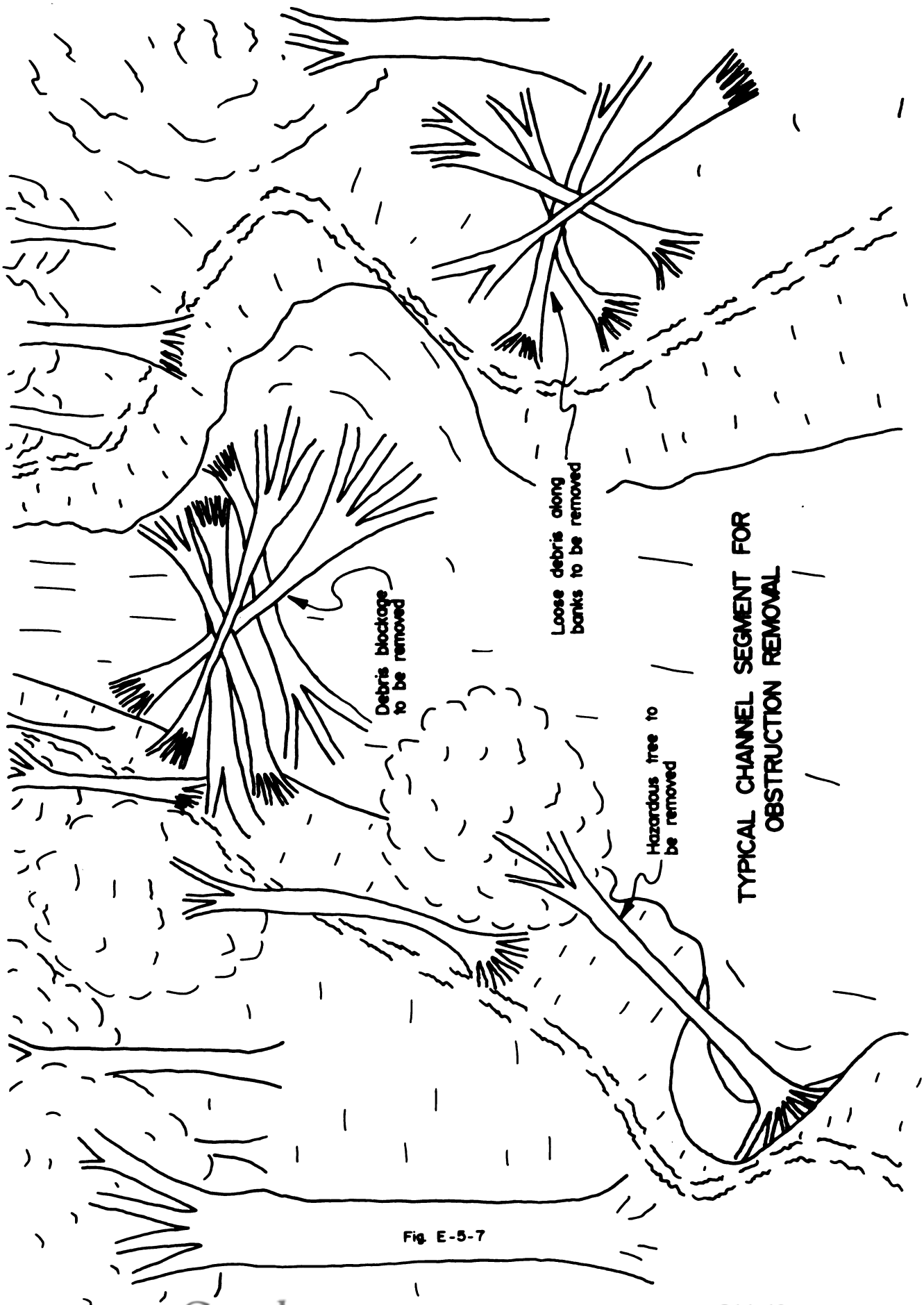
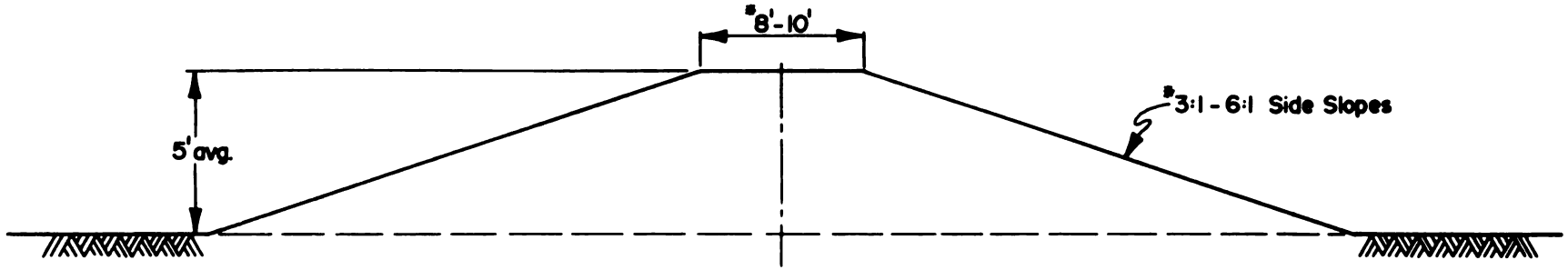


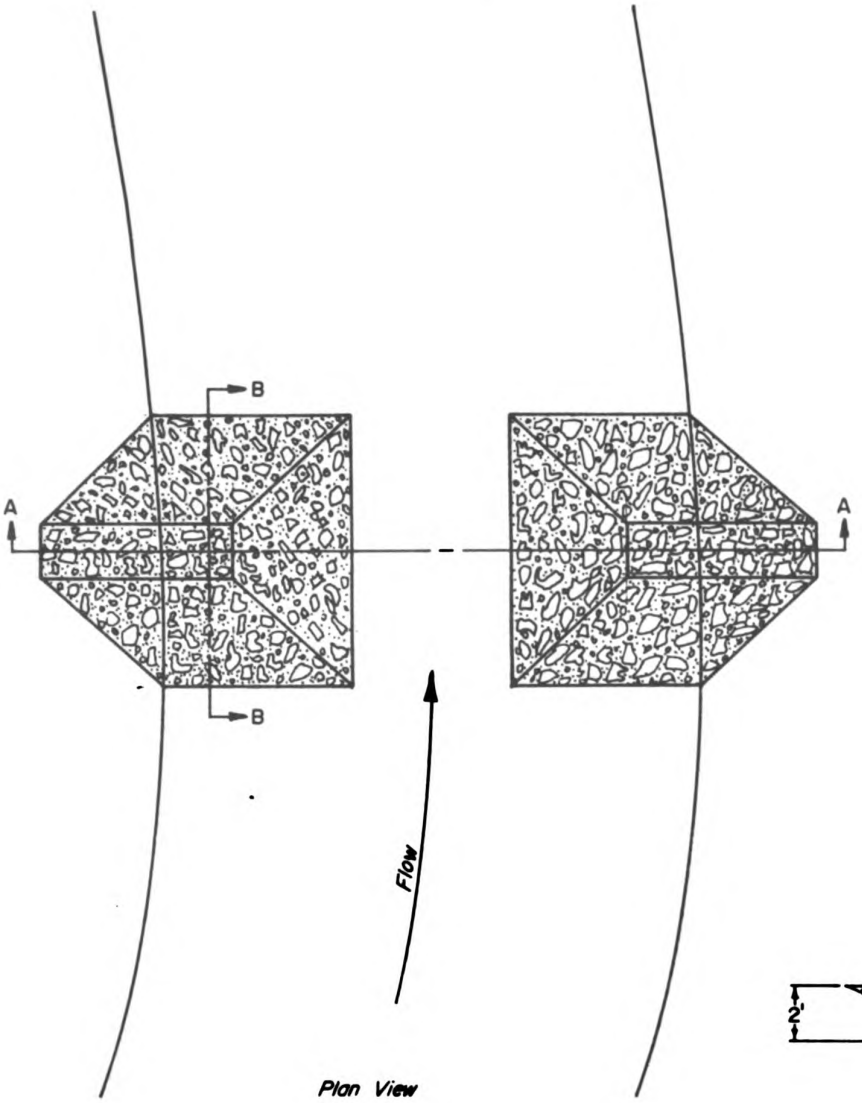
Fig. E-5-7

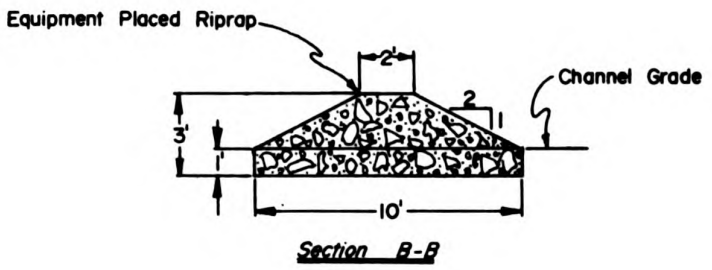


*Varies to fit topography.

Fig. E-5-8

TYPICAL SECTION HEBRON DIKE





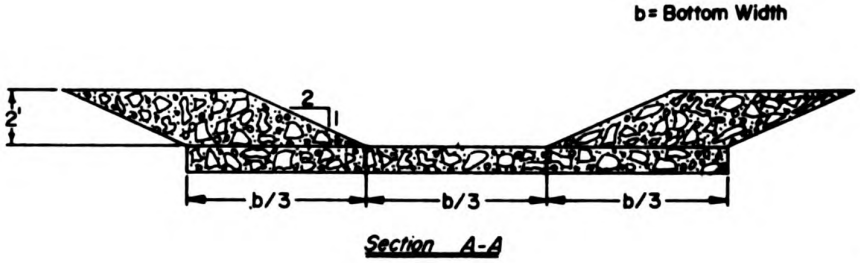


Fig. E-5-9

DETAILS OF DOUBLE WING ROCK DEFLECTOR

Nonstructural Measures

One nonstructural measure is included. It consists of one land acquisition and one house relocation in Granville. This property is located in the high hazard area as defined on page E-9-10.

Operation and Maintenance

Landowners and operators will operate and maintain conservation land treatment measures on their lands. Technical assistance will be available for operation and maintenance from the Fairfield, Licking and Perry Soil and Water Conservation Districts, the Soil Conservation Service, the Ohio Department of Natural Resources, and Division of Forestry in cooperation with the U.S. Forest Service. The project sponsors will encourage landowners and operators to operate and maintain the measure to protect and improve the watershed's resources.

The South Licking Watershed Conservancy District will operate and maintain structural project measures upon acceptance of construction work from the contractors. Funds for the work will be obtained by the South Licking Watershed Conservancy District through the procedures of Ohio's Conservancy District Law. The South Licking Watershed Conservancy District will use its staff, equipment, and materials or other means satisfactory to the Soil Conservation Service to do the work. The recreational facilities, custodial, policing, sanitation, safety, and other operational services will be provided by the South Licking Watershed Conservancy District or other organizations it may enlist.

Public and private bridges, other road facilities, and public utilities which have been modified to accommodate the project will be maintained by their respective owners with expenditures from their normal maintenance funds.

The Soil Conservation Service and the South Licking Watershed Conservancy District will complete an operation and maintenance agreement for each structural measure before signing a landrights, relocation, or project construction agreement. The agreements will provide for establishment periods, inspections, and reports. They will include specific provisions for retention and disposal of real and personal property acquired or improved with PL-566 funds. The agreements will be in accordance with the Ohio Watersheds Operation and Maintenance Handbook published by the Soil Conservation Service and will document the responsibilities of the South Licking Watershed Conservancy District and the Soil Conservation Service. An operation and maintenance plan will be prepared for each structural measure.

The planned flood prevention structural measures are designed to function without routine operational activities. The recreational facilities will be operated in accordance with requirements of the Ohio Department of Health and local health authorities, as provided in the operation and maintenance plans. The Lobdell Creek recreational facilities will require daily or continuous operational work such as refuse removal, sanitary facilities cleanup, and safety monitoring during heavy use seasons and frequent attention all year. The South Fork recreation area will require frequent attention to maintain safety and cleanliness.

Any incidental public recreation use that may be allowed in single-purpose flood prevention reservoir areas is contingent upon the South Licking Watershed

Conservancy District providing adequate sanitary facilities in accordance with state regulations and upon its developing, promulgating, and enforcing rules for the use of reservoir areas. The District will take actions necessary to prevent public access and use of the reservoirs if sanitary facilities are not provided.

Maintenance work will be done to keep the structural measures in good condition for proper functioning during the project life. The reservoirs and channel work have design lives equal to the 100-year economic evaluation period. Some of the recreational facilities and channel appurtenances will have useful lives of less than 100-years and will be replaced when they become unserviceable.

To assure an effective maintenance program at minimum cost, inspections of the reservoirs and channel work areas will be made annually, after unusually severe storms, and whenever other unusual conditions may adversely affect the measures. In addition, reservoirs will be inspected annually and as often as necessary to assure safe, sanitary, attractive, and efficient operations. The Soil Conservation Service and the South Licking Watershed Conservancy District will jointly conduct these inspections. A qualified SCS engineer will assist in the inspections on the initial filing for dams, annually during the first three years, after major storms and once every five years after the initial three year period. Authorized persons will have free access for inspections at any reasonable time.

The Sponsors agree to inform the public of the flooding potential in the watershed area and particularly the areas near Buckeye Lake, Granville, Hebron and Heath. Licking County Commissioners have established a flood plain management division which regulates all building in any flood prone area. FIA is presently financing a study to identify all flood prone areas in Licking County. This study is scheduled for completion in 1981. This information will aid the local units of government in regulating flood plain development.

The inspection will determine if conditions of the structural measures are favorable for their proper functioning. Written inspection reports will describe needed maintenance work and will include cost estimates for the work.

Typical inspection items for reservoirs include the following: drainage systems, relief wells and outlets; evidence of slope instability such as slides, slumps or cracking; condition of vegetation; evidence of rodent or erosion damage; and the condition of riprap, concrete and metal work.

Typical inspection items for channel areas include the following: the condition of and around drain pipe outlets, concrete water inlets and retaining walls, and channel lining materials; evidence of excessive erosion, deposition or rodent damage; condition of vegetation and maintenance travelways; and the quality and quantity of wildlife habitat areas that were established to mitigate habitat losses from the project's construction.

Typical inspection items for recreational facilities include the following: effectiveness of groundskeeping, refuse disposal and sanitary facility cleaning; records of water supply testing; conditions of diving platforms, swimming area markers and safety equipment; and the state of repair for roads, docks, tables, buildings, and equipment.

The South Licking Watershed Conservancy District will maintain records of continuing and completed maintenance work and will furnish reports of these activities to the Soil Conservation Service and the Division of Water, Ohio Department of Natural Resources. Periodic reports will continue until all deficiencies described in inspection reports are satisfactorily corrected.

The South Licking Watershed Conservancy District will protect the permanent vegetation from farming activities or their encroachment by prompt, timely enforcement of landrights instruments. Where vegetation is damaged by maintenance work or natural forces, it will be restored to comparable quality and quantity.

Vegetative growth established for erosion control in reservoir, recreation, and stream construction areas will be maintained in a vigorous condition by fertilizing, reseeding, and other means as necessary. Unwanted vegetation will be controlled by mowing or other means. Mowing will be delayed until after July 1 to minimize disturbances to nesting and young wildlife. During the establishment period, earlier mowing will be used, if needed, to control competition from annual plants.

Wildlife habitat quality will be maintained on areas planted as part of the project measures by replanting or by management of natural plant successions.

Erosion damage will be repaired promptly and rodents controlled where necessary. Debris and sediment accumulations that create flow restrictions in channel work reaches will be removed. Concrete and metal work will be maintained in good functional order by painting, repairing, or replacing as necessary.

For complex or unusually difficult or extensive maintenance work, the Soil Conservation Service may provide technical assistance upon request of the South Licking Watershed Conservancy District and within the limits of available resources. Drawings, specifications, layout, advice on techniques, and similar services may be provided.

The South Licking Watershed Conservancy District will prohibit installation of facilities or appurtenances that would interfere with the operation and maintenance of the structural measures. The District will obtain Soil Conservation Service approval of any drawings and specifications for altering or repairing a structural measure. The estimated total average annual operation, maintenance, and replacement costs shown in Table 4 are $170,861. This includes $16,919 for channel work, $4,130 for the reservoirs, $145,482 for the recreational facilities of which $34,811 is for replacement, $100 for dikes, and $4,230 for the environmental quality component consisting of Heath critical area stabilization and Raccoon Creek obstruction removal.

Funds needed for the works of improvement will be raised by the District through normal legal procedures. User fees for the Lobdell Creek recreational facilities will help to defray operation, maintenance, and replacement costs. Fee schedules will be based on the type and diversity of available facilities and will be commensurate with customary charges at similar facilities. The South Licking Watershed Conservancy District will be responsible for funds needed to operate the South Fork channel recreational facility and the Lobdell Creek recreational facility.

Mitigation Plan

An interagency mitigation team was formed to provide acceptable mitigation measures for the South Fork of Licking River Watershed Project. The members consisted of biologists from the USDI, Fish and Wildlife Service (F&WS), Soil Conservation Service (SCS), and the Ohio Department of Natural Resources, Division of Wildlife and Water (ODNR). The following recommendations are a result of the team's effort and represent the recommendations completed to date. The mitigation recommendations have been tentatively agreed to by the F&WS, ODNR, and SCS for inclusion within the plan. The plan includes wildlife planting, fish and stream improvement structure recommendations. Field investigations of each site may cause variation in some individual recommendation but it is not anticipated significant alteration in the proposed mitigation plan will occur.

During the past four years much consultation has been held between the F&WS, SCS, and ODNR. On May 8, 1978 and again on August 18, 1978, the F&WS provided SCS with comments and recommendations for each individual site within the watershed. SCS responded on June 13, 1979 indicating their concurrence with most of the recommendations requested by the F&WS. The following proposed mitigation plan is a direct result of this interagency correspondence. ODNR was contacted concerning the fish and wildlife aspects within the proposed mitigation plan. They presented no significant adverse comment and provided their concurrence with the present mitigation plan.

Existing Conditions

Present land use and minimum land requirements for all floodwater retarding reservoirs are found in Table E-5-1, Page E-5-3 of this EIS. According to this table dams, spillways, and outflow areas will require 108 acres of land and 100 year deposition area will require 84 acres of land. The total amount of permanent land use change is 192 acres (cropland 42 acres, pasture 64 acres, forest 67 acres, and other 19 acres).

According to Table E-5-1, areas temporarily affected by construction of the floodwater retarding reservoirs are those periodically inundated (181 acres), flowage rights (58 acres), and construction and borrow areas (16 acres). Land use in these areas is cropland 91 acres, pasture 86 acres, forest 70 acres, and other 7 acres.

The Lobdell Creek recreation site and the South Fork channel will require 480 acres of land, and 370 acres of land, respectively (Table E-5-2).

Lobdell Creek recreation development will require 319 acres for the dam site, spillway, flowage rights and lake area. The remaining 161 acres will be developed into various public recreational uses (Appendix E).

Table E-5-3 of this EIS provides all the minimum land area requirements for channel work and dike work.

According to this table, 154 acres will be required for the new bypass channel adjacent to I-70. South Fork channel enlargement will require 20 acres of temporary land use change. The South Fork obstruction removal will require 29 acres for spoil placement and obstruction storage representing a temporary land use change.

Mitigation Plan for Channel Construction

In areas where cover is being cleared for channel construction, the channel side slope will be seeded with a perennial grass. The 15-foot maintenance berm and other disturbed areas except crop and pasturelands will be seeded with wildlife habitat meadow mixture. The seeding mixture will generally consist of bromegrass, alfalfa, red clover, timothy and orchard grass. Sweet clover and crown vetch may also be used. These grasses and legumes provide nesting cover and food for pheasants, quail, cottontail rabbits, and some songbirds.

To mitigate the disturbances of woody vegetation by channel work, shrubs will be planted at the rate of about 1,200 plants per acre, and trees will be planted at the rate of about 436 per acre.

The following types of shrubs and trees will be used to provide wildlife food and cover depending on availability and desires of landowners:

Pin Oak	Autumn Olive	Zumi Crabapple
Snowberry	Common Alder	White Mulberry
White Pine	Smooth Sumac	American Hazelnut
Scotch Pine	Gray Dogwood	Blackhaw Viburnam
Wild Cherry	Silky Dogwood	Sargent's Crabapple
Norway Spruce	American Plum	Tatarian Honeysuckle
Black Walnut	Austrian Pine	American Highbush
Silver Maple	Staghorn Sumac	Cranberry

In order to develop a more natural condition, the trees and shrubs will be scattered randomly throughout the areas rather than planted in rows. Clump plantings of mixed species of trees and shrubs of similar sizes and growth habits will be utilized at every opportunity.

The following construction techniques will be used to protect or mitigate damage to the fish, wildlife, and plant resources along the construction areas:

a. Construct the channel bottom in a manner that will concentrate low-flows and create scattered pools and riffles rather than have the flow spread too shallow for most aquatic life.

b. Construct fences to keep livestock away from areas of construction and permanent vegetative strips.

c. Mark the limits of the vegetative strip along cropland with durable posts or other suitable means where needed to preclude farming practices from damaging the vegetation.

d. Establish minimum clearing limits needed for construction and maintenance.

e. Seed disturbed areas, except channel slopes, to temporary or perennial vegetative cover at the end of each days work except where other construction is expected to take place sooner than the normal period of germination for the seed used. Seed channel slopes to perennial vegetative cover at the end of each days work.

f. Pile the spoil in wooded and brushy areas and spread in cropland and pasture areas.

g. Automotive barriers will be installed to prevent vehicular damage.

h. On construction reaches when winter shutdown is expected, the disturbed areas will be temporarily seeded and mulched. Upon completion of construction, the site will be permanently seeded.

i. Berms, diversions, and terraces will be constructed on banks and around spoil piles as necessary to provide stable banks and prevent erosion and subsequent sedimentation.

j. Debris and sediment basins will be constructed where conditions warrant to prevent sediment from reaching the streams.

k. Equipment parking areas, haul roads, and other construction areas will be managed to minimize erosion and sedimentation.

Approximately three-fourths of a mile of South Fork channel is scheduled for enlargement. The existing fisheries in the South Fork are of fair quality. The water quality is poor and will tend to curtail good population numbers of usable sport fish species.

The team agreed by placing at least five double wing deflectors within the channel enlargement section, needed diversity would be restored to this section. Large rocks should be placed in the pool area below each structure.

In accordance to the proposed plan obstruction removal along the South Fork has been scheduled. The interagency team should mark the trees for removal. Representatives from each agency and the respective conservancy districts should be requested to provide team members. The team will mark the trees for removal, inspect and concur with all obstruction removals and provide onsite recommendations for improvement of construction techniques to insure minimum disturbance during the operation.

The remaining newly constructed channel paralleling I-70 provides an area between I-70 and the new channel for a potential of approximately 20 acres of wildlife habitat development. No decision has been made concerning this area. Final habitat development design rests with the Ohio Department of Transportation.

Mitigation Plan for Structure Sites

Exact areas needed for construction will not be known until final design is completed. Where grass and cropland is needed for spoil disposal, the spoil can be spread and the land returned to its original use the following year. The wildlife habitat value of the grassland and cropland taken for channel banks and berms is offset when these same areas are seeded to grass and wildlife meadow mixture. As final design is known, and before each contract is offered for bid, the location and areas needing woody planting for wildlife mitigation will be finalized.

The Sponsors will obtain landrights for the acreage needed to mitigate wildlife habitat lost due to project construction.

The following actions will be taken during construction to minimize soil erosion as well as water, air, and noise pollution:

a. The clearing limits will include only the minimum areas necessary for construction and maintenance. Areas to be cleared will be delineated on the construction drawings and staked in the field prior to clearing operations.

b. All disturbed areas except channel slopes will be seeded to temporary vegetative cover at the end of each days work, except where other construction is expected to take place within three weeks. Channel slopes will be seeded to permanent types of vegetative cover at the end of each days work.

c. During installation, all applicable air and water quality and health regulations will be adhered to. The provisions of construction contracts will require compliance with all existing regulations. Required permits under Section 404 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) will be obtained. Contractors will be required to keep project work areas and access roads in an orderly condition. Upon completion of work, contractors will be required to remove any buildings, debris, unused material etc., from the areas as specified in the contracts. All debris removed from the areas of channel work will be disposed of in an acceptable manner as approved by the Ohio EPA. Any solid or liquid materials which might cause pollution will be handled in accordance with emergency response regulations of the Ohio EPA. Vector control, where necessary, will be accomplished through the use of local drainage and with approved insecticides. Contractors will be required to comply with the provisions of the Occupational Safety and Health Act of 1970 (PL 91-596) and the Safety and Health Regulations for construction of the U.S. Bureau of Reclamation.

Structures

The following recommendations are made for all structures except as noted. The team will formulate individual mitigation plans covering mitigation for fish and wildlife habitat development.

1. Replant all dams, spillways, and disturbed outflow areas with grasses of value to wildlife immediately following construction.

2. Replant all unavoidably cleared areas and disturbed flowage rights areas to grasses and shrubs of value to wildlife immediately following construction.

3. Leave vegetation in the permanent pool area to serve as fish and wildlife attractors.

4. Construct in disturbed areas fish habitat improvement structures in accordance with ODNR specifications (Approximately 6 per acre).

5. Obtain easements on periodically inundated land (189 acres) to insure its present wildlife values will be preserved or enhanced.

6. Kirkersville and Lobdell - Clean-up existing dump.

7. Kirkersville - Obtain an easement on high ground between the two forks of the impoundment.

8. Lobdell - Develop multi-use recreational resources which will maintain the lake in a natural state.

9. Lobdell - Stock fish in accordance with ODNR's recommendation (106 acre lake).

10. Lobdell - Develop recreation control to prevent erosion and destruction by overuse.

11. Develop wetlands along the edge and within the permanent pool area wherever possible.

12. Obtain additional easements, for wildlife habitat preservation or enhancement, surrounding the structure site whenever possible.

Project Costs

Project installation costs, distributed to PL-566 and other funds, are shown in Table E-5-5 (See Watershed Plan, Tables 1 and 11, for greater detail).

Table E-5-5

Project Installation Costs (Dollars) 1/

Installation Cost Item	PL-566 Funds	Other Funds	Total
Land Treatment			
Going Program		(1,562,500)	(1,562,500)
Accelerated	170,400	955,000	1,125,400
Total	170,400	955,000	1,125,400
Structural Measures			
Construction	6,346,192	2,382,488	8,728,680
Other	1,514,805	193,960	1,708,765
Nonstructural Measures			
Land Acquisition	12,100	4,400	16,500
Total Project 2/	8,043,497	3,535,848	11,579,345

1/ Price Base 1978.

2/ Total Project Costs do not include the costs of Going Program Land Treatment.

ENVIRONMENTAL SETTING

Physical Resources

The South Fork Licking River Watershed consists of 180,364 acres located in Licking (161,180 acres), Fairfield (13,284 acres) and Perry (5,900 acres) Counties within central Ohio. The largest city, partially in the watershed, is Newark with a population of 41,836 1/, followed by Heath with 6,768 people. The villages of Alexandria, Granville, Hebron, Johnstown, Kirkersville, and Pataskala are located within the watershed. The total urban population is 39,553. The rural population is estimated at 18,921. The population of the area is growing quite rapidly, partially due to the very rapid expansion of the Columbus metropolitan area.

The watershed is located within the Ohio River Water Resource region and is part of the Muskingum River subregion number 504 as designated by the Water Resources Council.

Approximately 9,322 acres located within the South Fork and Raccoon Creek valleys are susceptible to flooding of which 4,964 acres are in cropland or pasture-land. Urban flood damages occur primarily in the communities of Pataskala, Hebron, Buckeye Lake, Johnstown, Alexandria, Granville, Newark, and Heath.

The most damaging flood in recent history was the flood of January 1959. Other serious floods of record for South Fork and Raccoon Creek occurred in 1898, 1913, 1964, 1968, and 1975. Other major flood producing storms occurred in 1935, 1937, 1940, 1943, 1945, 1948, 1950, 1952, 1956, 1957, and 1963.

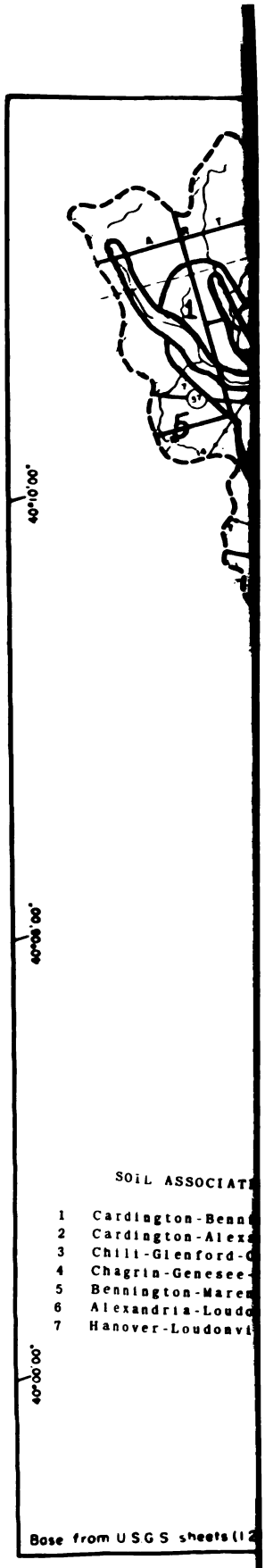
Appendix D (Project Map) shows the economic evaluation reaches used in the study. The major agricultural damage occurs in reaches 12, 13, 72, and 73. The major urban and commerical damage occurs in reaches 11, 12, 69, and 71. Appendix G (urban flood plain map) shows the urban areas subject to flood damage.

Soils in the South Fork Licking River Watershed vary greatly in nature according to their parent material, slope, age, and moisture conditions. There are seven soil associations present, each consisting of two or three dominant similar soils for which the association is named. The soils in the watershed are very productive when subject to proper management.

The general soil map (Map E-6-1) shows the location and distribution of each of the following soil associations: Cardington-Bennington-Marengo Association (38 percent); Cardington-Alexandria-Bennington Association (17 percent); Chili-Glenford-Ockley Association (15 percent); Chagrin-Genessee-Shoals Association (13 percent); Bennington-Marengo Association (9 percent); Alexandria-Loudonville Association (4 percent); and Hanover-Loudonville Association (3 percent).

The watershed is located in the glaciated plateau of Ohio. The area is primarily underlain by bedrock formations of the Mississippian System consisting of stratified sandstone, shale, and conglomerate of the Cuyahoga and Logan formations except for small areas at the eastern boundary where younger rocks of the Pennsylvanian System occur. These strata have a regional dip of 20 to 30 feet per mile to the southeast.

1/ All population data based on Federal Census of Population, April 1970. One-half of the population of Newark (20,918) is estimated to be within the watershed boundary.



General Soil Map Legend

1. Cardington-Bennington-Marengo Association: Level to gently sloping, very poorly to moderately well-drained soils formed in clay loam glacial till on the uplands.

2. Cardington-Alexandria-Bennington Association: Gently sloping to sloping, somewhat poorly to well drained soils formed in clay loam glacial till on the uplands.

3. Chili-Glenford-Ockley Association: Nearly level to sloping, moderately well or well drained soils formed in loamy material over stratified gravel and sand on stream terraces adjacent to streams.

4. Chagrin-Genesee-Shoals Association: Nearly level, somewhat poorly or well drained soils formed in loamy alluvium on bottomlands adjacent to streams.

5. Bennington-Marengo Association: Nearly level to gently sloping, very poorly or somewhat poorly drained soils formed in clay loam glacial till deposits on uplands.

6. Alexandria-Loudonville Associaton: Gently sloping to steep, well-drained soils formed in loam glacial till on uplands.

7. Hanover-Loudonville Association: Sloping to steep, well-drained soils formed in shallow deposits of glacial till over sandstone bedrock on uplands.

The surficial deposits consist of both ground and end moraines of glacial origin. The end moraines form ridge-like accumulations of till within the flat-lying ground moraines. The glacial till consists primarily of unconsolidated silty clay.

During the retreat of the last glacier, deposits of sand and gravel glacial outwash were laid down in large meltwater channels which are now the main Raccoon and South Fork Valleys. These deposits underlie the recent silty clay alluvium which was laid down in the flood plains of the modern streams in the area.

There was a large glacial lake in what is now the Buckeye Lake area which extended up the South Fork Valley to the area of present day Kirkersville. The resulting lacustrine deposits are clayey and poorly drained. Since the last glaciation the terrain has been further dissected causing a modified dendritic drainage pattern which gives the area its rolling appearance.

The highest point in the watershed, located in Section 20 of St. Albins Township in Licking County, is 1,260 feet above sea level. The lowest point is located at the confluence of South Fork and North Fork Licking Rivers at 800 feet above sea level. Total relief in the watershed is approximately 460 feet.

The climate of the watershed is temperate with relatively cool to cold winters and mild to warm summers. Mean annual precipitation ranges from 42-48 inches distributed unevenly, producing a dry harvest season during late summer and early fall. Average monthly temperatures range from 30-40 degrees F in January to 70-80 degrees F in July. The mean annual freeze-free period ranges from 150 to 180 days.

The watershed has very few mineral resources of current commercial value. Historically, fire clay and natural gas have been important resources. However, these deposits have diminished since the early 1900's.

Ground water yields vary by location within the watershed. The ability of the various geologic materials to yield ground water depends on the size, shape, and arrangement of the individual particles present. Yields may range from less than one gallon per minute in the clay shale formations to as high as 700 gallons per minute in thick permeable gravel deposits of glacial outwash located adjacent to the main valleys of South Fork and Raccoon Creek. The ground water supply is generally adequate for individual wells for domestic use, both in quantity and quality throughout the watershed. Many areas, especially those adjacent to the main streams, are well suited for municipal ground water supplies.

Land use in the watershed is 52 percent cropland, 27 percent grassland, 13 percent forest land, and 8 percent in miscellaneous land. The miscellaneous land consists of one percent railroads, 71 percent urban land and rural homes, 24 percent roads, and 4 percent recreational land and water.

Land use in the flood plain is 56 percent cropland, 5 percent pastureland, and 39 percent other uses (urban, roads, etc.).

South Fork Licking River, the watershed's main stream, flows southeast to the Buckeye Lake area and then north to Newark. The stream has been straightened and enlarged extensively in the lacustrine area north of Buckeye Lake. The major tributary, Raccoon Creek, flows southeast and joins South Fork at Newark (see project map, Appendix D).

The watershed's principal streams are listed in Appendix Q, Table 1. Data on streams affected by project structural measures are shown on Appendix Q, Table 2. There are no impoundments or flow retarding structures on perennial streams in the watershed 1/.

Buckeye Lake, about 2,830 acres in size, was built in the 1830's as a water supply reservoir for the Ohio Canal. A canal remnant from near Sellers Point at Buckeye Lake supplies water to the Hebron National Fish Hatchery about 1½ miles north of the lake.

The lake receives water from Honey Creek, smaller unnamed streams, and the reservoir feeder. The reservoir feeder was constructed to intercept water from South Fork near Kirkersville and from about five other streams that originally flowed into the lacustrine area now traversed by South Fork. The feeder no longer intercepts South Fork water at Kirkersville.

The fish hatchery, Lake Hudson, and five other lakes each have surface areas over five acres. Seventeen watershed lakes or ponds are two to five acres in size and about 400 are smaller than two acres 2/. The watershed has about three percent of the state's lake and pond area, and about 0.7 percent of the state's total area.

The watershed's surface waters are designated by the Ohio EPA for "Agricultural Water Supply," "Industrial Water Supply", "Primary Contact Recreation," and "Warmwater Habitat." Criteria associated with the use designations are contained in Rule OAC 3745-1, promulgated by the Ohio EPA in 1977.

The July 1975 field and laboratory water quality tests for selected stream sampling stations represent typical base flow conditions (Appendix Q, Table 3).

The data show relatively low dissolved oxygen concentrations for about half the sampling locations. Suspended solid concentrations were low with only three of twenty-five locations having over 50 mg/l concentrations. Mid-summer stream water temperatures averaged about five degrees celsius, below ambient air temperatures, with only four of twenty-five locations showing higher water temperatures. Hardness ($CaCO_3$ equivalent) ranged from 110 to 325 mg/l, considered moderate for the area.

Metal concentrations in sediments are very low, indicating little accumulation. Measured pesticide concentrations in the waters and sediments do not suggest excessive accumulations, and it is not expected that toxic concentrations exist elsewhere in the watershed 3/.

Fecal coliform content at seven sample locations ranged from 54 to 1,448 per 100 ml for a single sampling as shown in Appendix Q, Table 3. The Ohio Environmental Protection Agency standards 4/ for any 30-day period are shown in Appendix Q, Table 4.

1/ E.D'Appolonia Consulting Engineers, Inc., Water Quality and Biological Assessment, South Fork Licking River Watershed, Ohio, Volume 1, 1976, page 4-3.
2/ Ibid., Table 5-3.
3/ Ibid., page 4-8.
4/ Ohio Environmental Protection Agency, Amendments to Rule OAC-3745-1 (Water Quality Standards), 1977, pages 33-34.

