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REND LAKE, ILLINOIS (OPERATION AND MAINTENANCE).(U)
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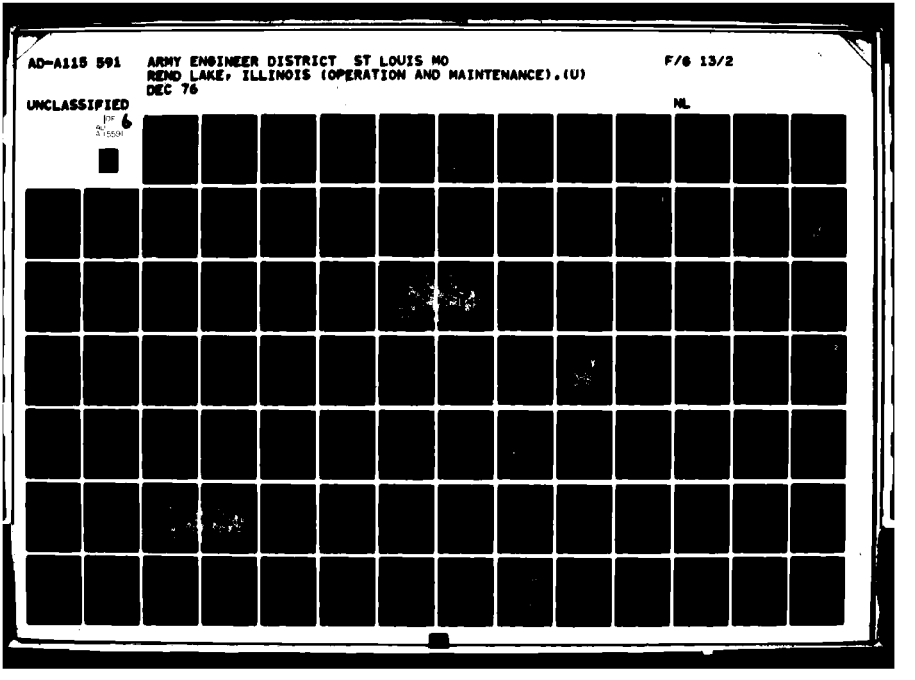

FINAL
ENVIRONMENTAL STATEMENT

REND LAKE, ILLINOIS
(OPERATION & MAINTENANCE)

PREPARED BY:
U. S. ARMY ENGINEER DISTRICT
ST. LOUIS, MISSOURI
DECEMBER 1976

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
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16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for release; distribution unlimited

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

Operation and maintenance of Rend Lake in Franklin and Jefferson Counties, Ill., is an 18,900 acre multipurpose reservoir completed in 1972. The justifying purposes of the lake were: flood control, down stream water quality control, water supply, recreation, fish and wildlife, and area development. This statement describes and reviews the environmental, economic and social impacts created by the operation of the lake for its stated purposes; the impacts or effects which will enhance or impair the project purposes; the effects of the

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reservoir and its operation upon the surrounding environment; the effects of the changing environment on the lake and its future operations.

FINAL

ENVIRONMENTAL STATEMENT

REND LAKE, ILLINOIS
(OPERATION & MAINTENANCE)

PREPARED BY
U.S. ARMY ENGINEER DISTRICT
ST. LOUIS, MISSOURI
DECEMBER 1976

STATEMENT OF FINDINGS
REND LAKE, ILLINOIS
(OPERATIONS & MAINTENANCE)

1. I have reviewed, in light of the overall public interest, the operation and maintenance program at Rend Lake, Illinois, relative to the various practicable methods of carrying out its authorized purposes of flood control, water quality control, water supply, recreation, fish and wildlife conservation, and area redevelopment. I have considered the comments of all interested parties in response to the draft environmental statement issued in December 1974.

2. In my review of this lake's operation and maintenance program, I have found that Rend Lake has helped to reduce downstream peak flood levels on the Big Muddy River by storing river flows during flood periods. Water quality conditions downstream of the reservoir have been enhanced due to the insured continual minimum release of water from the reservoir. Recreation facilities have been provided for a multitude of outdoor activities, including tent and vehicle camping, hunting and fishing, and outdoor educational programs. Fish and wildlife conservation purposes are being fulfilled in the way of an intensive waterfowl management program, with particular emphasis on building a flock of Canada Geese. Fishing is permitted in all areas of the project, and is a traditional sport of the region. Fish stocking is a major part of the project's management plan. Rend Lake's water supply is a major, direct stimulus to redevelopment of the heretofore severely depressed regional economy.

3. I have noted and carefully considered the adverse environmental impacts which have resulted or will result from the operation and maintenance program at Rend Lake. As these impacts relate to the Lake's stimulus to area redevelopment, uncontrolled development could greatly diminish the economic potential of the area and the visual environment of Rend Lake, particularly if the growth is not tied to land use controls, sewer service and other municipal services. On a long range basis appropriate planning and management steps should be taken to avoid potential conflicts between consumptive and non-consumptive uses of the project resources.

4. I believe that all appropriate steps were taken in the preparation and presentation of the environmental impact statement to disclose fully all known environmental issues. All pertinent facts have been presented, studied, and discussed by appropriate professional personnel on my staff. I believe the environmental impact statement complies with the spirit of the National Environmental Policy Act of 1969.

5. Alternatives to the present operation and maintenance program have been studied according to environmental, social, and economic effects including regional development and engineering feasibility. Alternatives considered included revised management plans and the use of structural

features relating to the maintenance of various lake levels. Other alternatives addressed minimum operation and maintenance procedures and other no action choices. The alternative of a single agency management structure for all project lands rather than the current multi agency structure was also considered.

6. Therefore, being appraised of the environmental, social, and economic losses and gains that have and will accrue from the operation and maintenance program at Rend Lake and having considered the practicable alternatives in the light of economic and environmental factors, social well-being and engineering feasibility, I have concluded that, on balance, the effects of the operation and maintenance program at Rend Lake are beneficial and that it is in the best public interest that they be continued.

23 Dec 1976
(Date)

Leon E. McKinney
LEON E. McKINNEY
Colonel, CE
District Engineer

I concur with the preceding Statement of Findings.

17 Feb 77
(Date)

F. P. Koisch
F. P. KOISCH
Major General, USA
Division Engineer

I concur in the preceding Statement of Findings.

26 May 1977
(Date)

Drake Wilson
DRAKE WILSON
Brigadier General, USA
Deputy Director of Civil Works

SUMMARY

REND LAKE, ILLINOIS (OPERATIONS AND MAINTENANCE)

( ) Draft (X) Final Environmental Statement

Responsible Office: U.S. Army Engineer District, 210 North 12th Street, St. Louis, Missouri 63101
Phone: 314-268-2821

1. Name of Action: (X) Administrative ( ) Legislative

2. Description of Action: Operation and maintenance of Rend Lake in Franklin and Jefferson Counties, Illinois. The lake is an 18,900 acre multi-purse reservoir completed in 1972. The justifying purposes of the lake were: flood control, down stream water quality control, water supply, recreation, fish and wildlife, and area development. Four governmental agencies are directly responsible for implementing these purposes through their operations and maintenance programs at the lake: The U.S. Army Corps of Engineers, the State of Illinois Department of Conservation, the Rend Lake Conservancy District, and the Casey Fork Park District.

This statement describes and reviews: the environmental, economic, and social impacts created by the operation of the lake for its stated purposes; the impacts or effects which will enhance or impair the project purposes; the effects of the reservoir and its operation upon the surrounding environment; the effects of the changing environment on the lake and its future operations.

3. Environmental Impacts: Five major impacts which represent the overwhelming consequence of continued operation and maintenance of Rend Lake are identified.

a. Beneficial Environmental Impacts

*Water Supply - An extensive supply system has been generated from the lake. This system alleviates a chronic water supply problem throughout the region, and should be a major social/economic asset.

*Recreation - The lake should serve over a million visitors annually for all types of water related activities in an area lacking these opportunities.

*Fish and Wildlife - The operational and maintenance activities will be beneficial to waterfowl populations, improved fish production capacity and diversity, preservation of large holdings of land and water for wildlife habitat and improved hunting and fishing opportunities with corresponding economic benefit to the area.

Area Redevelopment - The project purposes - water supply and recreation - should prove to be an economic stimulus for the entire region.

b. Adverse Environmental Impacts

Area Redevelopment - Uncontrolled development could greatly diminish the economic potential of the area and the visual environment of the lake, particularly if the growth is not tied to lane use controls, sewer service and other municipal services.

Resource Management - On a long range basis, the visual environment of the lake could be impaired. Erosion and sedimentation could become localized problems during construction and development around the lake. Generally, long range conflicts between consumptive and non-consumptive uses at the lake can be anticipated.

4. Alternatives to the Current Operation and Maintenance Practices

Several types of alternatives are described. A discussion of the probable effects of these alternatives and a judgment as to the desirability of implementing these changes is also included. The alternatives are categorized under the following headings.

a. Alternatives to the current practice of managing land and wildlife resources according to the concept of mixed uses.

b. Structural alternatives relating to the maintenance of various lake levels.

c. Alternatives based upon a decision to:

1. Put the area back to the way it was
2. Abandon the project
3. Provide only necessary minimum maintenance

d. The alternative of a single agency management structure for all project lands rather than the current multi agency structure.

5. Comments Requested:

Environmental Protection Agency
Advisory Council on Historic Preservation
U.S. Soil Conservation Service
U.S. Forest Service
U.S. Department of Commerce
U.S. Department of Housing and Urban Development
U.S. Department of Interior
U.S. Department of Transportation
U.S. Department of Health, Education and Welfare

State Clearing House
Illinois Archeological Survey
Illinois Natural History Survey
Illinois Historical Survey
Illinois Geological Survey
Illinois Department of Conservation
Illinois Environmental Protection Agency
Illinois Department of Public Health
Illinois Department of Transportation
Illinois Department of Business and Economic Development
Illinois Department of Labor
Greater Egypt Regional Planning & Development Commission
Rend Lake Conservancy District
Southern Illinois, Inc.
Mt. Vernon Chamber of Commerce
Benton Chamber of Commerce
Christopher Chamber of Commerce
West Frankfort Chamber of Commerce
Old Ben Coal Company
Orient Coal Company
Outdoor Illinois
Illinois Wildlife Federation
Illinois Association of Soil and Water Conservation District
Izaak Walton League of America, Inc. - Illinois Division
Illinois Audubon Society
Outboard Boating Club of America
Sierra Club - Great Lakes Chapter
National Campers and Hikers Association, Inc.
The Nature Conservancy - Illinois Chapter
American Fisheries Society - Illinois Chapter
Ducks Unlimited
Migratory Waterfowl Hunters, Inc.
The Wildlife Society - Illinois Chapter
The Coalition on American Rivers
Coalition for the Environment
Environmental Response

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Southern Illinois University - Carbondale

6. Draft Statement to CEQ 30 December 1974.

PREFACE

Rend Lake, an 18,900-acre multi-purpose reservoir completed in 1972, is located in Franklin and Jefferson Counties, Illinois. The justifying purposes for construction of the reservoir were: flood control, down stream water quality control, water supply, recreation, fish and wildlife, and area redevelopment. Three governmental agencies are directly responsible for implementing these purposes through their operations and maintenance programs at the lake: the U.S. Army Corps of Engineers, the State of Illinois Department of Conservation, and the Rend Lake Conservancy District.

Credit for much of the information presented in this environmental impact statement is acknowledged as input from an environmental inventory of the Rend Lake project area that was compiled in 1974 by Brauer and Associates, Inc., Minneapolis, Minnesota, under contract with the St. Louis District Corps of Engineers. Information from Brauer and Associates' inventory was directly incorporated into the environmental statement. A comprehensive effort was made, both by Brauer and Associates in compiling their inventory and by the Corps of Engineers in assembling the environmental statement, to evaluate the operations and maintenance programs for Rend Lake in light of their present and/or anticipated impacts on this multi-purpose resource.

REND LAKE

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PROJECT DESCRIPTION

Section 1

PROJECT DESCRIPTION

1.1 PROJECT LOCATION

Rend Lake, an 18,900-acre, multi-purpose reservoir completed in 1972, is located in Franklin and Jefferson Counties of southern Illinois. The main dam, impounding the main branch of the Big Muddy River and its tributaries, lies 103.7 river miles above the confluence of the Big Muddy and Mississippi Rivers.

Benton, Illinois (population 6,800) is three miles southeast of the main dam and Mount Vernon, Illinois (population 15,980) is 18 miles to the north. Several smaller towns (populations less than 2,000) including Ina, Bonnie, Waltonville, Sesser, Valier, Christopher, Buckner, Rend City and West City are located within five miles of the project boundary.

(Figure 1-1 shows the regional location of Rend Lake.)

1.2 PROJECT AUTHORIZATION AND HISTORY

1.2.1 AUTHORIZATION

Rend Lake was authorized by the Flood Control Act of 23 October 1962 (Public Law 87-874, 87th Congress, HR No. 13273) in accordance with the Chief of Engineers' recommendation, contained in House Document No. 541, 87th Congress, Second Session. The authorizing Act was then amended by Public Law 88-122, 88th Congress, HR No. 4823, approved 9 September 1963, to authorize the Secretary of the Army to credit local interests against their required payment for water supply for any work done by such interests on the project.[1]

On-going purposes for which the project was originally justified by Congress include:

a. flood control
b. downstream water quality control
c. water supply
d. recreation
e. fish and wildlife
f. area redevelopment

Authorization by Congress concluded years of study and effort toward meeting water resource needs within the Big Muddy Basin.

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[1]USCE, Rend Lake Reservoir, Design Memo No. 6B, The Master Plan and Appendices, 1965.

1.2.2 PROJECT HISTORY

1.2.2.1 Prior to 1950's Drought

The Big Muddy first came under federal attention when a preliminary examination of the river was carried out by the U.S. Army Corps of Engineers in 1926. The report concluded that flood control improvements were not feasible at that time.

In 1933, under authority of the Rivers and Harbors Act of 1925, a second report was prepared by the Corps of Engineers, containing a study of navigation possibilities on the Big Muddy River, with recommendations unfavorable to improvements at that time.

A general plan for improvements of the Mississippi River above the mouth of the Ohio River in the interest of flood control, navigation, and water power was prepared and sent to Congress in 1940. A reservoir on the Big Muddy River at Murphysboro was considered as a possible means of flood control at some future time. The matter officially lagged from then to the early 1950's.

1.2.2.2 1950's Drought and Conservancy District Formation

During 1953 and 1954 a severe drought in the Big Muddy watershed demonstrated the inadequacy of domestic water supplies. Franklin and Jefferson counties had no groundwater resources adequate either in volume or quality for domestic or industrial needs. Domestic water supply was provided by several small surface impoundments; several million gallons were brought in by truck.

A citizens' group, the Rend Lake Association, was formed at this time to promote the development of an adequate surface water supply to serve local domestic needs and to provide a stimulus for long-needed industrial growth. Promotional activity revived interest in original Big Muddy Studies.

By public referendum, initiated by the Rend Lake Association under authority of the River Conservancy District Act of 1926, the Rend Lake Conservancy District was formed in 1955. The enabling act has given the District broad powers to conserve and regulate water resources within its boundaries.

1.2.2.3 Rend Lake Project Formulation

In 1957 another preliminary examination of the Big Muddy was completed by the Corps of Engineers, concluding that it was technically feasible to provide improvements to accommodate barge traffic on the Big Muddy River, and recommending that a survey report be completed to determine the economic feasibility of such improvements. Water supply projects then lay outside the authority of the Corps of Engineers.

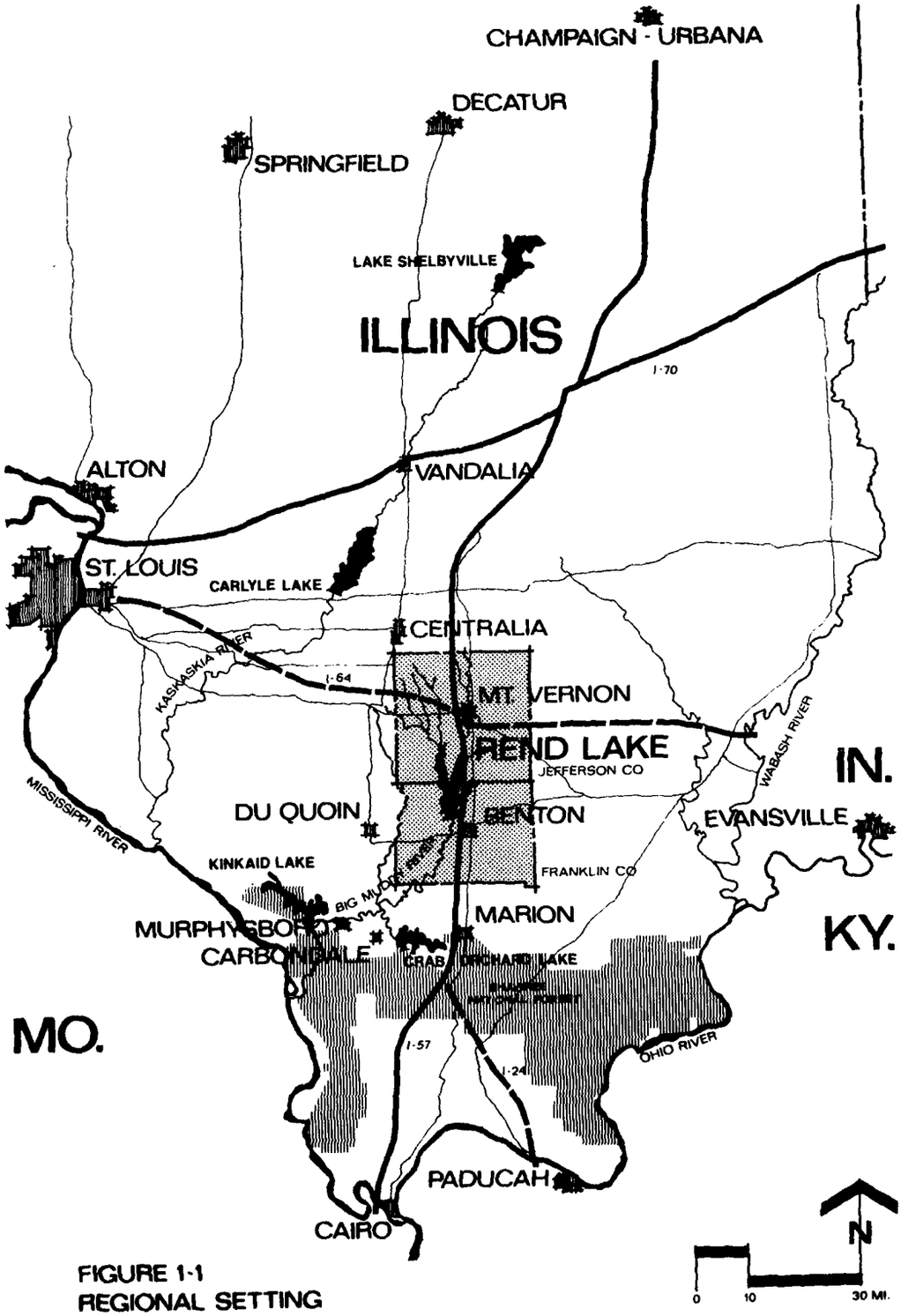


FIGURE 1-1
REGIONAL SETTING

A report prepared the same year by the State of Illinois, Division of Waterways, determined the engineering feasibility of a dam and reservoir on the Big Muddy River near Benton, Illinois, to serve the purposes of municipal and industrial water supply, recreation, conservation and other related uses. This later served as the basis for design of the reservoir, with modifications to meet Corps of Engineers' criteria. After progressing through several levels of priority in the House Public Works Committee, and initially coming within the purview of the Area Redevelopment Administration, the Rend Lake Reservoir was authorized by the Flood Control Act of 23 October 1962. Formal cooperative agreements with the State of Illinois and Rend Lake Conservancy Districts had been reached earlier in 1962. Appendix A-1 is the text of the original memo of understanding, which details the initial and on-going responsibilities to which each party agreed.

Construction of the two sub-impoundment dams began on 25 June 1965 and was completed on 8 March 1966. Construction of the main dam began on 4 May 1968, initial filling of the reservoir began on 24 October 1970 and the dam was completed on 15 December 1971.

1.3 PROJECT PURPOSES, COSTS AND BENEFITS

1.3.1 PROJECT PURPOSES

In order for Congress to justify the investment of public money in construction and operation of Rend Lake, the design had to be such that the intended purposes would produce a net public benefit greater than the public cost, on a continuing basis. Once constructed a project is operated to accomplish authorized purposes and reap associated benefits; therefore, on-going project maintenance, operation and management plans are directed specifically toward continually implementing project purposes. Rend Lake's construction was justified on the basis of annual benefits which could be expected to accrue from features of the total project which would provide:

a. downstream flood control
b. downstream water quality control
c. water supply
d. recreation
e. fish and wildlife conservation
f. area redevelopment

Design analyses showed that annual costs, including operation and amortized construction of these project features, would be less than annual benefits. A background and description of these purposes follows.

1.3.1.1 Downstream Flood Control

Discharge records indicate that notable floods occurred on the

Big Muddy River in 1913, 1915, 1943, 1944, 1946, 1950 and 1961. Flood data shows that the river was above flood stage during every year but one during the period 1940 to 1961. Records indicate that most flooding along the Big Muddy River occurs during the period January through May. Damage from flooding has been generally confined to the bottomland areas of the Big Muddy River.

Between the river mouth and Rend Lake are approximately 103,400 acres of bottomlands subject to flooding. Approximately 38,800 acres of this, about 37% of the total, were planted in 1962. It was then estimated that approximately 10% of the remaining 64,600 acres was urban areas, farmsteads, roads, stream beds and lakes, and the other 58,100 acres was timber. Urban areas subject to inundation by the standard project flood include portions of West Frankfort, Freeman Spur, Royalton, Herrin, Carbondale, Hurst, Blairsville and Murphysboro. Total flood damages on the Big Muddy River below the present reservoir were estimated at $157,100 per year based on 1962 cost indices. This includes urban, crop and rural property damage.

Rend Lake is intended to provide flood control benefit by storing river flows during flood periods, thereby reducing peak flood levels downstream and reducing annual damages.

1.3.1.2 Downstream Water Quality Control

Essentially zero flow has been experienced in the river near the Rend Lake Dam site during drought periods. Lack of rainfall over the basin during these periods is magnified by the small contribution of ground water to the surface water flow. Although the State of Illinois enacted stringent water pollution control objectives, and progress was being made in attaining them through construction and upgrading of sewage treatment facilities in the area, it was anticipated that low flow conditions in the Big Muddy River would result in critically low oxygen levels. Low dissolved oxygen levels would result in the loss of aquatic life in the stream, as well as septic conditions, odors and aesthetically unpleasing results. These conditions would adversely affect use of the Big Muddy River for recreational purposes. For these reasons, there was a need to augment periodic low flows in the Big Muddy River as well as to upgrade the sewage treatment facilities to meet State of Illinois objectives.

Rend Lake is intended to aid in improving downstream water quality by continual release of water from the reservoir, which insures that flow remains above the critical minimum level.

1.3.1.3 Water Supply

Before the construction of Rend Lake, towns and farmsteads within the Big Muddy River Basin obtained water from wells or small surface impoundments. Because of the nature of soils and bedrock in the area, well water proved available only for small rural households. Ground

water is subject to seasonal fluctuations, and during droughts becomes critically scarce. Ground water in many areas of the basin is saline, hence unusable for domestic supply. Many rural homes which depended upon ground water had to purchase water delivered by tank truck during droughts.

Many communities in the basin relied on small surface impoundments for their domestic water supply. During 1953-1954, a severe drought afflicted the Big Muddy River basin, and many surface impoundments proved inadequate to meet demands. The capacities of many of the small impoundments became seriously impaired by sedimentation. Several communities that depended upon inadequate surface impoundments lost interested industries because of lack of an adequate water supply. This has been identified as one of the most restrictive factors on the industrial development of the Big Muddy River basin.

A portion of Rend Lake's water is intended to insure the availability of an adequate water supply which is treated and distributed by the Conservancy District.

1.3.1.4 Recreation

With the impoundment of water and purchase of land, new recreational opportunities have been created. Tent and vehicle camping areas are available, provided with tables, braziers, comfort stations, shelters and play equipment. Utilities have been partly installed.

The Gun Creek Development, undertaken by the Conservancy District, will be a major recreation facility with motels and related services. A golf course is presently in place. Ina Peninsula will be the site of a state park which will include facilities for camping picnicking, boat launching, nature study and riding. It is presently being developed.

Other areas are reserved for lease by concessionnaires. In addition to bait and food stores, the major concession is now complete in the large marina north of the project headquarters. Recreation facilities are expected to be the largest generator of tourism to the area.

1.3.1.5 Fish and Wildlife Conservation

All land above the Big Muddy and Casey Fork subimpoundment dams, as well as the Nasson Point area, is reserved for intensive waterfowl management, with particular emphasis on building a flock of Canada Geese. During the winter of 1974-1975 the flock numbered between 36,000 - 40,000. The Upper Gun Creek area, north of the causeway, is managed for hunting, which will be permitted throughout the project, except in public access and other designated areas. Hunting has traditionally been very popular in the region, and has been locally supported in recent years as a means of promoting tourism.

Fishing is permitted in all areas of the project, and is another traditional sport of the region which should stimulate tourism, as well as enhance the attraction of the project for recreation. Fish stocking is part of the management plan.

1.3.1.6 Area Redevelopment

Scarcity of water caused potential industries to reject nearby sites for years, in spite of a competent surplus work force being available. Moreover, lack of water for domestic and agricultural uses has required an annual importation of up to 30 million gallons of water, this appreciable expense being borne by the residents.

Rend Lake's water supply is a major, direct stimulus to redevelopment of the heretofore severely depressed regional economy. The recreational features of Rend Lake are intended to encourage associated commercial growth. Considerable secondary development is also expected to support the industrial and commercial base of the area.

Other

Other purposes for the project were originally considered which would have theoretically had a bearing on redevelopment. These were barge navigation provided in the lower Big Muddy below the Rend Lake dam, and power generation. Studies during early design phases showed that total costs of these purposes would far exceed expected benefits.

1.3.2 PROJECT COSTS AND BENEFITS

1.3.2.1 Benefits

Benefits which will accrue from continuing operation and maintenance of Rend Lake in accordance with Design Memorandum No. 2, U.S. Army Corps of Engineers, General Design Memorandum, Rend Lake, Illinois are as follows:

Benefits

Project Purpose	Estimated Annual Benefits
Flood control	$ 504,000
Downstream water quality control	120,000
Water supply	706,000
Recreation	918,000
Fish and wildlife	358,000
Area redevelopment	520,000
Total estimated annual benefits	3,126,000
Less adverse effects*	- 6,000
Total estimated net benefits	$ 3,120,000

*Adverse effects (sometimes called negative benefits) include inconvenience to travelers resulting from roadway modifications.

1.3.2.2 Annual Costs

Costs effective 1 July 1973 including amortized construction and continuing operation were estimated and distributed as follows:

	Federal	Non-Federal	Total
Project first costs	$ 44,700,000	10,000,000	54,700,000
Interest during construction*	4,917,000	1,050,000	5,967,000
Gross investment	49,617,000	11,050,000	60,667,000
Salvage value	0	0	0
Net investment	49,617,000	11,050,000	60,667,000
Interest	1,489,000	332,000	1,821,000
Amortization	82,000	18,000	118,000
Maintenance & operation	534,000	82,000	616,000
Early replacement charges	100,000	18,000	118,000
Adjustment for loss of land productivity	64,000	0	64,000
Total annual charges	2,269,000	450,000	2,719,000

* Including allowance for net loss of land productivity

1.3.2.3 Benefit/Cost Ratio

Comparing project benefits and costs from analyses made just prior to congressional authorization, the overall benefit/cost ratio for the entire Rend Lake project is:

$$\frac{\text{Benefit}}{\text{Cost}} = \frac{\$3,120,000}{\$2,719,000} = 1.15$$

1.4 PROJECT STRUCTURAL FEATURES

1.4.1 MAJOR STRUCTURAL FEATURES

Figure 1-2 shows the location of the major structural features of the Rend Lake project including the water treatment plant.

1.4.1.1 Main Dam

The principal structure of Rend Lake is the main dam,

10,600 feet long, with a maximum height of 54 feet above the riverbed. Width at the top is 30 feet, which accommodates a two-lane highway.

The dam is a compacted earthfill embankment which is sloped at a low angle for stability. To prevent erosion of the faces, it is rip-rapped with limestone on the upstream side, and grassed on the downstream side. Should any seepage through the dam occur, it would be intercepted and controlled by a drain. The main dam and spillway areas are monitored for seepage and excessive fluid pressure by fields of piezometers.

The main spillway, a concrete structure located within the east dam abutment, is of the ogee type, a reverse curve in cross-section, 435 feet wide, with the crest at an elevation 410.0 feet above mean sea level. A notch, 31 feet wide and 5 feet deep, is centered in the main spillway, with its crest at elevation 405.0 MSL. To assist the main spillway in passing unusually high flood flows, an auxiliary spillway visible as an 800-foot long dip in the highway over the east abutment, was constructed with a crest elevation of 415.0 MSL. The existing valley is utilized as the exit channel.