Twenty-five point sources (Appendix Q, Table 3) of waste discharge were identified in 1975 1/. Eleven waste sources are municipal or commercial sewage treatment plants and 14 are industrial discharges. Three of the watershed's known waste sources are located in the Newark area, six in the Heath area, six in the industrial area north of Hebron, five in the Buckeye Lake area, and five at points near Kirkersville, Pataskala, Granville, and Johnstown. The industrial discharges are concentrated in the downstream segments and the municipal discharges are more prevalent in the upper stream reaches.

The range of 5-day biochemical oxygen demand for sewage treatment facility discharges reported in 1975 was 10 to 61 mg/l 1/.

Agricultural non-point waste sources do not appear to be prominent in the watershed. Low-flow suspended solids and agricultural chemical residues were generally low during the 1975 sampling period as shown in Appendix Q, Table 3. Diffuse petroleum product seepage in the Ramp Creek area in Heath has been a chronic pollution source. Ongoing control and elimination efforts have benefited water quality in the area.

Forty percent of the cropland is in land Classes II, IIIe, IVe, with average annual soil loss ranging from four to eight tons per acre per year. Thirty-seven percent of the cropland is in land classes I, IIw, and IIIw with average annual soil loss ranging from two to four tons per acre per year.

The present average annual soil loss for South Fork Licking River Watershed due to sheet and rill erosion is an estimated 428,320 tons or about 2.41 tons per acre. Average annual soil loss by land use is illustrated below.

Land Use	Acre	Tons, Acre,Year	Tons
Cropland	94,576	3.93	371,937
Pastureland	22,000	1.40	30,888
Forest Land	21,647	0.43	9,192
Hayland	24,679	0.22	5,429
Other	14,499	0.75	10,874
Total	177,401 1/	2.41	428,320

1/ Does not include Buckeye Lake.

Three replicate samplings of aquatic macroinvertebrates (stream benthic fauna) were used to indicate overall, long-term water quality at five sampling stations (Appendix Q, Table 5). The sampled streams were classified according to the water quality tolerance of the collected organisms and values range from 1.05 to 1.43.

1/ E. D'Appolonia Consulting Engineers, Inc., Water Quality and Biological Assessment, South Fork Licking River Watershed, Ohio, Volume I, 1976, Table 4-1.

The value "0" denotes poor water quality; mostly organisms tolerating adverse conditions are present. The value "1" indicates intermediate water quality and "2" indicates high quality with mostly organisms intolerant of low water quality being present.

Water quality in the Lobdell reservoir site must meet standards for "bathing waters" as defined in Ohio EPA Water Quality Standards Chapter 3745-1-07, Section I. This requires a geometric mean fecal coliform count not to exceed 200 per 100 ml. in more than 10 percent of the samples in a 30-day period. The fecal coliform count was 54 per 100 ml at the Lobdell site. Since the sampling was done over a less than a 30-day period, no conclusive evidence can be stated. Also, the Lobdell sample station was at a no flow condition during the sampling period. However, in view of the lack of specific data, projections were made by E. D'Appolonia Consulting Engineers, Inc., from other sites.

Water impounded by the proposed reservoirs will be generally suitable for most recreational and agriculture applications, including irrigation, watering of livestock, recreational boating and fishing. Human body contact sports such as swimming and water skiing may be inappropriate only for sites located downstream of major sources of agriculture of municipal wastes. 1/

Since no major sources of such wastes are present upstream of the site, it can be reasoned that the Lobdell site should be suitable for body contact sports.

Present and Projected Population

An estimated 58,474 persons live in the watershed. The city of Newark is the largest municipality in the watershed. Approximately half of Newark (20,918) is within the drainage boundaries plus almost all of Heath. Villages located in the watershed are Alexandria, Buckeye Lake, Granville, Hebron, Johnstown, Kirkersville, and Pataskala. Appendix Q, Table 6 lists the communities and their population for 1970.

The watershed is located near the metropolitan area of Columbus. The OBERS projections show a steady increase in the population surrounding the city of Columbus. This will have a definite impact on the watershed. Appendix Q, Table 7 compares the population of water resources Subareas 504 and 506. The water resource Subarea 504 is the Muskingum region and includes the South Fork Licking Watershed. Water resource Subarea 506 includes the Scioto River Basin which includes the city of Columbus. It is evident the projected rate of change will be greatest in Subarea 506 versus 504.

According to the 1970 Census-Characteristics of Population, Licking County has a mean family income of $10,126 with 8.4 percent below poverty level. For farm families 10.3 percent are below poverty level. It listed eight Spanish speaking families and 68 Negro families below poverty level.

Licking County has a rural farm population of 5,200, all of whom are white. It has a rural nonfarm population of 44,081, of which 338 are Negro and 94 are other races.

1/ Ibid.

Economic Resources

The South Fork Licking Watershed is predominantly privately owned. The major exception is state-owned Buckeye Lake. It encompasses 3,327 acres in the southern part of the watershed. Other areas include the Hebron Fish Hatchery owned by the United States which encompasses 217 acres and the Mound Builders and Octagon Mound State Memorials owned by the Ohio Historical Society which occupies 204 acres.

The watershed is rural in nature. Approximately 60 percent of the land is in farms. There are about 1,050 farms in the watershed and average 160 acres in size. The farms are a combination of grain and livestock enterprises. In Licking County, which occupies nearly 88 percent of the watershed area, cash receipts for 1976 were evenly split between crops, livestock and livestock products. Corn, soybeans, and wheat are the major crops grown with dairy, cattle and calves operations being the major livestock enterprises. Average yields are 100, 35, and 40 bushels per acre, respectively.

Land values in the watershed have been fluctuating the last few years reflecting changes in crop and livestock prices. Upland land values range from $800 to $1200 with flood plain land ranging in value from $800 to $1000.

Interstate 70 is the major transportation artery crossing the watershed. It crosses the flood plain of South Fork east to west. State Routes 13, 15, 37, 62, 79, 158, 161, 188, 204, 310, 360, and 661 plus U.S. Route 40 and numerous county and township roads traverse the watershed. The main lines of the Baltimore and Ohio and the Conrail Railroads cross the watershed in a southwesterly direction from Newark. Farmers are readily accessible to market centers.

The economic and social conditions in the watershed are affected significantly by the industry around Newark and the proximity to the metropolitan area of Columbus. Many people live in the rural areas of the watershed but commute to the factories and businesses in Newark and Columbus. Appendix Q, Table 8 shows the employment by industry for 1970 for each of the three counties encompassing the watershed and the state of Ohio.

Unemployment is generally higher in the watershed as compared to the state average. Appendix Q, Table 9 illustrates the number and percent unemployed for the three counties, the state of Ohio, and the United States in 1976.

Comparison is made between all families and rural farm families in Appendix Q, Table 10 for the three watershed counties and the state of Ohio. The mean family incomes are below the state average and the proverty level percent is higher than the state average.

Average market value of all agricultural products sold per farm in 1974 amounted to $22,657 in Fairfield County, $18,756 in Licking County, and $9,274 in Perry County. This compares to a state average of $24,551. An estimated 50 percent, 50 percent, and 57 percent, respectively, worked off the farm more than 200 days in 1974. This compares to a state average of 39 percent.

Plant and Animal Resources

Present land use of the project area shows 52 percent cropland, 25 percent herbaceous land, 13 percent forest land and 10 percent miscellaneous land. Only a small percentage of present forest is representative of the climax association which includes beech-sugar maple, silver maple-American elm, and mixed mesophytic oak forest. The largest forested acreage consists of the successional hardwood forest association, and includes oak, sycamore, and hawthorne as representative species. Wildlife usage is typical of that of an agriculturely based area. It satisfactorily compares to other agricultural areas in the midwestern states. Species common to the project area are the eastern cottontail rabbit, white-tailed deer, eastern gray squirrel, raccoon, skunk, groundhog and upland game birds including ruffed grouse, ring-necked pheasant, morning dove and bobwhite quail. Associated fauna of the agricultural communities supply habitat for song birds such as robins, blackbirds, and grackles.

E. D'Appolonia Consulting Engineers were hired to provide a complete study of the wildlife habitat, fisheries resource, benthic resource and water quality. During Phase I and Phase II of the field studies, performed from July 27, 1975 to August 24, 1975, all wildlife species observed were recorded and were subsequently broken into the following catagories: mammals; amphibians and reptiles; game birds; and birds. An estimate of species relative abundance or range capabilities was provided when information was available. Data for this determination was based on range data obtained from ODNR publications (See Appendices K and M).

During the watershed planning process, interdisciplinary field trips were made with representatives from the Ohio Department of Natural Resources, USDI, Fish and Wildlife Service, U.S. Environmental Protection Agency, Ohio Environmental Protection Agency, and Ohio State University. Other state, local and private agencies and groups were contacted for input as the specific needs required. Species observed during the field trips were recorded by catagories similar to those of E. D'Appolonia's report and the compared results show no significant difference.

Mammals that are considered to be relatively abundant in the watershed are the white-tailed deer, gray squirrel, muskrat, raccoon and woodchuck. The cottontail rabbit and gray fox squirrel are considered to be at a medium density level. No population density estimates are included for the skunk, mink, gray fox, red fox, opossum, chipmunk or red squirrel (See Appendix K).

Game birds inventories in the E. D'Appolonia report include the bobwhite quail, ring-necked pheasant, ruffed grouse, American woodcock, and waterfowl. Low-medium population density estimates are indicated for the bohwhite quail and ring-necked pheasant. No range data was included concerning the relative abundance or range capabilities of the ruffed grouse and the waterfowl species (See Appendix M).

No relative abundance or range capabilities are included for the amphibians and reptiles (See Appendix L) or the birds (See Appendix N). For these catagories only the observed species were recorded indicating presence and utilization of the watershed.

A complete checklist of all the birds recorded at the Hebron National Fish Hatchery since 1958 is contained in Appendix O. The birds are listed by season observed and by an estimate of abundance during that season.

The stream, fish, and benthos resource was documented by E. D'Appolonia 1/; complete results are recorded in Volume 1, pages 6-1 to 6-8 of his March 1976 report. Important information pertaining to the watershed has been summarized from this report.

Twenty-seven stream sampling investigations were conducted throughout the watershed. Sixteen of the sites were located at proposed reservoir sites and the remaining eleven were located within proposed stream channel modification areas along the South Fork Licking River and Raccoon Creek. Collections included samples for field and laboratory analyzation of the water sediment and stream biota. Recorded at the same time were observations of the physical characteristics of the stream's substrate, dimension, cover, shading, vegetation and pool-to-riffle ratio. Water quality data was collected at all sampling sites. Appendix I contains a location map of the fish samples sites and Map E-6-2 of the EIS provides the location of the benthic sampling sites.

Stream habitat observations were made on the physical characteristics of the stream and other factors important to the determination of habitat suitability. Appendix P summarizes the observed stream habitat conditions of each sampling site and includes information on the stream cover, width, depth, and substrate. Results of the observations show that the stream habitat conditions are quite variable.

The composition of the substrate varied from silt and clay to bedrock. Many of the sampling stations had silt or silty sand present at significant amounts. The pool-to-riffle ratio varied from 2:1 to 5:1 and shading varied from 0 percent to 100 percent. The streams support little in the way of aquatic vegetation (macrophytes), although organic debris (primarily decaying wood) was abundant. The aquatic macrophytes and the organic debris provide the essential food source for the stream invertebrates and bottom-feeding fish.

Little difference was apparent between Raccoon Creek and South Fork Licking River when the following parameters were compared: shading, substrate, cover, amount of silt present, pool-to-riffle ratio and amount of organic debris. A bed material of silt was present in the channel at all sample locations. The bankside vegetation and shading along the stream were not well preserved and in many areas inadequately managed. Intermittent flows result in exposure of riffles to extended periods of drying. Many of the riffles are covered with fine grained sediment and are not suitable for spawning nor conducive for feeding. In many areas the streams' habitat lacks the essential requirements for developing a diverse population of benthic organisms as well as not being suited for riffle requiring species of fish.

Fish collections were made at 16 potential reservoir sites and 11 locations along South Fork and Raccoon Creek (See Appendix I). Streams were sampled by use of a portable electrofishing unit, dip nets and seines. Collections from the South Fork Licking River subbasin (upstream of the Raccoon Creek confluence) yielded 35 species and the Raccoon Creek subbasin collections contained 29 species. Of these, 23 species were common to both streams, 12 were taken exclusively from the South Fork Licking River subbasin and six were exclusive to Raccoon Creek subbasin.

1/ E. D'Appolonia Consulting Engineers, Inc., Water Quality and Biological Assessment, South Fork Licking River Watershed, Ohio. Volume 1, 1976.

The stoneroller, collected at all but three stations, occurred in the greatest number; it was followed closely by the white sucker. Common to the area were the bluntnose minnow and the creek chub. The most diversed collections were made from the upper reaches of the Raccoon Creek, Lobdell Creek and Muddy Fork. In all cases these samples were located in the headwaters upstream from major communities. The intermittency of flow did not prohibit utilization of the stream by fishing during the year. A greater number of pond fish species were found in the South Fork Licking River than were found in the Raccoon Creek subbasin. This may be partially explained due to accessibility of the outlet from Buckeye Lake and from the Federal Fish Hatchery. Appendix I gives a summary list of all species collected during the investigation and those reported from various collections made by ODNR, Division of Wildlife and Division of Water.

Jezerinac recently made collections in the South Fork Licking River subbasin 1/ and Raccoon Creek 2/ yielding 43 species and 45 species respectfully. His Raccoon Creek collections were made at 37 locations from June 1972 to August 1974 and his South Fork collections were made at 16 locations from June through August 1975. His summary includes two species from South Fork Licking River subbasin not reported by other sources. They are the striped shiner (Notropis chrysocephalus) and orangethroat darter (Etheostoma spectabile). Four species reported from Raccoon Creek subbasin, not reported by other sources, are the roseyfaced shiner (Notropis rubellus), striped shiner (Notropis chrysocephalus), mimic shiner (Notropis volucellus), and orangethroat darter (Etheostoma spectabile). Included on the summary list of species collected (See Appendix I) is an additional 18 species that are indicated by Trautman 3/ as having possible ranges extending into the South Fork Licking River Watershed.

Stream benthos quantitative and qualitative sampling was conducted at Stations I, III, VII, IX, 25, and 30 (See Location Map E-6-2). Results of the aquatic invertebrate collection at all sampling stations is given in Appendix J, Table 1. Of the taxa collected, the largest number of organisms encountered (449) was at Station VII on South Fork Licking River above the Bell Run confluence. Seventeen invertebrates were common to both subbasins, five were collected exclusively in Raccoon Creek and seven were collected exclusively in South Fork. The lowest number (40) was collected at Station III on Beaver Run.

A water quality classification was assigned to each taxon on the following basis: organisms tolerant of poor water quality were assigned the value "0"; intolerant organisms were assigned a "2"; and facultative organisms (neither especially tolerant nor intolerant) were assigned the value "1". Classifications assigned to organisms are based upon those utilized in a similar study conducted in the Muskingum River Basin (Federal Water Pollution Control Administration, 1968) and are listed in Appendix J, Table 1. These data were used for computation of an index of stream classification for the location of each collection made. The data utilized for this computation are given in Appendix J, Table 2 with the resulting

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1/ Jezerinac, Raymond F., 1975a. A Checklist of the Fishes of the South Fork Licking River Watershed, Ohio, unpublished.

2/ Jezerinac, Raymond F., 1975b. A Checklist of the Fishes ofRaccoon Creek, Ohio, unpublished.

3/ Trautman, Milton B., 1957. The Fishes of Ohio, The Ohio State University Press, Columbus, Ohio.

water quality index. Detailed quantitative data from three replicate samples were collected at each station and are recorded by taxon.

The summation of the three replicate samples and mean density of each organism was computed. These data were utilized for computations of diversity and equitability indices, the data are summarized in Appendix J, Table 3. Diversity was calculated by the formula given by Lloyd, Zar and Carr 1/ and a coefficient of equitability was determined by the method of Lloyd and Ghelardi 2/.

Communities existing under stable environmental conditions with an abundant source of energy and/or nutrient materials tend to become more diverse than communities exposed to severe environmental stresses (e.g., heat, cold, toxic substances). Biological competition for food, space, and other resources may become greater in those environments which survival of physical and chemical rigors is not the primary issue. More diverse communities are indicative of stable environmental conditions and low diversity suggests presence of rigorous environmental conditions (only the tolerant species may exist), as in the case of polluted waters. Equitability is a measure of divergence from a theoretically "normal" distribution of individuals among species.

The parameters and indices in Appendix J, Table 3 are useful in assessing the nature of long-term conditions of water quality and substrate for the stream reach in which each sample was selected. However, these data should be used with caution for interpretative purposes since they are the cumulative result of a number of processes and conditions, including: nature of substrate, quality of water, level of predation, availability of food, availability of cover and the life cycle of each taxon involved. Precisely stated, there is presently neither an environmental quality index nor a grouping of organisms which gives consistently factual indications of environmental quality for a wide range of substrate types and other environmental parameters.

Station IX from Raccoon Creek below confluence with Moots Run received the highest stream classification (Q_I= 1.43), a higher diversity (D_I= 2.51) and the most equitable distribution of organisms among the different taxa (e = 1.0). The indices of diversity (D_I) and equitability (e) from Station III should be disregarded because of the small sample size (40 specimens). It is recommended that the smallest sample size to be used for computation of a diversity index contain at least 100 individuals.

The endangered species status of Ohio has been assessed by various authors. Smith, Burnard, and Good 3/ enumerated the rare and endangered vertebrates of Ohio. Miller 4/ catalogued rare, endangered, and depleted freshwater fishes for Ohio as well as other states. The Ohio Revised Code Section 1531.25 effective January 1,

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1/ Lloyd, M.J., H. Zar, and J.R. Karr, 1968. "On the Calculation of Information - Theoretical Measures of Diversity," AM. Mid. Nat. 79(2): 257-272 pp.

2/ Lloyd, M. and R.J. Ghelardi, 1964. "A Table for Calculating the 'Equitability' Component of Species Diversity," J. Amim Ecology. 33: pp. 217-225.

3/ Smith, H.G., R.K. Burnard, E.E. Good, and J. M. Keener, 1973. "Rare and Endangered Vertebrates of Ohio." Ohio Journal of Science, 73(5): 257-271 pp.

4/ Miller, Robert Rush, 1972. "Threatened Freshwater Fishes of the United States." Transactions of the American Fisheries Society, 101(2): 239-252 pp.

1974 provided for the identification and protection of native species of wild animals threatened with statewide extinction. A list of these animals was adopted in a public hearing of May 1, 1974 and is distributed by the Ohio Department of Natural Resources 1/.

A previous collection by Trautman 2/ in 1957 indicated the presence of the Western Lake Chubsucker (Erimyzon sucetta) in the Licking River Watershed. Extensive collections in 1974 by Jezerinac 3/ 4/ in the South Fork Licking River and Raccoon Creek and failed to record the presence of this species. No collections or observations made during this investigation indicated that any rare or endangered species are present in the study area. Additional inquiries made of ODNR biologists knowledgeable in this area have also failed to reveal the presence of any unique or unusual species or communities. If any endangered species are discovered during development of the project, steps will be taken for its protection in accordance with the Endangered Species Act of 1973.

Recreational Resources

The Ohio State Comprehensive Outdoor Recreation Plan, 1975-1980, divides the state into 15 planning regions Map E-6-2. These planning regions are the official planning regions to be utilized for recreation planning analysis. The watershed lies principally in planning Region 6 with a small portion (Perry County) in Region 8.

The population of Region 6 (Appendix Q, Table 11) in 1970 represented eleven percent of Ohio's population. The regional population (Appendix Q, Table 12) is expected to increase by almost 400,000 people by 1990. The increased population is expected to increase the demand for public water-based recreation.

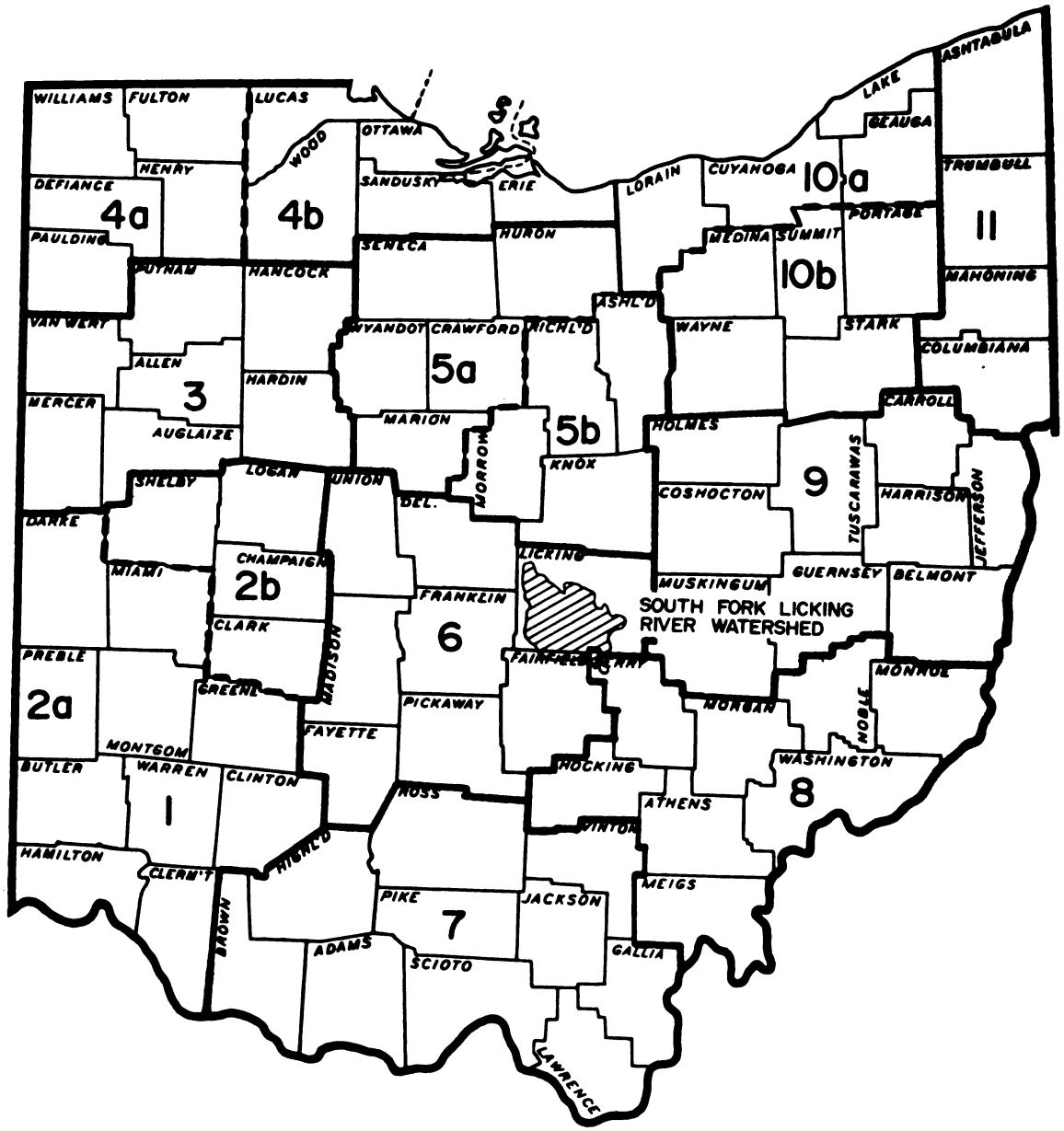
The state plan inventoried recreation space. Available recreation space in the three-county area is summarized in (Appendix Q, Table 13). Recreation space totals approximately 42,000 acres with 36,000 acres public and 6,000 acres private. The major areas of public recreation space are located around Buckeye Lake in Licking County and national forest land in Perry County. Approximately 75 percent of the recreation space is located in Perry County.

Recreation space within the watershed boundary totals about 12 percent or 5,200 acres of the total for the three counties. The majority of the public space is located around Buckeye Lake in Fairfield and Licking Counties.

Approximately eight percent or 3,500 acres of the total recreation space in the three counties is water (Appendix Q, Table 14). The majority of the water space, 3,300 acres, occurs within the watershed boundary. The 3,300 acres of water recreation area represents 94 percent of the total public water recreation space within the watershed.

1/ Ohio Department of Natural Resources (ODNR), 1974c. Engangered Wild Animals in Ohio. Publication No. 316 (974), Division of Wildlife, Columbus, OH.
2/ Trautman, Milton B., 1957. The Fishes of Ohio. The Ohio State University Press, Columbus, Ohio.
3/ Jezerinac, Raymond F., 1974a. A Checklist of the Fishes of South Fork Licking River, Ohio. Unpublished.
4/ Jezerinac, Raymond F., 1974b. A Checklist of the Fishes of Raccoon Creek, Ohio. Unpublished.

STATE PLANNING REGIONS
OHIO



SCALE

0 50 100 150 Miles

0 50 100 150 Kilometers

Map E-6-2

Recreational areas provide facilities for numerous activities including picnicking, camping, fishing, and boating. Available public and private recreation areas and activities for the watershed are included in Appendix Q, Table 15. Also, numerous outdoor education areas provide group recreation facilities. A list of outdoor education areas is provided in Appendix Q, Table 16.

The Ohio Statewide Comprehensive Outdoor Recreation Plan provides recreation capacities, demands and facility needs for 1973-1990. Capacity and demands for eight recreation activities are reported in Appendix Q, Tables 17 and 18.

The following are summaries for the eight activities:

Boating: The 1980 and 1990 demand for boating greatly exceeds the 1973 capacities for each county. Region 6 demand in 1960 and 1990 will exceed the 1973 capacity by 400 and 500 percent.

Camping: The 1980 and 1990 demand for camping well exceeds the 1973 capacities in all but Perry County which indicates a surplus of camping capacity. The heavily urban populated Region 6 demands will exceed 1973 capacity by 200 to 300 percent for 1980 and 1990.

Canoeing: The 1973 capacities for canoeing in Fairfield and Licking Counties are expected to satisfy the 1980 demand and almost satisfy the 1990 demands. Perry County has no canoeing capacity but is expected to receive a small demand by 1980 and 1990. The Region 6 1980 and 1990 demands are expected to be 18 percent and 48 percent greater than the 1973 capacity.

Fishing: The 1980 and 1990 demands for fishing in Perry County are expected to be below the 1973 capacity thus satisfying the local county fishing demand. Fairfield County 1973 capacities are expected to remain adequate through 1980 and the demand to increase slightly more than capacities in 1990. Licking County fishing demand is expected to be twice the 1973 capacity by 1990. Region 6 is expected to increase the demand by greater than twice the 1973 capacity by 1990.

Hiking: The 1980 and 1990 demand for hiking is expected to exceed the 1973 capacities of each county in the watershed. Region 6 demands are expected to greatly exceed 1973 capacities by 1990.

Hunting: 1973 capacities of all three counties and Region 6 are considered adequate to meet 1980 and 1990 demands.

Picnicking: Picnicking demand is expected to greatly exceed capacities in all three counties and Region 6 by 1990.

Swimming: Swimming 1990 demands are expected to be two to three times the 1973 capacities in the three counties and Region 6.

As indicated by the above demand and capacity discussion, recreation demand will be greater than capacity for numerous outdoor recreation activities. Opportunities for developing additional recreation facilities are good within the three county area. The rolling topography and moderate tree cover gives this area good potential for attracting outdoor recreation enthusiasts.

Strip mining activities in Perry County detract from the recreational aspects, but reclamation of the land is underway by the state of Ohio and private coal companies. Several coal companies have expressed interest in developing reclaimed lands for recreation.

Licking County has a well developed system of highways and county roads which provide recreationists with good access. The Perry County and Fairfield County roads network is fairly well developed. Strip mining activities have segmented some roads in Perry County.

The center of the watershed is within a 30-45 minute drive of the Columbus metropolitan area and ten to fifteen minutes of Newark.

Archaeological and Historical Resources

In April 1975, the Soil Conservation Service and the Ohio Historical Society entered into a cooperative agreement for a survey to locate archaeological and historic sites in designated portion of the South Fork Licking River Watershed. The survey was undertaken to help determine the scope of the channel work and the choice of impoundments to be constructed 1/.

There are no sites in the area affected by the project works presently listed in the National Register of Historic Places (NRHP). (Sites which are included in the National Register of Historic Places are published regularly in the Federal Register.)

The survey located two sites containing features of scientific value which could be affected by proposed structural measures. The Mississippian Raccoon Shale facies of the black hand sandstone outcrops within the pool areas of planned structure site on Simpson Run. (The report points out that the former name of this stream is "Stimpson Run." Current maps and other references, U.S. Geological Survey quadrangles, county highway maps, plat maps, and the Gazetteer of Ohio streams, show the name "Simpson Run" and many area residents know the stream by this name. The name "Simpson Run" is used in the watershed plan and environmental impact statement in accordance with current usage.) This locality is one of the few places where marine fossils can be found in this facies. The survey report recommended that "the geology and paleontology of these strata should be thoroughly studied and an extensive collection of fossil specimens made before this reservoir is built." The report recommended also that the small knolls (kames) along Raccoon Creek be avoided during channelization because they contain "some" archaeological material. Currently, no channel work alternatives exist which would affect these knolls. None of these sites have been declared eligible for the National Register of Historic Places.

A letter of agreement has been obtained from the Ohio State Preservation Officer stating that the Service will provide surveys for the following sites prior to construction: Lobdell Creek Reservoir including recreation area; Big Hollow Reservoir; Etna Reservoir; and the Hebron Dike. The Service will perform this

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1/ All information in this section was obtained by James Murphy "An Assessment of the Archaeological and Historical Resources in Portions of Raccoon Creek and South Fork Licking River, Licking and Fairfield Counties, Ohio," Ohio Historical Society, Columbus, Ohio, September 26, 1975.

work with cooperative assistance from the Ohio Historical Society. This agreement represents the concurrence of the State Historic Preservation Officer that the courses of action taken by the Service in archaeological and historic matters is satisfactory.

Disposition or preservation of sites and materials will be by joint decisions of the agencies involved. Other provision of Public Law 89-665, relating to preserving historic properties, will be followed before and during construction.

Soil, Water, and Plant Management Status

There are 715 soil and water conservation district cooperators in the watershed, 323 of which have conservation plans for their farms. Fifty percent of the watershed is covered by cooperative agreements. (A cooperative agreement is an agreement entered into by a landowner and the soil and water conservation district in which the cooperator agrees to apply needed conservation practices on his land.) The soil and water conservation districts in Licking, Fairfield, and Perry Counties take an active part in promoting soil and water conservation by conducting tours, holding field days, and having active education programs.

Twenty-two different soil and water conservation practices have been planned and applied on many of the farms in the watershed. These practices include conservation croppping systems, critical area planting, contour strip cropping, pasture and hayland management, pasture and hayland planting, minimum tillage, diversions, tree planting, wildlife upland habitat management, ponds, and fish pond management. Application of planned conservation practices by soil and water conservation district cooperators ranges from 50 to over 90 percent on individual operating units.

Projects of Other Agencies

The Buckeye Lake reservoir was studied by an interagency task force composed of representatives of the Ohio Department of Natural Resources, Ohio Department of Transportation, and the Soil Conservation Service. The study included: (1) the operational plans for the facility; (2) dike and spillway conditions; (3) feeder canal conditions; and (4) safety and potential hazards of existing works. The study report presented four alternatives for improving discharge facilties at the lake. The Corps of Engineers is undertaking a further study of the reservoir's safety.

Hydrologic, hydraulic, and related data from the South Fork Watershed Plan studies will be available for the Buckeye Lake Studies. Interrelationships between the South Fork project and any proposals for Buckeye Lake will be investigated as the Buckeye Lake study progresses.

The Log Pond Run project plan is to divert Log Pond Run through Sharon Valley to Raccoon Creek. It currently discharges into the North Fork of Licking River. The plan is approved for construction under the auspices of the Corps of Engineers.

Hydrologic and hydraulic studies for the South Fork Licking River project was made assuming the Log Pond Run diversion in place. The two plans are compatible since the peak flow rates in Raccoon Creek are the same with and without the diversion.

WATER AND RELATED LAND RESOURCE PROBLEMS

Land and Water Management

The objectives of applying soil and water conservation practices are to reduce soil losses to a tolerable rate, solve water management problems, and increase income. The most important management problem is how to maintain the resource base with the continuing economic pressure to produce sustained higher yields on soils whose T value is being exceeded.

Delays in land treatment installation encountered on individual farms are due primarily to lack of necessary capital to install some of the more costly practices such as structures for water control and drainage field ditches. Annual progress summaries show steady application for most of the planned practices. Additional technical assistance would be expected to produce more planning and practice application (Table E-7-1).

Floodwater Damage

The major flood problem in the watershed is the periodic flooding of crops, pasture, urban and industrial areas, and transportation systems. Average annual damage to crop and pastureland is estimated at $94,311 with urban damages and transportation damages contributing an additional $295,993 and $2,574 annually. The periodic flooding also causes delays in planting and restricts crop selection. An estimated $254,619 (average annual) loss from agricultural inefficiencies contributed to the potential flood condition. Another limitation attributed to flooding is the detours and delays from the closing of Interstate 70. Rerouting of traffic flow from a four-lane highway to a two-lane highway causes delays to truck and vehicular traffic. This delay is estimated to cost an average $23,288 annually.

Small frequent floods are very significant in causing damage throughout the watershed. Wide flood plains on South Fork between Hebron and Kirkersville and on Raccoon Creek from Granville to Alexandria are particularly flood prone areas.

The flooding that occurs in the watershed has an adverse effect on the economy because of a constant fear of another 1959 flood occurring. Most efficient use of agricultural land cannot be achieved because of the constant threat of flooding. Traffic interruptions, especially on Interstate 70, causes economic hardship to trucking firms, local businesses, and other business people. Delays in services to the local people is another problem associated with flooding. Also, safety and health of the watershed residents is affected by floodwater conditions. With the urban areas of Newark, Granville, Buckeye Lake, Heath, and Hebron being affected along with the rural areas, a real concern for their safety and welfare is present.

Erosion Damage

Erosion rates are above T values on IIe, IIIe, IVe soils with average annual soil losses ranging from four to eight tons per acre per year.

There are approximately 4.8 miles of unstable and eroding streambanks along South Fork and its tributaries. In some areas where the stream is cutting into the valley walls, raw unvegetated banks, in excess of fifty feet high, are exposed. The greatest problem occurs in the Village of Heath where approximately 10,600 feet of

Table E-7-1

Selected Land Treatment Measures Applied to June 30, 1977

Practice	Description	Units Applied	
Contour Stripcropping	Growing crops in a systematic arrangement of strips on the contour to reduce water erosion.	1,450	Acres
Critical Area Planting	Planting vegetation on critical soil loss areas to reduce erosion.	340	Acres
Diversions	An earth embankment or ridge constructed across a slope for water erosion control.	101,640	Feet
Livestock Exclusion	Excluding livestock from an area such as woodland or wildlife areas where grazing is not desired.	50	Acres
Pasture and Hayland Management	Proper treatment and use of pasture and hayland to maintain vegetative cover and prevent erosion.	3,810	Acres
Pasture and Hayland Planting	Establishing or reestablishing long-term stands of perennial forage plants to provide animal grazing and prevent erosion.	2,110	Acres
Structure for Water Control	A structure in a drainage management system that controls rate and flow of water.	8	No.
Drainage Mains or Laterals	An open drainage ditch constructed to a designed size and grade.	66,941	Feet
Tree Planting	Planting tree seedlings or cuttings to improve the timber stand and reduce erosion and runoff.	1,570	Acres
Upland Widlife Habitat Management	Retaining, creating or managing wildlife habitat to the advantage and benefit of upland wildlife species.	1,060	Acres
Ponds	Constructing a dam or embankment to store water for wildlife, recreation or some other planned use.	363	No.

Practice	Description	Units Applied	
Fish Pond Management	Managing ponds to produce sustained yields of healthy, catchable sized game fishes for sport fishing.	109	No.
Conservation Cropping System	Growing crops in combination with needed cultural and management measures to protect cropland.	55,160	Acres
Subsurface Drains	A conduit, such as tile, pipe, or tubing, installed beneath the ground surface and which collects and/or conveys drainage water.	2,436,800	Feet
Land Adequately Treated	Land used within its capability on which conservation practices that are essential to its protection and planned improvement have been applied.	116,883	Acres

streambanks are being eroded by Ramp Creek and South Fork. It is estimated that channel erosion consisting of streambank, gully, and road bank erosion is responsible for 18,950 tons of soil loss per year.

Raccoon Creek from the vicinity of Granville to near the confluence with the South Fork is somewhat unstable. This instability is due to the effects of dead fallen trees, limbs and accumulated debris and log jams within the channel. These obstructions cause flow deflections which result in bank and streambed scour. This problem began as a result of the rapid die-off of abundant elm trees which had succumbed to the Dutch Elm disease. The problem will continue until all of the elm trees have been eliminated or until this reach can be placed under annual maintenance.

Erosion in the watershed represents a loss to the general economy of the area. It reduces the ability of the soil to produce its maximum yield agriculturally. Along with fertile topsoil, expensive agricultural chemicals are also lost during excessive soil erosion. Water quality is lowered by the presence of sediment. Deposition of sediment in aquatic habitats lowers the value of the habitat for fish and wildlife purposes.