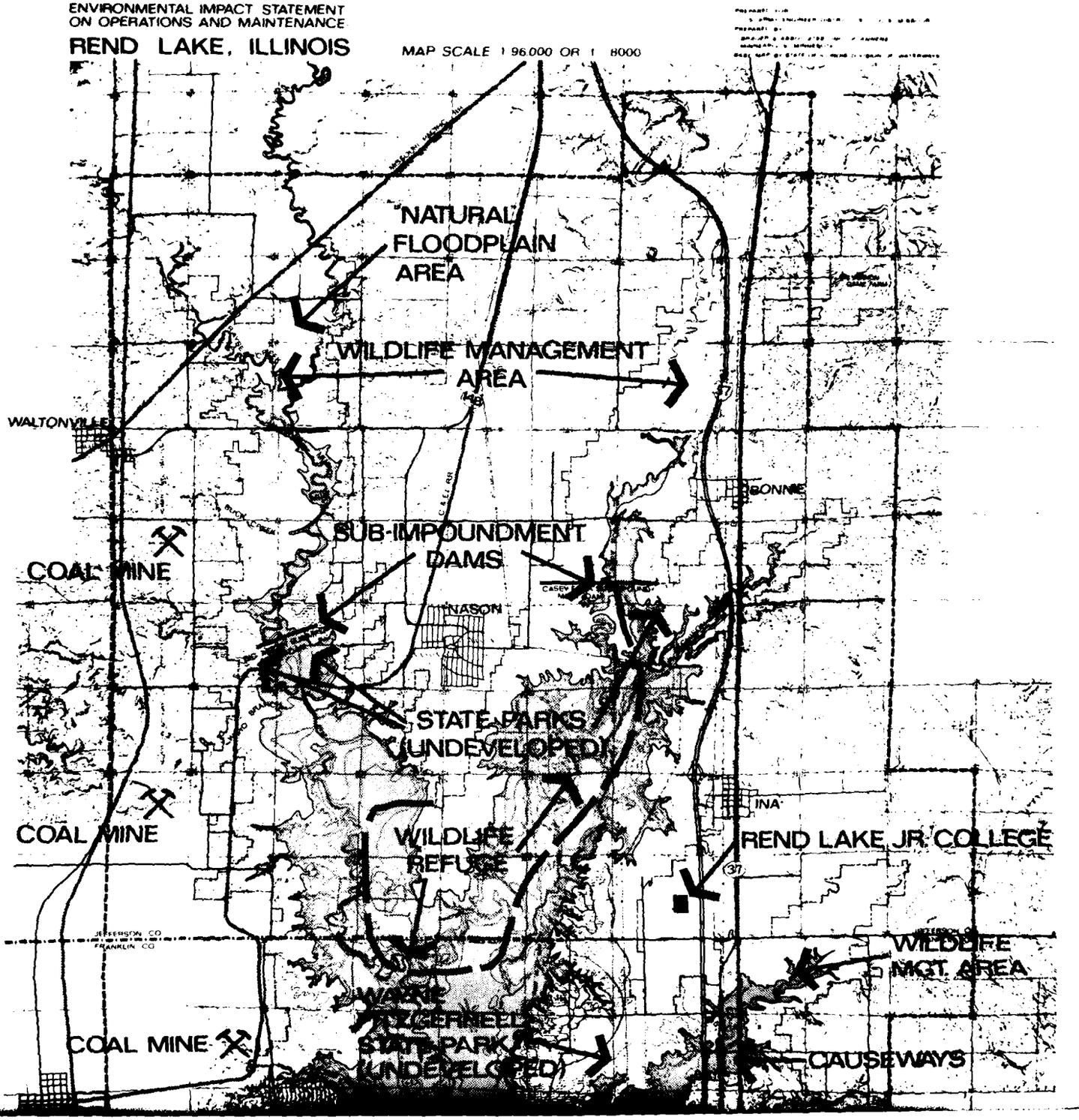
An outlet works, separate from the main and auxiliary spillway, is used to pass low flow, and was used for diversion during construction of the main dam and spillway. The outlet works consist of an upstream gatewell, a downstream stilling basin with baffles and two 4 by 6 foot rectangular conduits connecting the gatewell with the stilling basin, the flow being regulated by slide gates. The conduit size and capacity were determined by requirements of diversion during construction, but during normal operation of the reservoir only one conduit with operating gates is used to meet the low flow discharge requirements, the alternate conduit being used only when the normal conduit is out of operation due to normal maintenance or operational emergency. (See Figure 1-3)

1.4.1.2 Subimpoundment Dams

Two subimpoundment dams, consisting of a compacted earth core with rip-rap facing, were constructed in the upper arms of the reservoir. The overflow sections are at elevation 412.0 and the crests are at elevation 416.0 MSL. Both have gravity outlets. The Big Muddy subimpoundment dam is equipped with a 6 x 8 foot rectangular gate, and the Casey Fork subimpoundment dam is equipped with a 4 x 6 foot rectangular gate, these being used to control this discharge rate and thus regulate the level of the pools for fish and wildlife management. (See figure 1-2)

1.4.1.3 Other Major Operating Structures

An essential feature in implementing the water supply purpose of Rend Lake, but not included in the Corps of Engineers' construction is the existing water treatment plant.


ENVIRONMENTAL IMPACT STATEMENT
ON OPERATIONS AND MAINTENANCE
REND LAKE, ILLINOIS
MAP SCALE 1 96,000 OR 1 8000
"NATURAL" FLOODPLAIN AREA
WILDLIFE MANAGEMENT AREA
WALTONVILLE
BONNIE
SUB-IMPOUNDMENT DAMS
COAL MINE
NASON
STATE PARKS (UNDEVELOPED)
COAL MINE
INA
WILDLIFE REFUGE
REND LAKE JR. COLLEGE
WILDLIFE MGT. AREA
COAL MINE
CAUSEWAYS

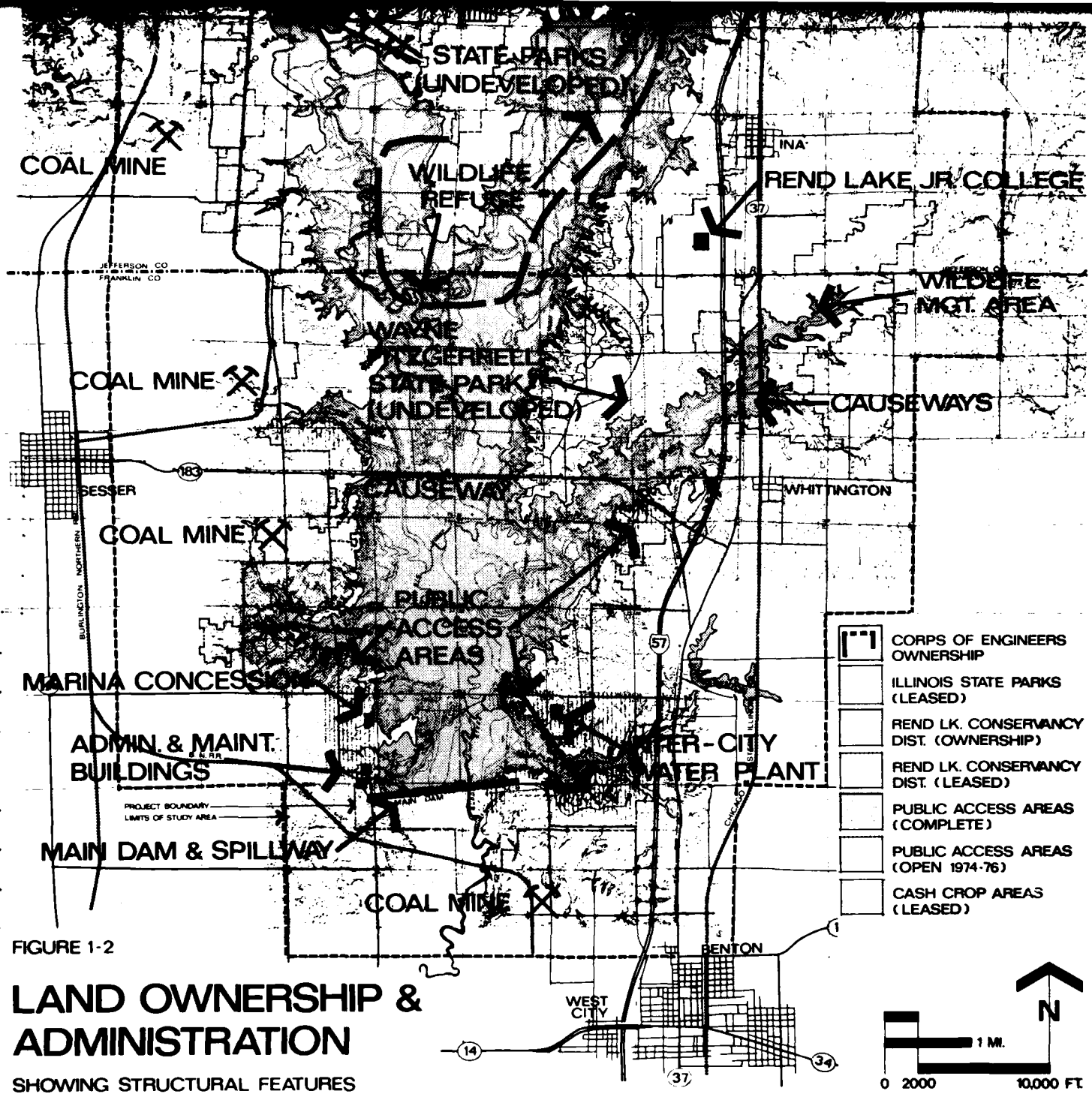


FIGURE 1-2

LAND OWNERSHIP & ADMINISTRATION

SHOWING STRUCTURAL FEATURES

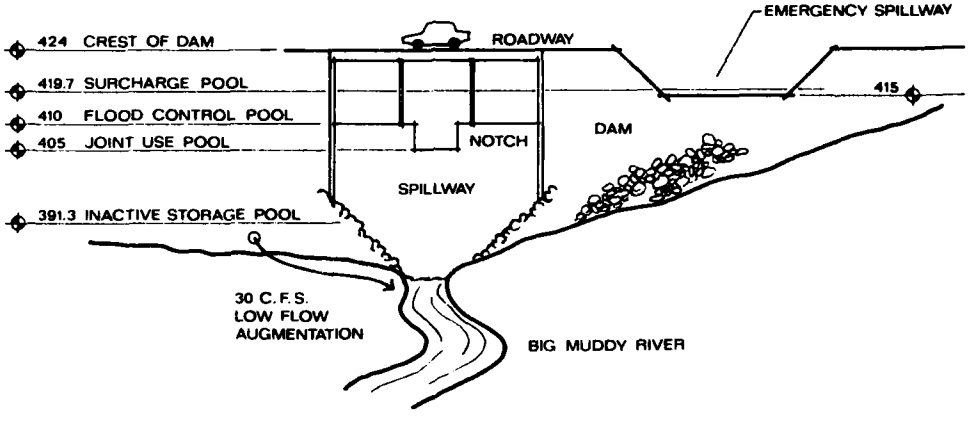


FIGURE 1-3
SCHEMATIC ELEVATION OF DAM LEVELS,
SHOWING RESERVOIR OPERATION

This treatment plant, constructed by the Rend Lake Conservancy District, was placed in operation in August 1971, having an average design capacity of 18 million gallons per day (mgd) and a maximum design capacity of 27 mgd. The plant treats raw water taken from Rend Lake, and distributes it to 49 municipalities. At the present time, the plant is treating an average of 10.4 mgd, with a seasonal high during August of 11.7 mgd and a seasonal low during April of 9.7 mgd.

The plant consists of the following essential components: raw water intake with 3 pumps, chemical feed system capable of feeding the following chemicals - lime and liquid alum for coagulation, carbon for taste and odor removal, sulfuric acid for pH control, fluoride for dental hygiene, chlorine for disinfection, and ammonia for chlorine residual control; four upflow clarifiers for soluble solids removal, eight rapid mixed media filters for suspended solids removal, a four million gallon clear well for treated water storage, three high service pumps for water distribution, an emergency power generator capable of supplying sufficient electricity to treat and distribute 10 mgd during commercial power outages, and two sludge lagoons for dewatering waste solids from the clarifiers.

The Conservancy District's regional water distribution system is shown in Figure 4-1.

1.4.2 SECONDARY STRUCTURES

Secondary structural development is not yet complete and both the Corps and Conservancy District have on-going building programs underway. Secondary features include roads, buildings, and public use areas.

1.4.2.1 Buildings

The Corps of Engineers' Rend Lake administration building is located on a slight knoll northwest of the dam on Franklin County Road 15, at one of the highest points of elevation on the project. It serves as an information center, staff office and conference building. A radio tower and staff motor pool are adjacent. The maintenance building and storage yard is located across the road, to the south.

The other sizeable building on the project is the office and shop of the Pharaoh's Gardens Marina, a concession on leased land between the administration building and the Sandusky Creek access areas. Related structures are the roofed and open docks, launching ramp and parking lot. The jetties were built by the Corps of Engineers.

Conservancy District construction has included the district's administration building which is located just north of the water treatment plant building. Both structures are attractive brick and suitably landscaped.

1.4.2.2 Roads

Interstate Highway 57, the principal access route to this project, crosses the east boundary at several points, and parallels State Highway 37 between Benton and Mount Vernon. The principal interchange is with State Highway 183 at Whittington. This latter route bisects the Lake on a causeway, providing access to the Gun Creek Recreation Area, the State Park, Sandusky Creek Recreation Areas and the town of Sesser. Other routes serving the site are State Highway 148 between Waltonville and Mount Vernon, and the county roads crossing Casey Fork and the main dam. Access to other points around the perimeter is provided by county, township and Corps-maintained roads, but many of these are fair-weather routes only. Some are single lane, and may not be passable in thaw or wet weather.

Improvements made during construction of the reservoir included: slope protection for Interstate Highway 57, relocation and raising of State Highway 183 crossing the main body of the Lake, revetments at bridge sites on State Highway 37, alteration of ten county and township roads, and provision of several new bridges.

1.4.2.3 Public Access Areas

Figure 1-2 depicts the various access areas which are either constructed and operational, or scheduled for development. Basically there are four areas scheduled to be opened for public use during 1975: Dam West, Sandusky Creek, North Marcum and Gun Greek. These areas generally include the following structures: camper pads, picnic tables, charcoal broilers, picnic shelters, play structures, control buildings, gate house, trash receptacles, boat ramps, parking lots, drainage structures, toilet facilities, showers and pumpout stations.

1.4.2.4 Private Development

Private development such as lake cottages is not permitted within the project boundary. Concession areas are leased under Corps supervision to private interests.

1.4.3 BASIC PROJECT PHYSICAL DATA

Appendix A-2 contains a tabulation of pertinent physical data describing design features of the Lake and major Corps of Engineers structures.

1.5 NEW AND CONTINUING CONSTRUCTION

Several areas of the overall Rend Lake program are under construction or being designed. This section will briefly outline what is

planned for future development around the lake. While there may be overlap with another segment of this report, it is necessary to note all construction that is underway or proposed. The projects listed in this section will take several years to complete and the total amounts to more than 20 million dollars in construction cost.

1.5.1 U. S. ARMY CORPS OF ENGINEERS

a. Marcum South Access Area and Spillway Access Area: Project presently under construction. Estimated construction cost, $1,800,000. Bids opened February, 1974. Contract awarded, April, 1974 - completed 1976.

b. Landscaping Contract for Marcum South Access Area and Spillway Access Area: Project to be advertised for bids January, 1975. Bids opened February, 1975. Construction completed Spring, 1976. Estimated project cost, $175,000.

c. Recreation Facilities at Dam West Access Area and North Marcum Access Area: Total project cost is $1,600,000 and the project is presently complete.

d. Landscaping Contract for the North Marcum Access Area: Estimated construction cost, $80,000. Project advertised for bids in April and bids opened in May, 1974. Project to be completed June, 1975.

e. Upgrading and expansion of Sandusky Creek Access Area: Design being completed. Estimated project cost, $2,200,000. Project advertised for bids in March, 1974. Bids opened in April, 1974. Construction scheduled to be completed by 1976.

f. Recreation Facilities at Jackie Branch Harbor: This project is part of the Sesser Access Area project. Total project cost is $130,000, project was completed in October, 1974.

g. Nutrient removal facilities have been added to the existing sewage treatment facilities. The nutrient removal facilities are now operational.

a. Wayne Fitzgerrell State Park; Master Plan deisgn has been completed; however, project cost is not available at this time. As of January 1976 the following facilities were either completed or under contract: 247 camp sites, 72 picnic sites, 30 tent sites, 5 boat launching sites, a bridle path, hiking trail, playground equipment, and day use facilities. Further proposed facilities include more tent and picnic sites, 2 fish cleaning stations, a boathouse, stable, kennel, and more day use facilities.

b. Boat launching facilities near sub-impoundment dams: Although some access is provided, additional minimal facilities will be provided at a later date.

c. State Division of Parks, in conjunction with the Division of Wildlife, is proposing five primitive parking areas for access to wildlife areas in the northern portions of the lake:

3-Gun Creek area, east of I-57
1-Atchison Creek area, east of I-57
1-Southwest of Nason, south of the Big Muddy sub-impoundment dam.

Each parking area cost about $4,000.

1.5.3 REND LAKE CONSERVANCY DISTRICT, GUN CREEK RESORT DEVELOPMENT

Conservancy District plans for future development include the following: (These costs are for construction. Operational costs are currently being developed and are not available at this time)

Resort Convention Motor Hotel	$3,840,000
Golf Course	967,400
Marina Facilities	1,821,000
Commercial Motel	2,610,000
Convention Center	1,675,000
Rental Cottages	547,400
Road System	1,786,300

1.5.4 CASEY FORK PARK DISTRICT, INA ACCESS AREA

Master Plan Design has been completed, however, project costs figures are from June, 1975. Revision of these figures are not yet available. Existing developments as of January, 1976 include one boat launching ramp, one picnic site, and parking for 35. The completed development plans include provisions for the following:

Marina Facilities	$ 249,000
Lodge & Cabins	502,000
Gas Station	14,000
Sewage	15,000
Marine Sewage Pumping	3,000
Water Supply	15,000

1.6 PROJECT OPERATION AND MANAGEMENT

This section outlines project operational objectives, project organization and administration, and summarizes operation and maintenance plans of operating agencies.

Changes in the water levels at Rend Lake are minimal. There is usually a slight difference between spring and fall, the former being slightly higher than the latter. The maximum recorded difference between high and low water stages is 6 feet. The water level is maintained at a constant 405 feet. Therefore, an annual rule curve, if produced, would simply be a straight line at 405 feet.

1.6.1 PROJECT OPERATIONAL STATUS AND OBJECTIVES

Implementation of the Rend Lake Master Plan is in its last stages of development, and operational objectives have been established for on-going administration of the project.

1.6.1.1 The Master Plan and Operational Status

Prior to beginning of Rend Lake construction a master plan of the project was prepared, its purpose being:

> ". . . a guide for the orderly and coordinated development and management of all land and water areas of the project. It presents data on the type of development considered necessary immediately upon completion and placing of the project into operation, and an estimate of first-phase future requirements."[2]

The development of this master plan included coordination of final design and construction planning activities with local and state agencies and resolution of final details of agreement for the responsibilities to be carried by all agencies which would have a continuing hand in project operation. (Appendix A-1 of this report shows a memo of understanding which summarizes the agreements between major parties of the Rend Lake project prior to development of the final master plan.)

The master plan includes all known and anticipated project development in either final, preliminary or reconnaissance design stages. All new and continuing construction mentioned in Section 1.5 above is in accordance with the master plan scope.

Appendices to the master plan include descriptions of coordination efforts made prior to development and on-going responsibilities for development and management of the project by the Corps, State of Illinois, Rend Lake Conservancy District, and Casey Fork Park District.

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[2] U.S.C.E., op.cit.

Major structure construction has been completed and Rend Lake has been specified as operational. It is now at the point of last phase construction and first phase operation. New construction activity will continue and several years will be required to complete all recreational activity areas and minor structures. However, full project responsibility now rests with the Operations Division of the St. Louis District. (Appendix A-4)

In summary, the Rend Lake project is operational although construction will continue. Project management is conforming generally to the routine forseen by the master plan, but long-term operating details, plans and organizational development are not yet complete.

1.6.1.2 Project Purposes and Operational Concepts

The Rend Lake development sequency has been as follows: Continuing local and regional water resource needs have been forseen; a design has been proposed for a multi-faceted project to meet these needs; Congress has insured that the design is a good public investment (benefits exceed costs); and the project has been constructed.

Previous sections described project purposes and benefits in detail. These purposes, including flood control, downstream low-flow augmentation, water supply, recreation, fish and wildlife conservation, and area redevelopment are the objectives of on-going Rend Lake maintenance, operation and management efforts, since they are essentially responsive solutions to continuing local and regional needs.

Project management plans and organization are formulated to accomplish purpose/objectives. Appendix A-4, Part I shows the U.S. Army Corps of Engineers' view of project operation and management objectives. Project purposes remain as continuing on-going objectives and the "operational concepts" define the scope of these objectives more precisely than the previous discussion of project purposes.

Appendix A-4, Part II enumerates the basic federal laws which control the Corps of Engineers' on-going administration and management effort. Areas of control and responsibility delegated to the State of Illinois and the Rend Lake Conservancy District are also subject to an additional body of State of Illinois law which control these agencies. Limits of all agency operations are defined in federal regulations since most of the Rend Lake land is retained under federal ownership.

1.6.2 PROJECT ORGANIZATION AND ADMINISTRATION

1.6.2.1 Project Organization and Allotment of Responsibility

Prior to construction of Rend Lake, authorities which would bear on-going responsibility for project operation were identified and agreement among the authorities was reached regarding the scope of these long-term responsibilities. (Appendix A-1 contains the original agreement between the Corps, state and Conservancy District). Allotment of project management responsibility has been generally consistent with initial agreements.

By initial agreement, the Corps retains general control and ownership of fee lands and waters after construction of the project. Specific management tasks for project purpose implementation have been shared among the Corps, the State of Illinois Department of Conservation, and the Rend Lake Conservancy District. Figure 1-2 shows the areas leased, licensed, outgranted and owned by the three operating agencies.

Project purpose responsibility for day-to-day management is essentially allotted as follows:

1. Corps of Engineers: reservoir main structure operation for water impoundment, recreation site development, management and maintenance, timber and wildlife management on Corps administered lands; overall project administration.

2. State of Illinois Department of Conservation: wildlife management including operation of sub-impoundment dams on lease, licensed lands; all fisheries management; safety enforcement hunting, fishing, boating on lake surface; state park development and management; land and forest conservation on state administered lands.

3. Rend Lake Conservancy District: water supply treatment and distribution; area redevelopment promotion and major resort development; operation and maintenance of leased recreational area; resource management and conservation on all Conservancy District administered lands.

4. Casey Fork Park District: recreational development, management and maintenance of Ina Access Area.

Several agreements with local support agencies and contracts with private individuals administered by each of the above provides specialized services required such as police and fire protection, garbage pickup and marina concession operation.

Overall project responsibility rests with the Corps of Engineers since project lands (except those owned by the Conservancy District) are owned or controlled through lease, license or outgrant terms. Agencies such as the State of Illinois and Conservancy District may maintain and manage these lands on a day-to-day basis; yet certain standards must be met. The temper of the overall responsibility of the Corps to insure compliance with standards is best said by the following paragraph from the St. Louis District Lake Management manual:

> "4. Each manager, assistant and Ranger must consider the inspection and protection of outgranted lands as important as the management and protection of Corps administered lands. It is the Corps' responsibility to make sure that these lands are not mistreated and are being used in the public interest.

1.6.2.2 Administration

Project administration is divided along lines of allotted responsibilities, with each agency developing both long-term master plans directed toward the implementation of their specific purposes, and day-to-day management plans to discharge daily, monthly and annual operation and maintenance responsibilities.

The Corps, retaining overall control, has set minimum general standards of accomplishment and administration for such tasks as soil and water conservation, timber management, land encroachments, inspections, etc. All agency plans must provide for activities which will expeditiously accomplish overall Rend Lake project purposes. All lease, license, and outgrant agreements also contain standards for maintenance and management.

Long-term operation and development master plans, annual operating plans and detailed specifications and design drawings for construction prepared by the State of Illinois and Rend Lake Conservancy District must be reviewed by the Corps of Engineers for conformance to project objectives. Annual and semi-annual inspections of various types are performed by Corps personnel to insure that operational goals are being accomplished and maintenance standards met on all lands administered by others. The Rend Lake Management Office of the Corps must also undergo the reviewing process so as to avoid undesirable elements or programs. The reviewing process is the only way to insure proper development of the project.

1.6.3 OPERATION, MAINTENANCE AND MANAGEMENT PLANS OF OPERATING AGENCIES

Since Rend Lake is in an early stage of long-term operation, not all management plans are complete. The basic organization and general management and operation concepts now serve as guidelines in areas where specific plans are incomplete.

1.6.3.1 Corps of Engineers

The Corps is presently preparing detailed operational and administrative guidelines. When completed, primary day-to-day guidance for field operations will come from the following (which supplement general orders, directions and manuals):

1. St. Louis District Lake Management Manual
2. Appendices to the Master Plan - General Design Memorandum 6B including:

    Appendix A - Project Resource Management Plan
    Appendix B - Forest Management Plan
    Appendix C - Fire Protection Plan
    Appendix D - Fish and Wildlife Management Plan
    Appendix E - Project Safety Plan

3. Reservoir Regulation Manual

The operation and maintenance program of the Rend Lake Management Office can be divided into several categories. These are resource management , main dam and lake maintenance with the associated development of minor access areas, the development and management of major access areas, law enforcement, and environmental interpretation. General guidelines for each of these areas of concern are described below.

Resource Management

The management of resources includes activities such as the planting of trees and shrubs (50,000 so far), the creation and maintenance of food plots for Canadian Goose and other wildfowl (300 acres), stabilizing steep banks with Crown Vetch, erection of Wood Duck boxes and Purple Martin houses, and the reestablishment of native prairie grass plots. Most of these activities are accomplished by hired labor.

In addition, areas suitable for farming are leased each year to the highest bidders. These areas - between 300-500 acres - not only provide waste grain for wildlife but also increase the edge effect and increase diversity by retarding the natural succession.

In 1976 the Rend Lake Management Office and the Rend Lake College will cooperate in the establishment of a demonstration conservation plot. Two hundred acres of land will be intensely managed, demonstrating proper methods of soil erosion control, crop rotation and practices beneficial to wildlife. This activity will not require any hired labor or involve any cost to the Rend Lake Management Office.

Maintenance of North Dam and Lake

Certain activities are carried out in order to properly maintain satisfactory turf on the downstream side of the earthen embankment. This has required many hours devoted to dirt filling, liming, fertilizing, reseeding and irrigation, as necessary.

Regulatory buoys are set and maintained in order to accomplish use zoning. Additionally, for reasons of safety, control of undesirable use pattern and convenience of lake uses, a number of minor areas have been developed using hired labor. These include a 2 lane concrete boat ramp with a parking lot and a ten car parking area at popular hunting and fishing spots.

Management of Major Access Areas

These recreation areas include the beaches, picnic shelters, individual picnic sites, boat ramps and campgrounds. The management of the access areas is accomplished by either contract or by hired labor. The private contracts for the mowing and cleaning of facilities extend from April through November and the work is inspected daily by Rend Lake personnel. Repairs to facilities, rejuvenation of grounds, and construction of new facilities is accomplished by hired labor. Fee booths in the campgrounds are manned by Park Aids from Memorial Day to Labor Day being open 8 hours a day during the week and 16 hours a day on weekends. The primary duties of the Park Aids are collection of fees, dispensing information, check for occupancy and 14 day limit, and restricting traffic into the camping area. The Park Aids are not directly involved with the enforcement of rules or regulations.

Day use areas close at 9:00 P.M. while all boat ramps and the entire spillway area remain open 24 hours a day.

The campgrounds are open from April through November except that the West loop of North Marcum remains open throughout the year as the required free area. Traffic in the campgrounds is restricted to campers and their guests with no sightseeing allowed.

Law Enforcement

Law enforcement authority is limited to Title 36 Code of Federal Regulations. These are basically "housekeeping" regulations and are classified as misdemeanors. Close liaison is maintained with the Sheriff of Franklin County, Illinois State Police and the Conservation Police Officers of the Illinois Department of Conservation. In 1975 203 written warnings and 116 citations were issued by Rend Lake employees. Most were written in the major access areas for the "housekeeping" type violations, but a few were for reckless vehicle or boat operation, littering and destruction of Government property.

Environmental Interpretation

During the summer of 1974 an Environmental Interpretation Program was initiated at Rend Lake. The first year's program consisted of evening campfire programs with the campers and a Sunday afternoon program

on reptiles. The snake program capitalized on the controversy of whether or not Cottonmouths were found at Rend Lake. Total attendance of the year's programs was 4,364.

Prior to the start of the '75 Program, the Rend Lake Management Office obtained a Mobile Environmental Interpretive Center - i.e. a trailer equipped with aquariums dioramas, mounted waterfowl specimens and microscopic displays. This unit was used in the campfire programs, afternoon programs with the general public, and organized groups. It was also taken to various fairs and folk festivals throughout Southern Illinois. The Interpretive Program for 1975 was more varied and received excellent repsonse from the public. Total attendance for the year's program was 27,635.

During the first two years, 2 part-time employees handled the entire program. As of 1976 there will be a permanent Naturalist/Interpreter, 2 part-time employees and 4 practicum students. Environmental Interpretation is becoming one of the areas of increasing importance at Rend Lake.

1.6.3.2 State of Illinois Department of Conservation

Responsibilities, plans and objectives for managing fish and wildlife and developing the state park area are contained in master plans which have been submitted to the Corps for approval. Appendix 1-6 provides copies of the General Design Memorandum 6B, the Master Plan, Appendix I, Section B which sketches the scope of the state fish and wildlife management program including operation of the sub-impoundment areas. This is not complete in detail but provides a quick overview for the reader.

Development and management plans for the park areas are outlined in Section 2.4 of this report.

1.6.3.3 Rend Lake Conservancy District

The Conservancy District operates the Intercity Water System, which implements the water supply purpose (and provides part of the area redevelopment stimulus) of the Rend Lake project.

The District also is actively promoting area redevelopment and is undertaking development of a major resort complex in the Gun Creek area. Sections 2.3 and 3.2.6 discuss these activities in greater detail. The district has broad powers in influencing area development and conserving water resources, but as yet has not developed detailed resource management plans.

1.6.3.4 Casey Fork Park District

The Park District is responsible for the development, operation, and maintenance of the Ina Access Area. Resource Management Plans emphasizing recreational development have been submitted to the Corps for inclusion in the Revised Master Plan - General Design Memorandum 6B.

1.6.3.5 Operating Levels

Appendix 1-3 to this report shows the relative level of financial support of each agency's annual management program. These figures show current levels of support only. All may be expected to increase as Rend Lake construction is completed and user activity increases.

1.6.4 SUMMARY

The above sections have outlined the organization and scope of the operation and management effort currently established to insure that Rend Lake's purposes will be achieved on a continuing basis.

Detailed plans and objectives are identified and discussed throughout the rest of this report where needed to develop discussion on a particular operation and maintenance impact.

1.7 REND LAKE'S ROLE IN FEDERAL, STATE AND REGIONAL PLANNING

Rend Lake is being incorporated into the resource planning of several federal, state and regional authorities in attempting to meet future and/or existing social, economic or natural resource needs. (Section 2.3.5 expands further upon regional planning.)

1.7.1 UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY

This study[3] begun in 1963, of the water and land resource needs of the Mississippi River Basin lying north of the Ohio River identified the major problems and needs within the Big Muddy River Basin as including:

- Flood and Sediment Damage Control
- Water Quality Control (including strip mine area rehabilitation)
- Recreational Opportunity
- Environmental Preservation

It recommends additional work to accurately quantify needs and establish alternative management solutions. Current planning in the Big Muddy Basin includes (among others) a comprehensive basin study by various federal agencies and comprehensive regional planning by the Greater Egypt Regional Planning and Development Commission.

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[3]UMRCBS Coordinating Committee, Upper Mississippi River Comprehensive Basin Study, Volume I - Main Report, 1972.

This study is essentially an effort to define problems basin-wide, inventory assets, and propose broad solutions to provide a framework into which specific projects may be integrated. Rend Lake is seen, along with other Southern Illinois water projects, as serving a portion of the Big Muddy Basin's regional needs mentioned above and focuses attention on the Big Muddy Basin Comprehensive Plan for specifics. (See Figure 1-4)

1.7.2 BIG MUDDY RIVER COMPREHENSIVE BASIN STUDY (Figure 1-5)

The Big Muddy Comprehensive Study,[4] completed in 1971, integrates Rend Lake's management purposes into a recommended program for the basin which includes in part:

a. Providing flood and sediment control in the Big Muddy Basin
b. Providing low flow augmentation for stream water quality maintenance and enhancing Big Muddy River bottom recreational use
c. Development of an "environmental corridor" on the Big Muddy for preservation and recreational use
d. Maintaining the fish and wildlife populations of the basin
e. Providing ample water supply for the area

It recommends that a total land and water resources management system be established within the basin to meet the above objectives. Projects already built, authorized or under construction within the basin would be included in the system. Existing projects in addition to Rend Lake are: Crab Orchard National Wildlife Refuge in Williamson County, maintained by the Bureau of Sport Fisheries and Wildlife; Shawnee National Forest, a portion of which is located in the basin and managed by the U.S. Forest Service under a multi-use program; and another multiple-purpose reservoir, Kincaid Lake, managed by the Reeds Creek Conservancy District.