Sediment Damage

Damages caused by floodwater are, in part, due to associated sediment deposition. Where crops are flooded during the growing season, the deposition of sediment on plant leaves can greatly reduce the leaf's productivity. In both urban and agricultural flooding, sediment damages are accounted for in the assessment of floodwater damages.

Sediment is a pollutant found in all of the streams in the watershed. It is unsightly and expensive to clean up. It causes a loss of functioning ability of ponds, reservoirs, and drainage systems. Agricultural chemicals are transported along with the sediment which contribute to eutrophication as a result of excess nutrients in the streams.

The estimated average annual sediment yield from South Fork Licking River to the North Fork of the Licking River is 109,950 tons or an average concentration of 360 milligrams per litre.

Approximately 45.1 square miles of the watershed drain into Buckeye Lake where practically all of the sediment produced in this area is trapped and deposited. It is estimated from sediment survey data that about 42,200 tons of sediment are deposited in the lake annually. At this rate there is a 0.19 percent loss of original storage capacity per year.

Drainage Problems

Western portions of the watershed contain extensive upland soils on glacial plains poorly dissected by stream systems. (Generalized Soils Map, Map E-6-1.) The better drained lands are generally used for cropland while areas difficult to drain typically are forest and pasture.

Soil wetness limits crop production and timely operations on some upland fields.

Some bottomland crop areas, however, need group cooperation (two or more landowners) to provide adequate drainage outlets.

Residential development in some watershed areas have changed drainage patterns, altered drainage needs, and created drainage conflicts between developed areas and adjacent agricultural lands. Some residential areas lack adequate storm drain facilities. The lake side area at Buckeye Lake has plans for limited drain facilities. Other communities in the area have varying degrees of surface water disposal problems.

Drainage is considered inadequate on about 42 percent of the watershed cropland. About 29 percent of the cropland needs additional on-farm drainage measures. About 41 percent of the total watershed land is in land capability subclasses IIw and IIIw. Class II lands require moderate conservation practices and Class III lands require intensive practices for adequate protection and development of full productive potential. Wetness is the principal limitation of lands in the "w" subclass.

Recreation Problems

A major problem in the watershed area is a lack of recreation facilities. The watershed borders a great metropolitan complex which includes Columbus, Newark, and Zanesville with inadequate recreation facilities to meet most present demands as well as future demands. The watershed will be within one hour or less driving distance for 2,000,000 people by the year 2000. Recreational facilities within the watershed can help meet the demand for recreation.

The Ohio State Comprehensive Outdoor Recreation Plan surveyed recreational needs. Eight recreational needs are recorded in Tables E-7-2 and E-7-3. The survey indicates that out of the eight recreation activities only two activities, canoeing and hunting, are presently being satisfied. By the year 1990, canoeing miles are expected to be needed. The regional needs, Table E-7-3 indicate that all activities except hunting have present and future needs.

Another problem facing public recreation developments is that most land is privately owned. Private land is generally unavailable for public recreation access by people from outside the local community.

Plant and Animal Problems

Little remains of the climax forest associations and extensive wetlands once endemic to the watershed. The continuing need for cropland is resulting in the clearing of more forest land. Although suitable food sources are generally available for forest game birds and mammals, the forest cover is usually not extensive enough to permanently sustain good populations. The lack of aquatic macrophytes and marshland limits the suitability of the area for aquatic furbearers and waterfowl. While grain crops draw waterfowl to more open areas along streams during migration, appropriate cover is insufficient to keep them in the area for very long.

Many streams are almost devoid of desirable game fishes, such as smallmouth bass, and in those having fish populations, the predominance was among fishes tolerant to pollution, turbidity, and silt-clay substrates. The destruction of habitat is a factor in the extirpation of fish populations. No state management programs have been developed which emphasize stream fisheries. Historically, the reservoir fishery programs have traditionally been emphasized. This trend has been continued to date.

Table E-7-2

Recreation Needs by County

	Boating Acres	Camping Sites	Canoeing Miles	Fishing Acres	Hiking Miles	Hunting Acres	Picnic Tables	Swimming Sq.Ft.
Fairfield County								
1975	3,459	122	0.5*	4*	1.9	Adeq.	106	48,302
1980	4,087	192	0	214	3.1	Adeq.	170	66,899
1990	5,175	328	0.7	594	5.2	Adeq.	276	99,587
Licking County								
1975	3,306	202	0.7*	926	12.0	Adeq.	63	176,488
1980	3,826	309	0.1*	1,170	13.8	Adeq.	154	201,562
1990	4,730	518	1.0	1,614	17.0	Adeq.	309	247,372
Perry County								
1975	255	6*	0.2	330*	1.1	Adeq.	134	40,964
1980	357	5*	0.2	291*	1.3	Adeq.	147	44,294
1990	516	3*	0.3	227*	1.7	Adeq.	167	49,923
Total								
1975	7,020	318	1.0*	592	15.0	Adeq.	303	265,754
1980	8,270	496	0.1	1,093	18.2	Adeq.	303	312,755
1990	10,421	843	2.0	1,981	23.9	Adeq.	752	396,882

* Refers to surplus.

Adeq. refers to adequate supply.

Table E-7-3

Recreation Needs by Region and Estimated Needs Supplied with PL-566

	Boating Acres	Camping Sites	Canoeing Miles	Fishing Acres	Hiking Miles	Hunting Acres	Picnic Tables	Swimming Sq. Ft.
Region 6								
1975	54,444	3,677	30.2	16,616	137.2	Adeq.	5,316	1,941,768
1980	63,733	4,377	43.1	19,951	160.2	Adeq.	6,432	2,265,394
1990	81,385	5,984	76.4	26,647	207.4	Adeq.	8,622	2,921,158
PL-566	106	100	7.4	161	12.4	0	270	26,000

Adeq. refers to adequate supply.

Wetland environments and wet prairies have been reduced only to a few occurrences.

Visual Resource Problems

Unique visual elements of the watershed would include the remnants of the climax forest associations and wetland environments. The rolling topography and land use patterns create a good variety throughout the watershed; however, in some upland areas where agriculture is the primary land use, there is little visual variety.

Water Quality Problems

Intermittent commercial and industrial wastes in watershed streams is a recurring problem. Ohio Department of Natural Resources records from 1967 to 1974 show 16 instances of pollution centered in the South Fork, Ramp Creek, and Raccoon Creek areas of Newark and Heath. Over 175,000 fish were reported killed in one incident 1/. Petroleum product seepage in the lower Ramp Creek area is a continuing problem. Control efforts have been partially successful.

Low dissolved oxygen concentrations are sometimes encountered during summer stream flow conditions. In July 1975 tests, seven of 24 locations showed dissolved oxygen at less than 60 percent of saturation and seven locations showed less than 5 mg/l dissolved oxygen.

The sewage treatment plants in the watershed may at times discharge large organic loads to streams. Five day biochemical oxygen demands of 30 and 61 mg/l were reported in 1975 from flows of 0.446 and 0.347 mgd 2/.

Economic and Social Problems

The majority of farms in the watershed are family farms. In parts of the watershed farming is marginal. This is indicated by the number of farmers working off-the-farm and gross value of sales. Licking County in 1974 reported approximately 67 percent of the farmers earned income off-the-farm. At the same time, nearly 77 percent of the farms had gross sales less than $10,000. Even more dramatic, one-third of the farms had gross sales below $2,500. Perry County is located within the Appalachia Region.

The migration out of agriculture has put pressure on employment in the industrial and commercial sector. Unemployment in 1976 for Licking County, as mentioned earlier, was significantly higher than the state average. Occupying nearly 88 percent of the watershed area, Licking County is in need of additional employment opportunities. This plus the floodwater problem has been a handicap to the social and economic development of the area.

1/ E. D'Appolonia Consulting Engineers, Inc., Water Quality and Biological Assessment, South Fork Licking River Watershed, Ohio, Volume 1, 1976, Table 4-5.

2/ Ibid., Table 4-1.

RELATIONSHIP TO LAND USE PLANS, POLICIES, AND CONTROLS

The state of Ohio currently has no state land use plan in effect. At the local level, Licking and Fairfield Counties have published "Optimum Land Use Policy and Plans." Perry County has no such plan.

All three counties have county planning commissions. Land use controls consists of zoning, subdivision, and health regulations. In Licking County, the communities of Granville, Kirkersville, Heath, Newark, Johnstown, Pataskala, and Hebron have zoning ordinances. Only Buckeye Lake and Alexandria have no zoning ordinances. The community of Millersport in Fairfield County has no zoning ordinances.

Townships in Licking County with zoning ordinances are Etna, Franklin, Granville, Harrison, Jersey, Liberty, Licking, Lima, Monroe, Newark, St. Albans, and Union. These ordinances include agricultural-residential-commercial zoning. Liberty and Walnut Townships in Fairfield County are zoned agricultural-residential. Enforcement is lacking. Thorn Township in Perry County has no zoning regulations.

It is recommended that the Sponsors urge the respective local units of government to enact ordinances and to the extent possible prevent the development (both new and reconstructed) in the area subject to flooding by the 100-year storm event. The local sponsors agree to publicize periodically the remaining flood hazards.

No known conflicts exists between the South Fork Licking Watershed Project and state and local zoning regulations.

The areawide waste treatment management plan to be developed in accordance with Section 208 of the Federal Water Pollution Act Amendments of 1972 (PL 92-500) is scheduled for completion in 1979. The plan will treat existing and future water quality conditions and problems. It will contain recommendations for controlling and abating water quality problems necessary to meet the 1983 goal and will show impacts of alternatives and of the recommended plan.

The South Fork Licking River Watershed Plan is expected to be compatible with the waste treatment management plan. There are no known conflicts between the effects of the South Fork project (described in the Environmental Impact Section) and the waste management plan.

The South Fork Licking River Watershed project complements the Ohio River Comprehensive Survey. It will not conflict with any other water resource development plan in the area. No adverse cumulative effects from the planned project measures are anticipated.

ENVIRONMENTAL IMPACT

Land Treatment

Conservation land treatment measures are being applied throughout the watershed by 715 landowners cooperating with the Licking, Fairfield, and Perry Soil and Water Conservation Districts. These measures are being applied according to 323 conservation plans and will result in planting and improving the cover conditions on 55,160 acres of cropland. These measures coupled with the development of farm ponds, water control structures, wildlife habitat plantings, and critical area plantings will reduce average annual erosion to less than three tons per acre. These land treatment measures will also increase opportunities for recreation and enjoyment of natural areas, improve wildlife food and cover, and improve the visual resource of the watershed.

The application of the planned land treatment under the combined ongoing program and the accelerated land treatment program will result in adequately protecting an additional 10,350 acres of cropland, 2,100 acres of pasture, 1,420 acres of forest land, and 360 acres of other land. (See Table 1 of watershed plan for acres adequately protected from ongoing and accelerated program).

Installation of proposed land treatment measures will provide increased levels of protection from erosion on cropland, pastureland and forest land. This will result in about a four percent reduction in sheet and rill erosion in the watershed. Table E-9-1 illustrates estimated impacts of the implimentation of the proposed conservation land treatment. This will enhance the productive value of the prime agricultural land in the watershed.

Table E-9-1

Estimated Average Soil Loss by Land Use with Installation of Land Treatment Practices

Land Use	Acres	Tons, Acre Year	Tons	Reduction Percent
Cropland	94,576	3.82	361,013	3
Pastureland	22,000	1.23	26,973	13
Forest Land	21,647	0.41	8,840	4
Hayland	24,679	0.22	5,429	0
Other	14,499	0.75	10,874	0
Total	177,401	2.33	413,129	4

The average soil loss will decrease from 2.41 to 2.33 tons per acre per year.

The planned reduction in erosion will result in a subsequent reduction of the amount of sediment transport and aquatic deposition. It is estimated that the amount of sediment yield at the mouth of the South Fork Licking River will be reduced from 109,950 tons per year to 105,552 tons per year after installation of land treatment. This in turn will reduce the average annual suspended sediment concentration from 360 milligrams per litre to 346 milligrams per litre, a four percent reduction.

Conservation land treatment measures are expected to increase rainfall infiltration and percolation through the soil profile. Use of conservation cropping systems with minimum tillage rather than conventional tillage will increase soil cover. Increasing the quantity of subsurface drains is expected to increase the amount of water reaching the stream system through the soil profile.

One Ohio research project for high clay soils indicates 1/ that sediment losses are greatest for conventional tillage. Also a tile drainage system contributes as much to sediment losses as does a surface drainage system. Phosphorus and potassium losses are greater for surface runoff than for tile effluent.

Measured agricultural pesticide losses in the same research were higher in surface runoff than tile effluent, and also were higher for conventional tillage than with minimum tillage 2/.

The combination of increased minimum tillage practices and increased tiling is expected to reduce the amounts of fertilizer nutrients entering the watershed's surface waters. The expected effects on the amounts of agricultural pesticides reaching surface waters is uncertain.

Although the net effects of conservation land treatment on water quality are expected to be positive, some pollutants may increase in surface waters. Quantitative effects are not predictable.

Conservation land treatment measures will result in a reduction in runoff and an increase in the amount of infiltration. This will lead to slightly increased ground water recharge and slightly higher potential ground water table levels.

With accelerated conservation land treatment the flood runoff has been estimated to be three percent less than the without project condition.

Land use changes will occur on the miscellaneous land as it is converted to recreation land, cropland, wildlife land, and forest land. Some cropland will be converted to wildlife land. These land use changes will improve the visual resource by increasing visual variety.

Increases in overall efficiency in crop production, rates of moisture storage, improved cover conditions, and reduced erosion will result from the land treatment practices applied to cropland, pastureland, and forest land throughout the watershed.

Installation of accelerated land treatment measures will improve the crop, pasture and forest land management. This will enable farmers to better utilize the land and create a more equitable income balance.

Land treatment measures will improve the visual resource within the watershed by reducing the flood problem, improving water quality, reducing erosion and improving natural vegetation. The general health and safety of the watershed residents will improve.

1/ G. O. Schwab and E.O. McLean, Chemical and Sediment Movement from Agricultural Land into Lake Erie, Project Completion Report No. 390Z, State of Ohio Water Resources Center, Ohio State University, 1972, page 33.

2/ G.O. Schwab, Tables 5 and 6.

Structural Measures

The five flood prevention reservoirs and the one multipurpose reservoir will permanently inundate approximately 4.4 miles of natural stream conditions and in addition periodically inundate about 3.0 miles of streams. Such inundation will change the aquatic environments either periodically or permanently from stream to lake environments. The degrees to which the aquatic vertebrates and invertebrates are affected by the subsequent changes in their habitats will depend on the types and degrees of those changes on each species' ability to adapt to them.

Values of areas to be inundated for raccoon feeding areas, waterfowl and wading bird habitat, stream fishing and aesthetic qualities, will have some temporary changes while others will be completely foregone.

The six reservoirs (including embankments, spillways, borrow areas, sediment, permanent and detention pools), 0.74 mile of channel work, 3.26 miles of bypass channel and planned recreation development will change the land uses for the life of the project on about 800 acres. (See Tables E-5-1 and E-9-2.)

Structural measures, sediment and permanent pools, will inundate 42 acres of cropland, 64 acres of grassland, 67 acres of forest land, and 19 acres of land in other uses. Therefore, 192 of these acres will be converted from terrestrial wildlife habitat to aquatic wildlife habitat.

The flood pools of the proposed structures will temporarily inundate 122 acres of cropland, 129 acres of grassland, 113 acres of forest land, and 13 acres of land in other uses. This acreage will be periodically flooded causing temporary disturbance to terrestrial wildlife but very little damage to terrestrial habitats.

Dams, emergency spillway areas, and borrow areas will replace 40 acres of cropland, 47 acres of grassland, 32 acres of forest land, and 5 acres of land in other uses. These areas will be established in grasses and legumes which will provide food and cover for terrestrial wildlife species. Table E-9-2 displays the estimated acres by land use to be affected by structural measures.

The six proposed impoundments will change 4.4 stream miles into five sediment pools and one permanent pool totaling approximately 190 acres. This habitat change will favor sunfish, largemouth bass, and catfish over present species such as stoneroller, creek chub, dace, and darters. Periodic inundation of stream reaches above the sediment and permanent pools will cause some deposition of sediment along an additional three miles of streams. There will be a corresponding reduction of sediment deposition below each structure for the life of the project.

Water impounded by the proposed reservoirs will be generally suitable for most recreational and agricultural applications, including irrigation, watering of livestock, recreational boating and fishing. Human body contact sports such as swimming and water skiing may be inappropriate only for sites located downstream of major sources of agricultural or municipal wastes. The impounded water will be suitable for municipal uses provided adequate treatment is rendered. However, the reliable yield of most of the reservoirs will be too low to accommodate heavy commitments to water supply.

Flood reduction will occur on 325 farms.

The following effects of the reservoirs on stream water quality are noted:

The improvement of clarity and reduction of sediment loads on the downstream side of reservoirs.

The reduction of nutrient loads on the downstream side of reservoirs because the spillway outlet is located above the thermocline.

The temperature of the stream during summer months is not expected to be significantly effected by solar heating of the reservoir. Some heating is anticipated but according to studies performed in Rush Creek Watershed by U.S. Geological Survey, the impact of topwater release on stream temperature is negligible.

Rush Creek is an adjacent watershed which contains similar characteristics and has a reservoir that was constructed about five years ago.

Results of temperature fluctuation tests performed below the structure by U.S. Geological Survey on the Rush Creek sites are consistently within standards set by Ohio Environmental Protection Agency for warm water habitat.

The 3.26 miles bypass channel will be constructed across dry land adjacent to Interstate 70. The 0.74 miles of channel enlargement will be on the South Fork Licking River, immediately downstream from the junction with the new bypass channel. Construction will be from the north side for approximately 1800 feet, then will switch to the south side for the remaining 1,685 feet of the channel and will follow the existing alignment. Approximately two acres of trees and brush will be cleared and the channel will be widened. Fish shelter, such as weeds, tree limbs, and brush will be removed from some areas of the stream. Five fish pools, constructed by excavation and the placement of large riprap will be installed. The bypass channel will create a significant visual impact due to the near proximity of I-70. To minimize this visual impact, screen plantings will be made between the channel and the highway. Trees will be preserved by easement on the south bank and in between the stream and I-70 to reduce the visual impact of the channel enlargement just downstream of the bypass channel. Where major roads cross the channel enlargement and bypass channel, special attention will be given to reduce the visual impact. The dike at Hebron will have a significant visual impact due to its near proximity to the residential area. When possible, a curved alignment and varying side slopes will be considered that will retain trees to reduce the visual impact to the area.

The Etna and Lobdell structure sites are prominent and will impose a visual impact to the area. Undesired views of the dam and emergency spillways will be screened when possible.

The stream bottom will be constructed in a manner that will concentrate low flows to help maximize water depths during periods of low rainfall. Erosion, sedimentation, and turbidity will increase during project construction and until a sod cover is established on the disturbed areas.

Channel work will temporarily displace benthic organisms and other sedimentary or slow moving fauna. Fish and other free swimming vertebrates will migrate from the area during construction.

Table E-9-2
Estimated Present Land Cover Conditions
To Be Changed by Structural Measures

Structures	Acres Required 1/				
	Cropland	Grassland	Forestland	Other	Total
4 (Kirkersville)	4	43	14	1	62
22 (Kiber Run)	4	0	20	15	39
27 (Simpson Run)	5	14	6	0	25
30 (Lobdell Creek)	46	50	37	6	139
32 (Etna)	29	5	3	0	37
43 (Big Hollow)	0	2	24	3	29
I-70 Bypass	53	0	0	14	67
Channel Enlargement	5	0	2	3	10
Flood Prevention Dike	1	0	0	1	2
Totals	147	114	106	43	410

1/ This includes the dams, spillways, outflow areas, the 100-year sediment deposition (pool) areas, and the recreation pool on the Lobdell site. The dams, spillways, and outflow areas will be seeded to grass and legume cover.

Considering the short period of construction involved, and the history of previous work on the stream, the project impact will be minimal. The aquatic community will recover most of its productivity within one year after construction completion.

Impact, Structures - Permanent land use change according to Table E-5-1 for dams, spillways, outflow areas, and permanent pool 192 acres (Lobdell not included). Forty-two acres of cropland, 64 acres of pasture, 67 acres of forest land, and 19 acres of other land will be destroyed. The dam, spillway, and outflow area will be planted to predominantly grasses, creating 75 acres of high quality herbaceous land.

The remaining acreage in the permanent pool area will create approximately 43 acres of good quality fish habitat and approximately 41 acres of Type 7 wetland. These areas will enhance fish and wildlife production within each project site.

Periodically inundated land according to Table E-5-1 will temporarily disturb approximately 181 acres of which 46 acres are forest land. The remainder is cropland (60 acres) pasture (69 acres), and other land (6 acres). Temporary flooding of the herbaceous areas (68 acres) will normally occur when ground nesting species are active. Temporary disturbance will cause a decrease in some wildlife species. However, no long term significant adverse effect is anticipated. Temporary flooding of forest land is not expected to decrease any ground nesting species nor disturb any existing tree nesting species. Wood duck use of the areas for nesting, roosting, and resting is expected to increase.

With the addition of 84 acres of permanent water to the watershed, several species of ducks (wood ducks, mallards, black, teal) could be expected to frequent the area.

According to Table E-5-2 and the estimates on page E-5-7 approximately 319 acres in the Lobdell Site will undergo land use change. The remaining 161 acres will be converted to intensive recreational use. Twenty-eight acres of forest, 40 acres of cropland, 36 acres of pasture, and 2 acres of other land will be converted to a 106-acre multi-use recreation lake. The remaining 161 acres surrounding the lake, consisting of cropland, pasture, forest and other land will be converted to a recreational development. The wildlife production within this area is expected to decrease. The woodland will be impacted through heavy human use. Severe loss of forest species can be expected in the heavy use areas near the beach, and some loss can be expected in the less utilized areas of the nature trails and adjacent to the primitive camping area.

A wildlife habitat management plan will be incorporated over the entire Lobdell recreation development. Wildlife shrubs and plantings will be incorporated into the plan whenever possible. The increased recreational use of the area for boating, camping, fishing, hiking, and outings is considered to be a benefit to the area.

Impacts, Channel - The new channel bypass along I-70 will require 87 acres for spoil placement and construction. Eighty acres are cropland and seven acres are classified as other land. The spoil will be spread wherever feasible and mixed into the cropland. The area located between I-70 and the new channel contains about 20 acres that can be developed into wildlife habitat. Final approval of all plans for this area, adjacent to I-70, will be coordinated with the Ohio Department of Transportation.

Channel enlargement berms and dikes will require 67 acres to construct the new channel. A land use change of 53 acres of cropland and 14 acres of other land will be converted to channel. The channel berm and all disturbed areas will be seeded to a grass creating high quality herbaceous land. Approximately five acres have been set aside adjacent to the proposed bypass channel for a single row planting of woody vegetation. These shrubs will be placed between the cropland and channel creating a diverse habitat for birds, rabbits, and ground dwelling species. No long-term adverse impacts are anticipated to the habitat.

The section of channel scheduled for enlargement is about three-fourths of a mile long and is located near Buckeye Lake.

The construction will remove five acres of cropland, two acres of forest land, and three acres of other land, and temporarily disturb six acres of cropland, one acre of forest and three acres of other land.

The construction will create a land use change of 10 acres. The channel side slopes and berm will be seeded down to grasses of value to wildlife and erosion prevention creating a high quality herbaceous habitat.

Trees and shrubs removed during construction will be replaced providing good habitat diversity.

Whenever possible (during construction), trees will be left along the berm, minimizing the adverse impacts.

Obstruction removal will not require extensive forest land loss. Areas will be required for machinery ingress and egress. These areas will be kept to a minimum. Obstruction removal storage may require approximately 29 acres. No long term adverse habitat destruction is anticipated in these areas.

The common white sucker, hog sucker, carp, and other fishes may be affected by project measures. Their spawning migrations up tributary streams, such as Lobdell, Simpson, and Kiber run will be blocked by the reservoirs constructed on these streams. However, these fishes will continue to have access to numerous spawning areas downstream from the reservoirs and on over forty other tributary streams within the watershed with no reservoirs.

None of the wetlands within the watershed will be affected by the project measures. The construction of the six reservoirs will create wetland like conditions, especially around the Etna site, which is shallow.

There are no known threatened or endangered plant or animal species in the watershed.

There will not be a significant increase in cropland acres due to the planned structural measures in the project. However the installation of land treatment measures such as drainage mains, drainage field ditches, tile drains, and grassed waterways in the cropland area will result in increased production.

Installation of project measures will make it possible for farmers to more fully utilize flood plain land. More intensive use on 4,680 acres of cropland is estimated to occur. Reduction in flood hazard will enable farmers to plant early without fear of flood loss.

Table E-5-4 shows the three road closings that are necessary in the Lobdell Creek area. The closings will increase the average travel distances about two and one half miles for residents with destinations on the opposite side of the reservoir. An estimated 30 families in the area will experience increased travel distances due to road closings for destinations at and beyond the opposite side of the reservoir area.

Installation of channel work and associated bank protection measures when established will reduce streambank erosion by an estimated ten percent. This will create a very slight improvement in water quality and also will slightly improve the quality of aquatic habitats.

In addition to sediment reduction through land treatment measures, the seven watershed dams will trap approximately 90 percent of the sediment that enters them. Once incoming sediment has settled out of suspension in the slack water behind the dams, it is no longer available to be transported downstream. The dams will reduce the amount of sediment delivered out of the watershed by an estimated 10,000 tons annually.

The combined impact of the land treatment measures and structural measures is a reduction of sediment delivered out of the watershed from 109,950 tons to approximately 95,000 tons. This will reduce the average suspended sediment concentration from 360 milligrams per liter to an estimated 315 milligrams per liter, a 13 percent reduction.

Should a large runoff event occur during construction before streambank protection measures are established, erosion rates will accelerate temporarily through those reaches affected. This acceleration will only involve curves and short reaches in areas of recent disturbance.

If this occurs, water quality will be slightly and temporarily lowered with a corresponding temporary reduction in aquatic habitat values.

Water quality problems are not anticipated in lakes, streams, and ponds having recreational potential. Based on one sample, the water quality in Lobdell Creek at the proposed multipurpose structure site should be of sufficient quality to meet Ohio EPA standards for "bathing waters." The quality of water in the portion of the South Fork channel planned for canoeing is anticipated to be well within the secondary contact recreation standards set by the Ohio EPA.

The permanent and sediment pools of all structures will remove approximately 190 acres from terrestrial recreation opportunities, such as hunting, hiking, and birding.

The total annual recreation visits for recreation developments are expected to total 179,840 visits. Recreation facilities will help satisfy a significant portion of many of the county and regional needs. Table E-7-4 indicates the regional needs expected to be satisfied.

The construction of channel improvements and adjacent berms will have an impact on recreational opportunities. Visual resource qualities associated with the area to receive channel improvement will be temporarily altered until vegetation is established along cut slopes, spoil piles, and dikes.

Channel berms will provide increased opportunities for incidental recreational use in the form of walking and hiking. These activities will exist potentially year round but at the discretion of individual landowners.

Impoundment of water behind the proposed structures will create a positive energy gradient into the underlying water table. Recharge into bedrock zones will be very slow due to the very low permeability of local strata. Periodic and temporary recharge will occur within temporarily inundated areas (flood pools) and permanent recharge will occur within permanent pool areas.

Channel work will not measurably affect ground water conditions.

Qualitatively, the overall impact of project installation on ground water recharge will be positive and favorable. Due to very low recharge rates and the relatively small watershed area affected, the quantitative impact on the ground water table with respect to total reserves will be insignificant.

Stream flows in the lower 1200 feet of Bell Run and the lower 7500 feet of Koontz Ditch will be intercepted by the I-70 area bypass channel (Project Map, Appendix D). The total flow distance of Bell Run waters (to the point where the I-70 area bypass rejoins South Fork) will be reduced about 3500 feet. The total flow length for Koontz Ditch waters will be reduced about 4800 feet.

The three-fourths mile existing South Fork channel segment to be enlarged (Station 1687+00 to 1725+85) will remain shaded on the south side for 1800 feet due to one-sided construction techniques.

Increased dust, exhaust gases and noise levels are expected to lower air quality in localized areas during construction and maintenance operations. Construction techniques will minimize dust production. Construction equipment will conform to Occupational Safety and Health Act standards for noise and exhausts.

The installation of the project will displace two families and take land out of private use and put it into public ownership.

The health and well being of those now affected by floods in the rural and urban areas will be improved once the structural measures are installed. Due to the flood protection provided by the structural measures, improvements can be made to homes, buildings, roads, and bridges.

All structures proposed for installation have been classified as to possible downstream effects if the dam suddenly breached. Existing or future flood plain developments were considered in the classification process. Potential loss of life could occur if inappropriate development is permitted downstream from the dams.

The dams were classified and designed according to Class "C" criteria where there was a hazard to loss of life. These dams will safely pass a storm of 25.4 inches in six hours. This is the probable maximum precipitation for this area.

In areas where there is not a hazard to loss of life the dams were designed to Class "B" criteria. These rainfalls are shown in Table 3 of the watershed plan.

Measures have been included in the structural design to prevent failure from causes other than over topping.

There is always a risk of failure anytime a dam is constructed. However, using the best investigation, design, and construction techniques available this risk is kept to a minimum. Local land use planning organizations should be aware of the hazard and plan the land use development accordingly. No residential or industrial development should be permitted downstream from a dam where there is any chance for loss of life should the dam breach.

The following classes of dams have been established: Class "A" - Dams located in rural or agricultural areas where failure may damage farm buildings, agricultural land, or township and country roads; Class "B" - Dams located in predominantly rural or agricultural areas where failure may damage isolated homes, main highways or minor railroads or cause interruption of use or service of relatively important public utilities; Class "C" - Dams located where failure may cause loss of life, serious damage to homes, industrial and commercial buildings, important public utilities, main highways, or railroads.

Nonstructural Measures

Nonstructural measures such as flood proofing of buildings and flood warning systems are eligible to be included in PL-566 projects. For this planned project one dwelling will be relocated as a nonstructural measure.

One family will be relocated.

Economic and Social

The planned project will have a positive effect on the socio-economic growth in the watershed. Employment opportunities will be available from project construction, operation and maintenance, and recreational development at the Lobdell site. This will offset any loss of employment resulting from agricultural land being taken out of

production due to installation of the flood control structures and recreation development. Additional employment opportunities will be available as a result of the recreation site. Low income persons and minorities are expected to share in project benefits and none are expected to be adversely affected.

The reduction in agricultural floodwater damages will improve agricultural efficiency and have a positive effect on the farm enterprise. Presently, farmers delay plantings and alter their cropping practices due to the threat of flooding. The planned project will reduce this threat and encourage more efficient operation of their farm business.

The planned project will also reduce flooding to 449 residences and 35 businesses. Transportation delays from flooding along Interstate 70 will be reduced. The effect will be an improvement in the quality of living for watershed residents both physically and psychologically. The threat of injury, health hazards, and inconveniences will be diminished. This will have a beneficial effect on the watershed economy.

High hazard areas were evaluated in the watershed based on the 100-year with project elevations. Anytime there was a high risk to loss of life it was identified as a "high hazard." The criteria used was:

a. Two or more feet of water on the first floor.
b. A velocity of four feet/second or greater and water on the first floor.

Twenty-one residential properties were identified. The flood prevention dike at Hebron will eliminate flooding on 13 residences. One residence in Granville will be relocated. No action was taken for 5 residences located along the Buckeye Lake Outlet and 2 residences along the north shore of Buckeye Lake.

The planned project has minimal effect on the flood elevations in the area along the lake outlet. Any action taken in this area would be difficult to administer equitably. This is due to the number of adjacent houses that are flooded only slightly less than the assumed "high hazard" criteria.

The two residences along the north shore of Buckeye Lake are beside similar shoreline houses which all have exits at the second floor level on the dam embankment. Even though flooding would be 2.0 feet deep on the bottom floor, it is not considered to be a threat to loss of life.

Two families will need to be relocated. The social and economic effect is not significant. Adequate replacement dwellings are available in the general area.

The planned project overall will have a positive effect in the watershed area. The reduction in flooding of agricultural land and urban properties will help stimulate the economy. The close proximity of the watershed to the metropolitan area of Columbus will encourage continued immigration which will have a positive effect on the economy. In addition, the recreational development will have a favorable socio-economic effect on the area. The economic and social effects from the planned project will carry throughout the project life.

Favorable Environmental Impacts

a. Reduce erosion and sedimentation.

b. Allow more efficient utilization of 8,355 acres of existing prime agricultural land in the flood plain.

c. Provide an estimated 179,840 annual recreation visits.

d. Reduce crop and pasture damages by $54,640.

e. Reduce flooding on 449 residences and 35 businesses.

f. Stabilize 5.9 miles of channel on Ramp Creek and South Fork.

g. Streambank erosion will be reduced by an estimated 10 percent.

h. Sediment yield at the mouth of the watershed will be reduced from 109,950 tons per year to 95,000 tons per year and in turn reduce average annual suspended sediment concentration from 360 milligrams per litre to 315 milligrams per litre.

i. Create average annual benefits of $1,020,972.

j. Create 190 acres of aquatic and waterfowl habitats.

k. Improve the habitat diversity in the project area.

l. Improve visual variety of the watershed.

m. Improve three-fourths mile of stream and fish habitat diversity by installing five double winged deflectors.

n. Create approximately 41 acres of Type 7 wetland.

o. Create a 106 acre recreational lake (boating, camping, hiking, etc.).

p. Create 175 acres of high quality herbaceous land for wildlife habitat.

q. Increase lake fishing opportunities in the project area.

Adverse Environmental Effects

a. Inundate 42 acres of prime cropland, 64 acres of grassland, 67 acres of forest land, and 19 acres of land in other uses.

b. Cause temporary disturbance to terrestrial wildlife by periodically flooding 60 acres of cropland, 68 acres of grassland, 46 acres of forest land, and 6 acres of land in other uses.

c. Permanently inundate about 4.4 miles and periodically inundate about 3.0 miles of natural stream conditions.

d. Remove approximately two acres of bottomland hardwoods along 0.74 miles of South Fork.

e. Channel work will remove benthic organisms and other sedimentary or slow moving fauna along 0.74 miles of South Fork.

f. Reduce the populations of fish, amphibians, aquatic invertebrates, and other aquatic life in the construction areas until these areas return to more natural conditions.

g. Temporarily increase erosion, sedimentation, and turbidity during construction, adversely affecting aquatic habitats.

h. Displace and relocate two houses.

i. Inundate portions of three rural roads.

j. Temporarily increase dust, exhaust gases, and noise during construction.

k. Temporary visual impact will be created during construction.

ALTERNATIVES

Numerous ways have been proposed and studied for solving the watershed problems. Suggestions from agencies, groups and individuals were used in determining the proposed alternatives. Obviously there are other alternatives not included here. Listed are those believed to be feasible from an economic, environmental, and physical viewpoint.

1. No Project

The alternative of "no work" would leave the water and related land resource problems unsolved. Flooding of agricultural land and urban areas would still occur. Approximately 8,355 acres of land and 484 properties would still be affected by floodwaters.

Currently land uses in the flood plains are expected to continue without a project. Residential or commercial use of flood plains is not expected to increase appreciably due to flood hazards and trends toward more land use restrictions. Estimated average annual net benefits foregone are $130,565 if project plan is not implemented.

2. Accelerated Land Treatment

Another alternative is to apply conservation land treatment measures exceeding those expected to be applied with no additional work on the project.

The land to be treated and typical practices for each land use are shown in Table E-10-1.

Table E-10-1

Accelerated Conservation Land Treatment
As A Project Alternative

Land Use	Acres To Be Treated	Typical Conservation Land Treatment Measures
Cropland	2,880	Conservation cropping systems, contour farming, crop residue management, surface and subsurface drains, grassed waterways or outlets, stripcropping.
Pasture and Hayland	1,060	Pasture and hayland plantings, pasture and hayland management, spring development.
Forest Land	600	Livestock exclusion, tree plantings, supervised harvest cutting, supervised stand improvement.
Other Land	160	Debris basins, disposal lagoons, diversions, ponds, recreation trails and walkways, upland wildlife habitat management.

It is based on an eight-year projected period of accelerated land treatment. These measures would improve conservation farming systems for crops, pastures, and haylands, increase the level of forest land management, and improve the balance of land use. Benefits from reduced surface runoff, reduced sedimentation, and enhanced wildlife habitat would be the same as for the proposed project.

However, the reduction in runoff and flood damages attributed solely to accelerated land treatment would be relatively insignificant in solving the total flooding problem.

The accelerated land treatment costs are estimated to be $1,125,400.

3. Flood Insurance Program

The flood insurance program allows individuals to spread losses over a long period of time and to reduce the premiums through federally subsidized insurance rates.

In order for individuals to participate in the insurance program the local government must institute regulations to restrict the development in the flood plain areas. Therefore the flood insurance program would restrict any future flood plain development but would have no effect on existing structures. The bulk of the damages would be a cost to society. Damages to agricultural crops and pastures as well as transportation and utilities would remain unchanged.

Costs of this alternative include flood insurance estimated annual claims and administrative costs of $333,535. Premiums of $86,775 are paid by local property owners. In terms of a one-time cost this would be $4,845,075 for flood insurance claims and $1,260,530 for premiums.

This alternative would not achieve the land treatment, recreation, and agriculture water management goals as proposed in the plan.

4. Accelerated Land Treatment, Flood Proofing, and Flood Warning System

This alternate includes the land treatment outlined in Alternative No. 2, with the addition of flood proofing and a flood warning system.

Flood proofing would consist of structural alterations to existing buildings to reduce the damage when a flood occurred. These alterations would not be feasible on some homes and commercial buildings, especially in the Buckeye Lake area where the homes are built right against the lake dike. Therefore, flood proofing would not eliminate all flood damages. Some of the flood proofing measures would require action prior to a flood. In order to do this, a flood warning system would be installed in Granville, Newark, and Buckeye Lake areas to alert the residents of an impending flood. The warning system and flood proofing would only be effective if the residents were at home to implement the flood proofing measures and the measures were in good working order. There are 449 residents and 35 businesses affected by flooding.

The stream environment would be undisturbed and the current effects of floods on the environment would be unaltered.

Flood damages to utilities and transportation facilities would remain unchanged. Sediment and erosion damage would be reduced by the land treatment measures.

Initial installation costs (including design and administrative costs) are estimated to be $1,633,020. Maintenance costs and operation costs for installing flood proofing facilities and removing them after floods are estimated to be $1,120 annually. This is translated into a one time cost of $2,774,750 including the accelerated land treatment measures.

5. Accelerated Land Treatment and Flood Plain Purchase

This alternate includes the land treatment outlined in Alternative No. 2 with the addition of flood plain purchase.

Flood plain purchase would consist of buying the 449 residential dwellings and the 35 commercial buildings. The structures would be razed and the people and businesses relocated. This would cause a severe social and economic hardship to the Buckeye Lake and Newark area.

It is doubtful that sufficient housing would be available in the area for this type of mass upheaval. The land would be left in private ownership for restricted uses or in public ownership for recreation or other acceptable flood tolerant uses.

The problems associated with flooding of agricultural land, transportation facilities, and utilities would continue at the present level. The urban flood damages would be eliminated.

Costs associated with the purchases would include buying the properties, razing the buildings, relocating the people and businesses plus the legal fees associated with the purchases.

The cost is estimated to be $18,270,550, less the urban damages of $4,300,349, leaving a net cost of $13,970,201. The accelerated land treatment cost is $1,125,400.

6. Accelerated Land Treatment, Two Reservoirs, Recreational Facilities, I-70 Area Bypass Channel, Flood Prevention Dike, and Land Acquisition

(Appendix B - National Economic Development Plan)

This alternative consists of one single purpose flood retarding structure, one multipurpose flood retarding and recreation structure, I-70 area bypass, channel enlargement and obstruction removal, Hebron diking, and South Fork and Lobdell recreation facilities.

Incremental analysis for the Raccoon Creek portion of the National Economic Development Plan (NED) started with the multipurpose Lobdell structure. The second increment is two flood retarding structures (Kiber and Simpson Run). This increment did not give net incremental benefits, and neither did the addition of diking along portions of the stream to protect farmland. For Raccoon Creek, the multipurpose flood and recreation structure and recreation facilities will be the NED Plan.

The first increment on South Fork is one single purpose flood retarding structure at Big Hollow (adding other structures, either singly or in combination, resulted in incremental costs higher than incremental benefits). The second increment

showing increased net benefits is the I-70 bypass and related channel enlargement and obstruction removal. The addition of Hebron diking gives net incremental benefits making this the third increment. The final increment yielding net benefits is South Fork recreation. The South Fork portion of the NED Plan is the flood retarding structure (Big Hollow), I-70 area bypass, Hebron diking, and South Fork recreation.

The total project installation cost is estimated at $8,125,105 of which $1,125,400 are for accelerated land treatment and $6,999,705 for installation of structural and nonstructural measures. Net monetary average annual benefits for this plan are $259,157. The benefits from conservation land treatment and from recreation for this alternative will be the same as for the selected plan.

7. Accelerated Conservation Land Treatment, Six Reservoirs, Recreational Facilities, Bell-Beaver Bypass Channel, Flood Prevention Dike and Land Acquisition

(Appendix B - Plan 2)

The accelerated conservation land treatment, six reservoirs, and recreational facilities in the planned project could be supplemented by a new and enlarged channel system constructed to convey floodwaters away from the floodwater damage area at and north of Buckeye Lake.

A new channel would be constructed from South Fork at a point west of the National Trails Raceway. At this point, flood flows would divide with the existing South Fork channel carrying full bank flows and the new channel carrying flows exceeding the South Fork existing channel capacity.

The new channel would be excavated along the west Raceway property line, around the northwest end of the raceway, across Refugee Road (Twp. Rd. 30), across Bell Run (intercepting its flow), through the watershed divide between Bell and Beaver Runs, and would join Beaver Run where it turns east. The Beaver Run channel would be enlarged to its outlet at South Fork.

The maximum depth of cut at the highest point between the Bell and Beaver Valleys would be about 25 feet. Because of the steepness of the Beaver Run channel grade, the enlarged channel would be rock lined to withstand the erosive forces of increased flows. Existing vegetation on both sides of the channel would be replaced with the rock lining.

Obstruction removal would be required on the South Fork channel from the Beaver Run outlet to the junction with Raccoon Creek. The work would counteract the small increases in flood elevations on South Fork due to channel work on Beaver Run.

The new channel length would be about 1.8 miles and the enlarged channel length (on Beaver Run) would be about 3.5 miles. About 60 acres would be required for new channel, channel enlargement, berms, and woody plantings. Another 119 acres would be required for spoil placement and construction. About 13 acres of clearing would be required.

The total project installation cost is estimated at $10,665,554 of which $1,125,400 are for accelerated land treatment and $9,540,154 for installation of structural and nonstructural measures. Net monetary average annual benefits for this plan are $172,088.

The benefits from conservation land treatment and from recreation for this alternative will be the same as for the selected plan.

8. Accelerated Land Treatment, Six Seven Reservoirs, Recreational Facilities, Channel Enlargement on South Fork, Flood Prevention Dike and Land Acquisition

(Appendix B - Plan 3)

The South Fork channel could be enlarged to provide flood damage reduction benefits. The accelerated conservation land treatment measures, recreational facilities, and the six reservoirs would be the same as for the selected plan.

The upstream end of channel enlargement would be a point 2,200 feet upstream from the upstream (west) Interstate 70 crossing of South Fork. The downstream end of enlargement would be at the junction of South Fork and the Buckeye Lake outlet channel. The total enlargement length would be about 5.4 miles.

To counteract the expected small downstream increases in flood elevations due to channel enlargement, obstructions would be removed from the South Fork channel from the Buckeye Lake outlet to Raccoon Creek.

The land required for channel enlargement, berms, and woody plantings would be about 102 acres, with another 85 acres required for spoil placement and construction. About 42 acres would be cleared.

The recreation benefits and the effects of the conservation land treatment will be the same as for the planned project.

The total project installation cost is estimated at $11,297,720 of which $1,125,400 are for the accelerated land treatment, and $10,172,320 for installation of structural and nonstructural measures. Net monetary average annual benefits for this plan are $53,949.

9. Accelerated Land Treatment, Six Reservoirs, Recreational Facilities, I-70 Area Bypass Channel, Flood Prevention Dike, Land Acquisition and Raccoon Creek Dikes

(Appendix B - Plan 4)

The measures for this alternative would be the same as for the selected plan with the addition of 10.4 miles of dikes along Raccoon Creek and excluding features of the environmental quality objective.

The dikes would be located on one or both sides of Raccoon Creek and along tributaries in the Raccoon Creek flood plain to provide flood protection to agricultural lands from Alexandria to near Granville. About four miles of Raccoon Creek would receive flood protection from the dikes.

The dikes would confine flood flows to a narrower and deeper flow area, and would increase flow velocities within the channel. Rock lining would be needed for about 1.1 miles of channel banks to protect them from increased velocities and erosion.

About 64 acres would be needed for the dikes and an additional 56 acres of borrow, haul roads, and other construction area would be needed. Clearing area would total about three acres in small, scattered areas.

The total project installation cost is estimated at $12,127,255 of which $1,125,400 are for accelerated land treatment and $11,001,855 for installation of structural and nonstructural measures. Net monetary average annual benefits for this plan are $88,166.

The recreational facilities and the conservation land treatment measures will have the same effects in this alternative as in the planned project.

10. Emphasizing Environmental Quality

(Appendix B - Environmental Quality Plan)

This alternative has limited development with emphasis on preservation of the environment. Accelerated land treatment would be the same as the planned project. Three structures (Etna, Kirkersville, and Lobdell) and the I-70 bypass, excluding channel work on South Fork, are also part of the alternative. These structures would have a lesser effect on the environment than the other structure alternatives considered.

Preservation of 70 acres of wetlands at 70 separate sites is planned. Acquisition of the wetlands will provide important habitat primarily for water fowl and furbearers, and will provide spawning areas for fish when areas are continguous with lakes or streams.

Improved fisheries management of the three reservoirs and improved wildlife habitat management of the surrounding areas will provide maximum benefit to the resource base.

Critical area stabilization of ten areas along Ramp Creek and South Fork near Heath and obstruction removal on 37,290 feet of Raccoon Creek are included to improve the environmental condition. This is needed to reduce the streambank erosion which is reducing the visual and water quality of the stream.

The level of recreational development will be less than the planned project. The facilities at Lobdell and along South Fork would be in keeping with the character of the area and would not be as intensive as the planned project. The Lobdell site would have a boat ramp, a parking area, nature trail, and sanitary facilities. South Fork would have a parking area, access ramps, nature trails, and sanitary facilities.

The total project installation cost is estimated at $8,642,395 of which $1,125,400 are for accelerated land treatment and $7,516,995 for installation of structural and nonstructural measures. Net monetary average annual benefits for this plan are negative $98,756.

11. Accelerated Land Treatment, Six Reservoirs, I-70 Area Bypass Channel Flood Prevention Dike, Land Acquisition and Recreational Facilities

(Appendix B - Plan 1)

This alternative, excluding environmental quality features, is the same as the selected plan.

The total project installation cost is estimated at $10,547,055 of which $1,125,400 are for accelerated land treatment and $9,421,655 for installation of structural and nonstructural measures. Net monetary average annual benefits for this plan are $205,803.

12. Selected Plan

The South Fork Licking Watershed Conservancy District, considering the alternative plans, selected for economic development the plan consisting of accelerated land treatment, six reservoirs, I-70 bypass channel, a flood prevention dike at Hebron, land acquisition, and recreation facilities (although not justified economically, the structures at Etna, Kirkersville, Kiber, and Simpson were included to provide a higher level of flood protection to urban areas). Features of the environmental quality objective include critical area stabilization along the streambanks in Heath and obstruction removal from Raccoon Creek. This plan was judged to best meet their desires and had the best support of the public which they represent (Appendix B - Selected Plan).

Table E-10-2 compares selected factors for the previously listed alternatives 6 through 12. These factors reflect the major considerations used by the decision makers in formulating the selected plan.

Table E-10-2

Effects of Alternative Plans
South Fork Licking River Watershed, Ohio

	Selected Plan Alternative 76 & 68	NED Alternative 75 & 69A	EQ Alternative 69 & 79	Plan 1 Alternative 76 & 68 Less EQ Components	Plan 2 Alternative 23 & 68 Plus Bell Beaver	Plan 3 Alternative 77 & 68	Plan 4 Alternative 76 & 67 Dikes
COST							
Total Installation (mls) 1/	12.9	9.4	7.9	11.8	11.8	12.4	13.5
Average Annual (dollars)	890,407	646,044	545,554	815,169	810,015	854,691	926,639
BENEFITS							
Total Average Annual (dollars)	1,020,972	905,201	446,798	1,020,972	982,103	908,640	1,014,805
Agriculture 2/	205,288	120,859	103,327	205,288	147,588	129,749	255,070
Transportation	1,185	982	610	1,185	1,427	1,104	863
Redevelopment	44,591	33,292	26,795	44,591	43,827	51,618	53,171
Urban	310,156	296,510	293,890	310,156	318,013	279,552	245,949
Recreation	447,960	447,960	19,489	447,960	447,960	447,960	447,960
I-70 Delay	11,792	5,598	2,687	11,792	23,288	-1,343	11,792
NET BENEFITS	130,565	259,157	-98,756	205,803	172,088	53,949	88,166
STRUCTURAL							
Land Required (Acres) 3/	1,459	1,090	1,226	1,459	1,375	1,321	1,524
Single Purpose Flood Dams	5 4/	1 5/	2 6/	5 4/	5 4/	5 4/	5 4/
Multipurpose Dams 7/	1	1	1	1	1	1	1
Permanent Pools (Acres)	190	123	140	190	190	190	190
IMPACT							
Reduction of Flood Plain (Acres) 8/	1,514	408	472	1,514	1,396	758	1,420
Roads Closed (No.)	3	3	3	3	3	3	3
Bridges Built (No.)	2	2	2	2	2	-	2
Streambank Stabilization (Miles)	5.9	-	5.9	-	-	-	-
Houses with No Flooding (No.)	268	241	239	268	369	259	184
Man Years Created (Agr.)	18.9	11.3	9.4	19.1	13.5	12.3	23.6
Percent Urban Flood Reduction	89.3	85.4	84.6	89.3	91.6	80.5	70.8
Recreation Units Provided (No.)	179,840	179,840	8,214	179,840	179,840	179,840	179,840
Wetlands Preserved (Acres)	-	-	70	-	-	-	-

1/ Does not include accelerated land treatment. Does include OM&R and project administration.
2/ Includes crop and pasture, other agriculture, and agriculture enhancement.
3/ Includes dam site, permanent pool, temporary pool, channel work, recreation facilities sites, and flowage rights.
4/ Includes Big Hollow, Etna, Kirkersville, Kiber and Simpson Run.
5/ Includes structure - Big Hollow.
6/ Includes structures Etna and Kirkersville.
7/ Includes structure Lobdell.
8/ Difference between with and without project at the 100-year storm frequency.

SHORT-TERM VS. LONG-TERM USE OF RESOURCES

Present land use in the South Fork Licking River Watershed is predominantly agricultural. Future land use is expected to be agriculturally oriented with urban development in the western and eastern parts taking place. The western part of the watershed is affected by the continued expansion of metropolitan Columbus. The development will be in the Pataskala area. The eastern edge is affected by the Newark-Heath area. Some additional development is projected near the recreational development on Lobdell Creek. Land use controls may be needed to regulate private development and to protect the environment.

The planned project will reduce flooding, reduce erosion and sedimentation, improve cover conditions, and improve agricultural efficiency for immediate and long-term uses. Installation of conservation measures such as strip cropping, ponds, diversions, and wildlife food and cover planting will permit continued use of land to serve the present generation while preserving it for future generations. The conservation land treatment and structural measures will encourage more intensive use of flood plain lands by farmers. This can help in achieving a more favorable income balance. Less intensive use of upland or erosive soils to cropping, therefore, will better serve man and his environment.

The planned project measures are designed to be fully effective for 100-years. Beyond this time period, the project will continue to provide water and related land resource benefits.

The South Fork Licking River Watershed is located in the Ohio River Basin Water Resources Region. It comprises approximately .15 percent of the Ohio River Basin. The status of the PL-566 watershed program in the region is 72 watersheds in the application stage, 30 watersheds authorized for planning, 73 watersheds authorized for operation, and 37 watershed projects completed.

The South Fork Licking River Watershed is part of two water resource subareas, the Muskingum and the Portsmouth-Little Kanawha-Big Sandy.

The Muskingum water resources subarea has one project approved for operation, one authorized for planning, and three in the application stage.

The Portsmouth-Little Kanawha-Big Sandy water resources subarea has two completed PL-566 projects, seven authorized for operation, two authorized for planning, and twelve in the application stage.

The completed and authorized for operation watershed projects for the two water resources subareas represent a drainage area of approximately 590,000 acres, of which an estimated 174,000 acres will have conservation measures applied. Included also are 70 structures controlling floodwater and sediment on about 222,300 acres. Through the expected life of these structures, over 14,500 acre-feet of sediment will be trapped and stored.

The South Fork Licking River Watershed project complements the Ohio River Basin Comprehensive Survey. It will not conflict with any other water resource development plan in the area. No adverse cumulative effects from the planned project measures are anticipated.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The dams, spillways, and borrow areas of the six structures will change land use by 124 acres. The pool area will affect 190 acres of land while the recreational facilities will encompass an additional 531 acres.

The I-70 bypass channel will change 67 acres from its present land use. The South Fork channel enlargement and obstruction removal will alter 10 and 29 acres, respectively.

An estimated 260 acres of cropland and pastureland will be lost to agricultural production as a result of the project.

Labor, energy, and capital investments utilized during construction and operation and maintenance will be irretrievably lost.

Two houses and a portion of three county roads will be lost.

CONSULTATIONS AND REVIEW

Activities leading to the development of the South Fork Licking River Watershed Plan began in 1964 with the application for assistance under provision of Public Law 566, 83d Congress. The Sponsors of the application were the Licking County Commissioners, the Licking Soil and Water Conservation District, the Fairfield County Commissioners, the Fairfield Soil and Water Conservation District, the Perry County Commissioners, the Perry Soil and Water Conservation District, and the Muskingum Watershed Conservancy District. The application was approved in September 1964 by the director of the Ohio Department of Natural Resources acting on behalf of the Governor in accordance with the provisions of the Act. In September of 1965, the application was amended to include Raccoon Creek which is a tributary of the South Fork and had been submitted under a separate application.

In April of 1969, a preliminary investigation was conducted by the Soil Conservation Service and approved by the Sponsors. The South Licking River Watershed Conservancy District was formed in October 1969 and became the primary Sponsor. Planning authority for development of a Plan was issued by the Administrator of the Soil Conservation Service on February 16, 1970.

The Forest Service was advised of the planning authorization and proceeded to develop the forest land plan and the forest land data to be incorporated into the Plan. At that time, the following agencies were notified of planning intentions and were requested to furnish any comments or suggestions they might have concerning the project:

U.S. Army Corps of Engineers
U.S. Department of Agriculture:
  Agricultural Stabilization and Conservation Service
  Farmers Home Administration
U.S. Department of Health, Education, and Welfare
U.S. Department of the Interior:
  U.S. Fish and Wildlife Service
Ohio Agricultural Extension Service
Ohio Department of Natural Resources
Ohio Environmental Protection Agency

Overall consultations and coordination among local organizations, state, and federal agencies has been comprehensive during the history of the project development. Since the formation of the South Licking Watershed Conservancy District meetings have been held on a regular basis. These meetings have been publicized and open to the general public. Through the past three years these meetings have been attended by numerous property owners and other concerned individuals. Most of these meetings have been attended by members of the Watershed Planning Staff and Ohio Department of Natural Resources, Division of Water. Project formulation was greatly influenced by the various inputs and concerns expressed at these meetings.

The Sponsors held a meeting on December 15, 1977 to present the various alternatives being considered in plan formulation. This meeting was extensively advertized over a 15-day period and was attended by over 100 people. The alternatives were presented using slides and other visual aids and stimulated considerable discussion. Some of the people objected to the project and expressed concerns about the appraisal methods to be used to make assessments for local

funding. Overall reaction to the proposed alternatives was favorable and no serious objection was made by any individual, group, or agency.

Data furnished by the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service and the various divisions of the Ohio Department of Natural Resources was used in plan formulation. Specific comments from these agencies were discussed with the Sponsors and incorporated in the alternatives. Structural measures involving highways were coordinated with the Ohio Department of Transportation.

In April of 1975, a cooperative agreement was executed between the Ohio Historical Society and the Soil Conservation Service for an assessment of the archaeological and historical resources in the watershed. A report was prepared and submitted in September of 1975 and the recommendations observed in project formulation.

The U.S. Fish and Wildlife Service, the Ohio Department of Natural Resources and local sponsors were involved in the formulation of the mitigation plan.

In June of 1975, the Soil Conservation Service contracted with E.D'Appolonia Consulting Engineers, Inc., to investigate the biological characteristics and quality of surface and ground water resources for the watershed. This study was completed and the report submitted in March of 1976. In the preparation of this report the consultants contacted:

U.S. Army Corps of Engineers
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Geological Survey
Ohio Department of Agriculture
Ohio Department of Natural Resources
Ohio Department of Transportation
Ohio Environmental Protection Agency
Dennison University
Fish and Wildlife Reference Service
Ohio Academy of Science
Ohio Historical Society
Ohio State University

The data from this report was used extensively in the formulation of the alternatives.

Federal, State, and Local Agencies from Which Written Comments Were Requested

Department of the Army 1/
Department of Commerce
Department of Health, Education, and Welfare 1/
Department of the Interior 1/
Department of Transportation 1/
U.S. Environmental Protection Agency 1/
Office of the Secretary, (Office of Equal Opportunity), USDA 1/
Federal Energy Regulatory Commission 1/
Forest Service, USDA 1/

1/ Response received.

Ohio Environmental Protection Agency 2/
Mid-Ohio Regional Planning Commission 3/
Office of the Governor (Ohio), State Clearinghouse 1/
Hocking Valley Regional Development District
Licking Valley Planning Commission
Environmental Defense Fund
Natural Resource Defense Council
National Wildlife Federation
Friends of the Earth
National Audubon Society

Comments were received from the following: (See Appendix C for letters of comments received.)

1/ Response received.

2/ Governor's designated agency.

3/ Areawide clearinghouse.

I. Department of the Army

1. Comment: Reference is made to your correspondence of 20 November 1979, subject as above, requesting comments concerning the adequacy of the statement on matters of environmental concern to this agency and comments relative to adverse effects on hydraulics and on river and flood control projects.

Members of my staff have reviewed the statement with respect to the specific interest and jurisdiction of the U.S. Army Corps of Engineers, and find no significant impact from the project upon navigation, river hydraulics or flood control projects. The following comment is provided however, to aid you in your planning process.

The Corps has permit jurisdiction on the South Fork of Licking River and its associated tributaries, under Section 404 of the Clean Water Act. Under Section 404, a Department of the Army Permit is required prior to the discharge of dredged or fill material into waters of the United States, natural lakes and adjacent wetlands. Any stream work, channel relocation, construction, or alteration of existing streams or adjacent wetland that involves the deposit of dredged or fill material will require a Department of the Army Permit before construction is begun.

We respectfully suggest that application for a permit be made as early as possible in the planning process. Application forms and instructions concerning permits should be directed to Mr. Arlie D. Bishop of the Permit Section, Waterways Management Branch, Operations Disivion, at AC 304-529-5210.

The opportunity to review the statement is appreciated.

Response: Comment noted.

II. Department of Health, Education, and Welfare

1. Comment: It is stated that "vector control, where necessary, will be accomplished through the use of local drainage and with approved insecticides." Surveys of flood control reservoirs on such projects have shown that with proper shoreline maintenance, vector mosquito production is not a serious problem. The multipurpose reservoir could become an important source of mosquitoes and the final EIS should contain a provision in the operation and maintenance section for control if the need arises. Items to be addressed should include, but not be limited to, types of control planned, types of insecticides, and the manner and rate of application.

Response: During the design phase, guidelines for vector control will be developed in consultation with the Ohio Environmental Protection Agency and State Health Department.

2. Comment: The final EIS should provide detailed descriptions of the sanitary facilities planned in the recreational areas. Items which should be discussed include: number of people served by each facility, number and size of facilities, proposed schedule for servicing and pumping the facilities, the proposed final disposition of the pumped effluent from the vault toilets and the trailer dump station, and a description of the planned disposal for the grey water from the showers and other sources.

Response: A detailed discussion of each exact sanitary facility is not possible at this time. The number and type of sanitary facilities were estimated from information provided for typical facilities in state parks and other similar recreational complexes. A consultant with expertise in recreation design will be contracted to do the detail plans. At the time of final design, the State Health Department and Ohio Environmental Protection Agency must review and approve all public sanitary and drinking facilities. This will ensure that they meet applicable sanitary standards. (Also see expanded narrative on page E-5-15, paragraph 1.)

III. U.S. Department of the Interior

1. Comment: The draft environmental statement is inadequate in assessing the impacts that certain structural measures will have on existing riparian habitats. Examination of alternative sites for the seven proposed impoundments appears to have been done superficially, especially in regard to the Coon Hollow site.

Response: More than 40 structure sites were evaluated in the planning stages as well as major channel improvements on five streams. Several designs at the bypass channel with combinations of structures and related channel work were tried in order to solve the associated flood problems in the watershed. Many of the sites were rejected due to economics, engineering, landrights or environmental problems.

The reservoir sites that were chosen were a compromise between engineering, landrights, economics and a balance of channel work to achieve the flooding reduction desired by the sponsors. The Coon Hollow site has been dropped from the selected plan.

Assessment of the riparian habitat by the interagency team is covered on page P-2-2, paragraph 2 and 3 under the mitigation plan.

2. Comment: By letter of August 21, 1979, the office of the Ohio State Historical Preservation Office (SHPO) recommended that additional survey be conducted to identify properties eligible for the National Register of Historic Places, and to determine the effect of the undertaking on recorded properties and sites. We support the SHPO's recommendation, and urge that the proposed survey work be undertaken.

Response: The Ohio Historical Society is currently preparing a reconnaissance plan and cost estimate to perform this additional work. Areas to be surveyed include: recreational areas of the Lobdell site; Big Hollow Reservoir; Etna Reservoir; and the Hebron Dike. In addition, they will prepare a statement on the existing properties included in the National Register of Historic Places and any possible impacts to these properties. This information will be used and conflicts resolved before construction is begun.

A letter of agreement has been obtained from the Ohio State Preservation Officer stating that "The Service will provide surveys for the following sites prior to construction: Lobdell Creek Reservoir including recreation area; Big Hollow Reservoir; Etna Reservoir; and the Hebron Dike." The Service will perform this work with cooperative assistance from the Ohio Historical Society. This agreement represents the concurrence of the State Historic Preservation Officer that the courses of action taken by the service in archaeologic and historic matter is satisfactory.

3. Comment: Page P-2-6, items 8 and 9. This section contains information concerning construction measures for the dry structure and spillway proposed for Coon Hollow. It is stated that minimal clearing will be necessary to construct these structures. We believe this statement is inaccurate. The positioning of the dry structure in the middle of the project site and construction of the spillway will destroy a large, not minimal, portion of the excellent fish and wildlife habitat located within Coon Hollow. After examination of detailed plans for the Coon Hollow structure, we believe that the dry structure and proposed spillway are nearly as environmentally damaging as the permanent structure originally proposed. Therefore, the final documents should address in detail the possibility of eliminating the Coon Hollow site entirely, either by relocating the site, or by providing additional storage at other sites.

Response: The Coon Hollow site has been dropped from the selected plan.

4. Comment: The DEIS shows the need for permits from the Corps of Engineers for construction of stream improvement structures as part of the proposed plan. Under these circumstances, the U.S. Fish and Wildlife Service (F&WS) will be commenting to the Corps on the permit applications. While the F&WS would like to be totally responsive on all such permits, site-specific information concerning construction areas will not be known until final design plans are completed. We anticipate that the F&WS will not object to the issuance of any permits on this project as long as they are consistent with the DEIS, the recommendations of the interagency mitigation team, and the recommendations made in the F&WS's report dated May 8, 1978. Accordingly, these comments do not preclude additional and separate comments, pursuant to the Fish and Wildlife Coordination Act, when F&WS reviews the permit applications.

Response: Agree

5. Comment: Page E-8-1, Paragraph 4. Although it is recommended that the sponsors enact ordinances preventing further development in the flood plain, it is not clear whether such ordinances will in fact be enacted. Would the project go forward without such ordinances, and what is the likelihood of new developments raising flood damages to the pre-project level?

Response: The sponsors have no legal authority in enacting ordinances concerning flood plain development. Flood plain zoning regulations are the responsibility of the townships. Presently, Licking County and all municipalities in the watershed are participating in the flood insurance program, which regulates the flood plain development.

IV. U.S. Department of Transportation, U.S. Coast Guard

1. Comment: Roadway and bridge designs should meet applicable state and federal design standards. The plans should be submitted to the Ohio Department of Transportation (ODOT) for review.

Construction of the roadways and bridges should be in accordance with state specifications and subject to state inspection.

All work to be done on state right-of-way in conjunction with the bypass channel along I-70 will require a permit. The permit will be coordinated with ODOT and submitted to the division office for approval.

Response: Agree. See page E-5-17, Paragraph 3.

2. Comment: We suggest that the screen planting along I-70 be coordinated with ODOT and be consistent with ODOT/FHWA landscape design guidelines.

Response: Agree. See Figure E-5-2.

3. Comment: Any effects of the improvements along I-70 on the highway drainage should be addressed. Include any modifications that will be necessary to the highway drainage facilities.

Response: This has been addressed in the final plan (Page E-5-17, Paragraph 3).

V. U.S. Environmental Protection Agency

1. Comment: Water - The impacts on water quality within the proposed reservoirs and downstream releases need to be examined in greater detail in the Final EIS. Low dissolved oxygen concentrations, the potential for prolonged thermal stratification, and increased stream temperature all need to be examined more fully.

Low dissolved oxygen concentrations in the summer months may be even further reduced by low flows associated with the proposed reservoirs. The streams within the watershed are classified by the Ohio EPA as warm water habitat. Ohio EPA standards require 5 mg/l dissolved oxygen for 16 hours and 4 mg/l for the remaining eight hours in these waters. As test results show seven locations in violation of this standard, steps must be taken to upgrade rather than degrade the water quality. The 5 mg/l dissolved oxygen is a minimum concentration required to maintain good fish populations; mitigative measures should be employed to increase the dissolved oxygen content of the water.

The potential for prolonged thermal stratification in the reservoirs is not adequately addressed. Elevation of stream temperature will likely be an impact of the project, yet alternatives for mitigation of this problem and effects that can be expected from a temperature rise are not included in the EIS. The EIS states that as long as this does not occur and spillway outlets are located above the thermocline, nutrient loads will be reduced on the downstream side. Mitigative measures should be employed to insure that this will be the case, and that nutrient loads are in fact reduced.

Overall, the impact of changing 4.4 miles of stream into six sediment pools and one permanent pool will be to degrade water quality in certain important aspects. Mitigative measures such as the use of shade trees, discharging from a deeper layer of a reservoir provided water quality is suitable, and aeration of the water should be considered. Maintaining the present quality of the water is essential, but improvement is most definitely desirable. Assurances should be obtained, before project implementation, that applicable State water quality standards will be achieved and maintained.

Response: In accordance with your letter of September 21, 1979, a meeting was held on December 6, 1979 with U.S. Geological Survey. We requested information concerning test sample results taken from a structure located in Rush Creek Watershed. Rush Creek Watershed borders the southern boundary of the South Fork Licking Watershed and has similar physical features and geologic history. This

structure is five years old, has a drainage area of 5,000 acres, and a pool area of 45 acres. It has the same type of topwater release structure that is planned for the dams on South Fork. Water samples were obtained from four sites located: (1) on a stream above the lake; (2) on the lake surface; (3) on a stream below the lake, and (4)on an adjacent stream. The study showed that the temperature from above the structure and below the structure did not vary significantly. Fluctuations in temperature and dissolved oxygen were similar when compared between all stream samples and the lake surface. Temperature and dissolved oxygen fluctuations have been determined to be within limits set by Ohio EPA, Warm Water Habitat Standards. Publication will not be accomplished until the testing is complete. Information from test results is available from U.S. Geological Survey, 975 West Third Avenue, Columbus, Ohio 43212. For a detailed description of the Rush Creek Watershed see the Rush Creek Watershed Final Environmental Impact Statement and Supplemental Plan dated August 1978.

Paragraph 5 and 6, on page E-9-4, has been rewritten as follows: Nutrient loads will be reduced downstream of the dam because the spillway inlet is located above the thermocline.

The temperature of the stream during summer months is not expected to be significantly affected by solar heating of the reservoir. Some heating is anticipated, but according to studies performed in the Rush Creek Watershed by U.S. Geological Survey the impact of top water release on stream temperature is negligible.

Results of temperature fluctuation tests performed below the structure by U.S. Geological Survey on the Rush Creek sites are consistently within standards set by Ohio Environmental Protection Agency for warm water habitat.

2. Comment: Wildlife Habitat - The impact of the proposed project on wildlife needs to be examined in the final EIS. Both terrestrial and aquatic habitats will be altered by the project. The statement that periodic flooding above impoundments will do little damage to terrestrial habitats is not substantiated. Flooding will occur when ground nesting species are active. The affected areas should be evaluated more thoroughly and mitigative measures suggested to counter-act the loss of habitat. Also, the impact on the aquatic habitat of obstruction removal on 18.2 miles of stream needs to be more fully examined.

Response: Periodic flooding will occur around proposed reservoirs annually. According to the figures taken from Tables E-5-1 and E-5-2, the acres affected by temporary flooding are located from the permanent pool elevation to the design high water elevation and consist of approximately 378 acres. Flooding will have a direct impact on all ground nesting species within these elevations.

After installation of the six proposed structures, page E-1-1 shows that approximately 1,514 acres of terrestrial upland habitat located adjacent to the channel corridor will be protected from flooding. This represents a net increase of about 1136 acres of potential ground nesting area.

3. Comment: Air and Noise - Analysis of the air and noise impacts of the expected 179,840 recreational visits per year to the proposed facilities within the watershed need to be provided in the final EIS.

Response: Adverse impacts of air and noise for the recreational developments are recognized. This will be considered by the engineering consultant during final layout design for the recreation area.

4. Comment: Soil - The impacts of the proposed project on the soil resource base, as well as the impacts of the soil resource base on the proposed project, need to be examined in greater detail. The protection of the soil resource base, spreading of channel spoil, and utilization of more detailed soil information need to be examined more fully.

One of the primary purposes of the project is to reduce erosion, thus reducing sediment loads and improving water quality. Since erosion rates are estimated to be above T values for IIe, IIIe, and IVe land, the land should be adequately treated as early in the project as possible, in order to get back within the allowable soil loss. Adequate land treatment measures will result in increased infiltration, higher water holding capacity, increased permeability, and, or course, reduced runoff. The time table for land treatment should be reevaluated and, if possible, revised to expedite conservation treatment of the land.

The EIS indicates that spoil materials removed during channel work are generally suitable for spreading on cropland with very little data for substantiation. An on-site soil investigation would yield information regarding spoil areas with the most suitable physical characteristics relating to tilth. These materials should be stockpiled and used to provide a favorable plow layer for future cropping. Consideration should be given to stripping off and stockpiling top soil from areas of cropland designated for the spreading of spoil. It could later be used to provide a favorable seedbed once channel work is complete. The pollutional nature of the spoil material should also be considered. Such parameters as pH, toxic and/or organic chemical contamination as well as possible sources of pollution need to be determined. Spreading of infertile or polluted sediments should be avoided.

The quality of soil information, in general, within the Draft EIS is considered inadequate. In as much as the soil is one of primary resources that the proposed project will protect, we think that a more detailed treatment of it should be included in the final EIS. If a detailed soil survey (i.e., at a scale of approximately 4" = 1 mile) is not available for the area, it should be completed before the project proceeds. A copy of the detailed map of the area should be included in the final EIS, along with a mapping legend and all necessary interpretive data pertinent to the project. Only by reviewing a detailed breakdown of the soil resource base can suitable decisions be made regarding its treatment and adequate protection.

Response: Paragraph 2 - The land treatment portion of the Plan was developed and approved by the district conservationist and the soil and water conservation district boards and represents the realistic schedule that they believe can be accomplished.

Paragraph 3 - The narrative has been expanded. (Page E-5-17, paragraph 7, "Topsoil will be removed from the channel excavation and spoil spreading areas and stock piled prior to excavation. The topsoil will then be spread on top of the excavated material to provide a good seedbed for crop production.")

"On site" geologic borings have been done at one quarter mile intervals by the Soil Conservation Service along the bypass alignment. In addition, the SCS has reviewed the geologic information used by the Ohio Department of Transportation

in the design of I-70. The Soil Conservation Service feels that the investigations do substantiate the claim that the material will be suitable for crop production.

Paragraph 4 - Progressive detailed soil surveys (at a scale of 1:15,840) are currently in progress in Licking and Perry Counties and are complete in Fairfield County. All areas in the watershed which will be undergoing accelerated land treatment and the areas above the dams will be mapped prior to implementation in order to provide a detailed breakdown of the soil resource base. This detailed information is required to meet the Soil Conservation Service's specifications by which land treatment measures will be installed. To publish detailed soil maps, legends, and interpretations in the final EIS would be considerable material of interest only to a few readers. The information will be available at the county soil and water conservation district offices. Detailed soil information is a necessary integral component of all land treatment and will be used by district people responsible for land treatment installation.

VI. Office of the Secretary, (Office of Equal Opportunity), USDA

1. Comment: We have reviewed the Draft Statement with particular interest in your assessment of the effects, if any, the proposed actions will have on minority populations (SCS Guidelines for Compliance with NEPA, 7 CFR 650.8(b)(3)). The Draft Statement makes no reference to this requirement.

Although it may be assumed that the fact of a small minority population in the Watershed and the extensive public participation process that has characterized the project to date minimizes any civil rights impacts, the Final Statement should specify that these impacts have been identified and dealt with. The Final Statement should conclude that no adverse effects upon minority persons will result.