The projects are to be supplemented by additional proposed improvements including: 73 reservoirs, 283 miles of main stem and 735 miles of lateral and sublateral channel improvements; 178 miles of river related land corridors, and installation of proper land treatment measures. The recommended structural developments, including a plan of improvement which may eventually be developed in the Cedar Creek Watershed are estimated to cost $228,870,000, based on July 1970 price levels.

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[4] U.S.C.E., Big Muddy River Comprehensive Basin Study - Summary Report, 1971

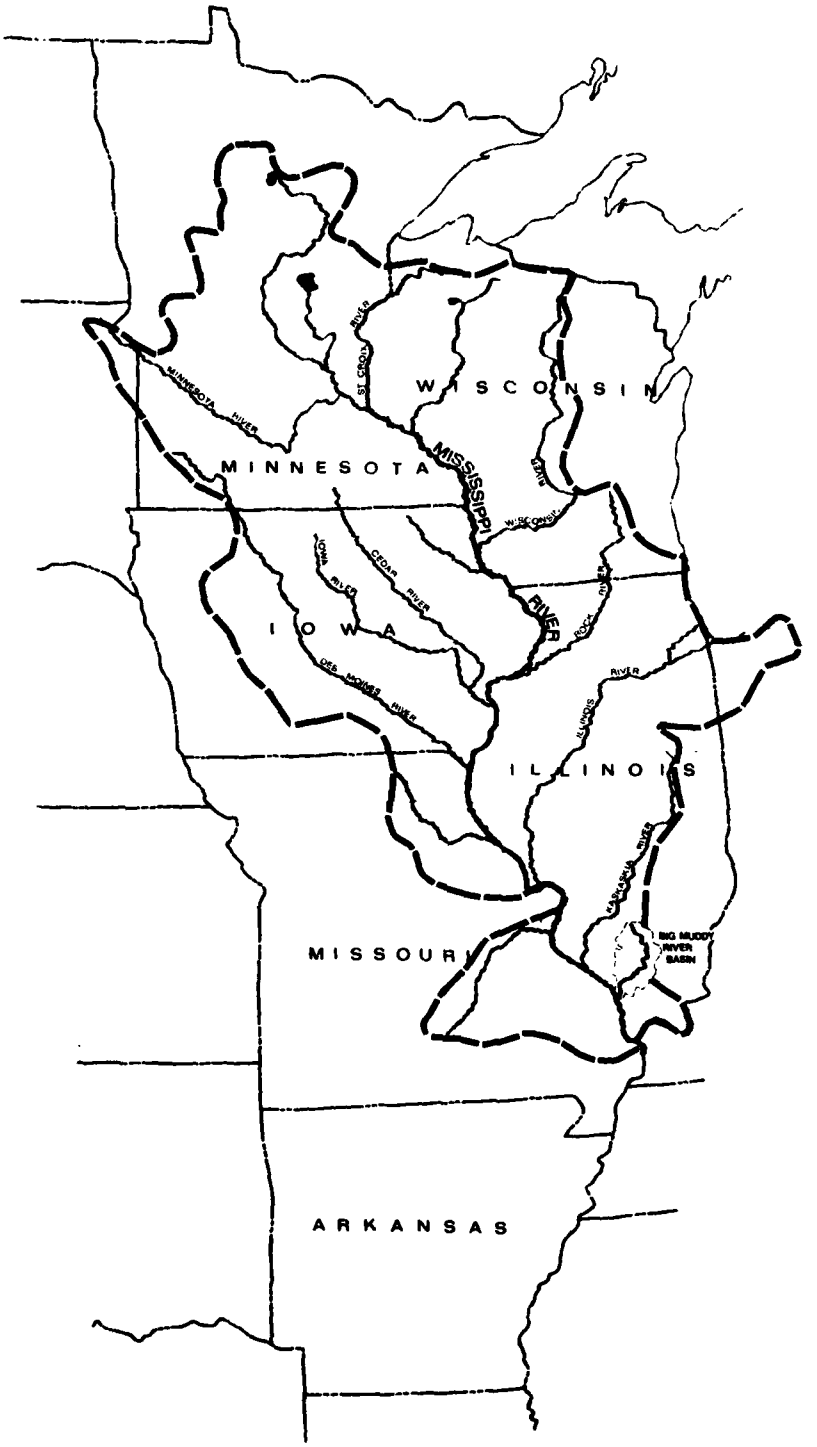

FIGURE 1-4
UPPER MISSISSIPPI RIVER BASIN

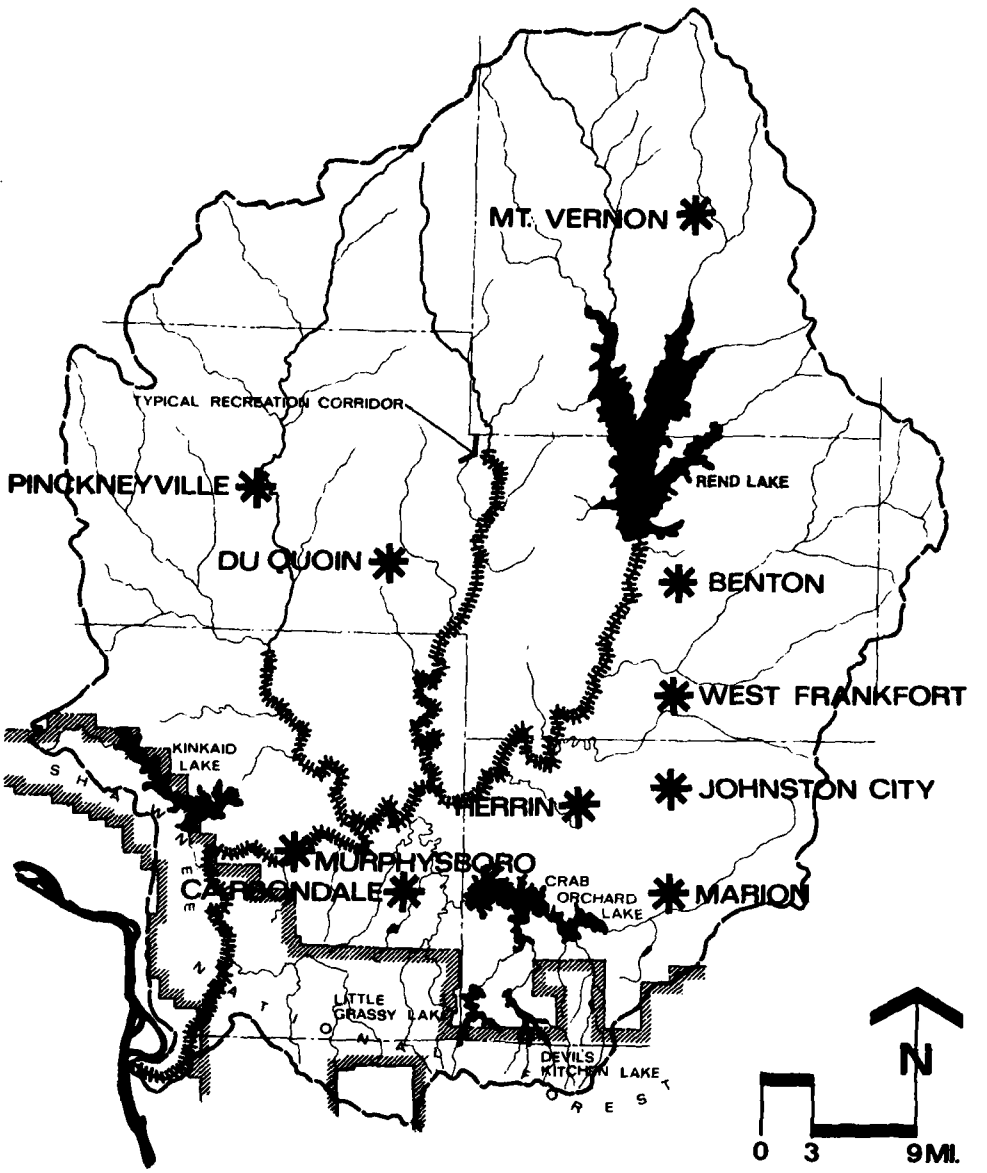

FIGURE 1-5
BIG MUDDY RIVER BASIN

At this point it is not clear how much of the proposed improvements are likely to ever be constructed, although it appears that some measures in the plan will be implemented, including the series of small, multi-purpose reservoirs near Rend Lake. One concept which appears to be gaining some acceptance is the establishment of environmental corridors to preserve open space and promote recreational uses along the flood plain areas of the Big Muddy and its major tributaries. This would also allow much of the region to be connected into the Shawnee National Forest by a series of open space corridors.

1.7.3 STATE OF ILLINOIS RECREATION, WILDLIFE AND ECONOMICS

The 1967 OUTDOOR RECREATION PLAN by the Illinois Department of Business Development, in discussing the "Region VI" or "Mount Vernon Hill Country" area including 26 counties of Southern Illinois, sees Rend Lake and other Corps of Engineers' reservoirs as increasing the state's total recreational water area by nearly 50 percent. The state's plan calls for development of "maximum opportunities" around these lakes with the aim of making them statewide examples of "optimum recreation development, management and opportunity".

The Illinois Department of Conservation sees Rend Lake as a major fish and wildlife management area providing refuge sanctuary and permanent open space for a wide range of wildlife with major emphasis on fish and waterfowl population development to attract hunting and fishing activity. The Rend Lake management area supplements other state and federal programs at Shwanee National Forest, Crab Orchard National Wildlife Refuge, and other areas.

Illinois sees Rend Lake mainly as a regional commercial redevelopment venture and not as a wilderness preservation project.

1.7.4 GREATER EGYPT REGIONAL PLANNING AND DEVELOPMENT COMMISSION (GERPS)

The Greater Egypt Regional Planning and Development Commission has developed a comprehensive plan for a five-county area which encompasses most of the Big Muddy Basin (and the lower half of Rend Lake). The regional plan inventories Rend Lake as a regional resource primarily for water supply and recreation and as a regional growth generator.

The plan foresees connecting and balancing the recreational resources of Crab Orchard, Rend Lake and Shawnee National Forest with the Big Muddy River, providing a "linear park" corridor to aid in connecting the system.

The GERPS 1964 Comprehensive Plan reviews the regional role played by each of the three major public areas. All quotations below are from the 1964 Greater Egypt comprehensive plan; parenthetical comments are those of the writer:

> "In general, the Shawnee National Forest Area (including Kincaid Lake) fits into the overall regional recreational plan as a natural wilderness area . . .
>
> Rend Lake. At the opposite extreme is the Rend Lake area in which the recommended development of recreational activities should be the most highly developed. Recreational areas around Rend Lake should include camp sites which offer such facilities as water and electricity and should also offer cabin and lodge facilities. Even such activities as an amusement park could be well utilized at the Rend Lake area. This lake would, therefore, be designed for that type of individual who is interested in getting away from the metropolitan area but does not desire to leave the modern conveniences of the city. Thus, more commercialization would be located in the area around Rend Lake than would be found in the other recreational areas of the Region.
>
> The Crab Orchard National Wildlife Refuge area would, within the plan, occupy a middle ground between the extremes of Kincaid and Rend Lake . . .
>
> . . . This (1964 comprehensive) plan recommends development of those activities best suited to the nature of the individual lake."[5]

Rend Lake's water supply and the Rend Lake Conservancy District's treatment and distribution systems are seen as supplying most of the water needs of at least the eastern portion of the Greater Egypt planning area.

1.7.5 REND LAKE AREA PLANNING

In the Rend Lake area, here defined as the area within Franklin and Jefferson Counties, countywide comprehensive plans have been prepared which together encompass Rend Lake and its environs.

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[5]Greater Egypt Regional Planning Commission and the Comprehensive Plan for the Greater Egypt Region, 1964.

1.7.5.1 Franklin and Jefferson County Planning

These countywide plans centering on land use and development are discussed in Section 2.3.5. Both county plans, developed under the guidance of the Greater Egypt planning staff, generally conform with GERPS plans for the region.

Rend Lake's water supply and recreational attractions, and the Conservancy District's water treatment and distribution system are recognized in both plans. Areas around Rend Lake likely to draw people and traffic have been set aside in both county master plans for commercial development (See Section 3.2.6.4 and Appendix 3.5).

1.7.5.2 Rend Lake Conservancy District

The Rend Lake Conservancy District owns outright and also leases from the Corps a large area on the east side of the lake. The District has been sponsor of the Rend Lake project from its inception and has assumed responsibility for domestic water system development and management, for promoting industrial development and for developing commercial recreational facilities to supplement federal and state areas. Rend Lake, therefore, is seen in Conservancy District plans as a water provider, impetus for area development and commercial attraction.

The Conservancy District has also undertaken detailed planning of its lands. In 1969, a land use plan was prepared for the lake by General Planning and Resource Consultants, St. Louis, Missouri, for the Rend Lake Conservancy District. This plan indicated that the lake should serve a complete range of recreational facilities including both active, intense recreational uses and major areas of near wilderness for wildlife management purposes. In short, the lake is to contain something for everyone; a complete range of recreational facilities. It is not known at this time (early 1976) what specific facilities will be developed on the Conservancy lands since the original plans are in the process of being revised.

REND LAKE

2

SECTION 2:

ENVIRONMENTAL SETTING OF THE EXISTING RESERVOIR

Section 2

ENVIRONMENTAL SETTING OF THE EXISTING LAKE

2.1 PHYSICAL ELEMENTS

2.1.1 GEOGRAPHIC SETTING

Rend Lake is an impoundment of the Big Muddy River of Southern Illinois, extending across Jefferson and Franklin counties, with the main dam located a few miles northwest of Benton. The rolling Mount Vernon hill country to the north, where the headwaters rise, gives way to a level plateau where Rend Lake fills a broad but shallow valley. The Big Muddy River, fed by many small creeks and streams, meanders some hundred miles southwestward to its juncture with the Mississippi.

The tight cohesive soils of the region allow a third of the annual rainfall of 40 inches to be lost as runoff, taking soil by erosion and backing up the river in frequent floods. Usable ground water is nearly nonexistent and frequently highly mineralized when found at all. Domestic water needs historically have been supplied by small surface impoundments which have proven unreliable in past droughts. The climate tends to hot summers, brief cool winters, and long mild springs and autumns very conducive to hunting, fishing and appreciating the considerable natural beauty of the region. Vast beds of coal underly the entire region, the mining of which has long been the dominant economic factor in the area.

2.1.2 GEOLOGICAL

2.1.2.1 Physiography and Geomorphology

Rend Lake is located in the Central Lowland Province, Till Plains Section.[1] Leighton, et. al. in their physiographic classification of Illinois, place Franklin and Jefferson Counties in the Mount Vernon hill country of the Till Plains Section.[2] Figure 2-1 shows the limits of the various physiographic divisions in Illinois.

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[1]Fenneman, N.M., 1938, Physiography of Eastern United States, New York, McGraw-Hill Book Company.

[2]Leighton, M.M., G.E. Eckblaw, and Leland Horberg, 1948, Physiographic Divisions of Illinois, Journal of Geology, Vol. 56, No. 1, p. 16-33.

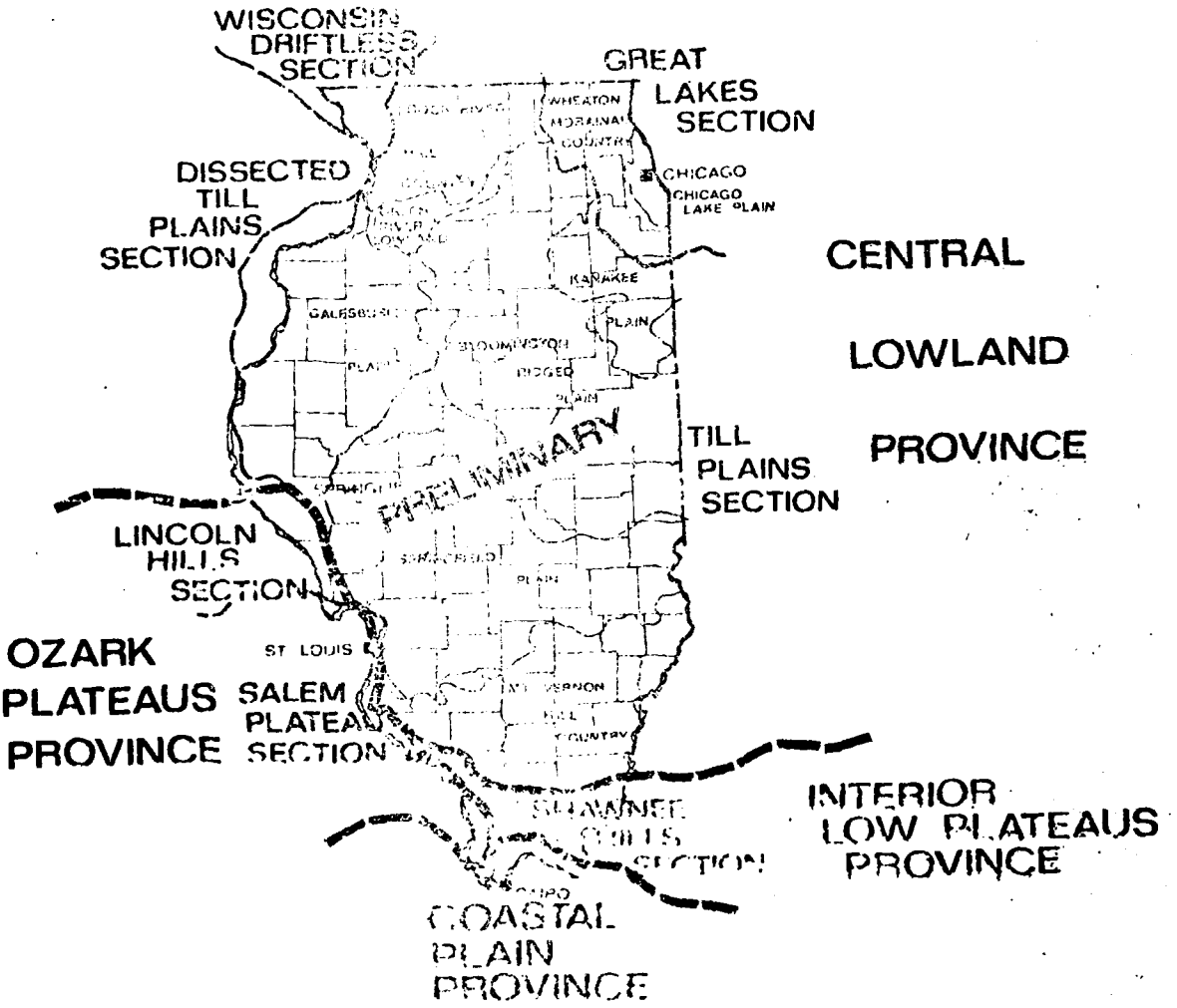

FIGURE 2.1
PHYSIOGRAPHIC DIVISIONS
OF ILLINOIS

Illinois is largely a prairie state and presents few striking physiographic features. The mean elevation of the state is about 600 feet above sea level, with a maximum of 1,241 feet at Charles Mound in the northeast and a minimum of 255 feet at the junction of the Ohio and Mississippi Rivers near Cairo, Illinois. Within Franklin and Jefferson Counties, the maximum relief is 280 feet with a high of 630± at the northwest corner of Jefferson County and a low of 350± where the Big Muddy River leaves Franklin County.

The Mount Vernon hill country includes the southern portion of the areas glaciated during Pleistocene time. The southernmost limit of continental glaciation in the northern hemisphere is close to the project area, in nearby Johnson County. Only the Illinoian glacial advance covered this area and deposited a fairly uniform layer of glacial till over the weak Pennsylvanian bedrock strata. This was covered by widespread deposition of eolian (wind blown) silts.

The most striking physiographic contrast in the project area is the valley of the Big Muddy River and its tributaries. These broad preglacial valleys were eroded, filled with alluvial sediments, and transformed into upland prairie. Frye, et. al. describe the mechanics of deposition in the nearby Saline River valley, which are similar to what occurred in the Big Muddy River valley.[3] Because of alluviation in the Ohio and Mississippi Rivers during the Altonian and Woodfordian substages of the Wisconsin Stage of glaciation, slackwater lakes formed in the southern Illinois river valleys. This resulted in deposition of the clays, silts, and small amounts of sand found in the area covered by glacial Lake Muddy. At some locations, terraces are visible and represent different lake levels in glacial Lake Muddy.

Glacial landforms are generally absent on the gently rolling uplands of Franklin and Jefferson Counties. The topography to a great extent is influenced by the structure of the underlying Pennsylvanian bedrock.

Man's activities are continually changing the existing landforms in the area. Underground coal mines result in large waste piles at the sites and in some cases subsidence of the land surface above the mining areas. There are no natural lakes in the two counties. However, the need for reliable drinking water supplies has resulted in construction of many reservoirs including the largest, Rend Lake.

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[3]Frye, J.C., A.B. Leonard, H.B. Willman, and H.D. Glass, 1972, Geology and Paleontology of Late Pleistocene Lake Saline, Southeastern Illinois, Circular 471, Illinois State Geological Survey, Urbana, Illinois.

2.1.2.2 Topography

Rend Lake is located in the broad flat valley of the Big Muddy River and its tributaries: Casey Fork, Gun Creek, and Atchison Creek. The area is bordered by gently rolling uplands with some areas relatively flat. The uplands reflect well weathered glaciated terrain where prior landforms have been removed by the action of wind and water. Drainage in the area is very well developed as shown by the absence of natural lakes.

Much of the land is favorable for agriculture, with the level areas resulting in little wasteland. Only along the limits of the flood plain do steep unusable slopes occur. Some soils are very heavy and are underlain by clay-like hardpan. In these areas, agriculture may be limited by excessive moisture and poor root development.

The flat topography results in a type of house construction where full underground basements rather than walkout type structures are the rule. Where water tables are normally high, seepage to these basements may be a problem.

The monotony generally associated with human activity in relatively flat areas is not present in the project area. Moderately high rainfall and less than intensive land use, especially around Benton, have resulted in large wooded areas, adding variety to the landscape.

2.1.2.3. Historical Geology

The geologic history of the Illinois Basin shows a long-term sequence of tectonic movements and sedimentary rock deposition. The process of change in the basin has occurred over a long time period. Table 2-. shows the standard geologic time sequence.[4]

The history of rock deposition and formation in the Illinois Basin encompasses the Precambrian and Paleozoic Eras. Figure 2-2 shows the sequence of deposition of Paleozoic rocks in the basin. During this era, the basin gradually settled as adjacent areas in the Appalachians, Ozarks, and Cincinnati Arch area of Indiana-Ohio were

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[4]Holmes, Arthur, 1965, Principles of Physical Geology, 2nd Addition Ronald Press, p.p. 360-361, 373, 375.

TABLE 2-1

MAJOR GEOLOGIC TIME DIVISIONS

Era	Period	Age of Boundaries (Millions of Years)
Cenozoic	Quaternary	2 - 3
	Tertiary	70
Mesozoic	Cretaceous	135
	Jurassic	180
	Triassic	225
Paleozoic	Permian	270
	Pennsylvanian	
	Mississippian	350
	Devonian	400
	Silurian	440
	Ordovician	500
	Cambrian	600
Pre-Cambrian		3000 plus

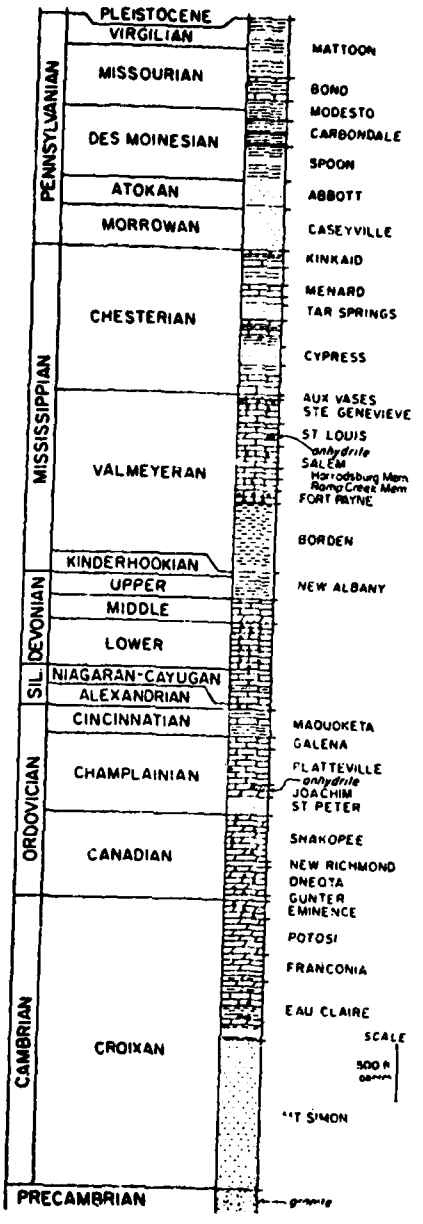

FIGURE 2-2
GENERALIZED GEOLOGIC COLUMN
ILLINOIS BASIN

fact that about three miles in thickness of sedimentary rocks exist in the deepest part of the basin.[5]

Most of the terrigenous sediments generated during the Paleozoic period were derived from areas northeast of the Illinois Basin. The Cambrian, Ordovician, Silurian, and Devonian periods were marked by marine deposition, emergence and erosion, and readvance of the seas with the accompanying new carbonate and sedimentary sand and mud deposition. The Silurian Period was marked by tremendous reef formation in the Basin. Many of these Silurian Reefs have been located and provide highly valuable oil resources.[5A] Active settlement of the basin and warping on the perimeter areas continued through these periods.[6]

During the Mississippian Period, locally produced carbonate sediments and also mud and sands from the northeast in Canada were deposited. The predominant muds and sands were carried by a major river across Michigan. As the sea in the basin rose and sank, deposition occurred over the area. Reasonably deep water deposits such as the St. Louis Limestone were followed by lowering of the sea level and Genevievian deposition of shallow water carbonates and clastics.[7]

The surface of the late Mississippian Chesterian Series was deeply eroded. This suggests that, at the end of the Mississippian Period, the Chesterian sea withdrew for a considerable time to allow valley formation and an identifiable drainage pattern.[8]

The Pennsylvanian Period is characterized by identifiable cycles of deposition. These cycles are called cyclothems of which about 50 are named in Illinois. The normal cyclothem sequence is from

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[5A]Bristol, H.M., 1974, Silvrian Pinnacle reefs and related oil production in southern Illinois, Illinois State Geological Survey, Illinois Petroleum Series 102, Urbana.

[5]Bond, D.C., E. Atherton, H.M. Bristol, T.C. Buschbach, D.L. Stevenson, L.E. Becker, T.A. Dawson, E.C. Fernalld, H. Schwalb, E.N. Wilson, A.T. Statler, R.G. Stearns, and J.H. Buehner, 1971, Possible Future Petroleum Potential of Region 9 - Illinois Basin, Cincinnati Arch, and Northern Mississippi Embayment, Reprint Series 1971M, Illinois State Geological Survey, Urbana, Illinois.

[6]Atherton, E., 1971, Tectonic Development of the Eastern Interior Region of the United States, Illinois Petroleum 96, Illinois State Geological Survey, Urbana, Illinois.

[7]Swann, D.H., 1963, Classification of Genevievian and Chesterian (Late Mississippian) Rocks in Illinois, Report of Investigation 216, Illinois State Geological Survey, Urbana, Illinois.

[8]Bristol, H.M. and R.H. Howard, 1971, Paleogeologic Map of the Sub-Pennsylvanian Chesterian (Upper Mississippian) Surface in the Illinois Basin, Circular 458, Illinois State Geological Survey, Urbana, Illinois.

bottom to top: basal sandstone, underclay, coal, black slaty shale, limestone, and gray shale. Not all units are present in most cyclothems but the cyclic nature is evident. The manner of deposition indicates sequences of marine and freshwater deposition. For example, marine fossils are found in some shales but are absent elsewhere. The coal deposits are freshwater swamp accumulations of plant debris.[9]

Post Pennsylvanian activities included faulting in the Rough Creek fault zone to the south and Warping at the Du Quoin monocline and the LaSalle anticlinal belt. There may have been continued sedimentary deposition during the Permian Period. However, this has since been eroded away. Following events such as Pleistocene glaciation continued the erosion and leveling process of the basin surface.

2.1.2.4 Stratigraphy and Lithology

The importance of the soil and rock materials that underlie the Rend Lake can be seen by observing the large coal mines and many oil wells near the lake. The unconsolidated soil materials are not discussed in this section but are covered in the section entitled "Pedology".

Figure 2-3 shows the surficial bedrock map for a portion of southern Illinois.[10] At the project, the uppermost bedrock is of Pennsylvanian age. The bedrock formations dip gently towards the northeast in the Rend Lake area exposing a sequence of Pennsylvanian formations.

Approximately 11,000 feet of sedimentary rocks are in place above the Precambrian basal granites at the site as shown in Figure 2-2. A general description of the method of deposition of these materials was given in the previous section. The following sections describe in detail the lithology of the near surface bedrock layers and briefly discusses underlying strata which at present appear to have little if any economic value at the site.

Pennsylvanian System

The Pennsylvanian System includes the uppermost bedrock in the project area. It is overlain by relatively thin layers of glacial drift, loess, and alluvial deposits in river valleys. The

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[9]Kosanke, R.M., J.A. Simon, H.R. Wanless, and H.B. Willman, 1960, Classification of the Pennsylvanian Strata of Illinois, Report of Investigation 214, Illinois State Geological Survey, Urbana, Illinois.

[10]Willman, H.B. 1967, Geologic Map of Illinois, Illinois State Geological Survey, Urbana, Illinois.