Response: This has been incorporated into the final plan (Page E-6-8, Paragraph 3 and 4 and page E-9-10, Paragraph 5).

2. Comment: The Draft Statement states, at page E-5-10, that "all recreation developments will be designed to provide access to the physically handicapped." Perhaps the Final Statement will include the specific features alluded to in this statement and, also, will state that the handicap accessibility plans have been declared adequate by handicapped organizations reviewing the plans.

Response: The final design plans will be prepared by an engineering firm through an A&E contract after this plan is approved. These plans will address the specific features for accessibility for the handicapped and conform to all federal and state requirements.

VII. Federal Energy Regulatory Commission

Comment: The staff concentrates its review of other agencies' environmental impact statements basically on those areas of the electric power, natural gas, and oil pipeline industries for which the Commission has juristiction by law, or where staff has special expertise in evaluating environmental impacts involved with the proposed action. It does not appear that there would be any significant impacts in these areas of concern nor serious conflicts with this agency's responsibilities should this action be undertaken.

Response: Comment noted.

VIII. U.S. Department of Agriculture, Forest Service

Comment: We have reviewed the Draft Environmental Impact Statement and Watershed Plan for the South Fork Licking River Watershed, Ohio. We have no comments.

Response: Comment noted.

IX. State Clearinghouse

1. Comment: The Ohio Department of Transportation and the Soil Conservation Service should do further work with respect to plan development. An agreement will be needed between the Ohio Department of Transportation, Soil Conservation Service and the South Licking Watershed Conservancy District to specify responsibilities of each agency. Details were not given with respect to the amount of encroachment that is to occur on I-70 R/W to build the bypass channel. Details should also be included on the estimated construction and added maintenance cost for the new bridge which will carry SR-37 over the bypass channel. The Ohio Department of Transportation defined its concerns in the attached letter.

Response: According to figure E-5-2, the spoil will be piled in the 50-foot recovery area adjacent to the berm. It will be piled no higher than 10 feet and no steeper than a 3 to 1 slope. Therefore, spoil will be placed no closer than 80 feet from the centerline of the I-70 median. Low growing tree and shrub plantings will be planted on the piled spoil in selected areas to improve the view. Final details of the spoil placement, drainage and shrub plantings will be coordinated with Ohio Department of Transportation at the time of final design.

The cost of the new bridge at SR-37 is included in the landrights costs, footnote 3 of Table 2, P-10-1. The cost was computed from information supplied by Ohio Department of Transportation for similar bridges. The estimated cost for this bridge is $272,600.

The indirect transportation benefits are based on the estimated costs to users of I-70. The estimate is based on items such as cost of additional miles drove, value of time lost and missed schedules.

Maintenance costs are included in costs under "operation and maintenance." Who will bear specific costs for the bridge maintenance will be part of the landrights agreement between the Conservancy District and the state.

No formal agreement is planned. However, informal meetings have been held during the planning phase and will continue through the design phase to work out mutual agreements for items of concern such as drainage, landscaping, bridges, etc.

2. Comment: An additional survey should be conducted to identify properties eligible for the National Register, and to determine the effect of the undertaking of recorded properties and sites. This should be accomplished during the preparation of the Final Environmental Impact Statement or addressed in the Final Environmental Impact Statement and accomplished prior to project construction.

While some archaeological surveys have already been conducted, the Ohio Historical Society has indicated in its attached comments other sites that should be surveyed.

Response: Agree. The Ohio Historical Society is currently preparing a reconnaissance plan and cost estimate to perform this additional work. Areas to be surveyed include: recreational area of the Lobdell site; Big Hollow Reservoir; Etna Reservoir; and the Hebron Dike. In addition, they will prepare a statement on the existing properties eligible for the National Register of Historic Places and any possible impacts to these properties. This work will be accomplished prior to project construction and any conflicts resolved before construction begins.

3. Comment: (Beginning with this comment and for the remaining comments, the more detailed comments from the Ohio Department of Natural Resources are printed and responded to.) Mitigation Plan for Structure Sites, Structures, Page P-2-6: The construction of a dry structure and minimum amount of clearing for the Coon Hollow Reservoir does not appear to have much mitigative value if the structure location and dimensions remain the same as originally proposed for a permanent pool reservoir. Table E-5-1 of the draft EIS estimates 10 acres of forest land to be committed to the dam, spillway, and outlet area of the reservoir, six acres will be required for the 100-year sediment deposition area, and nine acres of forest land would be included in the periodically inundated area. We would like to see the timber clearing plan and would encourage leaving timber standing where possible in water areas to provide fish and wildlife habitat.

Response: Coon Hollow Reservoir has been dropped from the selected plan. The timber clearing plan will be reviewed by the mitigation team and one of the practices included, when feasible, is to leave standing timber in water areas.

4. Comment: The planned public recreation developments on the South Fork Licking River are appropriate for the most part (ref. Draft EIS, Appendix F). Establishment of a recreational river segment may encourage stepped-up efforts to improve point and non-point sources of water pollution.

It is felt that some additional evaluation of the potential of the South Fork Licking River for canoeing should be included in the plan. Is the flow adequate for a reasonably sustained recreational season?

Structural Measures: P-5-3: The Plan indicates that the Conservancy District will employ qualified private consulting firms for engineering services for recreational facilities. The Department concurs in this and strongly recommends that park planning and design services be included in order to develop quality recreation areas and avoid any future use problems.

Lobdell Creek Public Recreation Development (ref. Appendix E, Draft EIS): The proposed layout of the Lobdell recreation area should be reconsidered in order to reduce possible traffic bottlenecks and user/vehicle conflicts, particularly around the bathhouse/beach area. Extensive roadside parking in the picnic area should be discouraged to avoid conflicts between vehicles and users, traffic congestion, and unauthorized driving in picnic areas. While the Department has not made an analysis of adjacent land uses, it does appear that additional buffer would be in order for the various use areas, expecially the camping areas.

Another element of the plan which should be re-evaluated is the provision of improvements for boating at the Lobdell impoundment. The proposed facilities for Lobdell recreation pool are in excess for the size of the pool. Using a standard of 7.5 acres per boat, a dozen dock slips and one ramp are more than adequate to service this lake.

Response: The recreation plans for Lobdell Creek public recreation area and South Fork channel recreation area as presented are not detailed final plans, but rather a guide as to quantity and quality of facilities to provide the estimated usage. Final plans and designs will be completed by a qualified engineering firm in recreation planning. In determining the recreation use for the canoe trail, seasonal low flows were anticipated. These elements have been included as part of the planning process.

5. Comment: Serious consideration should be given to restricting or prohibiting the use of internal combustion engines on the lake to avoid potential oil, gasoline, and noise pollution and to keep boating speeds at a reduced level to minimize potential for shore erosion and boating accidents.

Response: The sponsors, with consultation with the Ohio Department of Natural Resources and with compliance to Ohio laws, will adopt rules and regulations for use of the recreation development.

6. Comment: The proposed I-70 area bypass appears to impact a section of the Ohio and Erie Canal which the Ohio Department of Natural Resources' Canal Study has found to have recreational potential. Detailed plans for the bypass are required in order to assess this impact.

Response: Planning investigations and design work for the bypass channel were performed at final design intensity. The bypass channel will intersect a 400-foot wide section of the old canal alignment north of I-70 which is obliterated by existing County Road 171. No adverse impacts to viable canal sections will occur.

7. Comment: Plant and Animal Problems, page E-7-5: The major wildlife problems center around the South Fork Licking River Basin's degraded and decreasing habitat base. Water quality factors including physical alterations in stream courses and sedimentation and high nutrient input are limiting factors affecting fisheries. Wildlife resources are concentrated in narrow stream corridors. Remaining desirable wildlife cover conditions occur primarily along streams since upland areas are used more extensively for agriculture.

Reponse: Agree

8. Comment: Environmental Impact, Structural Measures, page E-9-3: While land cover conditions and natural stream conditions to be changed by structural measures are quantified (Table E-9-2), there is very little information in the environmental statement which qualified or quantifies wildlife habitat values. For example, it is known that alternative sites for retention reservoirs have varying wildlife and aquatic habitat values. The alternative sites also have differing runoff characteristics. The draft statement should at least address these factors and criteria for site selection because they are important in evaluating the potential impacts of the proposed structural measures.

Flood Prevention Reservoirs: Seven reservoirs are included in the selected plan. The recommendations for mitigation (page E-5-20) and the work of the interagency mitigation team should hold long-term adverse impacts to fish and wildlife resources to a minimum.

Regarding the discussion under Mitigation Plan, page E-5-16, the Department is in general concurrence with the mitigation plan as stated above. However, as mentioned in comment no. 1 on the watershed plan, there are serious reservations regarding the Coon Hollow site. Several field investigaitons by personnel from this Department and the U.S. Soil Conservation Service and U.S. Fish and Wildlife Service confirm that Coon Hollow exhibits excellent water quality, stream habitat, and diverse flora including distinct plant communities and examples of climax forest associations. Resident and migrant wildlife species are found here in great abundance. Further study of alternative reservoir sites should consider the natural and fish and wildlife values of each alternative. While specific hydrologic studies have not been conducted on the Coon Hollow site, the area exhibits excellent vegetal cover and some surface depression and flood plan storage. Despite the presence of some steep slopes, this area has characteristics which naturally slow the rate of runoff. An estimate should be provided of the natural water retention capability of the existing area. The natural storage capacity should be compared to the storage capability of the reservoir to determine whether or not structural measures are justified.

Response: The seven sites selected for the final plan were chosen from about 70 potential sites. Many of the sites were eliminated for hydrological, soils,or economic reasons. The seven sites selected reflected what was believed the most feasible for flood damage reduction. Field investigations were performed by an interagency biological team on each of the selected sites. These investigations resulted in the Coon Hollow site being dropped from the selected plan.

An interagency mitigation team is developing a mitigation plan on each reservoir site. This plan will evaluate existing wildlife and fisheries habitat and provide recommendations for proper and adequate replacement.

9. Comment: Because of the extent and degree of channelization and channel clearing proposed, additional consideration should be given to the importance of instream structures and stream bank vegetation and fish and wildlife habitat.

Along stream segments where only clearing or obstructions is proposed, trees determined to be potentially hazardous because they are destined to topple into the stream channel can be conserved by topping which would keep the tree roots alive. Exposed roots can be protected in certain instances by anchoring felled logs and branches to the stream bank. Elsewhere, anchoring logs and limbs can provide fish attractors and aquatic habitat. If engineered correctly, anchoring logs and brush against severely eroding stream banks will promote silt deposition at the erosion site. New growths of vegetation will further stabilize the formerly eroding bank.

Response: An interagency team will walk the channel marking the trees scheduled for removal. No trees or associated stumps will be removed without the teams agreement. Additional fish and wildlife habitat considerations will be provided in the final mitigation plan. Although the anchoring of trees and logs is valuable for fish and invertebrates habitat development, improper placement could interfere with the flood flow designs by depositing unwanted sediment and debris within the channel. During the teams inspection, recommendations for log and tree placement will be considered.

10. Comment: One-sided construction in channel modification areas is a commendable practice. Generally, however, the project plan and environmental statement should recognize the importance of retaining where possible shade-providing vegetation not only for habitat value, but because such vegetation stabilizes stream banks and discourages the growth of undesirable sun-tolerant vegetation within the banks which can cause silt build-up in channelized areas, changing the stream course and creating potential erosion problems.

Reponse: The only portion of the project which will require channel excavation in an existing stream is the segment near State Route 79 and Interstate 70. The shading effect of the trees was considered in choosing the side of construction. In this section, 1800 feet of work is planned on the north side. The remaining 1,685 feet will be on the south side. The south side was chosen because a power line crosses and then parallels the stream on the north side leaving too little room for construction work.

11. Comment: Physical Resources, page E-6-3: It is stated that the watershed contains very few mineral resources of current commercial value. There are, however, extensive deposits of sand and gravel (kames and outwash) in the watershed that are of potential economic value. Although the proposed watershed improvements will probably result in some commitment of these resources, the impact as based on available data is not considered significant.

Response: Agree

12. Comment: On page E-6-3, second paragraph, "preconsolidated" should probably be changed to unconsolidated.

Response: Changed

13. Comment: The U.S. Soil Conservation Service should coordinate closely with the Ohio Department of Transportation and Department of the Army, Corps of Engineers. The Buckeye Lake Hydraulics Study (Corps) may recommend improvements to the Buckeye Lake outlet. The waterway opening for the State Route 79 bridge (ODOT: Licking 79-4.60) could be affected by the results of the Corps' study. Temporary repairs of this bridge, proposed for replacement, should be considered until the results of this study have been finalized.

Response: The Soil Conservation Service and Ohio Department of Transportation have met on several occasions to discuss the mutual concerns of the bypass channel and its effect on the state highways. Since the lake outlet is downstream from State Route 79 bridge, it is not believed to have any bearing on the bridge opening. The Soil Conservation Service has reviewed the preliminary plans for the State Route 79 bridge and found them to be compatible with the channel work planned for this area.

Approved by:

Robert R. Shaw
State Conservationist

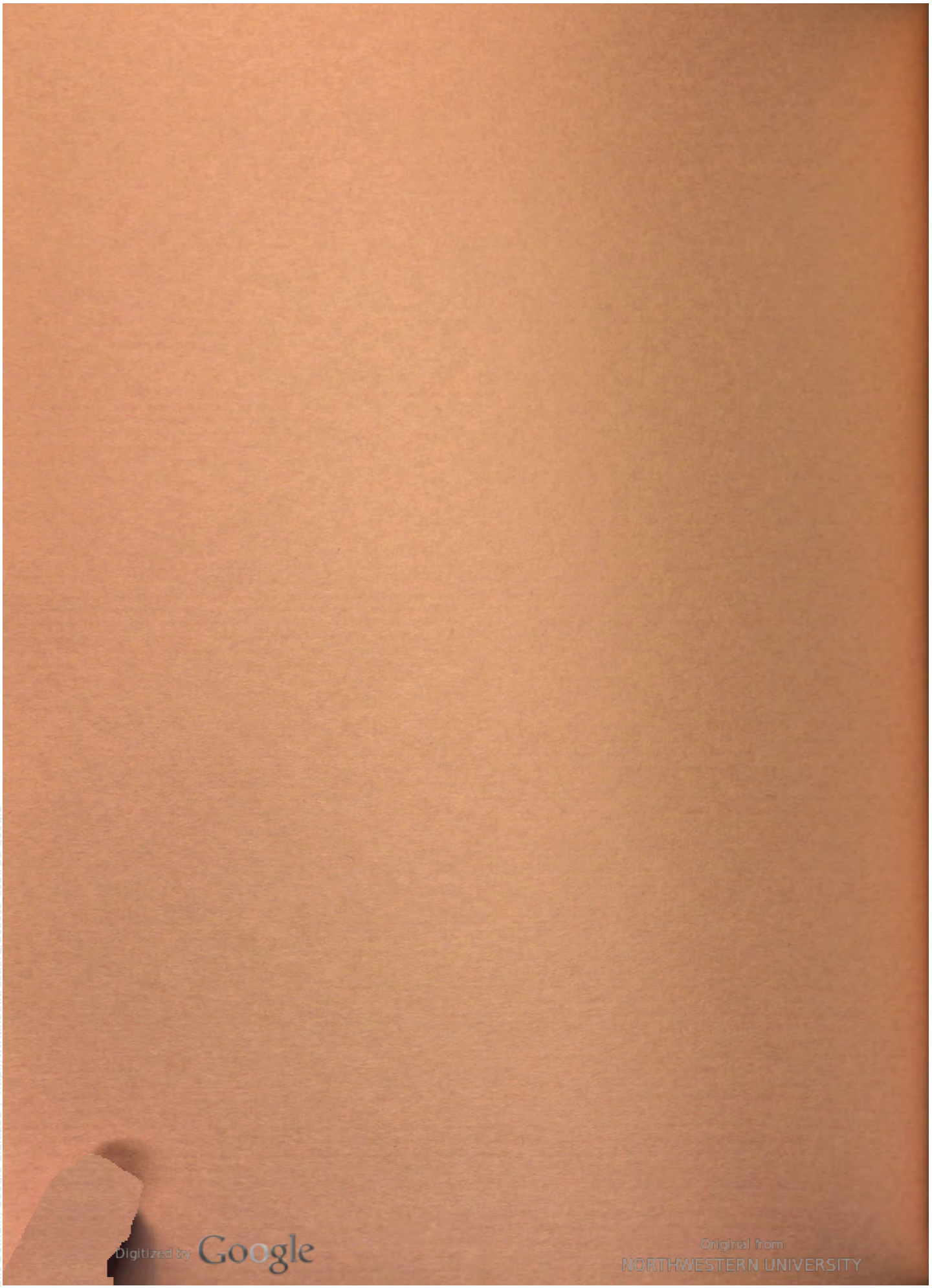
5/20/80
Date

APPENDICES

APPENDIX A

DISPLAY ACCOUNTS FOR SELECTED ALTERNATIVE

National Economic Development Account
Environmental Quality Account
Regional Development Account
Social Well-Being Account



SELECTED ALTERNATIVE

NATIONAL ECONOMIC DEVELOPMENT ACCOUNT
South Fork Licking Watershed, Ohio

Components	Measure of Effects (Average Annual) 1/2/	Components	Measure of Effects (Average Annual) 1/2/
Beneficial Effects:		Adverse effects:	
A. The value of users of increased outputs of goods and services.		A. The value of resources required for the plan.	
1. Flood prevention	$ 387,371	1. Five single-purpose and one multipurpose reservoirs, channel work, recreational facilities, critical area stabilization, obstruction removal, flood prevention dike, and land acquisition.	
2. Recreation	447,960	Project Installation	$601,931
3. Utilization of unemployed and under-employed labor sources.	44,591	OM&R	170,861
4. Agricultural enhancement	141,050	2. Project Administration	117,615
Total Beneficial Effects	$1,020,972	Total Adverse Effects	890,407
Net Beneficial Effects	$ 130,565		

Note: Land treatment beneficial effects were not evaluated. Land treatment costs are $2,687,900.

1/ 100-year at 6 7/8 percent interest.

2/ Price Base: 1978 current normalized prices for agricultural damages and benefits and 1978 prices for all others.

SELECTED ALTERNATIVE

ENVIRONMENTAL QUALITY ACCOUNT
South Fork Licking Watershed, Ohio

Components	Measure of Effects
Beneficial and adverse effects:	
A. Areas of natural beauty.	1. Reduce erosion and adequately treat 2,880 acres of cropland, 1,060 acres of pastureland, 600 acres of forest land, and 160 acres of other land. 2. Create six reservoirs; five single purpose flood prevention and one multiple purpose flood prevention recreation. 3. Create water surface areas totaling 190 acres from the six reservoirs. 4. Develop 7.4 miles of stream channel for recreational use. 5. Recreational facilities will provide 179,840 recreation visits to the rural environment. 6. Channel work on 0.7 mile of South Fork and 3.3 miles of by-pass channel. 7. Obstruction removal on 7 miles of Raccoon Creek and 11.2 miles of South Fork. 8. Critical area stabilization along 5.9 miles of Ramp Creek and South Fork. 9. Diking on 0.3 miles of South Fork near Hebron.
B. Quality considerations of water, land and air resources.	1. Reduce average annual soil loss by 15,191 tons with land treatment practices. 2. Reduce streambank erosion by an estimated 10 percent with channel work and associated bank protection measures. 3. Temporarily increase erosion, sedimentation, and turbidity during construction affecting aquatic habitats. 4. Temporarily increase dust, exhaust gases, and noise during construction.

C.	Biological resources and selected ecosystems.	1. Dams, emergency spillways, borrow areas and permanent pools will replace 42 acres of cropland, 64 acres of grassland, 67 acres of forest land, and 19 acres of land in other uses.
		2. Flood pools will temporarily inundate 122 acres of cropland, 129 acres of grassland, 113 acres of forest land, and 13 acres of land in other uses. Flooding will cause periodical disturbance to terrestrial wildlife but will cause little damage to terrestrial wildlife.
		3. Construction will remove two acres of bottomland hardwoods along the South Fork branch.
		4. Provide 190 acres of aquatic and waterfowl habitat.
		5. Establish 89 acres of grasses and legumes which will provide food and cover for terrestrial wildlife.
		6. Remove benthic organisms and other sedimentary or slow moving fauna along 0.74 miles of South Fork.
		7. Permanently inundate about 4.4 miles and periodically inundate about 3.0 miles of natural stream conditions.
D.	Irreversible or irretrievable commitments.	1. Convert 190 acres of land to reservoir pools.

SELECTED ALTERNATIVE
REGIONAL DEVELOPMENT ACCOUNT
South Fork Licking Watershed, Ohio

Components	Measure of Effects: State of Ohio	Measure of Effects: Rest of Nation
Income:		
	(Average Annual) 1/2/	
Beneficial effects:		
A. The value of increased output of goods and services to users residing in the region.		
1. Flood prevention	$ 387,371	0
2. Recreation	447,960	0
3. Agricultural enhancement	141,050	0
4. Utilization of unemployed and under-employed labor sources		
a. Project construction and OM&R	44,591	
B. The value of output to users residing in the region from pecuniary external economics		
1. Indirect activities associated with increased net returns		
a. Flood prevention	294,794	-294,794
b. Recreation	429,015	-429,015
Total Beneficial Effects	1,744,781	-723,809

Components	Measure of Effects: State of Ohio	Measure of Effects: Rest of Nation
Income:		
	(Average Annual) 1/2/	
Adverse effects:		
A. The value of resources contributed from within the region to achieve the outputs.		
1. Five single purpose and one multipurpose reservoirs, recreational facilities, channel work, critical area stabilization, flood prevention dike, and obstruction removal.		
Project Installation	164,208	437,722
OM&R	170,861	0
2. Project Administration	13,350	104,265
Total Adverse effects	348,419	541,987
Net Beneficial Effects	1,396,362	-1,265,796

1/ 100-year at 6 7/8 percent interest.

2/ Price Base: 1978 current normalized prices for agricultural damages and benefits and 1978 prices for all others.

SELECTED ALTERNATIVE

REGIONAL DEVELOPMENT ACCOUNT
South Fork Licking Watershed, Ohio

Components	Measure of Effects: State of Ohio	Measure of Effects: Rest of Nation
Employment		
Beneficial effects:		
A. Increase in the number and types of jobs.		
1. Agricultural employment	Utilization of 18.9 man-years of employment in agricultural production	
2. Employment in recreation service sector	3 permanent skilled, 4 permanent seasonal semi-skilled, and 11 permanent seasonal unskilled jobs.	
3. Employment in Project Construction	159.5 semi-skilled jobs for one year.	
4. Employment for project OM&R	1.4 permanent semi-skilled jobs	

Components	Measure of Effects: State of Ohio	Measure of Effects: Rest of Nation
Employment		
Advserse effects:		

SELECTED ALTERNATIVE

REGIONAL DEVELOPMENT ACCOUNT
South Fork Licking Watershed, Ohio

Components	Measure of Effects	
	State of Ohio	Rest of Nation
Employment		
Total Beneficial Effects	18.9 permanent jobs in agriculture. 3 permanent skilled jobs. 1.4 permanent semi-skilled jobs.	0 -
	4 permanent seasonal semi-skilled jobs. 11 permanent seasonal unskilled jobs. 159.5 semi-skilled jobs for 1 year.	

Components	Measure of Effects	
	State of Ohio	Rest of Nation
Employment		
Total Adverse Effects	-	-
Net Beneficial Effects	18.9 permanent jobs in agriculture. 3 permanent skilled jobs. 1.4 permanet semi-skilled jobs. 4 permanent seasonal semi-skilled jobs. 11 permanent seasonal unskilled jobs. 159.5 semi-skilled jobs for 1-year.	

SELECTED ALTERNATIVE

SOCIAL WELL-BEING ACCOUNT
South Fork Licking Watershed, Ohio

Components	Measure of Effects
Beneficial and adverse effects	
A. Real income distribution.	1. Create 38.3 low to medium income permanent jobs and 159.5 low to medium income jobs for one year.
	2. Create regional income benefit distribution of $1,744,781 by income class as follows:

Income Class (Dollars)	Percentage of Adjusted Gross Income in Class	Percentage Benefits in Class
Less than $5000	17	17
5,000 - 12,000	54	54
More than 12,000	29	29

3. Local cost to be borne by region total $348,419 with distribution by income class as follows:

Income Class (Dollars)	Percentage of Adjusted Gross Income in Class	Percentage Benefits in Class
Less than $5,000	17	17
5,000 - 12,000	54	54
More than 12,000	29	29

B. Life, health, and safety	1. Provide 79.4 percent flood damage reduction.
	2. Provide flood damage reduction for 449 residences and 35 businesses.
	3. Increase feed grain output.
C. Recreational opportunities	1. Creates 179,840 recreation visits for the watershed.

APPENDIX B

SUMMARY COMPARISON OF ALTERNATIVE PLANS

SUMMARY COMPARISON OF ALTERNATIVE PLANS

South Fork Licking River Watershed, Ohio

Account	Selected Plan	National Economic Development Plan	Environmental Quality Plan	Plan 1	Plan 2	Plan 3	Plan 4
National Economic Development							
Beneficial Effects	1,020,972	905,201	446,798	1,020,972	982,103	908,640	1,014,805
Adverse Effects	890,407	646,044	545,554	815,169	810,015	854,691	926,639
Net Beneficial Effects	130,565	259,157	-98,756	205,803	172,088	53,949	88,168
Environmental Quality							
Beneficial and Adverse Effects							
A. Areas of Natural Beauty	Create 6 impoundment areas with water surface area 190 acres.	Create 2 impoundments with water surface area of 123 acres.	Create 3 impoundments with water surface area of 140 acres.	Create 6 impoundments with water surface area of 190 acres.	Create 6 impoundments with water surface area of 190 acres.	Create 6 impoundments with water surface area of 190 acres.	Create 6 impoundments with water surface area of 190 acres.
	Channel work on 15.2 miles, obstruction removal on 7.0 miles, dikes on 0.3 miles of stream, and acquisition of one flood plain property.	Channel work on 15.2 miles, dikes on 0.3 miles of stream, and acquisition of one flood plain property.	Channel work on 14.5 miles, obstruction removal on 7.0 miles, dikes on 0.3 miles of stream, and acquisition of one flood plain property.	Channel work on 15.2 miles, dikes on 0.3 miles of stream, and acquisition of one flood plain property.	Channel work on 12.8 miles, dikes on 0.3 miles of stream, and acquisition of one flood plain property.	Channel work on 16.6 miles, dikes on 0.3 miles of stream, and acquisition of one flood plain property.	Channel work on 15.2 miles, dikes on 4.7 miles of streams, and acquisition of one flood plain property.
	Streambank stabilization along 5.9 miles.	No effect	Streambank stabilization along 5.9 miles.	No effect	No effect	No effect	No effect
	Develop 7.4 miles of stream channel and one reservoir impoundment for recreational use.	Develop 7.4 miles of stream channel and one reservoir impoundment for recreational use.	Develop 7.4 miles of stream channel and one reservoir impoundment for recreational use.	Develop 7.4 miles of stream channel and one reservoir impoundment for recreational use.	Develop 7.4 miles of stream channel and one reservoir impoundment for recreational use.	Develop 7.4 miles of stream channel and one reservoir impoundment for recreational use.	Develop 7.4 miles of stream channel and one reservoir impoundment for recreational use.
	Disrupt rural environment with 179,840 recreation visits provided from recreation developments.	Disrupt rural environment with 179,840 recreation visits provided from recreation developments.	Disrupt rural environment with 8,214 recreation visits provided from recreation developments.	Disrupt rural environment with 179,840 recreation visits provided from recreation developments.	Disrupt rural environment with 179,840 recreation visits provided from recreation developments.	Disrupt rural environment with 179,840 recreation visits provided from recreation developments.	Disrupt rural environment with 179,840 recreation visits provided from recreation developments.

Account	Selected Plan	National Economic Development Plan	Environmental Quality Plan	Plan 1	Plan 2	Plan 3	Plan 4
Environmental Quality							
B. Biological resources and selected ecosystems	Remove benthic organisms and other sedimentary or slow moving fauna along 0.74 mile of South Fork.	Remove benthic organisms and other sedimentary or slow moving fauna along 0.74 mile of South Fork.	No Effect	No Effect	Remove benthic organisms and other sedimentary or slow moving fauna along 3.5 miles of Beaver Run.	Remove benthic organisms and other sedimentary or slow moving fauna along 5.4 miles of South Fork.	Remove benthic organisms and other sedimentary or slow moving fauna along 0.74 mile of South Fork.
	Permanently inundate about 4.4 miles and periodically inundate about 3.0 miles of natural stream conditions.	Permanently inundate about 1.9 miles and periodically inundate about 1.3 miles of natural stream conditions.	Permanently inundate about 2.7 miles and periodically inundate about 1.9 miles of natural stream conditions.	Permanently inundate about 4.4 miles and periodically inundate about 3.0 miles natural stream conditions.	Permanently inundate about 4.4 miles and periodically inundate about 3.0 miles natural stream conditions.	Permanently inundate about 4.4 miles and periodically inundate about 3.0 miles natural stream conditions.	Permanently inundate about 4.4 miles and periodically inundate about 3.0 miles natural stream conditions.
	Create 190 acres of surface water for aquatic and waterfowl habitat.	Create 123 acres of surface water for aquatic and waterfowl habitat.	Create 140 acres of surface water for aquatic and waterfowl habitat.	Create 190 acres of surface water for aquatic and waterfowl habitat.	Create 190 acres of surface water for aquatic and waterfowl habitat.	Create 190 acres of surface water for aquatic and waterfowl habitat.	Create 190 acres of surface water for aquatic and waterfowl habitat.
	Improve stream ecosystems by trapping 797 acre-feet of sediment.	Improve stream ecosystems by trapping 486 acre-feet of sediment.	Improve stream ecosystems by trapping 561 acre-feet of sediment.	Improve stream ecosystems by trapping 797 acre-feet of sediment.	Improve stream ecosystems by trapping 797 acre-feet of sediment.	Improve stream ecosystems by trapping 797 acre-feet of sediment.	Improve stream ecosystems by trapping 797 acre-feet of sediment.
C. Quality considerations of water, land, and air resources	Reduce erosion on 5.9 miles of stream channel.	No Effect	Reduce erosion on 5.9 miles of stream channel.	No Effect	No Effect	No Effect	No Effect
Regional Development							
State of Ohio							
A. Income:							
Beneficial Effects	1,744,781	1,522,730	590,974	1,748,748	1,622,013	1,534,456	1,795,253
Adverse Effects	890,407	646,044	545,554	815,169	810, 015	854,691	926,639
Net Beneficial Effects	854,374	876,686	45,420	933,579	811,998	679,765	868,614

SUMMARY COMPARISON OF ALTERNATIVE PLANS

South Fork Licking River Watershed, Ohio

Account	Selected Plan	National Economic Development Plan	Environmental Quality Plan	Plan 1	Plan 2	Plan 3	Plan 4
B. Employment:							
Agricultural Employment	18.9 man-years of employment in agricultural production.	11.3 man-years of employment in agricultural production.	9.4 man-years of employment in agricultural production.	19.1 man-years of employment in agricultural production.	13.5 man-years of employment in agricultural production.	12.3 man-years of employment in agricultural production.	23.6 man-years of employment in agricultural production.
Recreation Service Sector	3 permanent skilled, 4 permanent seasonal semi-skilled, and 11 permanent unskilled jobs.	3 permanent skilled, 4 permanent seasonal semi-skilled, and 11 permanent unskilled jobs.	2 seasonal permanent unskilled jobs.	3 permanent skilled, 4 permanent seasonal semi-skilled, and 11 permanent unskilled jobs.	3 permanent skilled, 4 permanent seasonal semi-skilled, and 11 permanent unskilled jobs.	3 permanent skilled, 4 permanent seasonal semi-skilled, and 11 permanent unskilled jobs.	3 permanent skilled, 4 permanent seasonal semi-skilled, and 11 permanent unskilled jobs.
Project Construction	159.5 semi-skilled jobs for 1 year.	105.5 semi-skilled jobs for 1 year.	103.1 semi-skilled jobs for 1 year.	141.3 semi-skilled jobs for 1 year.	139.1 semi-skilled jobs for 1 year.	163.5 semi-skilled jobs for 1 year.	168.4 semi-skilled jobs for 1 year.
Project O&M	1.4 permanent semi-skilled jobs.	1.0 permanent semi-skilled jobs.	1.1 permanent semi-skilled jobs.	1.2 permanent semi-skilled jobs.	.5 permanent semi-skilled jobs.	.5 permanent semi-skilled jobs.	1.2 permanent semi-skilled jobs.
Social Well-Being	Reduce urban flooding by 89.3 percent.	Reduce urban flooding by 85.4 percent.	Reduce urban flooding by 84.6 percent.	Reduce urban flooding by 89.3 percent.	Reduce urban flooding by 91.6 percent.	Reduce urban flooding by 80.5 percent.	Reduce urban flooding by 70.8 percent.

NOTE: Land treatment effects were not evaluated. Land treatment costs for all plans are $2,687,900.
Included in each alternative is:
NED Plan: Hebron diking, I-70 bypass, relocation of one high hazard property, one floodwater retarding structure, one multipurpose structure, and recreational facilities.
EQ Plan: Hebron diking, I-70 bypass, Heath critical area stabilization, wetland protection, fish barrier, relocation of one high hazard property, two floodwater retarding structures, one multipurpose structure, Raccoon Creek obstruction removal, and recreational facilities.
Plan 1: Hebron diking, I-70 bypass, South Fork channel work and obstruction removal, 5 floodwater retarding structures, one multipurpose structure, relocation of one high hazard property, and recreational facilities.
Plan 2: Hebron diking, Bell-Beaver diversion, South Fork obstruction removal, 5 floodwater retarding structures, one multipurpose structure, relocation of one high hazard property and recreational facilities.
Plan 3: Hebron diking, channel work on existing route, South Fork obstruction removal, 5 floodwater retarding structures, one multipurpose structure, relocation of one high hazard property, and recreational facilities.
Plan 4: Hebron diking, I-70 bypass, South Fork channel work and obstruction removal, 5 floodwater retarding structures, one multipurpose structure, relocation of one high hazard property, Raccoon Creek diking, and recreational facilities.

APPENDIX C

LETTERS OF COMMENT RECEIVED ON DRAFT ENVIRONMENTAL IMPACT STATEMENT

JAN 2 - 1980

DEPARTMENT OF THE ARMY
HUNTINGTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 2127
HUNTINGTON, WEST VIRGINIA 25721

REPLY TO
ATTENTION OF:
ORHPD-R

18 December 1979

Mr. David O. Kile
Asst. State Conservationist (WR)
U.S. Department of Agriculture
Soil Conservation Service
303 Old Federal Building
Columbus, OH 43215

Re: Draft Watershed Plan and Environmental Impact Statement for South Fork Licking River Watershed, Licking, Perry, and Fairfield Counties, Ohio

Dear Mr. Kile:

Reference is made to your correspondence of 20 November 1979, subject as above, requesting comments concerning the adequacy of the statement on matters of environmental concern to this agency and comments relative to adverse effects on hydraulics and on river and flood control projects.

Members of my staff have reviewed the statement with respect to the specific interest and jurisdiction of the U.S. Army Corps of Engineers, and find no significant impact from the project upon navigation, river hydraulics or flood control projects. The following comment is provided however, to aid you in your planning process.

The Corps has permit jurisdiction on the South Fork of Licking River and its associated tributaries, under Section 404 of the Clean Water Act. Under Section 404, a Department of the Army Permit is required prior to the discharge of dredged or fill material into waters of the United States, natural lakes and adjacent wetlands. Any stream work, channel relocation, construction, or alteration of existing streams or adjacent wetland that involves the deposit of dredged or fill material will require a Department of the Army Permit before construction is begun.

ORHPD-R 18 December 1979
Mr. David O. Kile

We respectfully suggest that application for a permit be made as early as possible in the planning process. Application forms and instructions concerning permits should be directed to Mr. Arlie D. Bishop of the Permit Section, Waterways Management Branch, Operations Division, at AC 304-529-5210.

The opportunity to review the statement is appreciated.

Sincerely,

JAMES H. HIGMAN
Colonel, Corps of Engineers
District Engineer

SEP 14 1979

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333

September 11, 1979

Mr. Robert E. Quilliam
U.S. Department of Agriculture
Soil Conservation Service
200 North High Street
Room 522
Columbus, Ohio 43215

Dear Mr. Quilliam:

We have reviewed the Draft Watershed Plan and Environmental Impact Statement (EIS) for South Fork Licking River Watershed, Licking, Perry, and Fairfield Counties, Ohio. We are responding on behalf of the Public Health Service.

It is stated that "vector control, where necessary, will be accomplished through the use of local drainage and with approved insecticides." Surveys of flood control reservoirs on such projects have shown that with proper shoreline maintenance, vector mosquito production is not a serious problem. The multipurpose reservoir could become an important source of mosquitoes and the final EIS should contain a provision in the operation and maintenance section for control if the need arises. Items to be addressed should include, but not be limited to, types of control planned, types of insecticides, and the manner and rate of application.

The final EIS should provide detailed descriptions of the sanitary facilities planned in the recreational areas. Items which should be discussed include: number of people served by each facility, number and size of facilities, proposed schedule for servicing and pumping the facilities, the proposed final disposition of the pumped effluent from the vault toilets and the trailer dump station, and a description of the planned disposal for the grey water from the showers and other sources.

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

Sincerely yours,

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

SEP 25 1979

United States Department of the Interior

OFFICE OF THE SECRETARY
NORTH CENTRAL REGION
[illegible] WEST JACKSON BOULEVARD
CHICAGO, ILLINOIS [illegible]

ER 79/770

September 21, 1979

Mr. Robert E. Quilliam, State Conservationist
U.S. Soil Conservation Service
200 N. High Street, Room 722
Columbus, Ohio

Dear Mr. Quilliam:

We have reviewed the draft environmental impact statement and draft watershed plan for the South Fork Licking River Watershed, Licking, Perry and Fairfield Counties, Ohio, within our areas of jurisdiction and expertise. We find the statement is inadequate in its consideration of certain environmental resources, and offer the following comments.

GENERAL COMMENTS

The draft environmental statement is inadequate in assessing the impacts that certain structural measures will have on existing riparian habitats. Examination of alternative sites for the seven proposed impoundments appears to have been done superficially, especially in regard to the Coon Hollow site.

By letter of August 21, 1979, the office of the Ohio State Historic Preservation Officer (SHPO) recommended that additional survey be conducted to identify properties eligible for the National Register of Historic Places, and to determine the effect of the undertaking on recorded properties and sites. We support the SHPO's recommendation, and urge that the proposed survey work be undertaken.

SPECIFIC COMMENTS

Watershed Plan

Page P-2-6, items 8 and 9. This section contains information concerning construction measures for the dry structure and spillway proposed for Coon Hollow. It is stated that minimal clearing will be necessary to construct these structures. We believe this statement is inaccurate. The positioning of the dry structure in the middle of the project site and construction of the spillway will destroy a large, not minimal, portion of the excellent fish and wildlife habitat located within Coon HOllow. After examination of detailed plans for the Coon HOllow structure, we believe that the dry structure and

proposed spillway are nearly as environmentally damaging as the permanent structure originally proposed. Therefore, the final documents should address in detail the possibility of eliminating the Coon Hollow site entirely, either by relocating the site, or by providing additional storage at other sites.

Draft Environmental Impact Statement

The DEIS shows the need for permits from the Corps of Engineers for construction of stream improvement structures as part of the proposed plan. Under these circumstances, the U.S. Fish and Wildlife Service (FWS) will be commenting to the Corps on the permit applications. While the FWS would like to be totally responsive on all such permits, site-specific information concerning construction areas will not be known until final design plans are completed. We anticipate that the FWS will not object to the issuance of any permits on this project as long as they are consistent with the DEIS, the recommendations of the interagency mitigation team, and the recommendations made in the FWS's report dated May 8, 1978. Accordingly, these comments do not preclude additional and separate comments, pursuant to the Fish and Wildlife Coordination Act, when FWS reviews the permit applications.

Page E-8-1, Paragraph 4. Although it is recommended that the sponsors enact ordinances preventing further development in the flood plain, it is not clear whether such ordinances will in fact be enacted. Would the project go forward without such ordinances, and what is the likelihood of new developments raising flood damages to the pre-project level?

Sincerely,

David L. Jervis

David L. Jervis
Regional Environmental Officer

SEP 18 1979

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS: G-WS/TP11
U.S. COAST GUARD
WASHINGTON, D.C. 20590
PHONE: (202) 426-2262

12 SEP 1979

Mr. Robert E. Quilliam
State Conservationist
United States Department of Agriculture
Soil Conservation Service
Columbus, Ohio 43215

Dear Mr. Quilliam:

This is in response to your 26 July 1979 letter concerning the draft environmental impact statement on the South Fork, Licking River Watershed, Ohio.

The material submitted has been reviewed by concerned operating administrations and staff of the Department of Transportation. We offer the following comments:

1. Roadway and bridge designs should meet applicable State and Federal design standards. The plans should be submitted to the Ohio Department of Transportation(ODOT) for review.

2. Construction of the roadways and bridges should be in accordance with State specifications and subject to State inspection.

3. All work to be done on State right-of-way in conjunction with the by-pass channel along I-70 will require a permit. The permit will be coordinated with ODOT and submitted to the Division office for approval.

4. We suggest that the screen planting along I-70 be coordinated with ODOT and be consistent with ODOT/FHWA landscape design guidelines.

5. Any effects of the improvements along I-70 on the highway drainage should be addressed. Include any modifications that will be necessary to the highway drainage facilities.

The Department of Transportation has no other comments or objections to this draft environmental impact statement.

The opportunity to review this draft statement is appreciated.

Sincerely,

[redacted]
Captain, U.S. Coast Guard
Deputy Chief, Office of Marine
[redacted]
By direction of the Commandant

SEP 25 1979

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN ST
CHICAGO, ILLINOIS 60604

21 SEP 1979

Mr. Robert E. Quilliam
State Conservationist
U.S. Department of Agriculture
Soil Conservation Service
200 North High Street
Room 522
Columbus, Ohio 43215

RE: 79-050-935
D-SCS-F36062-OH

Dear Mr. Quilliam:

We have completed our review of the Draft Environmental Impact Statement (EIS) for the South Fork Licking River Watershed in Licking, Fairfield, and Perry Counties, Ohio dated July 1979, which consists of six flood retarding reservoirs, one multipurpose flood retarding-recreation reservoir, two recreational developments, a flood prevention dike, and stream channel improvements. We have classified our attached comments as ER-2. Specifically, this means that we have reservations regarding the environmental impacts of the proposal, and we believe additional information should be provided in the Final EIS. The classification and the date of our comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions under Section 309 of the Clean Air Act.

The major topic we would like to see addressed in the Final EIS is the deterioration of both water quality and wildlife habitat as affected by the seven reservoirs and stream channel improvements. Other topics we feel should be addressed are: analysis of air and noise impacts associated with the expected 179,840 recreational visits per year to the proposed facilities within the watershed, and a more detailed presentation of soil information for the area, in as much as conserving the soil is one of the primary intents of the project.

The following comments are for your use in preparing the Final EIS. If you have any questions regarding our categorization procedures or our comments, please contact Rick Pitorak, at 312/353-2307.

Sincerely yours,

William D. Franz

for Barbara J. Taylor, Chief
Environmental Impact Review Staff
Office of Federal Activities

Attachments

COMMENTS BY THE U.S. ENVIRONMENTAL PROTECTION AGENCY
ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE
SOUTH FORK LICKING RIVER WATERSHED, OHIO

WATER

The impacts on water quality within the proposed reservoirs and downstream releases need to be examined in greater detail in the Final EIS. Low dissolved oxygen concentrations, the potential for prolonged thermal stratification, and increased stream temperature all need to be examined more fully.

Low dissolved oxygen concentrations in the summer months may be even further reduced by low flows associated with the proposed reservoirs. The streams within the watershed are classified by the Ohio EPA as warm water habitat. Ohio EPA standards require 5 mg/l dissolved oxygen for 16 hours and 4 mg/l for the remaining eight hours in these waters. As test results show seven locations in violation of this standard, steps must be taken to upgrade rather than degrade the water quality. The 5 mg/l dissolved oxygen is a minimum concentration required to maintain good fish populations; mitigative measures should be employed to increase the dissolved oxygen content of the water.

The potential for prolonged thermal stratification in the reservoirs is not adequately addressed. Elevation of stream temperature will likely be an impact of the project, yet alternatives for mitigation of this problem and effects that can be expected from a temperature rise are not included in the EIS. The EIS states that as long as this does not occur and spillway outlets are located above the thermocline, nutrient loads will be reduced on the downstream side. Mitigative measures should be employed to insure that this will be the case, and that nutrient loads are in fact reduced.

Overall, the impact of changing 4.4 miles of stream into six sediment pools and one permanent pool will be to degrade water quality in certain important aspects. Mitigative measures such as the use of shade trees, discharging from a deeper layer of a reservoir provided water quality is suitable, and aeration of the water should be considered. Maintaining the present quality of the water is essential, but improvement is most definitely desirable. Assurances should be obtained, before project implimentation, that applicable State water quality standards will be achieved and maintained.

WILDLIFE HABITAT

The impact of the proposed project on wildlife needs to be examined in the Final EIS. Both terrestrial and aquatic habitats will be altered by the project. The statement that periodic flooding above impoundments will do little damage to terrestrial habitats is not substantiated. Flooding will occur when ground nesting species are active. The affected areas should be evaluated more thoroughly and mitigative measures suggested to counteract the loss of habitat. Also, the impact on the aquatic habitat of obstruction removal on 18.2 miles of stream needs to be more fully examined.

AIR AND NOISE

Analysis of the air and noise impacts of the expected 179,840 recreational visits per year to the proposed facilities within the watershed needs to be provided in the Final EIS.

SOIL

The impacts of the proposed project on the soil resource base, as well as the impacts of the soil resource base on the proposed project, need to be examined in greater detail. The protection of the soil resource base, spreading of channel spoil, and utilization of more detailed soil information need to be examined more fully.

One of the primary purposes of the project is to reduce erosion, thus reducing sediment loads and improving water quality. Since erosion rates are estimated to be above T values for IIe, IIIe, and IVe land, the land should be adequately treated as early in the project as possible, in order to get back within the allowable soil loss. Adequate land treatment measures will result in increased infiltration, higher water holding capacity, increased permeability, and, of course, reduced runoff. The time table for land treatment should be reevaluated and, if possible, revised to expedite conservation treatment of the land.

The EIS indicates that spoil materials removed during channel work are generally suitable for spreading on cropland with very little data for substantiation. An on-site soil investigation would yield information regarding spoil areas with the most suitable physical characteristics relating to tilth. These materials should be stockpiled and used to provide a favorable plow layer for future cropping. Consideration should be given to stripping off and stockpiling top soil from areas of cropland designated for the spreading of spoil. It could later be used to provide a favorable seedbed once channel work is complete. The pollutional nature of the spoil material should also be considered. Such parameters as pH, toxic and/or organic chemical contamination as well as possible sources of pollution need to be determined. Spreading of infertile or polluted sediments should be avoided.

The quality of soil information, in general, within the Draft EIS is considered inadequate. In as much as the soil is one of primary resources that the proposed project will protect, we think that a more detailed treatment of it should be included in the Final EIS. If a detailed soil survey (i.e., at a scale of approximately 4" = 1 mile) is not available for the area, it should be completed before the project proceeds. A copy of the detailed map of the area should be included in the Final EIS, along with a mapping legend and all necessary interpretive data pertinent to the project. Only by reviewing a detailed breakdown of the soil resource base can suitable decisions be made regarding its treatment and adequate protection.

SEP 26 1979

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

SEP 19 1979

OFFICE OF EQUAL OPPORTUNITY

IN REPLY REFER TO: 8140 Supplement 8

SUBJECT: Draft Plan and Environmental Impact Statement, South Fork Licking River Watershed, Ohio

TO: Robert ~~E. Quilliam~~ Shaw
State Conservationist

THRU: Verne M. Bathrust
Deputy ~~Administrator~~ for Administration, SCS

We have reviewed the Draft Statement with particular interest in your assessment of the effects, if any, the proposed actions will have on minority populations (SCS Guidelines for Compliance With NEPA, 7 CFR 650.8(b)(3)). The Draft Statement makes no reference to this requirement.

Although it may be assumed that the fact of a small minority population in the Watershed and the extensive public participation process that has characterized the project to date minimizes any civil rights impacts, the Final Statement should specify that these impacts have been identified and dealt with. The Final Statement should conclude that no adverse effects upon minority persons will result.

The Draft Statement states, at page E-5-10, that "all recreation developments will be designed to provide access to the physically handicapped." Perhaps the Final Statement will include the specific features alluded to in this statement and, also, will state that the handicap accessibility plans have been declared adequate by handicapped organizations reviewing the plans.

Thank you for the opportunity to review and comment on your plan.

Jacqueline G. Sutton

JAMES FRAZIER
Director

AUG 27 1979

FEDERAL ENERGY REGULATORY COMMISSION

WASHINGTON 20426

August 20, 1979

Robert E. Quilliam
State Conservationist
Soil Conservation Service
U.S. Department of Agriculture
200 North High Street, Room 522
Columbus, Ohio 43215

Dear Mr. Quilliam:

I am replying to your request of July 26, 1979 to the Federal Energy Regulatory Commission for comments on the Draft Environmental Impact Statement for the South Fork Licking River Watershed Plan, Ohio. This Draft EIS has been reviewed by appropriate FERC staff components upon whose evaluation this response is based.

The staff concentrates its review of other agencies' environmental impact statements basically on those areas of the electric power, natural gas, and oil pipeline industries for which the Commission has jurisdiction by law, or where staff has special expertise in evaluating environmental impacts involved with the proposed action. It does not appear that there would be any significant impacts in these areas of concern nor serious conflicts with this agency's responsibilities should this action be undertaken.

Thank you for the opportunity to review this statement.

Sincerely,

Jack M. Heinemann
Advisor on Environmental Quality

AUG 16 1979

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
Northeastern Area, State & Private Forestry
180 Canfield St., Morgantown, WV 26505

REPLY TO: 3510

August 10, 1979

SUBJECT: Draft EIS and Plan for South Fork Licking River Watershed

TO: Robert E. Quilliam, State Conservationist
USDA Soil Conservation Service
Federal Building Room 522
200 North High Street
Columbus, Ohio 43215

Dear Mr. Quilliam:

We have reviewed the Draft Environmental Impact Statement and Watershed Plan for the South Fork Licking River Watershed, Ohio. We have no comments.

Floyd L. Wiles

FLOYD L. WILES
Field Representative

SEP 28 1979

STATE CLEARINGHOUSE

30 EAST BROAD STREET • 39TH FLOOR • COLUMBUS, OHIO 43215 • 614 / 466-7461

September 26, 1979

Robert E. Quilliam
United States Department of Agriculture
Soil Conservation Service
200 North High Street, Room 522
Columbus, Ohio 43215

RE: Review of Environmental Impact Statement/Assessment
Title: Draft-South Fork Licking River Watershed Plan and Environmental Impact Statement. Licking, Perry, and Fairfield Counties, Ohio
SAI Number: 36-445-0002

Dear Mr. Quilliam:

The State Clearinghouse coordinated the review of the above reference draft environmental impact statement.

The Ohio Department of Transportation and the Soil Conservation Service should do further work with respect to plan development. An agreement will be needed between the Ohio Department of Transportation, Soil Conservation Service and the South Licking Watershed Conservancy District to specify responsibilities of each agency. Details were not given with respect to the amount of encroachment that is to occur on I-70 R/W to build the by-pass channel. Details should also be included on the estimated construction and added maintenance cost for the new bridge which will carry SR-37 over the By-Pass Channel. The Ohio Department of Transportation defined its concerns in the attached letter.

An additional survey should be conducted to identify properties eligible for the National Register, and to determine the effect of the undertaking on recorded properties and sites. This should be accomplished during the preparation of the Final Environmental Impact Statement or addressed in the Final Environmental Impact Statement and accomplished prior to project construction. While some archeological surveys have already been conducted, the Ohio Historical Society has indicated in its attached comments other sites that should be surveyed.

It is important that the watershed plan maximize benefits to the South Fork Licking River basin residents with a range of structural and management solutions acceptable to the various, and sometimes competing, interests. Several concerns have been made in reference to structural measures and recreation improvements proposed under the planned project:

1. If the structure location and dimensions remain the same as originally proposed for a permanent pool reservoir, the Coon Hollow Reservoir will not have much mitigative value.

2. The establishment of a recreational river segment may encourage stepped-up efforts to improve point and non-point sources of water pollution.

3. Park planning and design services should be included in order to develop quality recreation areas and avoid any future use problems.

4. The proposed layout of the Lobdell recreation area should be reconsidered to reduce traffic problems.

5. The provision of improvements for boating at the Lobdell impoundment should be re-evlauated.

6. The use of internal combustion engines on the lake should be restricted or prohibited.

7. Detailed plans for the by-pass are required in order to assess the impact on the Ohio and Erie Canal.

Additional concerns relate to the need for protecting the watershed's fish and wildlife resources and other natural resource values:

1. The major wildlife problems center around the South Fork Licking River basin's degraded and decreasing habitat base.

2. There is very little information in the environmental statement which qualifies or quantifies wildlife habitant values.

3. The recommendations for mitigation (p. E-5-20) and the work of the interagency mitigation team should hold long-term adverse impacts to fish and wildlife resources to a minimum. (See also No. 1 of the watershed comments).

4. Additional consideration should be given to the importance of instream structures and stream bank vegetation as fish and wildlife habitat.

5. One-sided construction in channel modification areas is a commendable practice, but the project plan and environmental statement should recognize the importance of retaining shade-providing vegatation.

6. There are extensive deposits of sand and gravel (kames and outwash) in the watershed that are of potential economic value.

7. The U.S. Soil Conservation Service should coordinate closely with the Ohio Department of Transportation and Department of the Army, Corps of Engineers. The waterway opening for the State Route 79 bridge could be affected by the results of the Corps' study.

Attached please find a letter from the Ohio Department of Natural Resources giving detailed information on the above listed concerns.

All the comments should be taken into consideration as you proceed with the development of your final environmental impact statement.

Upon completion of your final environmental impact statement, please forward five (5) copies to the State Clearinghouse for further review and comment.

Thank you for the opportunity to review this draft environmental impact statement and watershed plan.

Sincerely,

Judith Y. Brachman

Judith Y. Brachman
Administering Officer

JYB:frm

cc: DNR, Mike Colvin
OHS, Bert Drennen
ODOT, R.E. Catlin
EPA, Gene Wright -

OHIO Department of TRANSPORTATION

James A. Rhodes/Governor
David L. Weir/Director
25 South Front Street
P. O. Box 899
Columbus, Ohio 43216

September 20, 1979

Judith Y. Brachman
Administering Officer
State Clearinghouse
State Office Tower
30 East Broad Street
Columbus, Ohio 43215

Re: State Clearinghouse A-95 Review
Project Title: Draft South Fork Licking River Watershead Plan and EIS
SAI No.: 36-445-0002

Dear Ms. Brachman:

The E.I.S. report does not give any details with respect to the amount of encroachment that is to occur on I-70 R/W to build the by-pass channel. They do indicate that some I-70 R/W will be utilized to dispose of the material excavated from the new channel and to form a barrier between I-70 and the channel.

ODOT has agreed in principle to this arrangement providing there is no interference with drainage or safety standards for I-70.

The economic benefits listed on page P-4-1 as Transportation benefits are unsupported and are therefore questionable.

A new bridge will be required to carry SR-37over the By-Pass Channel. There is no estimated cost for this bridge nor is there any consideration given to the added cost by ODOT for maintaining a bridge as opposed to normal roadway maintenance.

There is much coordination yet to be done between ODOT and SCS with respect to plan development. Also there will be need for an agreement between ODOT - SCS - and the South Licking Watershead Conservancy District to specify responsibilities of each agency. ODOT approval of the Watershead Plan and EIS is conditioned to no ODOT financial contribution for construction or assessment for benefits.

Very truly yours,

R. E. Catlin,
Liaison Officer
ODOT Clearinghouse

REC:lje

hio Historic Preservation Office
o Historical Center I-71 & 17th Avenue Columbus, Ohio 43211 (614) 466-150

August 21, 1979

Robert E. Quilliam
State Conservationist
Soil Conservation Service
200 North High Street
Columbus, Ohio 43215

Re: Draft Watershed Plan and E.I.S.
South Fork Licking River Watershed

Dear Mr. Quilliam:

This office has received a copy of the Draft EIS and Watershed Plan for the South Fork Licking River Watershed in Licking, Perry and Fairfield Counties, Ohio. The Ohio Historic Preservation Office sent you letters on October 6 and November 18, 1975, commenting on the archaeological survey report referred to on page E-6-15 of the DEIS. It states that, "the survey was undertaken to determine the scope of the channel work and the choice of impoundments to be constructed." On page E-13-2 it states that the recommendations of the report were observed in project formulation. The archaeological survey reported the results of investigations in 31 proposed reservoir areas and the channelization projects along Raccoon Creek and the South Fork. Based upon the survey it was our opinion that three of the sites located were eligible for inclusion in the National Register of Historic Places. These three areas were not selected for reservoir construction and the Soil Conservation Service is to be commended on using the archaeological survey report as a planning tool in the decision making process.

However, the report recommends additional work in several reservoir areas if they were selected for construction. One of these was the Lobdell Creek Reservoir and on page 21 of the report it states that a large peninsular area near the central part of the reservoir site was in woods, pasture and weeds at the time of the field study and is worth further attention. Additionally only the reservoir area was surveyed in 1975 and the area to be developed for recreational use was never evaluated for archaeological potential. Three other reservoir areas were not included in the preliminary archaeological reconnaissance as they were not a part of the original watershed plan. The Big Hollow Reservoir, Coon Hollow Reservoir and Etna Reservoir must be surveyed to determine the effects of the proposed SCS- assisted project pursuant to 7 CFR 656.6 and 36 CFR 800.

Since 1975, other archaeological surveys have been conducted in portions of the South Fork Watershed such as "An Archaeological Survey of the Poston - Kirk Transmission Line" which located three additional sites along the South Fork Licking River just southeast of Pataskala. This office was never asked to comment on the Hebron Dike construction and no survey was conducted for that portion of the project. Land acquisition for House 144 in Granville was never coordinated with us to determine if it had historical or architectural significance. The DEIS does not address properties currently listed in the National Register of Historic Places located within the watershed such as the three historic structures in Granville and the Ohio Canal Groundbreaking Site in Heath. There are additional properties listed in Newark including the Newark Earthworks which is listed as a National Historic Landmark and the Licking County Courthouse. Cranberry Bog in Licking County is also listed in the National Register of Natural Landmarks.

In summary, we are recommending that additional survey be conducted to identify properties eligible for the National Register and determine the effect of the undertaking on recorded properties and sites. This should be accomplished during the preparation of the Final EIS or addressed in the Final EIS and accomplished prior to project construction. This office can provide a list of qualified professional archaeologists certified by the Ohio Archaeological Council to conduct the additional assessment surveys. We can also provide technical assistance in requesting determinations of eligibility and preparing preliminary case reports for the Advisory Council on Historic Preservation.

We look forward to receiving the additional documentation and coordination necessary for the protection of cultural resources within the South Fork Licking River Watershed.

Sincerely,

BCD

Bert C. Drennen, Head
Review and Compliance Department

BCD:cw

X. c: Jack Goldstein, ACHP, Washington, D. C.
Frank D. Jones, HCRS, Ann Arbor, Michigan
David L. Jervis, D.O.I., Chicago
Judith Brachman, State Clearinghouse

DRAFT OF A PROPOSED MEMORANDUM FROM THE SECRETARY OF AGRICULTURE CONCERNING CULTURAL RESOURCES*

Enhancement, Protection, and Management of Cultural Resources

Policy

The nonrenewable cultural resources of our country constitute a valuable and treasured portion of the national heritage of the American people. The Department of Agriculture is committed to the management--identification, protection, preservation, interpretation, evaluation, and nomination--of our prehistoric and historic resources for the benefit of all American people of this and future generations. The Department supports the cultural resource goals expressed in the National Historic Preservation Act of 1966 (specifically Section 106), Executive Order 11593 of 1971 "Protection and Enhancement of the Cultural Environment," the Archaeological and Historic Preservation Act of 1974, the Public Buildings Cooperative Use Act of 1976, Executive Order 12072, "Federal Space Management," and, most recently, the Regulations promulgating Section 106 of the 1966 Act (36 CFR 800) adopted by the Advisory Council for Historic Preservation. The Department will aggressively implement these historic policies to meet cultural resource management goals.

Implementation

It is the intent of the Department to carry out the program of cultural resource management in the most efficacious and efficient manner possible. Implementation must include appropriate priorities for resource utilization, exemplify good government, and constitute a non-inflationary approach which makes the best use of tax dollars. This commitment to cultural resource protection, while vital, must be balanced with the multiple goals of the Department food and fiber production, environmental protection, natural resource and energy conservation, and rural development. It is essential that all these programs be managed to reduce conflicts. In reaching decisions, the long-term needs of society and the irreversible nature of an action must be considered. The Department must act to preserve future options; loss of important cultural resources must be avoided except in the face of overriding national interest where there are no reasonable alternatives.

Direction to Agencies

Each Agency of the Department shall develop its own specific direction for implementing the 36 CFR 800 Regulations, Section 106 of the National Historic Preservation Act, and Executive Order 11593, in accordance with the Agency's programs, mission, and legislation. These implemeting procedures shall be published in draft and final forms in the Federal Register, and must be consistent with the requirements of 36 CFR Part 800. Each Agency's directive must additionally contain mechanisms to insure:

(1) Identification of all National Register and eligible properties that may be affected by the proposal;

*This will be formally introduced as a Regulation rather than a Memorandum.

(2) Early consultation with, and involvement of, the State Historic Preservation Officer and others with cultural interests/expertise;

(3) Early notification and meaningful involvement of the public in the Agency's decision-making process as it relates to cultural resources;

(4) Identification and consideration of alternatives to the proposed undertaking; and

(5) The funding of mitigation measures where required to minimize the potential to adversely affect cultural resources.

Each Agency of the Department must recruit, place, and develop, or otherwise have available, professional expertise in anthropology, archaeology, history, historic preservation, historic architecture, and/or cultural resource management (depending upon specific need) to develop and direct the program of the Agency. Such arrangements may include internal hiring, position sharing by Agencies, Intergovernmental Personnel Act, memoranda of agreement with other Agencies or Departments, or other mechanisms which insure a professionally directed program.

Compliance with cultural resource legislation is the responsibility of each individual Agency. Cultural resource values must be considered during the earliest planning stages of any undertaking. Cultural resource review requirements and compliance with Section 106 of the National Historic Preservation Act shall be integrated with the other environmental considerations under the National Environmental Policy Act (NEPA) regulations and shall run concurrently, rather than consecutively. As such, primary and secondary impacts on cultural resources must be addressed in the environmental assessment for every agency undertaking. In meeting these requirements, Agencies shall be guided by regulations implementing the procedural provisions of the National Environmental Policy Act (40 CFR Parts 1500-1508) and Department of Agriculture regulations (7 CFR 3100.20 *et seq.*).

Each Agency is required to work closely with the appropriate State Historic Preservation Officer(s) in the preparation of State plans, determination of inventory needs, and collection of data relevant to general plans or specific undertakings in carrying out mutual cultural resource responsibilities.

Each Agency shall, to the maximum extent possible, use existing historic structures for administrative purposes, in compliance with the Public Buildings Cooperative Use Act of 1976 and Executive Order 12072 of 1978.

Responsibilities of Department of Agriculture

Within the Department, the responsibility for cultural resources is assigned to the Office of Environmental Quality Activities (OEQA). The office is responsible for reviewing the development and implementation of Agency procedures, and insuring Departmental commitment to cultural resource goals.

The Coordinator of the Office of Environmental Quality Activities is the Secretary's Designate to the Advisory Council on Historic Preservation (ACHP). In order to carry out cultural resource responsibilities, there will be professional expertise within the OEQA to advise Agencies, aid the Department in meeting its cultural resource management goals, and to insure that all Departmental and Agency undertakings comply with applicable cultural resource protection legislation and regulations.

The Office of Environmental Quality Activities will be involved in compliance only where resolution cannot be reached at the Agency level. Prior to an Agency decision to refer the matter to the full Council of the ACHP, the OEQA will review the case and make recommendations to the Secretary regarding the position of the Department. The Agency also will consult with the OEQA before reaching a final decision in response to the Council's comments. Copies of all correspondence relevant to Section 106 compliance cases shall be made available to OEQA.

This memorandum is intended to meet Departmental-level requirements under Section 106 of the National Historic Preservation Act. This memorandum supercedes Secretary's Memorandum No. 1760, "Protection and Enhancement of the Cultural Environment." Other previous memoranda relevant to cultural resources issued by the Secretary of Agriculture are hereby nullified.

Secretary of Agriculture

ODNR
Ohio Department of Natural Resources
OFFICE OF OUTDOOR RECREATION SERVICES
Fountain Square · Columbus, Ohio 43224 · (614) 466-4974

September 21, 1979

COMMENTS ON DRAFT WATERSHED PLAN & ENVIRONMENTAL STATEMENT
South Fork Licking River Watershed, Licking, Perry & Fairfield Counties, Ohio
[U.S. Department of Agriculture, Soil Conservation Service, March, 1979]

WATERSHED PLAN

The following comments are in reference to structural measures and recreation improvements proposed under the planned project:

1. Mitigation Plan for Structure Sites, Structures, p. P-2-6: The construction of a dry structure and minimum amount of clearing for the Coon Hollow Reservoir does not appear to have much mitigative value if the structure location and dimensions remain the same as originally proposed for a permanent pool reservoir. Table E-5-1 of the draft EIS estimates 10 acres of forest land to be committed to the dam, spillway, and outlet area of the reservoir, six acres will be required for the 100-year sediment deposition area, and nine acres of forest land would be included in the periodically inundated area. We would like to see the timber clearing plan and would encourage leaving timber standing where possible in water areas to provide fish and wildlife habitat.

2. The planned public recreation developments on the South Fork Licking River are appropriate for the most part (ref. Draft EIS, Appendix F). Establishment of a recreational river segment may encourage stepped-up efforts to improve point and non-point sources of water pollution.

   It is felt that some additional evaluation of the potential of the South Fork Licking River for canoeing should be included in the plan. Is the flow adequate for a reasonably sustained recreational season?

3. Structural Measures, p. P-5-3: The plan indicates that the Conservancy District will employ qualified private consulting firms for engineering services for recreational facilities. The Department concurs in this and strongly recommends that park planning and design services be included in order to develop quality recreation areas and avoid any future use problems.

4. Lobdell Creek Public Recreation Development (ref. Appendix E, Draft EIS): The proposed layout of the Lobdell recreation area should be reconsidered in order to reduce possible traffic bottlenecks and user/vehicle conflicts, particularly around the bathhouse/beach area. Extensive roadside parking in the picnic area should be discouraged to avoid conflicts between vehicles and users, traffic congestion, and unauthorized driving in picnic areas. While the Department has not made an analysis of adjacent land uses, it does appear that additional buffer would be in order for the various use areas, especially the camping areas.

   Another element of the plan which should be re-evaluated is the provision of improvements for boating at the Lobdell impoundment. The proposed facilities for Lobdell recreation pool are in excess for the size of the pool. Using a standard of 7.5 acres per boat, a dozen dock slips and one ramp are more than adequate to service this lake.

   Serious consideration should be given to restricting or prohibiting the use of internal combustion engines on the lake to avoid potential oil, gasoline, and noise pollution and to keep boating speeds at a reduced level to minimize potential for shore erosion and boating accidents.

4. The proposed I-70 area by-pass appears to impact a section of the Ohio and Erie Canal which the Ohio Department of Natural Resources' Canal Study has found to have recreational potential. Detailed plans for the by-pass are required in order to assess this impact.

DRAFT ENVIRONMENTAL STATEMENT

It is important that the watershed plan maximize benefits to the South Fork Licking River basin residents with a range of structural and management solutions acceptable to the various, and sometimes competing, interests. The Department is concerned that the proposed project give full consideration to effects on upstream and downstream property and environmental quality. These considerations must be weighed against the economic necessity or benefit to be derived from the project.* It is felt that the proposed project represents a reasonable attempt to stress multiple uses and land use based on the watershed's physical capabilities.

The remaining concerns of the Department relate to the need for protecting the watershed's fish and wildlife resources and other natural resource values:

* Ohio Department of Natural Resources, Stream Modification Policy, October 6, 1975.

1. Plant and Animal Problems, p. E-7-5: The major wildlife problems center around the South Fork Licking River basin's degraded and decreasing habitat base. Water quality factors including physical alterations in stream courses and sedimentation and high nutrient input are limiting factors affecting fisheries. Wildlife resources are concentrated in narrow stream corridors. Remaining desirable wildlife cover conditions occur primarily along streams since upland areas are used more extensively for agriculture.

2. Environmental Impact, Structural Measures, p. E-9-3: While land cover conditions and natural stream conditions to be changed by structural measures are quantified (Table E-9-2), there is very little information in the environmental statement which qualifies or quantifies wildlife habitat values. For example, it is known that alternative sites for retention reservoirs have varying wildlife and aquatic habitat values. The alternative sites also have differing runoff characteristics. The draft statement should at least address these factors and criteria for site selection because they are important in evaluating the potential impacts of the proposed structural measures.

3. Flood Prevention Reservoirs: Seven reservoirs are included in the selected plan. The recommendations for mitigation (p. E-5-20) and the work of the interagency mitigation team should hold long-term adverse impacts to fish and wildlife resources to a minimum.

   Regarding the discussion under Mitigation Plan, p. E-5-16, the Department is in general concurrence with the mitigation plan as stated above. However, as mentioned in Comment No. 1 on the watershed plan, there are serious reservations regarding the Coon Hollow site. Several field investigations by personnel from this Department and the U.S. Soil Conservation Service and U.S. Fish and Wildlife Service confirm that Coon Hollow exhibits excellent water quality, stream habitat, and diverse flora including distinct plant communities and examples of climax forest associations. Resident and migrant wildlife species are found here in great abundance. Further study of alternative reservoir sites should consider the natural and fish and wildlife values of each alternative. While specific hydrologic studies have not been conducted on the Coon Hollow site the area exhibits excellent vegetal cover and some surface depression and flood plain storage. Despite the presence of some steep slopes, this area has characteristics which naturally slow the rate of runoff. An estimate should be provided of the natural water retention capability of the existing area. This natural storage capacity should be compared to the storage capability of the reservoir to determine whether or not structural measures are justified.

4. Because of the extent and degree of channelization and channel clearing proposed, additional consideration should be given to the importance of instream structures and stream bank vegetation as fish and wildlife habitat.

   Along stream segments where only clearing of obstructions is proposed, trees determined to be potentially hazardous because they are destined to topple into the stream channel can be conserved by topping which would keep the tree roots alive. Exposed roots can be protected in certain instances by anchoring felled logs and branches to the stream bank. Elsewhere, anchoring logs and limbs can provide fish attractors and aquatic habitat. If engineered correctly, anchoring logs and brush against severely eroding stream banks will promote silt deposition at the erosion site. New growths of vegetation will further stabilize the formerly eroding bank.

5. One-sided construction in channel modification areas is a commendable practice. Generally, however, the project plan and environmental statement should recognize the importance of retaining where possible shade-providing vegetation not only for habitat value, but because such vegetation stabilizes stream banks and discourages the growth of undesirable sun-tolerant vegetation within the banks which can cause silt build-up in channelized areas, changing the stream course and creating potential erosion problems.

6. Physical Resources, p. E-6-3: It is stated that the watershed contains very few mineral resources of current commercial value. There are, however, extensive deposits of sand and gravel (kames and outwash) in the watershed that are of potential economic value. Although the proposed watershed improvements will probably result in some commitment of these resources, the impact as based on available data is not considered significant.

   On page E-6-3, second paragraph, "preconsolidated" should probably be changed to unconsolidated.

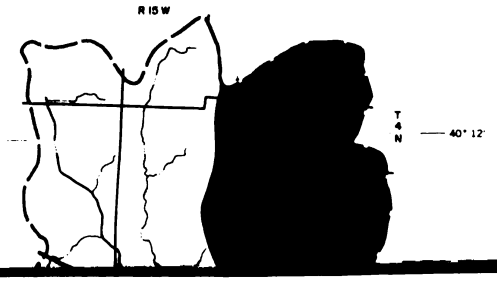
7. The U.S. Soil Conservation Service should coordinate closely with the Ohio Department of Transportation and Department of the Army, Corps of Engineers. The Buckeye Lake Hydraulics Study (Corps) may recommend improvements to the Buckeye Lake outlet. The waterway opening for the State Route 79 bridge (ODOT: Licking 79-4.60) could be affected by the results of the Corps' study. Temporary repairs of this bridge, proposed for replacement, should be considered until the results of this study have been finalized.

Finally, the Department supports the concept of reduced flood flows in the South Fork of the Licking River. Reduced flows will enable the Department at times to make increased water releases from Buckeye Lake, thus improving the safety factor of that dam.