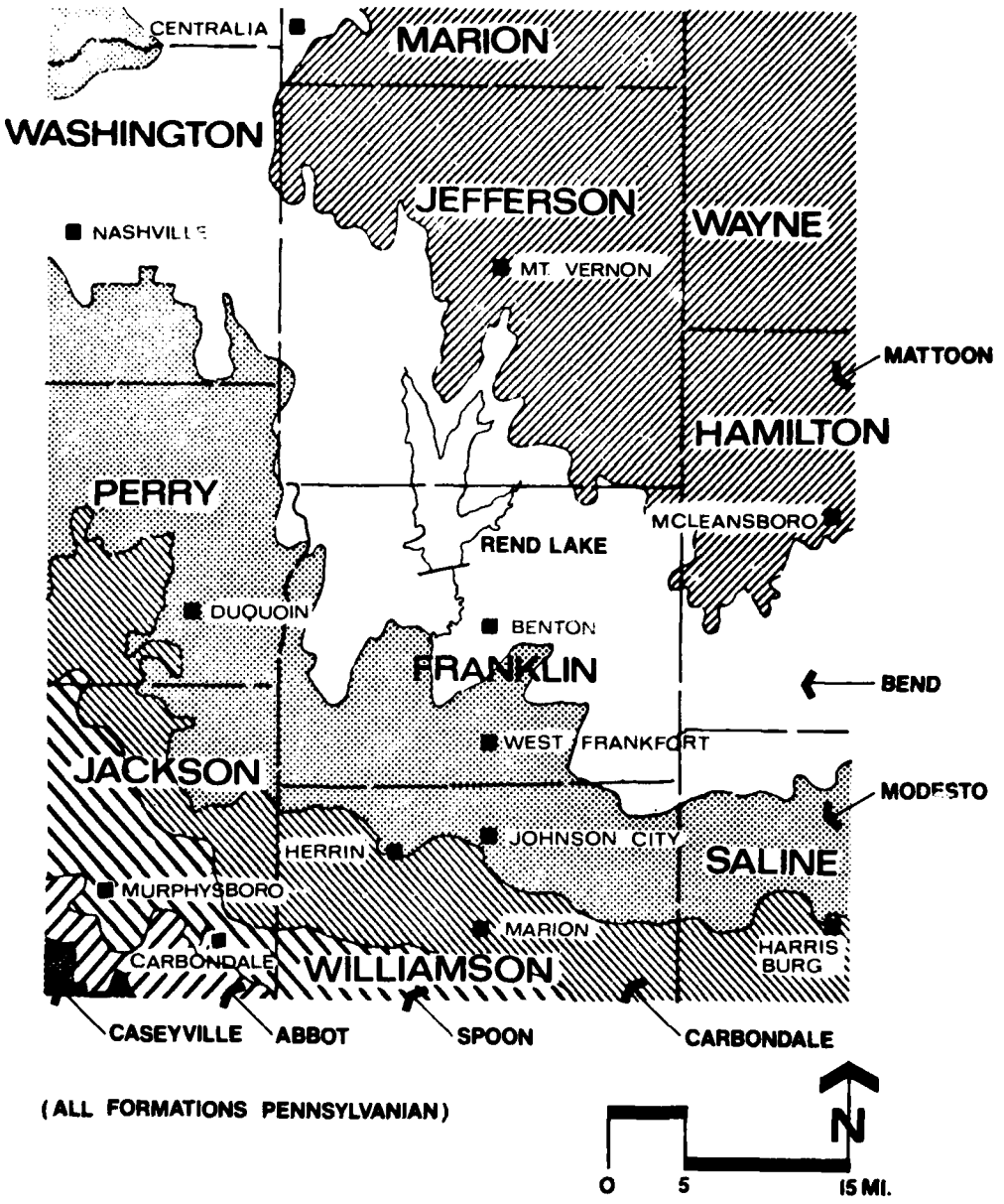

FIGURE 2-3
BEDROCK MAP

Pennsylvanian surface is eroded by action of preglacial streams, and in various locations differing formations are exposed at the bedrock-soil contact. Historically known as the "Coal Measures", the Pennsylvanian System contains all of the coal members of any value in Southern Illinois.

Willman designates five series in the Pennsylvanian System.[11] Figure 2-4 shows the various series and formations. The following sections discuss in detail each formation shown in the figure. Since the formation and series limits do not necessarily coincide, no detailed series description is given. Formation descriptions are based on information from Kosanke.[12] Other sources are shown in the text.

Matoon Formation

The Matoon Formation is the uppermost bedrock in the northeast half of Jefferson County. The formation consists of mainly shale and sandstone with some thin coal beds and limestones. The coals are not uniform. This bed in Jefferson County is thin, increasing in thickness only with the downslope of the basin to the northeast.

Bond Formation

The Bond Formation is the uppermost bedrock layer over much of Jefferson and Franklin Counties. The formation consists of predominantly shale with interlying strata of limestone. The lowest member, the Shoal Creek Limestone, is approximately 14 feet thick in the project area and serves as a valuable horizon marker. Coal members are quite thin (less than one foot) but are widely traceable. The formation is approximately 300 feet in thickness.

Modesto Formation

The Modesto Formation is the uppermost bedrock layer in the southwest part of Franklin County. It consists primarily of gray shales with localized sandstones. Coals are present but are thinner than in the underlying Carbondale Formation. There is considerable red shale. Coals are usually less than one foot in thickness and are widely distributed. The Modesto Formation is normally about 300 feet in thickness.

Carbondale Formation

The Carbondale Formation is the principal coal producing formation in the project area. The formation consists of predominantly gray

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[11] Ibid.
[12] Kosanke, R.M. and others, op. cit.

shale with locally prominent sandstones. Coal and limestone members are continuous over wide areas. The coal beds are generally 2 to 7 feet thick and are an important mineral resource. Most of the beds have well-developed underclays and black shale deposition above the coals. Ten separate coal members have been identified with the most important being the Harrisburg (No. 5) and the Herrin (No. 6) coals. The Carbondale Formation has a thickness of approximately 300 feet.

Spoon Formation

The Spoon Formation contains primarily shale with sandstone. The sandstones are micaceous and argillaceous and the shales contain less sand than in the underlying Abbott Formation. Underclays beneath the several coal layers are developed. The coal members (possibly seven) are thinner than in the Carbondale Formation and can be traced over considerable areas. The Spoon Formation has a maximum thickness of 350 feet in southern Illinois.

Abbott Formation

The Abbott Formation is characterized by primarily sandstone, sandy shale, and siltstone. It is differentiated from the underlying Caseyville Formation by the absence of quartz pebbles and the general grading of from clean quartz sandstone at the base to micaceious and argillaceous sandstone near the top. Several coal layers are identifiable; however, thicknesses are usually less than 24 inches and may not be continuous. An estimate of the thickness of the Abbott Formation at the project is 100 to 300 feet.

Caseyville Formation

The Caseyville Formation is characterized by sandstone development along with sandy shales and siltstones. At least two coal layers are present in the project area with the very thin Gentry Coal being the most readily traceable. The sandstones are composed of clear quartz sands and contain small rounded quartz pebbles. Limestone is usually not observed in the Caseyville Formation. Thickness of the formation, while quite variable due to irregularities of the pre-Pennsylvanian surface, can be estimated as 300 to 500 feet.

Mississippian System

The Mississippian System underlays the more recent Pennsylvanian System and included in descending order the Chesterian, Valmeyeran, and Kinderhookian Series. Much of the oil development in the Rend Lake area has been in the Mississippian System with the Aux Vases, Tar Springs, and McClosky Pay Zones being most widely exploited. Bond, et.al.

provides the following general description for the system.[13]

The Chesterian Series is a sequence of about 20 formations which are either limestone with shale or sandstone with shale. Of the total materials, about half is shale with one quarter each limestone and sandstone. The Chesterian System is approximately 1,000 feet thick in the project area.[14]

The Valmeyeran Series includes many of the layers producing oil in the area. The system has a thickness of approximately 1,600 feet. It consists primarily of limestone and dolomite with a 200-foot thickness of shale at the base. The limestones are, in most cases, fossiliferious.

The Kinderhookian Series is a thin limestone layer approximately 125 feet in thickness at the King Oil Field and forms the base of the Mississippian System. It is underlain by the Chouteau limestone and the New Albany shale.

Devonian System

The Devonian System is usually separated into three series; the upper, middle, and lower. Several oil wells in the Sesser Consolidated field penetrate Devonian strata; however, the larger fields in the project area are not producing from this System.[15] The Upper Devonian Series is shale and limestone and is underlain by primarily limestone deposits.

Lower Layers

The lower bedrock layers are shown in Figure 2-2. In the project area, little oil development has occurred below the Devonian System. Ven Den Berg shows no production in the Silurian and only 100 wells in the Trenton limestone of the Ordovician System (96 of these wells are in the Salem Consolidated field) in Franklin and Jefferson Counties.[16]

13 Bond, D.C., A.H. Bell, and W.F. Meents, 1968, Natural Gas in Illinois Basin, Natural Gases of North America, Volume 2, Memoir 9, American Association of Petroleum Geologists, Tulsa, Oklahoma.

14 Folk, S.H., and D.H. Swann, 1945, King Oil Field, Jefferson County, Illinois, Report of Investigation 109, Illinois State Geological Survey, Urbana, Illinois.

15 Van Den Berg, J. and T.F. Lawry, 1971, Petroleum Industry in Illinois, Illinois Petroleum 97, Illinois State Geological Survey, Urbana, Ill.

16 Ibid.

The basal Precambrian granites occur at a depth of approximately 11,000 feet in the project area.[17]

2.1.2.5 Structural Geology

The Illinois Basin is the dominant structural feature in the southern Illinois area. It is presently surrounded by areas of regional uplift, the Cincinnati Arch to the east and the Ozark Dome to the west. The Illinois Basin is oval in shape and consists of essentially all Paleozoic strata overlying Precambrian basement rock. There are three major areas of uplift in the basin, the LaSalle Anticlinal belt in eastern Illinois, the Du Quoin Monocline in Jefferson, Perry and Franklin Counties and the Rough Creek Fault Zone which runs east-west across southern Illinois. Within these uplift areas is the Fairfield Basin, the deepest portion of the Illinois Basin, where the Precambrian basement rocks are more than 14,000 feet deep. Figure 2-5 shows the location of these various structural features.[18]

The Du Quoin Monocline dips steeply to the east and faulting is inferred on a north-south line along the structure. The Rough Creek Fault Zone has uplift along the south side, and extends easterly well into Kentucky. The estimated time of occurrence of these three uplifts is during or after Pennsylvanian time. Faulting of a minor nature occurs throughout the Fairfield Basin. The minor faults are of importance to the extent that in the fault area, coal recovery is generally lower.

At the project site, the Pennsylvanian strata dips gradually (approximately 25-50 feet per mile) to the northeast. This is due to the location on the western flank of the Fairfield Basin.[19]

2.1.2.6 Economic Geology

Franklin and Jefferson Counties are located in the heart of the Illinois Basin coal and oil production area. In the past, exploitation of these minerals has provided the basis for the economy of the area.

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[17]Bond, op. cit.

[18]Ibid.

[19]Cady, G.H., 1941, Structure Map of the Herrin (No. 6) Coal Bed in Franklin, Williamson, and parts of Jefferson, Washington, Perry and Jackson Counties, Illinois State Geological Survey, Urbana, Illinois.

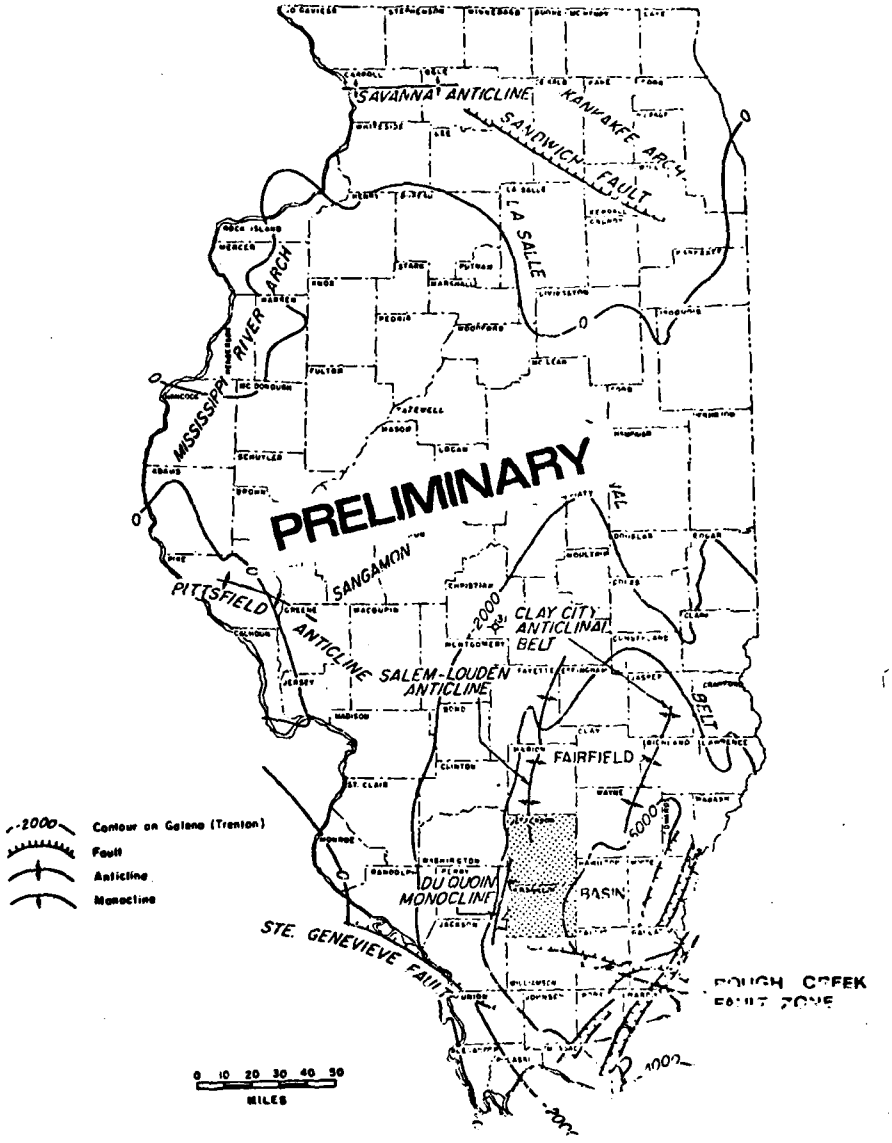

FIGURE 2-5
MAJOR TECTONIC FEATURES OF ILLINOIS

Coal

Coal was discovered in southern Illinois in the late 17th century.[20] Historically coal has been worked at surface outcrops to the south and west of Rend Lake. Mining of any consequence began in Franklin and Jefferson Counties in the late 19th century and production reached its peak in 1944 when over 18,500,000 tons were mined in the two counties. Peak mine employment occurred in 1923 when twice as many miners produced only two-thirds the 1944 production. There are five mines presently working beneath the project: Freeman Coal Company No. 6; Inland Steel; and Old Ben Coal Company No's. 21, 24 and 26.

Figure 2-4 shows a detailed stratigraphic column of the Pennsylvanian System in the project area. The principal coal reserve is the Herrin (No. 6) Coal. This member is being actively mined west, south and beneath Rend Lake. The extent of mining as of July 1973 is shown in Figure 2-6.[21] Less than 100 feet below the Herrin Coal is the Harrisburg (No. 5) Coal. This coal is an average of 48 inches in thickness as compared to 84 inches for the Herrin Coal. At present the Harrisburg Coal is not being mined near the lake Other coal formations are present (De Koven, Davis, etc.); however, member thicknesses are generally small making the economics of mining questionable. All mining is underground, as the Herrin Coal is at a depth of about 700 feet.

To a large degree, the present marketability of coal is dependent on the sulfur content of the product. Gluskater and Simon indicate that the Herrin (No. 6) Coal in this area is the most extensively mined low sulfur coal in Illinois.[22] This low sulfur coal deposit extends beneath Rend Lake and averages 1.5 percent sulfur. Figure 2-6 shows the estimated limits of the low sulfur coal. The remaining Herrin Coal and the underlying Harrisburg Coal are not estimated to have sulfur contents below 2.5 percent, the limit for "low sulfur" used by the Illinois State Geological Survey.

At Rend Lake, the Corps of Engineers purchased surface rights but generally did not purchase mineral rights.

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[20]Risser, H.E. and R.L. Major, Illinois State Geological Survey Educational Series #10, History of Illinois Mineral Industries

[21]Illinois State Geological Survey, Urbana, Illinois, 1974, Mined-Out Coal Area 29 and 30

[22]Gluskoter, H.J. and Simon, J.A., 1968, Sulfur in Illinois Coal, Circular 432, Illinois State Geological Survey, Urbana, Illinois.

Only mineral rights beneath the dams have been purchased to prevent subsidence of these critical structures. Consequently, large quantities of coal will be removed beneath project lands. Simon estimated that 238,140,000 tons of Herrin (No. 6) Coal remained beneath the 18,900-acre reservoir.[23] Figure 2-6, which shows mined out coal areas, indicates that considerable mining activity is now concentrated along the west and south sides of the lake with active areas moving easterly beneath the lake.