APPENDIX D - Project Map

U.S. DEPARTMENT OF AGRICULTURE

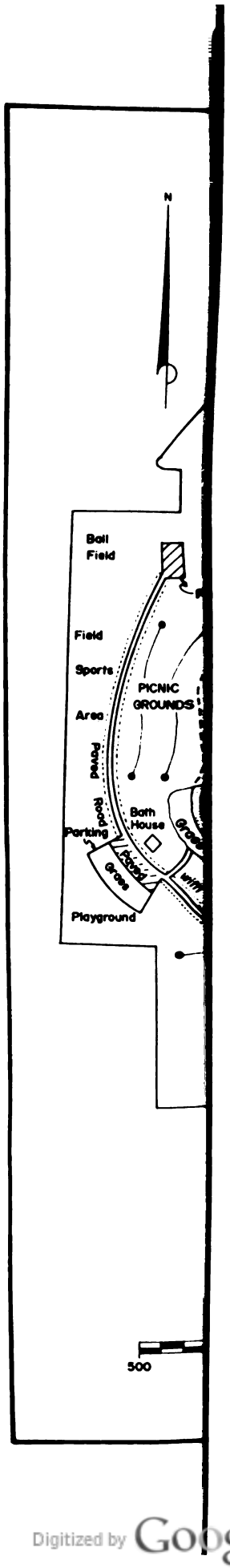
SOIL CONSERVATION SERVICE



LEGEND

- COUNTY BOUNDARY
- INCORPORATED TOWN
- UNINCORPORATED TOWN
- DRAINAGE
- INTERSTATE HIGHWAY

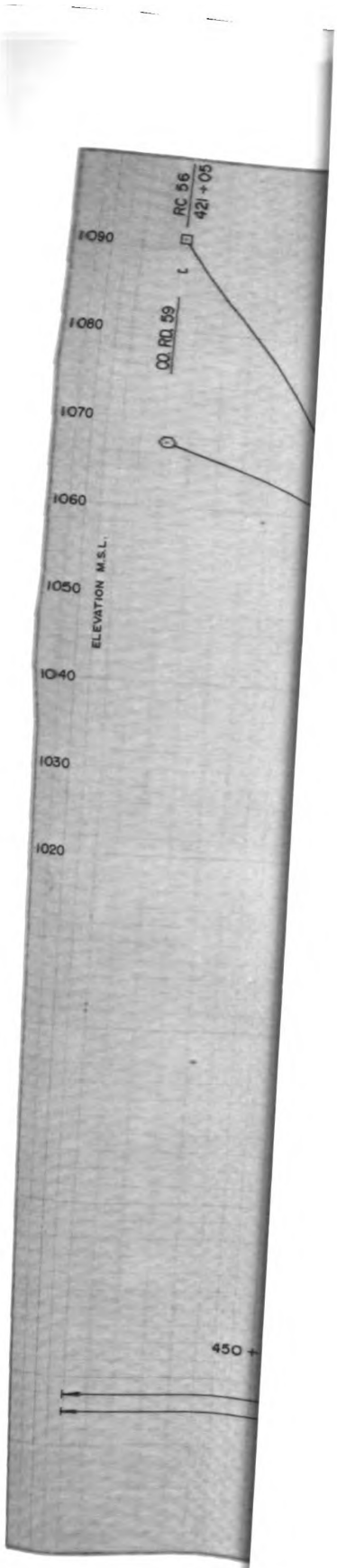
APPENDIX E - Lobdell Recreation Development

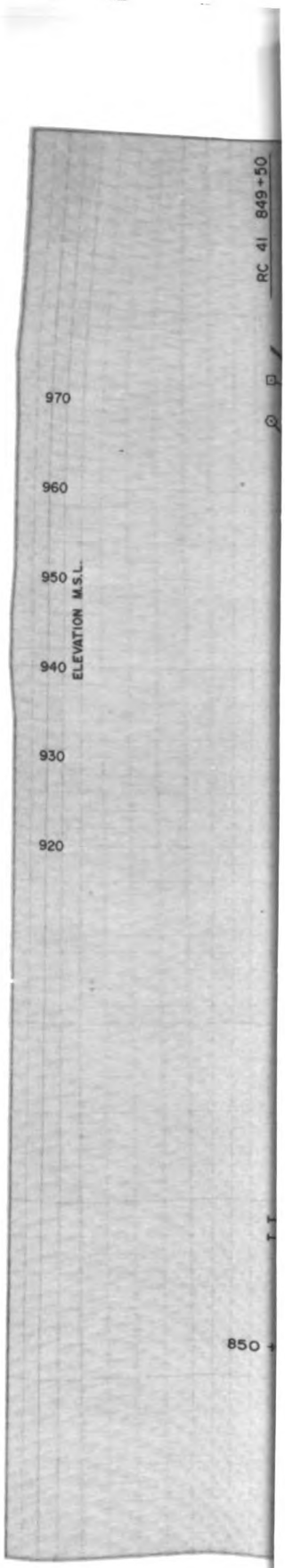


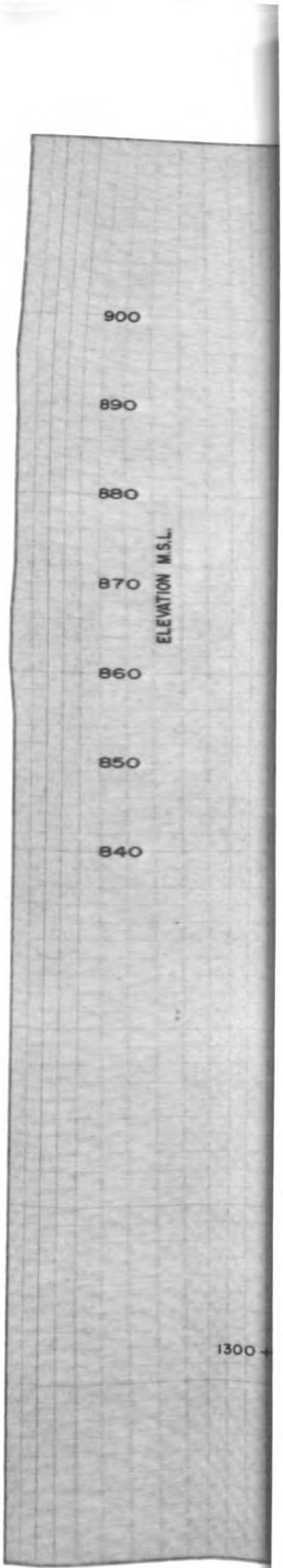
APPENDIX F - South Fork Channel Recreation Development

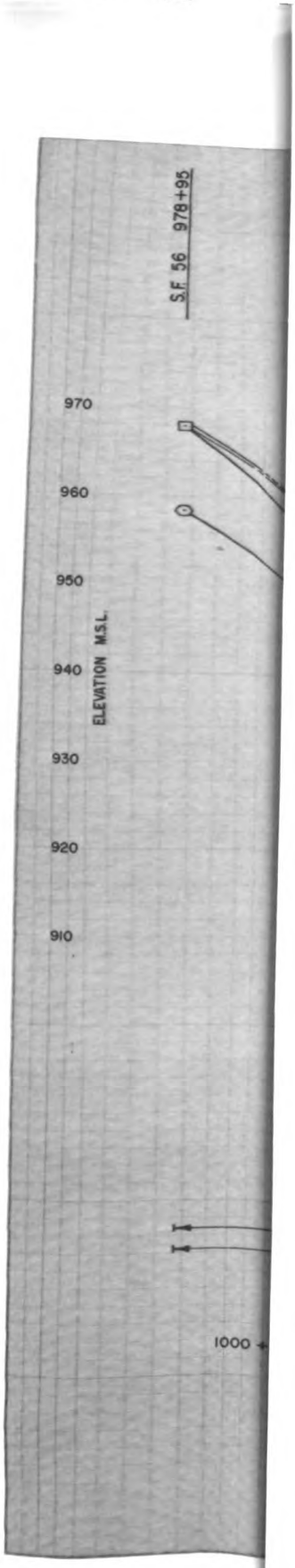
APPENDIX G - Urban Flood Plain Map

APPENDIX H - Channel Profiles









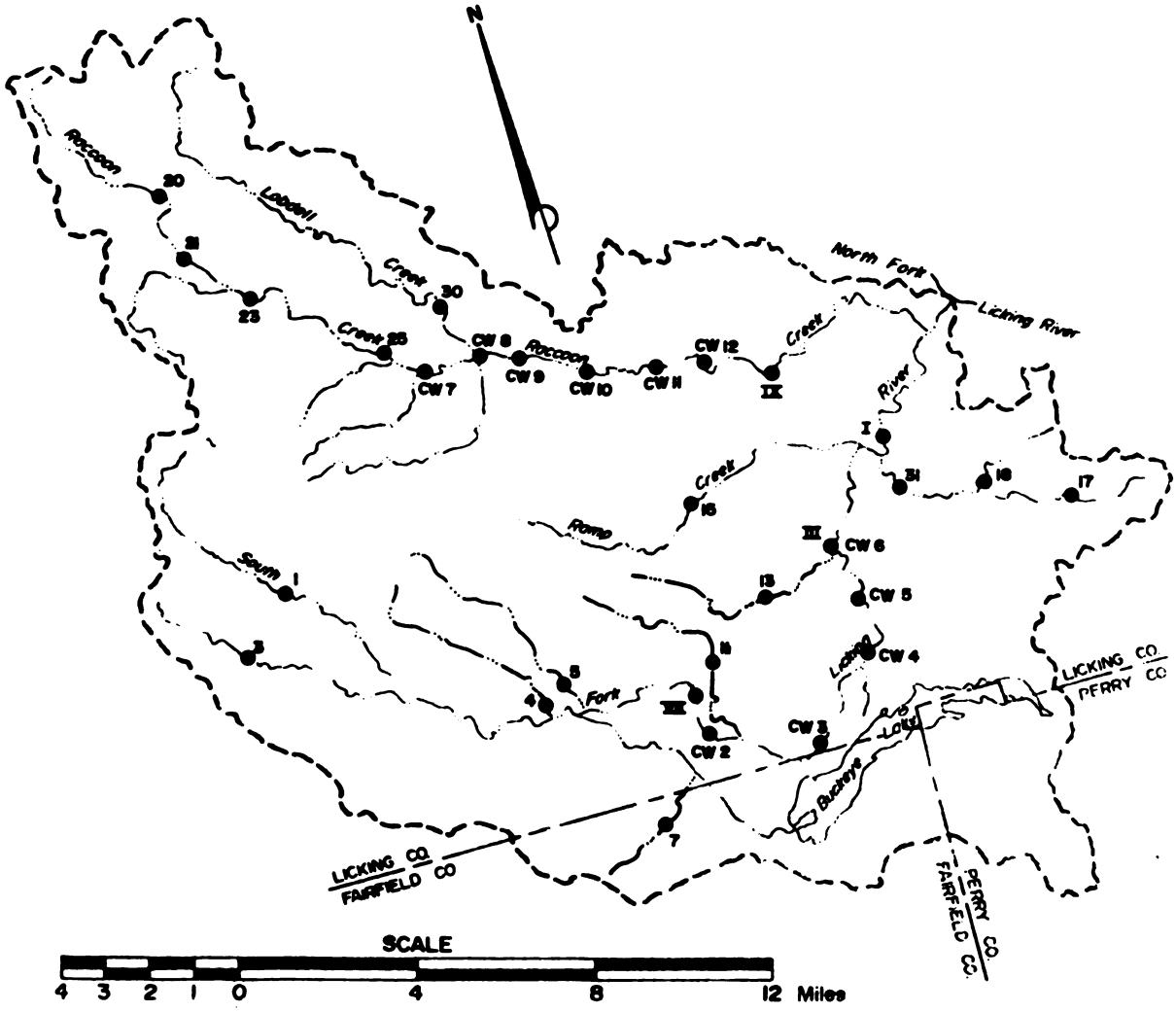
APPENDICES I - P

Wildlife Species Identified in the South Fork Licking River Watershed 1/

1/ E. D'Appolonia Consulting Engineers, Inc., Water Quality and Biological Assessment, South Fork Licking River Watershed, Ohio, Volume I, 1976, Table 6-2, 6-5, 8-1, 8-2, 8-3, and 8-4.

APPENDIX I

SOUTH FORK LICKING RIVER WATERSHED
FISH SAMPLING LOCATIONS



SAMPLING STATION	TYPE OF TESTS	
	Benthic Fauna Evaluation	Fish
1		X
3		X
4		X
5		X
7		X
11		X
13		X
15		X
17		X
18		X
31		X

SAMPLING STATION	TYPE OF TESTS	
	Benthic Fauna Evaluation	Fish
20		X
21		X
23		X
25	X	X
30	X	X
CW 2		X
CW 3		X
CW 4		X
CW 5		X
CW 6		X
CW 7		X

SAMPLING STATION	TYPE OF TESTS	
	Benthic Fauna Evaluation	Fish
CW 8		X
CW 9		X
CW 10		X
CW 11		X
CW 12		X
I	X	X
III	X	X
VII	X	X
IX	X	X

APPENDIX I
FISHES

Scientific Name	Common Name	Collected[2]		Reported	
		South Fork Licking R.	Raccoon Creek	Ohio DNR[3]	Trautman[4]
Dorosoma cepedianum	Gizzard Shad	x	-	x	x
Umbra limi	Central mudminnow	-	-	-	x
Exos americanus americanus	Redfin pickerel	x	x	x	x
Campostoma anomalum	Stoneroller	x	x	x	x
Carassius auratus	Goldfish	x	-	-	x
Cyprinus carpio	Carp	x	-	x	x
Ericymba buccata	Silverjaw minnow	x	x	x	x
Notemigonus crysoleucas	Golden shiner	-	-	-	x
Notropis ardens	Rosefin Shiner	-	x	x	-
Notropis cornutus	Common shiner	x	x	x	x
Notropis photogenis	Silver shiner	-	-	x	-
Notropis spilopterus	Spotfin Shiner	x	-	x	x
Notropis stramineus	Sand shiner	x	x	-	x
Notropis umbratillis	Redfin shiner	-	-	x	-
Phenacobius mirabilis	Suckermouth minnow	x	-	-	x
Phoxinus erythrogaster	Southern redbelly dace	x	x	x	x
Pimephales notatus	Bluntnose minnow	x	x	x	x
Pimephales promelas	Fathead minnow	x	x	x	x
Pimephales vigilax	Bullhead minnow	-	-	-	x

Scientific Name	Common Name	Collected[2]		Reported	
		South Fork Licking R.	Raccoon Creek	Ohio DNR[3]	Trautman[4]
Rhinichthys atratulus	Blacknose dace	x	x	x	x
Semotilus atromaculatus	Creek chub	x	x	x	x
Carpiodes cyprinus	Quillback	-	-	-	x
Carpiodes velifer	Highfin carpsucker	-	-	-	x
Catostomus commersoni	White sucker	x	x	x	x
Erimyzon sucetta	Lake chubsucker	-	-	-	x
Hypentelium nigricans	Nothern hog sucker	x	x	x	x
Moxostoma anisurum	Silver redhorse	x	-	-	x
Moxostoma duquesnei	Black redhorse	x	x	-	x
Moxostoma erythrurum	Golden redhorse	x	-	x	x
Ictalurus melas	Black bullhead	-	x	-	x
Ictalurus natalis	Yellow bullhead	x	-	x	x
Ictalurus nebulosus	Brown bullhead	-	-	-	x
Ictalurus punctatus	Channel catfish	x	-	-	x
Noturus flavus	Stonecat	-	-	-	x
Noturus gyrinus	Tadpole madton	-	-	-	x
Percopsis omiscomaycus	Trout-perch	-	-	-	x
Fundulus notatus	Blackstripe topminnow	-	-	x	x
Labidesthessicculus	Brook silverside	-	-	-	x
Morone chrysops	White bass	-	-	x	x
Ambloplites rupestris	Rock bass	x	x	x	x

Scientific Name	Common Name	Collected[2]		Reported	
		South Fork Licking R.	Raccoon Creek	Ohio DNR[3]	Trautman[4]
Lepomis syanellus	Green sunfish	x	x	x	x
Lepomis gibbosus	Pumpkinseed	-	-	-	x
Lepomis gulosus	Warmouth	-	-	-	x
Lepomis humilis	Orangespotted sunfish	x	-	x	-
Lepomis humilis x megalotis	Orangespotted sunfish x Longear sunfish	-	-	x	-
Lepomis macrochirus	Bluegill	x	x	x	x
Lepomis megalotis	Longear sunfish	-	x	x	x
Lepomis microlophus	Readear sunfish	-	-	-	x
Lepomis sp.	Sunfish	x	-	-	-
Micropterus dolomieui	Smallmouth bass	-	x	-	x
Micropterus salmoides	Largemouth bass	x	x	x	x
Pomoxis annularis	White crappie	-	-	-	x
Pomoxis nigromaculatus	Black crappie	-	-	-	x
Etheostoma blennoides	Greenside dater	x	x	x	-
Etheostoma caeruleum	Rainbow darter	x	x	x	x
Etheostoma exile	Iowa darter	-	-	-	x
Etheostoma flabellare	Fantail darter	x	x	x	-
Etheostoma nigrum	Johnny darter	x	x	x	x
Etheostoma variatum	Variegate darter	-	-	x	-
Etheostoma zonale	Banded darter	-	x	x	x

Scientific Name	Common Name	Collected 2/		Reported	
		South Fork Licking R.	Raccoon Creek	Ohio DNR 3/	Trautman 4/
Perca flavescens	Yellow perch	x	-	-	x
Percina caprodes	Longperch	x	x	x	x
Percina maculata	Blackside darter	-	x	-	x
Stizostedion vitreum vitreum	Walleye	-	-	-	x
Cattus bairdi	Mottled sculpin	x	x	x	x

1/ E. D'Appolonia Consulting Engineers, Inc., Water Quality and Biological Assessment, South Fork Licking River Watershed, Ohio, Volume 1, 1976.
2/ Collected during Phase I Field Studies, July 27, 1975 through August 2, 1975.
3/ From collections made by ODNR, Division of Wildlife and Water, July 14 and 23, 1975; USDA, Soil Conservation Service, May 5 and 6, 1975.
4/ Trautman, Milton B., The Fishes of Ohio, The Ohio State University Press, Columbus, Ohio, 1957.

x - indicates collected or reported; - indicates not collected or not reported.

APPENDIX J

Table 1

Benthic Organisms and Water Quality Classifications by Stations[1/]

Scientific Name	Common Name	Water Quality Classification[2/]	Station[3/] I	III	VII	IX	25	30
Nematomorpha	Horse-hair worms							
Gordiidae		1	+		+			+
Gastropoda	Snails							
Ferrisia sp.		1	+				+	
Lymnea sp.		1				+		+
Physa sp.		0					+	
Annelida	Segmented worms							
Tubificidae		0	+		+		+	
Amphipoda	Scuds							
Hyalella sp.		1			+			
Decapoda	Crayfish							
Cambarus sp.		1		+			+	+
Orconectes sp.		1	+	+	+	+	+	+
Ephemeroptera	Mayflies							
Baetis sp.		2	+	+	+	+	+	
Caenis sp.		1			+	+	+	
Stenonema sp.		2	+	+	+	+	+	+
Odonata								
Agrion sp.	Damselfly	1			+			+
Hemiptera	True bugs							
Hesperocorixia sp.	Water boatmen	0			+			
Veliidae	Riffle bugs	0						+
Coleoptera	Beetles							
Dineutus sp.	Whirligig beetles	0			+			
Laccophilus sp.	Predaceous water beetles	0			+			
Berosus sp.	Water scavenger beetles	0			+			
Laccobius sp.	Water scavenger beetles	0			+		+	
Tropisternus sp.	Water scavenger beetles	0			+			
Stenelmis sp.	Riffle beetles	1	+	+	+	+	+	+
Paephenus sp.	Water pennies	1	+			+		+

Scientific Name	Common Name	Water Quality Classification 2/	Station 3/ I	III	VII	IX	25	30
Tricoptera	Caddisflies							
Cheumatopsyche sp.		1	+	+	+	+	+	+
Hydropsyche sp.		2	+	+	+	+	+	+
Chimarra sp.		2				+		
Hydroptilidae		2				+		
Diptera	Flies							
Chironomidae	Midges	1	+	+	+	+	+	
Antocha sp.	Craneflies	2					+	
Hexatoma sp.	Craneflies	2					+	
Hemerodromia sp.	Dance Flies	1	+		+		+	

1/ E. D'Appolonia Consulting Engineers, Inc., Water Quality and Biological Assessment, South Fork Licking River Watershed, Ohio, Volume I, 1976. Table 6-5.

2/ 0 - Tolerant; 1 - Facultative; 2 - Intolerant.

3/ + - Present in collections made July 28 - August 2, 1975.

See Plate 1 for locations of stations.

APPENDIX J
Table 2
WATER QUALITY CLASSIFICATION OF BENTHIC SAMPLING STATIONS BY BIOLOGICAL INDICATORS 1/

Station	Location	Organisms by Water Quality Classification 0	1	2	Stream Classification
I	South Fork Licking River	1	255	17	1.06
III	Beaver Run	0	36	4	1.10
VII	South Fork Licking River (above Bell Run)	5	333	111	1.24
IX	Raccoon Creek (below Moots Run)	0	66	49	1.43
25	Raccoon Creek (above Pet Run)	6	171	24	1.09

1/ E. D'Appolonia Consulting Engineers, Inc., Water Quality and Biological Assessment, South Fork Licking River Watershed, Ohio, Volume 1, 1976, Table 6-6.

APPENDIX J
Table 3
SUMMARY OF QUANTITATIVE ANALYSES
OF BENTHIC COMMUNITY
SOUTH FORK LICKING RIVER, OHIO 1/

Station	Total Organisms	Density (no/ft_2)	Total Taxa	Diversity D_I	Equitability e	Stream Classification
I	273	91	9	0.68	0.22	1.06
III	40	13.33	7	2.04	0.71	1.10
VII	449	149.67	12	1.85	0.42	1.24
IX	115	38.33	8	2.51	1.0	1.43
25	201	67	15	2.64	0.6	1.09
30	-	-	-	-	-	-

1/ E. D'Appolonia Consulting Engineers, Inc., Water Quality and Biological Assessment, South Fork Licking River Watershed, Ohio, Volume 1, 1976, Table 6-7.

APPENDIX K
MAMMALS [1]

Common Name[2]	Observed[3]	Relative Abundance or Range Capabilities Estimate	Source
Common opossum	x	-	-
Eastern cottontail	x	Medium density population	Ohio DNR Pub.[4] No. 93
Eastern gray squirrel	-	Mostly Primary Range	Ohio DNR Pub. No. 95
Eastern fox squirrel	x	Mostly secondary range	Ohio DNR Pub. No. 95
Red Squirrel	x	-	-
Woodchuck	x	Abundant	Ohio DNR Pub. No. 165
Eastern Chipmunk	x	-	-
Beaver	-	15	Ohio DNR Inservice[5] Note No. 259
Muskrat	x	Abundant	Ohio DNR Pub. No. 105
Red Fox	x (sign only)	-	-
Gray Fox	-	-	-
Raccoon	x	Abundant	Ohio DNR Pub. No. 106
Mink	-	-	-
Common striped skunk	-	-	-
Whitetailed deer	x	Medium-High density population	Ohio DNR Pub. No. 101

1/ E.D'Appolonia Consulting Engineers, Inc., Water Quality and Biological Assessment, South Fork Licking River Watershed, Ohio, Volume I, 1976.
2/ Common names from Blair, et. al., 1968.
3/ Observed during Phase I and II Field Studies, July 27, 1975 through August 24, 1975.
4/ Ohio Department of Natural Resources Publication.
5/ Autumn, 1973 Population for Licking County, Ohio.

APPENDIX L [1/]
AMPHIBIANS AND REPTILES [2/]

Common Name [3/]	Observed [4/]
Red-backed salamader	x
Fowler's toad	x
American toad	x
Gray treefrog	
Spring peeper	
Western chorus frog	
Blanchard's cricket frog	
Northern leopard frog	x
Wood frog	
Bullfrog	
Green frog	x
Stinkpot	
Spotted turtle	
Eastern spiny softshell	x
Queen snake	
Northern water snake	x
Northern brown snake	
Butler's garter snake	
Eastern ribbon snake	
Eastern garter snake	x
Eastern hognose snake	
Northern black x blue racer	x
Black rat snake	
Northern cooperhead	
Eastern massasauga	

1/ E. D'Appolonia Consulting Engineers, Inc., Water Quality and Biological Assessment, South Fork Licking River Watershed, Ohio, Volume 1, 1976.
2/ Compiled from Conant 1951, and Walker 1967.
3/ Common names from Conant 1975.
4/ Observed during Phase I and Phase II Field Studies, July 27, 1975 through August 24, 1975.

APPENDIX M
GAME BIRDS[1/]

Common Name[2/]	Observed[3/]	Relative Abundance or Range Capabilities Estimate	Source
Waterfowl[4/]	x	-	-
Bobwhite	x	Low-Medium Density Population	Ohio DNR Pub.[5/] No. 14
Ringnecked pheasant	-	Low Density Population	Ohio DNR Pub. No. 92
Ruffed grouse	-	Absent or secondary range	Ohio DNR Pub. No. 98
American woodcock	x	-	-

1/ E. D'Appolonia Consulting Engineers, Inc., Water Quality and Biological Assessment, South Fork Licking River Watershed, Ohio, Volume, I, 1976.
2/ Common names from Blair, et al., 1968.
3/ Observed during Phase I and Phase II Field Studies, July 27, 1975 through August 24, 1975.
4/ Includes wood duck and unidentified species.
5/ Ohio Department of Natural Resources Publication.

APPENDIX N
BIRDS [1/]

Common Names [2/]	
Great blue heron	Common crow
Green heron	Blue jay
Wood duck	Tufted titmouse
Turkey vulture	Black-capped chickadee
Sharp-shinned hawk	White-breasted nuthatch
Red-tailed hawk	House wren
Sparrow hawk	Mockingbird
Bobwhite	Catbird
Common gallinule	Brown thrasher
Killdeer	Robin
American woodcock	Wood thrush
Rock dove	Cedar waxwing
Mourning dove	Starling
Black-billed cuckoo	Yellow warbler
Yellow-billed cuckoo	Ovenbird
Great horned owl	Yellowthroat
Chimney swift	Brown-headed cowbird
Ruby-throated hummingbird	Red-winged blackbird
Belted kingfisher	Common grackle
Flicker	Eastern meadowlark
Red-headed woodpecker	Cardinal
Hairy woodpecker	Indigo bunting
Downy woodpecker	House sparrow
Eastern kingbird	American goldfinch
Eastern phoebe	Rufous-sided towhee
Eastern wood pewee	Song sparrow
Purple martin	Field sparrow
Barn swallow	

1/ E.D'Appolonia Consulting Engineers, Inc., Water Quality and Biological Assessment, South Fork Licking River Watershed, Ohio, Volume 1, 1976.
2/ Common names from Blair, et al., 1968.

APPENDIX 0
Birds of the Hebron National Fish Hatchery
Licking County, Ohio 1/

Name	Abundance By Season 2/			
WATER BIRDS	S	S	F	W
Horned Grebe	u			u
Pied-billed Grebe	c	c	c	c
Western Grebe			a	a
Great Blue Heron	c	c	c	u
Green Heron	u	c	c	
Little Blue Heron	r	r		
Common Egret	u		u	
Cattle Egret	a	a		
Black-crowned Night Heron	u		r	
Yellow-crowned Night Heron	r	r	r	
Least Bittern	u	u	u	
American Bittern	r		r	
Glossy Ibis	a			
Whistling Swan	r		r	
Mute Swan	a			
Canada Goose	u			u
Snow Goose	u			r
Blue Goose	u			r
Mallard	c	u	u	c
Black Duck	c		u	c
Gadwall	u		u	u
Pintail	c		u	u
Green-winged Teal	u		u	
Blue-winged Teal	c	u	c	
American Wigeon	u		u	
Shoveler	c		c	
Wood Duck	c	c	c	
Redhead	u		u	
Ring-necked Duck	c		u	u
Canvasback	u		u	r
Greater Scaup	r		r	
Lesser Scaup	c		c	u
Common Goldeneye	u		u	u
Old-squaw	r			r
White-winged Scoter	r		r	
Surf Scoter	r		r	
Common Scoter	r		r	
Ruddy Duck	u		u	r
Hooded Merganser	u		u	
Common Merganser	u		u	
Red-breasted Merganser	u		r	

Name	Abundance By Season 2/			
VULTURES - HAWKS	S	S	F	W
Turkey Vulture	c	c	c	
Sharp-shinned Hawk	u	u	u	
Cooper's Hawk	u	u	u	
Red-tailed Hawk	c	c	c	u
Red-shouldered Hawk	u	u	u	r
Broad-winged Hawk	u		u	
Rough-legged Hawk	u			u
Marsh Hawk	u	u	u	
Osprey	r		r	
American Kestrel	c	c	c	c
GALLINACEOUS BIRDS				
Bobwhite	c	c	c	u
Ring-necked Pheasant	u	u	u	u
RAILS - COOTS				
King Rail	r		r	
Virginia Rail	u		u	
Yellow Rail	r		r	
Sora Rail	c		c	
Common Gallinule	c	c	c	
Purple Gallinule	a			
American Coot	c	u	c	
SHOREBIRDS				
Semipalmated Plover	c		c	
Piping Plover	a		a	
Killdeer	c	c	c	u
American Golden Plover	u		u	
Black-bellied Plover	r		u	
Ruddy Turnstone	u		r	
American Woodcock	c	u	u	
Common Snipe	c	u	c	r
Upland Sandpiper	r		r	
Spotted Sandpiper	c	u	c	
Solitary Sandpiper	c		c	
Willet	a		a	
Greater Yellowlegs	u		c	
Lesser Yellowlegs	c		c	
Knot	a		a	
Pectoral Sandpiper	c		c	
White-rumped Sandpiper	r		r	
Baird's Sandpiper	a		r	
Least Sandpiper	c	u	c	

Name	Abundance By Season 2/			
	S	S	F	W
SHOREBIRDS cont'd				
Dunlin	u		c	
Dowitcher	u		u	
Stilt Sandpiper	r		u	
Semipalmated Sandpiper	c		c	
Western Sandpiper	r		r	
Buff-breasted Sandpiper			r	
Sanderling	u		u	
European Ruff	a		a	
Northern Phalarope	a		a	
Wilson's Phalarope	a		r	
Red Phalarope			a	
Hudsonian Godwit			a	
American Avocet			a	
GULLS - TERNS				
Herring Gull	c		c	
Ring-billed Gull	c		c	
Bonaparte's Gull	u		u	
Forster's Tern	r		r	
Common Tern	r		r	
Caspian Tern	r		r	
Black Tern	c		u	
Least Tern			a	
DOVES - CUCKOOS				
Rock Dove	c	c	c	c
Mourning Dove	c	c	c	c
Yellow-billed Cuckoo	c	u	u	
Black-billed Cuckoo	u	u	u	
OWLS				
Screech Owl	c	c	c	c
Great Horned Owl	u	u	u	u
Barred Owl	u	u	u	u
Short-eared Owl				r
Snowy Owl				a
GOATSUCKERS - KINGFISHER				
Whip-poor-will	u	u	u	
Common Nighthawk	c	c	c	
Chimney Swift	c	c	c	
Ruby-throated Hummingbird	c	c	c	
Belted Kingfisher	c	c	c	u

Name	Abundance By Season 2/			
WOODPECKERS	S	S	F	W
Yellow-shafted Flicker	c	c	c	u
Pileated Woodpecker	r	r	r	r
Red-bellied Woodpecker	c	c	c	c
Red-headed Woodpecker	c	c	c	c
Yellow-bellied Sapsucker	c	c	u	
Hairy Woodpecker	u	u	u	u
Downy Woodpecker	c	c	c	c
FLYCATCHERS				
Eastern Kingbird	c	c	c	
Great Crested Flycatcher	u	u	u	
Eastern Phoebe	u	u	u	
Yellow-bellied Flycatcher	u	u	u	
Acadian Flycatcher	c	c	c	
Traill's Flycatcher	c	c	c	
Least Flycatcher	c	c	c	
Eastern Wood Pewee	c	c	c	
Olive-sided Flycatcher	u	u	u	
LARK - SWALLOWS				
Horned Lark	c	c	c	u
Tree Swallow	c	u	c	
Bank Swallow	c	c	c	
Rough-winged Swallow	c	c	c	
Barn Swallow	c	c	c	
Cliff Swallow	u		u	
Purple Martin	c	c	c	
JAY - CROW				
Blue Jay	c	c	c	c
Common Crow	c	c	c	u
GLEANERS				
Black-capped Chickadee	r			r
Carolina Chickadee	c	c	c	c
Tufted Titmouse	c	c	c	c
White-breasted Nuthatch	c	c	c	c
Red-breasted Nuthatch				u
Brown Creeper	c	c	c	c
WRENS - MOCKINGBIRDS				
House Wren	c	c	c	c
Winter Wren	u			u

Name	Abundance By Season 2/			
	S	S	F	W
WRENS - MOCKINGBIRDS cont'd				
Bewick's Wren	u		u	
Carolina Wren	c	c	c	c
Long-billed Marsh Wren	r			
Short-billed Marsh Wren	u	u	u	
Mockingbird	u	u	u	u
Catbird	c	c	c	u
Brown Thrasher	c	c	c	
THRUSHES				
Robin	c	c	c	r
Wood Thrush	c	c	u	
Veery	u	u		
Eastern Bluebird	u	u	u	r
GNAT-CATCHER SHRIKE				
Blue-gray Gnatcatcher	u	u	u	
Golden-crowned Kinglet	u			u
Ruby-crowned Kinglet	c	c	c	r
Water Pipit	u		u	
Cedar Waxwing	u		u	
Loggerhead Shrike				r
Starling	c	c	c	c
VIREOS				
White-eyed Vireo	u			
Yellow-throated Vireo	r			
Solitary Vireo	r			
Red-eyed Vireo	u	u	u	
Philadelphia Vireo	r			
Warbling Vireo	c	c	c	
WOOD WARBLERS				
Black-and-White Warbler	u		r	
Prothonotary Warbler	r			
Worm-eating Warbler	r			
Tennessee Warbler	u		u	
Nashville Warbler	u		u	
Parula Warbler	u			
Yellow Warbler	c	c	c	
Magnolia Warbler	c		u	
Cape May Warbler	u			
Black-throated-Blue Warbler	u			

Name	Abundance By Season 2/			
WOOD WARBLERS cont'd	S	S	F	W
Myrtle Warbler	c	c	c	u
Black-throated-Green Warbler	u		u	
Cerulean Warbler	u			
Blackburnian Warbler	c		u	
Yellow-throated Warbler	r			
Chestnut-sided Warbler	c			
Bay-breasted Warbler	c			
Blackpoll Warbler	u		u	
Pine Warbler	c			
Prairie	u			
Palm Warbler	c		u	
Ovenbird	u	u	u	
Louisiana Waterthrush	u			
Kentucky Warbler	u			
Connecticut Warbler	r			
Mourning Warbler	r		r	
Yellowthroat	c	c	c	
Yellow-breasted Chat	u	u	u	
Hooded Warbler	r			
Wilson's Warbler	u			
Canada Warbler	u			
American Redstart	c	u	u	
WEAVER FINCHES				
House Sparrow	c	c	c	c
BLACKBIRDS				
Bobolink	u			
Eastern Meadowlark	c	c	c	u
Red-winged Blackbird	c	c	c	c
Orchard Oriole	u			
Baltimore Oriole	c	c	c	
Rusty Blackbird	u		u	
Common Grackle	c	c	c	u
Brown-headed Cowbird	c	c	c	c
TANAGERS - SPARROWS				
Cardinal	c	c	c	c
Rose-breasted Grosbeak	u		u	
Evening Grosbeak				a
Indigo Bunting	c	c	c	
Common Redpoll				a
Purple Finch	u			u
Pine Siskin				r

Name	Abundance By Season 2/			
TANAGERS - SPARROWS	S	S	F	W
American Goldfinch	c	c	c	u
Rufous-sided Towhee	c	c	c	u
Savannah Sparrow	c	u	c	
Grasshopper Sparrow	u	u	u	
Vesper Sparrow	u		u	
Slate-colored Junco	u			c
Oregon Junco	r			r
Tree Sparrow	r			u
Chipping Sparrow	c	c	c	r
Field Sparrow	u	u	u	
White-crowned Sparrow	c			c
White-throated Sparrow	c			c
Fox Sparrow	u			
Lincoln Sparrow	r		r	
Swamp Sparrow	u	u	u	r
Song Sparrow	c	c	c	c
Lapland Longspur				a
Snow Bunting				a

1/ E. D. Appolonia Consulting Engineers, Inc., Water Quality and Biological Assessment, South Fork Licking River Watershed, Ohio, Volume 1, 1976, Published by U.S. Fish and Wildlife Service (no date). Compiled from observations of birds at the hatchery.

2/ c - common
u - uncommon
r - rare
a - accidental
S - spring
S - summer
F - fall
W - winter

APPENDIX P
Stream Habitat Descriptions 1/

Station	Typical Depth(ft)	Typical Width(ft)	Substrate	Cover
I	1.5 (0- 4)	30 (20-40)	Rock in riffles, grading to gravel; sand in pools. Silty patches generally near shorelines. Pool to riffle, 2:1.	Occasional overhanging branches; some debris (large rocks and concrete) near bridge; periphytic algae abundant, particularly in riffles; shading minimal.
II	.5 (0-1.5)	15 (10-20)	Cobbles and gravel in riffles; gravel grading to sand in pools. Pool to riffle 2:1.	Very little cover at station; 20-30 percent shading.
III	1.5 (0-3.5)	30 (15-40)	Cobbles and gravel grading to sand in riffles; pools and channels mainly sand and silt. Pool to riffle, 4:1.	Overhanging branches and tree roots common along bank; scattered logs and branches in water; 90-100 percent shading.
IV	2 (0-3.5)	35 (30-40)	Mostly silt and clay, little sand; water slow moving. No riffles.	Numerous logs and branches in water near bridge; 80-90 percent shading.
V	.5 (0-1.5)	15 (10-20)	Rock mixed with silt; only occasional shallow pools. Pool to riffle 10:1.	Periphytic algae abundant; many large rocks; small dam 50 yards upstream; 100 percent shading.
VI	1.5 (.5-2.5)	20 (18-25)	Silt and sand; slow-moving current. No riffles.	Small amount of debris in water, occasional overhanging branches upstream; Lemna along both banks 20-30 percent shading.
VII	.5 (0-2)	20 (10-40)	Rock and gravel in riffles; gravel and silt in pools. Pool to riffle, 3:2.	Small overhanging banks and sedges; trees on east bank provide partial shading.

Station	Typical Depth(ft)	Typical Width(ft)	Substrate	Cover
VIII	.5 (0-1.5)	25 (20-30)	Silt with numerous rocks from 1 inch to 6 inches. No pool, riffle.	Overhanging branches and large rocks, 80-90 percent shading.
IX	1 (0-3)	30 (15-40)	Sand with gravel and scattered rocks in pools; gravel and rocks in riffles. Pool to riffle, 4:1.	Occasional overhanging branches; 30-40 percent shading.
X	2 (0-5)	35 (20-55)	Silt with scattered rocks in pools; rock in riffles. Pool to riffle, 4:1.	Frequent overhanging branches; 30-40 percent shading.
XI	.5 (0-1.5)	20 (15-25)	Rocky; silt with rocks in pools. Pool to riffle, 2:3.	Dead wood in one location; no shading.
1	1 (0-1.5)	20 (10-25)	Silt; numerous large rocks; dry rocky riffles above and below pool.	Large rocks; occasional overhanging branches in water; 60-70 percent shading.
3	1 (0-2.5)	8 (5-15)	Silt, large rocks above and below pool; flow negligible.	Large rocks, logs and branches common; overhanging branches and banks present; about 70 percent shaded.
4	.5 (0-1.5)	12 (5-15)	Rocky; gravel interspersed with sand.	Occasional overhanging branches and flotsam; 80 percent shading.
5	.5 (0-1.5)	6 (6-10)	Bedrock (shale).	Occasional overhanging branches; fractured shale; complete shading.
7	.5 (0-1)	5 (3-10)	Rocky covered with silt.	Many large rocks, periphytic algae; occasional overhanging branches; 40-50 percent shading.

Appendix P cont'd

Station	Typical Depth(ft)	Typical Width(ft)	Substrate	Cover
11	.5 (0-1.5)	8 (5-10)	Silt, occasional rocks; stream has been channelized. No pool or riffle.	Many overhanging branches on east bank; 80-90 percent shading by trees on east bank.
13	1 (.2-2.5)	20 (15-30)	Silt and clay; scattered large rocks.	Overhanging branches and dead branches in water common; 20-30 percent shading.
15	.25 (0-1)	6 (2-15)	Rock and gravel in riffles; gravel grading into sand in pools. Pool to riffle, 2:3.	Large rocks very common; occasional overhanging and dead branches; almost complete shading.
17	.5 (0-1.5)	9 (5-15)	Silt with rocks; riffles of rock and gravel. Pool to riffle, 4:1.	Frequent overhanging branches; occasional dead wood in water; about 50 percent shading by small trees.
18	1 (0-4)	15 (10-20)	Pool and channels of silt with rocks; riffles of rock and gravel. Pool to riffle 2:1.	Overhanging branches and flotsam; about 50 percent shading.
20	1 (0-2.5)	30 (25-40)	Silt mixed with sand in midstream; large pool. No riffles.	Aquatic vegetation along banks, above and below pool; 0-10 percent shading.
21	1.2 (0-2.5)	12 (10-20)	Sand with silt. Pool to riffle, 9:1.	Overhanging trees common; much debris in water; 70-80 percent shading.
23	2 (0-5)	40 (30-50)	Sand and silt in large pool. No riffles.	Few overhanging branches; emergent vegetation above pool; 10-20 percent shading.

Station	Typical Depth(ft)	Typical Width(ft)	Substrate	Cover
25	.5 (0-1.5)	20 (15-25)	Rocky, grading into gravel and sand. No pools.	Scattered overhanging branches and rocks; 60-70 percent shading.
30	.5 (0-1.5)	8 (2-20)	Bedrock (shale); thin layer of silt in pools. Pool to riffle, 1:1.	Fractured shale, overhanging banks under abandoned bridge; few overhanging branches; 30-40 percent shading.
31	1.5 (0-4.5)	25 (20-35)	Sand and silt with debris (concrete, trash, etc); riffles or rock and gravel. Pool to riffle, 4:1.	Overhanging branches common; much debris (concrete, metal, trash, etc.) about 30 percent shading.
CW 1	0.1 (0-0.4)	1.5 (.5-2.5)	Sand and silt. No pool or riffle.	Periphytic algae in water; grasses and shrubs overhanging stream; no shade.
CW 2	1 (0-3)	30 (25-40)	Sand with little silt; riffle of gravel and rock. Pool to riffle, 5:2.	Debris and wood in water; occasional overhanging branches; 60 percent shading.
CW 3	2 (0-4)	40 (30-45)	Sand mixed with some silt along shore. Pool to riffle 5:1. Most of stream bed scoured channel under present conditions of flow.	Occasional overhanging branches and banks; relatively little cover; 70 percent shading.
CW 4	1.5 (0-4.5)	35 (30-40)	Layer of silt with many submerged branches. Small pools, no riffles.	Much dead wood in water; large log jam at confluence with reservoir outlet; 100-percent shading for about 50 yards; no shading elsewhere.

Appendix P cont'd

Station	Typical Depth(ft)	Typical Width(ft)	Substrate	Cover
CW 5	1.5 (0-4)	40 (35-50)	Silt with small cobbles (1 inch to 3 inches) in channel; silt in pools and banks; riffles of rock. Pool to riffle 4:1.	Overhanging branches and dead wood common; large rocks in water; 60 percent shading.
CW 6	1.5 (0-3.5)	30 (.5-40)	Sand and silt in channel and pools; rock and gravel grading into sand in riffles. Pool to riffle 4:1.	Overhanging branches and tree roots common along shore; scattered logs and branches in water; 90-95 percent shading.
CW 7	.5 (0-1.5)	23 (20-30)	Rock in riffles; sand, gravel and detritus in pools. Pool to riffle, 1:1.	Occasional overhanging branches, rocks; 60-70 percent shading.
CW 8	1 (0-4)	25 (15-50)	Silt in large pools; silt and rocks in small pools; riffles of rock. Pool to riffle, 2:1.	Overhanging branches in pool areas; scattered dead wood; about 10 percent shading.
CW 9	2 (0-4.5)	35 (10-45)	Silt, sand and gravel in most areas; riffles of rock and gravel. Pool to riffle 5:1.	Overhanging bank and trees along entire bank on one shore; about 70-80 percent shading.
CW10	2 (0-4.5)	35 (10-45)	Silt with gravel and rocks in channel; riffles of rock; 90 percent of streambed is scoured. Pool to riffle 1:1.	Many overhanging branches; many rocks in water; 30-40 percent shading.
CW 11	2 (0-5)	35 (20-55)	Silt, scattered rocks in pools; rock in riffles. Pool to riffle, 4:1.	Frequent overhanging branches, 30-40 percent shading.
CW 12	1.5 (0-3.5)	40 (30-55)	Sand and silt in pools; rock with much silt in channels; rock in riffles. Pool to riffle 5:2.	Occasional overhanging branches; 30-40 percent shading.

1/ E. D' Appolonia Consulting Engineers, Inc., Water Quality and Biological Assessment, South Fork Licking River Watershed, Ohio, Volume I, 1976, Table 6-1.

Note: A - See Appendix I and Map E-6-2 for location of stations. Stations 1-31 are reservoir sites. Stations CW 1-CW 12 are along channel work sites.

B - Numbers in parentheses indicate approximate range.

APPENDIX Q - Tables 1 through 18

APPENDIX Q

Table 1

Watershed Stream Resources 1/

Stream Name 3/	Length in Miles 2/ Perennial	Intermittent	Total
South Fork Licking River	39.1	1.9	41.0
Tributaries	28.1	77.0	105.1
Raccoon Creek	26.2	1.4	27.6
Tributaries	34.0	152.0	186.0
Dutch Fork	4.1	0	4.1
Tributaries	10.6	30.6	41.2
Ramp Creek	9.4	0.9	10.3
Tributaries	2.5	36.4	38.9
Beaver Run	4.4	3.0	7.4
Tributaries	0	10.1	10.1
Buckeye Lake Outlet			
Lake Tributaries	10.4	27.3	37.7
Reservoir Feeder	9.7	0	9.7
Tributaries	5.2	30.1	35.3
Bell Run	5.0	2.2	7.2
Tributaries	0	3.8	3.8
Muddy Fork	4.8	1.9	6.7
Tributaries	4.5	16.4	20.9
Watershed Total	198.0	395.0	593.0

1/ E. D'Appolonia Consulting Engineers Inc., Water Quality and Biological Assessment, South Fork Licking River Watershed, Ohio, Volume 1, 1976, Table 5-4.

2/ Excludes ephemeral streams.

3/ Major streams are listed in the order of their junction with South Fork, downstream to upstream. Tributaries are indented.

APPENDIX Q

Table 2

Watershed Streams Affected by Project Structural Measures

Name and Location 1/	Flow Condition 2/	Existing Channel Type 3/
Big Hollow	I	N
Coon Hollow	I	N
Etna Reservoir Site	I	N
Kiber Run	I	N
Kirkersville Reservoir Site	P	N
Lobdell Creek	P	N
Simpson Run	I	N
South Fork		
I-70 bypass area	-	0
1687+00 to 1725+85	P	M(1925)
1725+85 to 1810+00	P	M(1925)
1810+00 to 2317+45	P	N

1/ See project map, Appendix D.

2/ I (Intermittent): continuous flow through some seasons of the year but little or no flow through other seasons. P (Perennial): flow at all times except during extreme drought.

3/ M(): previously modified channel with approximate date of first major construction show in parentheses. N: an unmodified well-defined channel. O: No defined channel.

APPENDIX Q
Table 3 a/

Physical, Chemical, Bacterial and Flow Data
For Stream Base Flow Conditions of July 1975

Sampling Station b/	Collection Date	Collection Time	Temperature Air (°C)	Temperature Water (°C)	Turbidity (JTU)	Dissolved Oxygen % Sat.	Dissolved Oxygen (mg/l)	Free Carbon Dioxide (mg/l)	Odor	pH	Acidity (mg/l_3 ($CaC0^3$ Equivalent)
I	28/7/75	17:00	28.0	28.0	25	100	14.4	0.9	ND c/	8.30	1.0
II	29/7/75	8:30	19.0	19.0	6	78	7.1	2.6	ND	7.30	3.0
III	28/7/75	10:40	22.5	23.0	74	70	5.8	3.5	ND	7.10	4.0
IV	28/7/75	8:30	21.0	22.0	100	51	4.4	4.4	ND	7.20	5.0
V	30/7/75	9:30	26.0	24.0	66	49	4.0	1.8	ND	7.30	2.0
VI	30/7/75	10:15	24.0	25.0	93	48	3.9	1.8	ND	7.30	2.0
VII	30/7/75	11:15	31.0	22.0	13	91	7.7	0.9	ND	7.60	1.0
VIII	30/7/75	13:30	30.0	22.0	6	65	5.5	0.9	ND	7.50	1.0
IX	30/7/75	9:15	22.0	22.0	17	88	7.6	0.9	ND	7.60	1.0
X	29/7/75	16:00	35.0	23.0	9	0	0	0.9	ND	7.90	1.0
XI	29/7/75	14:30	34.0	25.0	11	100	8.8	0.9	ND	7.60	1.0
1	30/7/75	14:30	30.0	24.0	6	80	6.3	0.9	ND	7.60	1.0
3	30/7/75	15:45	33.0	26.0	17	67	5.3	0.9	ND	7.50	1.0
4	29/7/75	13:39	29.0	23.0	11	47	3.9	4.4	ND	7.40	5.0
5	28/7/75	12:00	28.0	22.0	5	48	4.2	4.4	ND	7.30	5.0
7	28/7/75	14:45	27.5	28.0	25	91	6.9	0.9	ND	8.40	1.0
11	30/7/75	12:20	27.0	22.0	17	55	4.8	0.9	ND	7.40	1.0
13	31/7/75	8:15	24.5	21.5	79	52	4.5	0.9	ND	7.35	1.0
15	31/7/75	9:30	24.5	19.0	5	67	6.1	1.3	ND	7.35	1.5
17	31/7/75	13:15	34.0	24.0	27	100	8.2	1.3	ND	7.25	1.5
20	31/7/75	16:10	32.0	27.0	19	100	9.0	1.3	ND	8.00	1.5
23	31/7/75	17:15	34.0	26.0	21	100	7.8	0.9	ND	8.00	1.0
25	29/7/75	12:05	30.0	22.0	11	100	9.0	0.9	ND	7.90	1.0
30	29/7/75	11:00	29.0	21.0	13	83	7.1	0.9	ND	7.60	1.0
31	31/7/75	10:45	27.5	20.5	11	78	6.9	0.9	ND	7.30	1.0

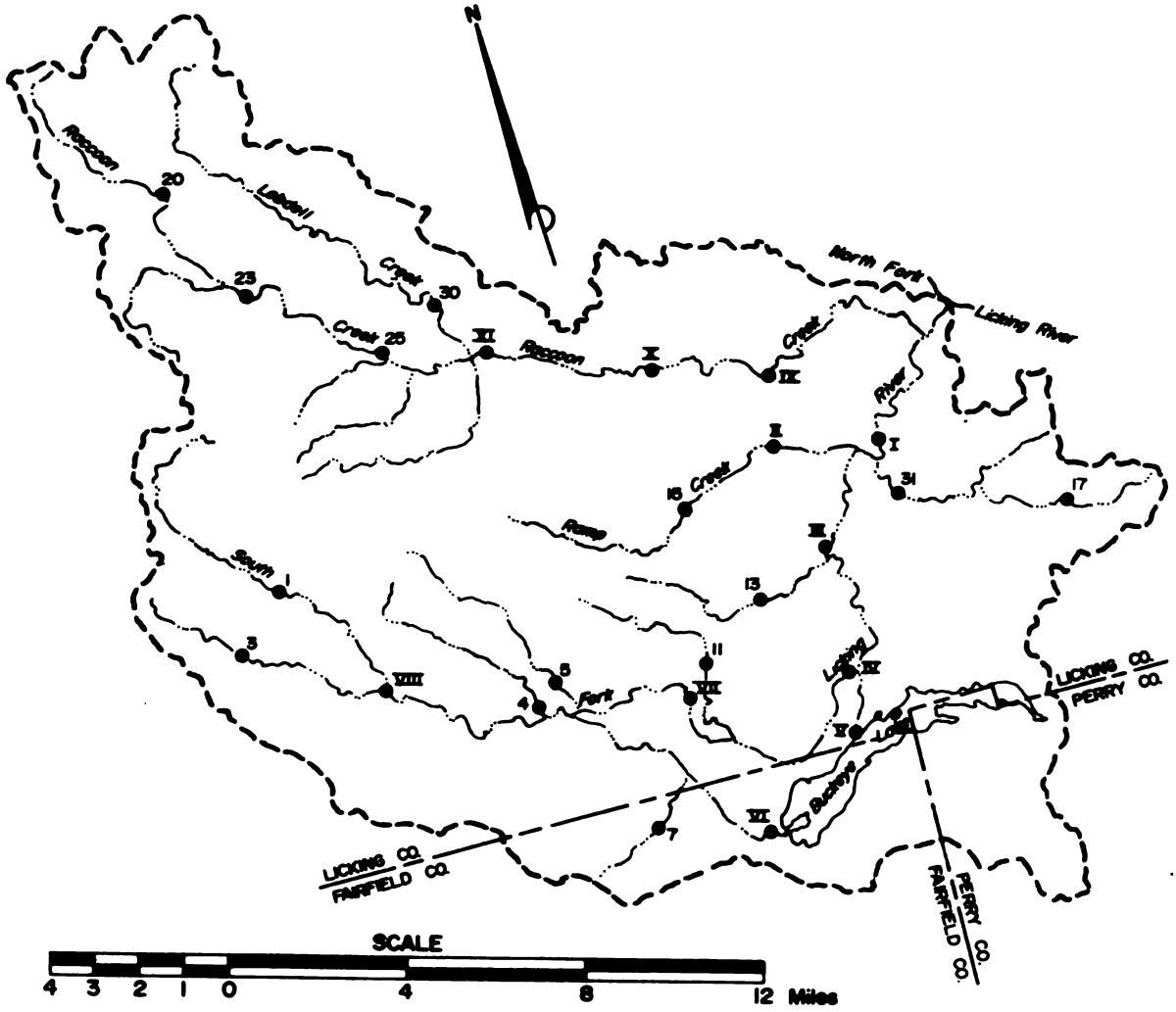
Sampling Station b/	Alkalinity $(mg/l)_3$ ($CaCO$ Equivalent)	Specific Conductance (umho/cm)	Hardness $(mg/l)_3$ ($CaCO$ Equivalent)	Dissolved Solids (mg/l)	Suspended Solids (mg/l)	Sulfate (mg/l)	Chloride (mg/l)	Ammonia (mg-N/l)
I	200	550	259	408	8	63.0	0.3	0.02
II	244	600	230	426	1	89.9	1.0	0.02
III	208	580	231	374	48	61.0	1.5	0.02
IV	196	430	208	306	57	54.0	0.5	0.02
V	96	270	110	231	23	40.0	0.5	0.02
VI	188	500	235	391	67	66.0	0.8	0.02
VII	252	700	294	412	33	66.0	0.3	0.02
VIII	288	1300	325	818	1	84.0	1.0	0.02
IX	238	495	274	376	20	58.0	1.0	0.02
X	246	620	266	382	11	62.0	0.5	0.02
XI	252	690	298	452	5	80.0	1.0	0.02
1	232	640	278	380	12	45.0	4.1	0.02
3	228	700	223	396	20	28.0	0.5	0.02
4	208	550	274	366	2	47.0	0.5	0.02
5	244	580	302	400	1	65.0	0.5	0.02
7	164	410	157	179	20	16.0	0.5	0.02
11	212	580	263	396	24	80.0	1.0	0.02
13	204	350	204	313	83	38.0	0.3	0.02
15	220	460	247	369	3	66.0	1.0	0.02
17	160	425	176	304	36	40.0	1.0	0.02
20	252	800	314	614	16	49.0	0.5	0.02
23	212	820	266	474	10	94.0	1.0	0.02
25	244	700	298	370	3	82.0	1.0	0.02
30	240	490	255	300	11	73.0	0.5	0.02
31	212	445	255	290	10	55.0	0.5	0.02

Sampling Station b/	Nitrate (mg-N/l)	Kjeldahl (mg-N/l)	Total Phosphorous (mg-P/l)	Ortho-Phosphate (mg-P/l)	Fecal Coliform (#/100ml)	Total Coliform (#/100ml)	Fecal Streptococci (#/100ml)	Flow (cfs)
I	0.10	0.02	2.05	0.16	142	735	450	36
II	0.24	0.02	0.14	0.04	0	0	0	21
III	0.28	0.02	0.58	0.32	1448	1455	900	7.5
IV	0.11	0.02	0.26	0.09	0	0	0	38
V	0.04	0.02	0.14	0.03	315	e/	6750	0.4
VI	0.25	0.02	0.31	0.29	910	e/	182	3.3
VII	0.04	0.02	0.05	0.02	300	e/	296	2.9
VIII	0.09	0.02	0.05	0.03	0	0	0	1.0
IX	0.14	0.02	0.28	0.22	0	0	0	13
X	0.14	0.02	0.17	0.05	0	0	0	21
XI	0.12	0.02	0.17	0.05	0	0	0	7.8
1	0.06	0.02	0.08	0.04	0	0	0	Trickle
3	0.07	0.02	0.21	0.15	0	0	0	Trickle
4	0.04	0.02	0.10	0.04	0	0	0	None
5	0.08	0.02	0.11	0.04	0	0	0	None
7	0.07	0.02	0.12	0.07	0	0	0	None
11	0.07	0.02	1.52	0.02	0	0	0	Trickle
13	0.04	0.02	0.11	0.05	0	0	0	Trickle
15	0.57	0.02	0.08	0.03	0	0	0	V .Low d/
17	0.21	0.02	0.14	0.10	0	0	0	0.4
20	0.28	0.02	0.11	0.07	0	0	0	Trickle
23	2.08	0.02	3.50	2.65	0	0	0	Trickle
25	0.04	0.02	0.21	0.12	244	404	484	10
30	0.07	0.02	0.10	0.02	54	449	158	None
31	0.15	0.02	0.09	0.04	0	0	0	6.1

Sampling Station b/	Location b/
I	South Fork near Heath.
II	Ramp Creek upstream from industries.
III	South Fork downstream from Beaver Run.
IV	South Fork at State Route 79 North of Buckeye Lake.
V	Downstream from Buckeye Lake outlet.
VI	Reservoir feeder north of Millersport.
VII	South Fork at U.S. 40.
VIII	South Fork southeast of Pataskala.
IX	Raccoon Creek west of Newark.
X	Raccoon Creek south of Granville at State Route 37.
XI	Raccoon Creek downstream from Lobdell Creek.
1	South Fork southeast of Jersey.
3	Muddy Fork upstream from Columbia Center.
4	South Fork tributary 3/4 mile upstream of Kirkersville.
5	South Fork tributary at State Route 158.
7	Reservoir feeder tributary near Fletcher Channel.
11	Bell Run north of Buckeye Valley Airport.
13	Beaver Run south of Licking Church.
15	Ramp Creek at State Route 37
17	Hog Run north of Amsterdam.
20	Raccoon Creek at State Route 37 northwest of Johnstown.
23	Raccoon Creek southeast of Johnstown.
25	Raccoon Creek upstream from Pet Run.
30	Lobdell Creek northeast of Alexandria.
31	Dutch Fork near Locust Grove.

a/ E. D'Appolonia Consulting Engineers, Inc., Water Quality and Biological Assessment, South Fork Licking River Watershed, Ohio, Volume I, 1976, Tables 4-2 and 4-3.
b/ Location shown on Map 1, Appendix Q, Table 3.
c/ None detected.
d/ Unable to determine.
e/ Too numerous to count.

SOUTH FORK LICKING RIVER WATERSHED
WATER QUALITY TESTS AND SAMPLING LOCATIONS



SAMPLING STATION	TYPE OF TESTS			
	Bacteria	Benthic Fauna Evaluation	Chemical and Physical	Metals and Pesticides
I	X	X	X	X
II			X	
III	X	X	X	
IV			X	
V	X		X	
VI	X		X	
VII	X	X	X	
VIII			X	
IX		X	X	X
X			X	
XI			X	

SAMPLING STATION	TYPE OF TESTS			
	Bacteria	Benthic Fauna Evaluation	Chemical and Physical	Metals and Pesticides
1			X	
3			X	
4			X	
5			X	
7			X	
11			X	
13			X	
15			X	
17			X	
20			X	
23			X	
25	X	X	X	
30	X		X	
31			X	

MAP 1

APPENDIX Q

Table 4

Water Use	Max. No. Fecal Coliform/100 ml Geometric Mean	10 Percent of Samples
Bathing Waters (lifeguard and/or bathhouse)	200	400
Primary Contact Recreation (full body contact)	1000	2000
Secondary Contact Recreation (partial body contact)	0	5000

APPENDIX Q

Table 5

Benthic Fauna, Metals, and Pesticides
At Selected Sampling Stations 1/

Parameter and Unit	Sampling Station and Location I South Fork Near Heath	III Beaver Run	VII South Fork at US 40	IX Raccoon Cr. West of Newark	XXV Raccoon Cr. Above Pet Run
Benthic Fauna					
Stream Classification 2/	1.06	1.10	1.24	1.43	1.09
Metals (Micrograms per gram)					
Cadmium	0.75			0.75	
Chromium	0.2			0.2	
Lead	5			5	
Mercury	0.038			0.110	
Nickel	3.75			1.25	
Zinc	.1			0.1	
Pesticides (part per million)					
Aldrin					
Water	0.0002			0.0002	
Sediment	0.05			0.05	
Dieldrin					
Water	0.0002			0.0002	
Sediment	0.003			0.004	
BHC					
Water	0.0001			0.0001	
Sediment	0.05			0.05	
Diazinon					
Water	0.0001			0.0001	
Sediment	0.001			0.001	

1/ E. D'Appolonia Consulting Engineers Inc., Water Quality and Biological Assessment, South Fork Licking River Watershed, Ohio, Volume 1, 1976, Tables 4-4 and 6-6.

2/ Scale range is from 0 to 2 with 0 indicating generally low water quality and 2 indicating generally high water quality. Values are computed from species compositions of benthic samples.

APPENDIX Q

Table 6

Population by Community and Remainder of Watershed for 1970

City of Village	1970 Population
Heath	6,768
Newark (41,836 one-half in watershed)	20,918
Alexandria	588
Granville	3,963
Hebron	1,699
Johnstown	3,208
Kirkersville	578
Pataskala	1,831
Subtotal	39,553
Remainder of watershed	18,921
Total	58,474

Source: 1970 Census of Population, Bureau of Census.

APPENDIX Q

Table 7

Projected Population for Water Resource Subareas 504 and 506 By time Frames

Water Resource Subarea	Projection Year 1980	1990	2020
Muskingum (504)	1,170,100	1,215,600	1,252,500
Scioto (506)	1,514,600	1,731,800	1,909,100

1/ OBERS Projections, U.S. Water Resources Council, April 1, 1974.

APPENDIX Q

Table 8
Employment and Percent Employed by Industry for Fairfield, Licking and Perry Counties, and the State of Ohio, 1970

Item	Fairfield County	Licking County	Perry County	State of Ohio
Agriculture, Forestry and Fisheries	1,107	1,212	255	83,574
Percent	4.1	3.1	3.0	2.1
Construction	1,629	2,451	455	204,493
Percent	6.0	6.2	5.3	5.0
Manufacturing	11,002	12,961	3,609	1,447,586
Percent	40.5	32.8	42.7	35.6
Other	13.440	22.911	4,143	2,328,127
Percent	49.4	57.9	49.0	57.3
Total	27,178	39,535	8,452	4,063,780

Source: 1970 Census of Population, Bureau of Census.

APPENDIX Q

Table 9

Employed, Unemployed, and Unemployed Rate for Fairfield, Licking, and Perry Counties, State of Ohio, and the United States, 1976

Location	Labor Force	Employed	Unemployed	Unemployed Percent
Fairfield County	34,254	31,667	2,587	7.6
Licking County	47,339	42,774	4,565	9.6
Perry County	10,561	9,776	785	7.4
State of Ohio	4,730,000	4,361,000	369,000	7.8
United States	N/A	N/A	N/A	7.7

N/A - Not Available.

Source - Ohio Bureau of Employment Services.

APPENDIX Q

Table 10

Comparisons Between All and Rural Farm Families in Fairfield, Licking, and Perry Counties, and the State of Ohio, 1969

	Fairfield County		Licking County		Perry County		State of Ohio	
	All Families	Rural Farm Families	All Families	Rural Farm Families	All Families	Rural Farm Families	All Families	Rural Farm Families
Mean Family Income	$9,718	$9,083	$10,126	$9,758	$7,623	$8,059	$11,488	$10,007
Per Capita Income	2,740	2,678	2,836	2,848	2,089	2,330	3,221	2,746
Percent Families Below Poverty Level	8.4	10.5	8.4	10.3	14.9	14.7	7.6	9.8

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Table 11

State Planning Regions

Planning Region	Counties in Region	1970 Population	Ohio Population (Percent)
1	5	1,362,339	12.8
2a	5	899,407	8.4
2b	4	260,426	2.4
3	7	337,369	3.2
4a	5	150,076	1.4
4b	5	748,083	7.0
5a	5	247,197	2.3
5b	4	236,443	2.2
6	8	1,174,893	11.0
7	10	350,565	3.3
8	8	218,146	2.0
9	9	368,721	3.5
10a	4	2,238,320	21.0
10b	5	1,221,289	11.5
11	4	742,550	7.0

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Table 12
Ohio Population by Planning Regions

Planning Region	1970 Number	1975 Number	1975 Ratio	1980 Number	1980 Ratio	1990 Number	1990 Ratio
1	1,362,339	1,429,049	105.0	1,496,004	109.8	1,619,624	118.9
2a	889,407	960,183	106.8	1,026,257	114.1	1,184,985	131.8
2b	260,426	278,192	106.8	298,445	114.6	345,617	132.7
3	337,369	349,883	103.7	365,852	108.4	405,917	120.3
4a	150,076	160,263	106.9	169,905	113.2	189,996	126.6
4b	748,083	785,918	105.1	825,218	110.3	915,610	122.4
5a	247,197	257,380	104.1	267,843	108.4	291,202	117.8
5b	236,443	247,470	104.7	256,981	108.7	273,928	115.9
6	1,174,893	1,255,881	106.9	1,341,079	114.1	1,531,239	130.3
7	350,565	354,162	101.0	355,702	101.5	351,384	100.2
8	218,146	223,431	102.4	227,674	104.4	232,810	106.7
9	464,914	470,772	101.3	474,731	102.1	479,998	103.2
10a	2,238,320	2,298,097	102.7	2,374,631	106.1	2,541,119	113.5
10b	1,221,289	1,288,308	105.5	1,361,417	111.5	1,517,337	124.2
11	742,550	764,891	103.0	776,049	104.5	789,280	106.3
State Total	10,652,017	11,123,880	104.4	11,617,788	109.1	12,670,046	118.9

Source: Ohio Department of Economic and Community Development, 1973. A projective study prepared by Battelle's Columbus laboratories for ODECD.

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Table 13

Available Recreation Space

County	Public	Private	Total
Acres			
Fairfield	4,233	1,894	6,127
Licking	1,953	3,341	5,294
Perry	29,794	724	30,518
Total	35,980	5,959	41,939
Within Watershed			
Fairfield	1,735	3	1,738
Licking	936	1,673	2,609
Perry	854	4	858
Total	3,525	1,680	5,205

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Table 14

Available Recreation Space by Land and Water

	Private			Public			Total		
	Land	Water	Total	Land	Water	Total	Land	Water	Total
Acres									
Fairfield	1,805	89	1,894	2,519	1,714	4,233	4,324	1,803	6,127
Licking	3,304	37	3,341	1,187	766	1,953	4,491	803	5,294
Perry	722	2	724	28,856	938	29,794	29,578	940	30,518
Total	5,831	128	5,959	32,562	3,418	35,980	38,393	3,546	41,939
Within Watershed									
Fairfield	3	0	3	52	1,682	1,735	55	1,683	1,738
Licking	1,645	28	1,673	170	766	936	1,815	794	2,609
Perry	4	0	4	8	846	854	12	846	858
Total	1,652	28	1,680	212	3,313	3,525	1,864	3,341	5,205

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Table 15

Available Recreation Facilities 1/

Area	Activity(s)
Fairfield County	
Buckeye Lake State Park	Picnic, hunting, boating, fishing, swimming, ice skating
Fishers Marina	
Greenfield Dam Wildlife Area	Hunting, boating, fishing
Licking County	
Buckeye Lake State Park	Hunting, boating, fishing, ice skating
Central Avenue Mini Park	Playground
Columbia Street Mini Park	Playground, court games
Cranberry Bog State Nature Preserve	Hiking, nature study
Everetts Field	Picnic, playground, court and field games, swimming
Flying M Archery Center	Archery
Forest Hills Public Golf Course	Golf
Frontier Ranch	Picnic, court and field games, hiking trail, camping
Harbor Hills Golf Club	Golf
Harbor Hills Polo Field	Polo
Heath Municipal Pool	Court and field games, swimming
Hebron Ball Field	Field games
Hi Valley	Fishing, camping
High Lands Golf Club, Inc.	Golf
High Valley Campground	Camping, fishing
Hillcrest Golf Course	Golf
Hollander Swimming Pool	Swimming
Jaycee Ettes Park	Picnic, playground, fishing
Lake Hudson, Inc.	Camping, picnic, playground, boating fishing
Paradise Valley	Camping, picnic, fishing
Pataskala Lions Park	Picnic, field games
Raccoon Valley Golf Course	Golf, nature study
Sherwood Green Archery	Camping, picnic, court games, hiking trail, hunting, nature study, boating, fishing, winter sports-ice skating
South Gate Park	Playground, court games
Spring Valley Pool	Picnic, playground, court games
State Rest Areas (2)	Picnic
Sugar-Loaf Park	Hiking Trail

Table 15 cont'd

Area	Activity(s)
SWL Park	Picnic, playground, field games
Town Commons	
Vince Hitt Farm	Horseback riding
Willow Run Golf Course	Picnic, golf
Zeume Farms Country Resort	Camping, playground, court and field games, hiking trail, horseback riding, boating, fishing, swimming, winter sports
Perry County	
Buckeye Lake	Hunting, boating, fishing, ice skating
Finks Boat Landing	Picnic, boating, fishing
Thornville Community Park	Picnic, court and field games, swimming
Walters Landing	Camping, boating, fishing

1/ Within watershed boundaries.

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Table 16

Outdoor Education Areas 1/

County	Type of Area	Shelter	Drinking Water	Sanitary Facilities	Picnic Tables	Parking	Hiking Trails	Guide Service	Camping
Fairfield									
Barnebey Center for Environmental Studies	NE	x	x	x	x	x	x		
Fairfield Union Land Laboratory	NE	x	x	x		x	x		
Geneva Hills	SC	x	x	x	x	x	x	x	x
Greenfield Dam and State Widlife Area	NE					x			
Lockville Locks	NE		x	x	x	x			
Olivedale Park	NE	x			x	x	x		
Rising Park and Mount Pleasant	NE	x	x	x	x	x	x		
Rock Mill Dam State Wildlife Area	NE					x			
Shallenberger State Nature Preserve	NP								
Tarlton Cross Mound	NE		x	x	x	x			
Wahkeena	NP	x	x	x		x	x	x	
Licking									
Blackhand Gorge State Nature Preserve	NP					x	x		
Buckeye Lake State Park	NE	x	x	x	x	x			
Camp Agape	SC	x	x	x	x	x	x		x
Camp Falling Rock	NE		x	x	x	x	x		x
Camp Ohio	SC	x	x	x		x	x		x
Camp Wakatomika	SC	x	x	x		x	x		x
Cranberry Bog State Nature Preserve	NP								
Dawes Arboretum	NE	x	x	x	x	x	x	x	

Table 16 cont'd

County	Type of Area	Shelter	Drinking Water	Sanitary Facilities	Picnic Tables	Parking	Hiking Trails	Guide Service	Camping
Dennison University Biological Reserve	NP	x	x	x		x	x		
Flint Ridge State Memorial	NE	x	x	x	x	x	x		
Hebron National Fish Hatchery	C		x			x	x	x	
Octagon Earthworks and Mound Builders Earthworks	NE	x	x	x	x	x			
Pine Woods	NE				x	x	x		
Pinecrest Tree Farms	C-NE			x		x	x		
Southwest Licking School Land Laboratory	NE	x			x	x	x		
Perry									
Clouse Lake State Wildlife Area	NE		x	x	x	x			
Fort Glenford	NP					x	x		
Perry Reclamation Area	C		x	x		x	x		

Legend: Natural Environment - NE; School Camping - SC; Conservation Education - C; Nature Preserve - NP; Available - x.

1/ A Guide to Ohio Outdoor Education Areas, 2nd Edition, Ruth W. Melvin, Ohio Department of Natural Resources, The Ohio Academy of Science, pp. 192-206.

APPENDIX Q

Table 17

1973 County Facility Capacity 1/ and 1980-1990 Demand 2/

Activity*	Fairfield			Licking			Perry		
	1973 Capacity	Demand 1980	Demand 1990	1973 Capacity	Demand 1980	Demand 1990	1973 Capacity	Demand 1980	Demand 1990
Boating	1,410	4,107	4,825	1,070	3,595	4,191	632	868	972
Camping	1,883	2,553	3,028	2,933	4,014	4,745	70	56	61
Canoeing	80	79	109	240	235	280	0	10	12
Fishing	3,546	3,540	4,531	2,691	4,632	5,370	1,590	1,109	1,214
Hiking	1,110	1,457	1,697	690	2,246	2,606	240	388	431
Hunting	25,426	597	685	30,192	853	967	22,028	345	381
Picnicking	2,406	3,214	3,716	4,003	4,733	5,469	332	1,027	1,123
Swimming	5,492	8,168	9,475	3,454	11,516	13,349	650	2,422	2,647

1/ Capacity figures are daily capacity in numbers of persons that can be accommodated by existing facilities.

2/ Demand figures are numbers of persons expressed in daily demanded capacity.

*Information obtained from county data, Recreation Planning Section, Ohio Department of Natural Resources.

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Table 18
1973 Regional 1/ Facility Capacity 2/ and 1980-1990 Demand 3/

Activity	Region 6		
	1973 Capacity	Demand 1980	1990
Boating	13,844	55,908	67,558
Camping	13,538	28,292	34,335
Canoeing	5,360	6,328	7,926
Fishing	34,820	60,196	72,857
Hiking	6,751	24,778	30,084
Hunting	208,065	5,118	5,928
Picnicking	29,882	53,357	64,547
Swimming	49,258	133,924	162,501

1/ See Map 1, State Planning Regions.

2/ Capacity figures are daily capacity in numbers of persons that can be accommodated by existing facilities.

3/ Demand figures are numbers of persons expressed in daily demanded capacity.

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