Table 2-2 shows data on coal production and reserves in Franklin and Jefferson Counties and at the Rend Lake project. Information is derived from unpublished Illinois State Geological Survey data, Simon[24], Illinois Department of Mines and Minerals production data, Bureau of Mines[25], and our calculations.

The Bureau of Mines[26] projects that production should increase above present levels for the next 50 years in the Big Muddy River Basin. Some discussion of trends in this industry are included in the economics section of this report. Employment considerations are also included in that section. It is apparent that the coal resource will have a long term impact on the economy of the Rend Lake area.

Oil

Franklin and Jefferson Counties have produced significant quantities of oil from fields scattered throughout the counties. Records indicate that the importance of this oil resource may be decreasing but production is expected to continue for some time. Figure 2-6 shows the principal oil fields in the project area. Figure 2-7 shows a stratigraphic column of the oil producing formations and indicates pay zones.

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[23]Simon, J.A., 1962, Coal Resources and Related Geology under Proposed Rend Lake in Franklin and Jefferson Counties, Illinois, Illinois State Geological Survey, Urbana, Illinois.

[24]Ibid.

[25]U.S. Department of the Interior, Bureau of Mines, Minneapolis, Minnesota, 1968, Big Muddy River Basin Comprehensive Basin Study, Appendix C, Mineral Resources.

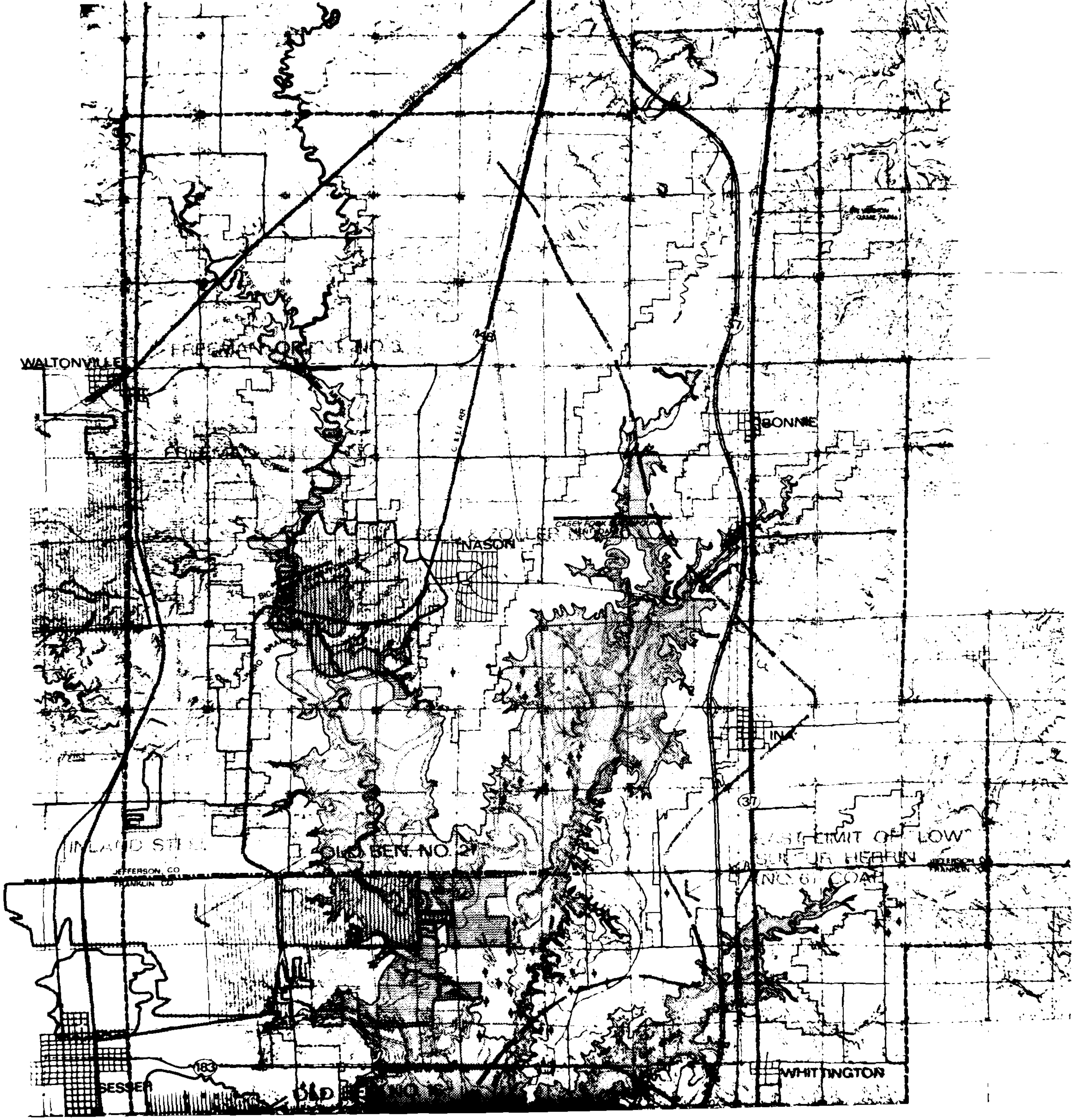
[26]Ibid.

ENVIRONMENTAL IMPACT STATEMENT
ON OPERATIONS AND MAINTENANCE:

REND LAKE, ILLINOIS

MAP SCALE 1:96,000 OR 1:8000

PREPARED FOR:
U S ARMY ENGINEER DISTRICT, ST LOUIS MISSOURI
PREPARED BY
BRAUER & ASSOCIATES INC PLANNERS
MINNEAPOLIS MINNESOTA
BASE MAP BY STATE OF ILLINOIS DIVISION OF WATERWAYS



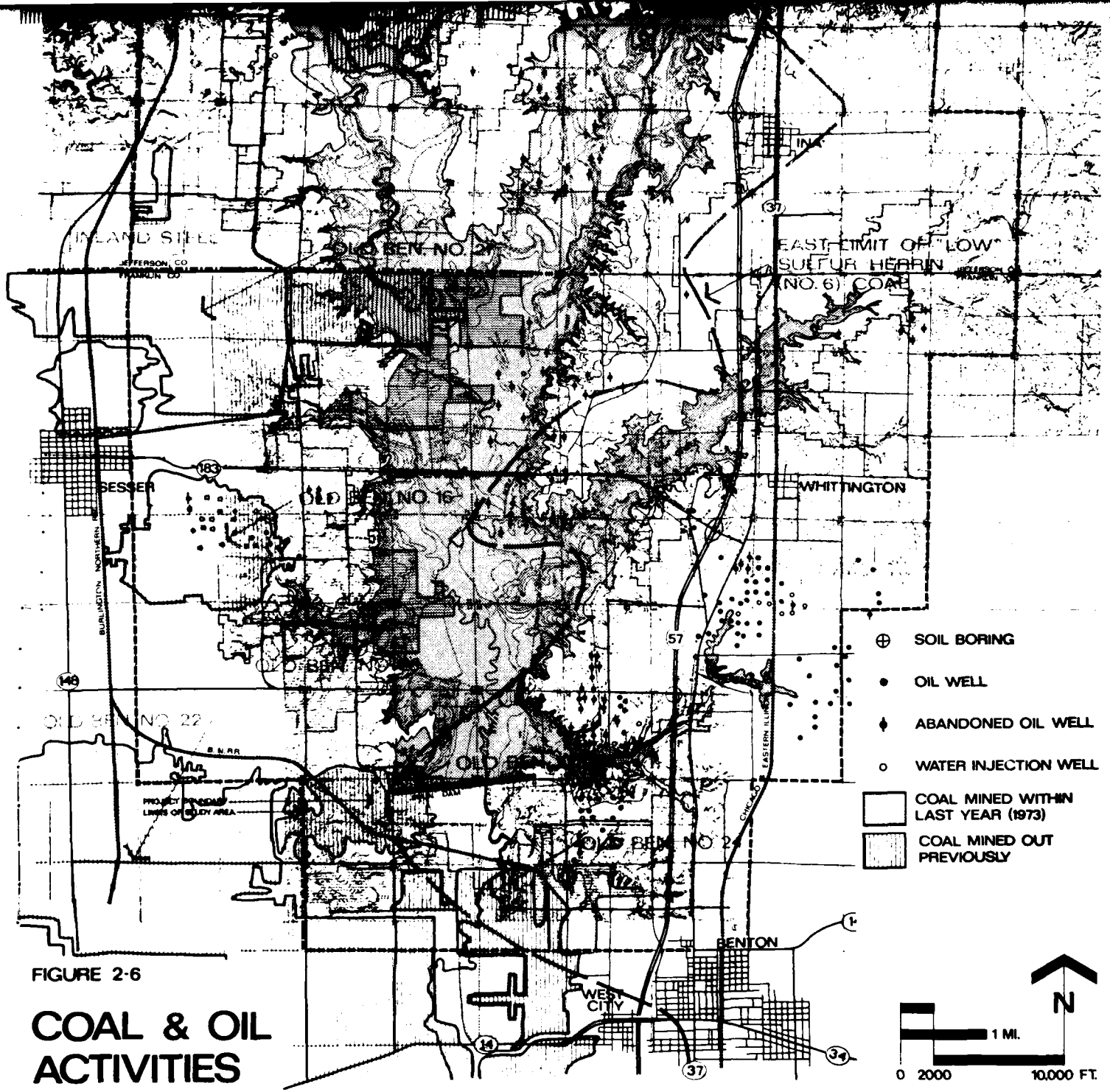


FIGURE 2-6

COAL & OIL ACTIVITIES

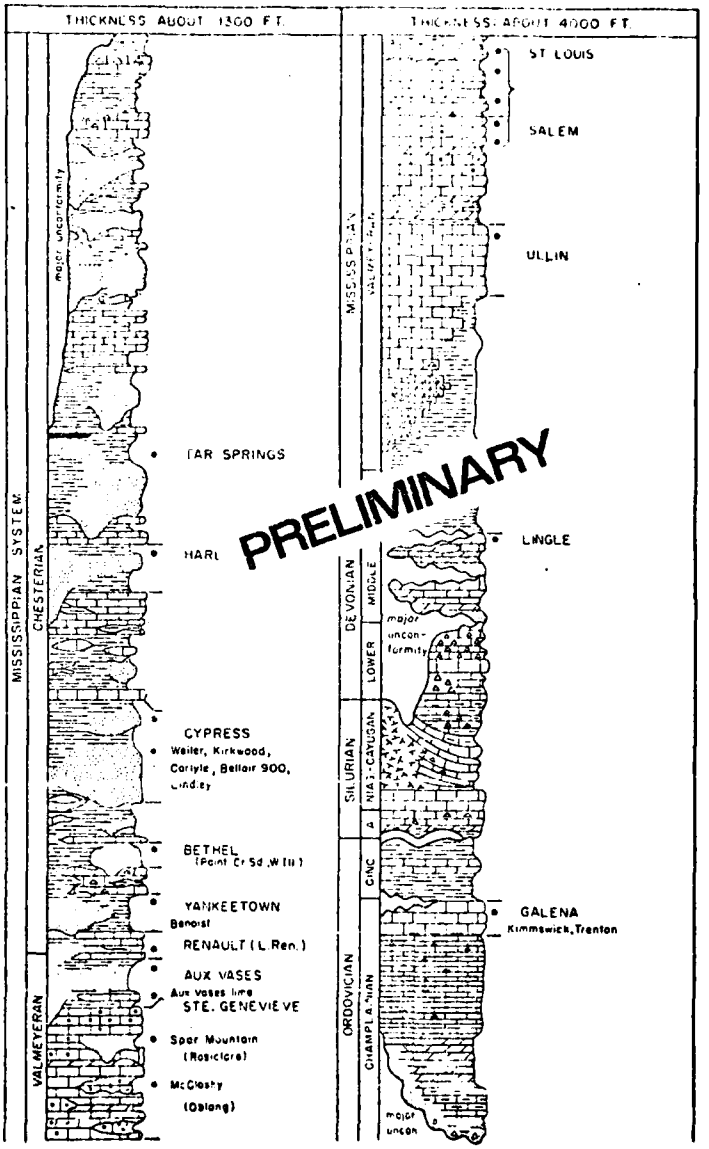


FIGURE 2-7
GENERALIZED GEOLOGIC COLUMN AND OIL PAY ZONES • MISSISSIPPIAN AND LOWER ROCKS

TABLE 2-2

COAL PRODUCTION AND RESERVES

Coal Production by Decades Franklin and Jefferson Counties	Coal - Tons
1890-1900	221,954
1901-1910	7,794,718
1911-1920	80,666,484
1921-1930	137,095,050
1931-1940	84,722,215
1941-1950	141,356,403
1951-1960	70,939,186
1961-1970	90,319,068
1971-1973	42,893,945
Total	656,009,023
Remaining Reserves in the Ground Franklin and Jefferson Counties	
Herrin (No. 6)	5,061,944,000
Harrisburg (No. 5)	4,420,459,000
De Koven	362,147,000
Davis	507,878,000
Misc. Coals	94,406,000
1973 Production	
Jefferson County	7,289,076
Franklin County	6,482,077
Reserves in the Ground Beneath the 40,633 Acre Rend Lake Project	
Herrin (No. 6)	434,000,000
Harrisburg (No. 5)	292,500,000

Busch shows the estimated oil production for the years 1888 through 1971 as follows:[27]

County	Total Production - Barrels
Franklin	68,176,000
Jefferson	78,106,000

Production has decreased over the years and considerably more secondary production has occurred. Water flooding is now a standard procedure in many of the fields. Table 2-3 shows production data for the years 1963 to 1971.[28]

TABLE 2-3

OIL PRODUCTION

Year	Total Production - Barrels	
	Franklin	Jefferson
1963	1,701,000	2,016,000
1964	1,646,000	1,856,000
1965	1,360,000	1,411,000
1966	1,449,000	1,337,000
1967	1,654,000*	1,612,000*
1968	1,560,000	1,442,000
1969	1,244,000	1,293,000
1970	956,000	1,133,000
1971	773,000*	1,096,000*

*From Busch (1968)

In 1970, waterflooding accounted for approximately 71 percent of Franklin County and 53 percent of Jefferson County production.

Records from the Corps of Engineers show that prior to filling the lake, there were 84 production, injection and freshwater wells within the project limits. Illinois State Geological Survey records show 17 production wells and 5 injection wells remaining on Corps fee property. Several wells are located in the South Marcum Access Area. These leases expired in 1975 and were not renewed.

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[27]Busch, W.L., 1973, Mineral Production in Illinois in 1971 and Summary of Illinois Mineral Production by Commodities, 1941-1970. Circular 477, Illinois State Geological Survey, Urbana, Illinois (Note: Similar reports also used for the years 1933-1964, 1966, 1967, 1968, 1969, and 1970.).

[28]Van Den Berg, op. cit.

The Bureau of Mines indicated that after the year 1980, the oil production in the Big Muddy River Basin will decrease to minimal levels and will not be a significant factor in the local economy.[29] In 1960, the proved reserves in the counties were as follows:

County	Reserves (proved) - Barrels
Franklin	27,485,000
Jefferson	13,467,000

Since that time, removals in the counties have been: Franklin - over 11,000,000 barrels and Jefferson - over 13,000,000 barrels. Therefore, it is evident that further production is limited.

Two events may change the oil production picture. Bond, et. al. prepared an optomistic report on potential future oil reserves.[30] They indicated that promising new areas for exploration in the Illinois Basin exist in the deeper Middle and Lower Devonian, Silurian, and Middle Ordovician strata. Similarly, price increases may encourage additional drilling and waterflooding in existing pay zones. In January of 1974, price controls were lifted for stripper wells (those producing less than 10 barrels per day). This will likely make continued operation of formerly marginal wells more profitable.

Gas

Natural gas as a usable natural resource is not a consideration in Franklin and Jefferson Counties. Since 1965, little natural gas has been produced in the Illinois portion of the Illinois Basin.[31] Van Den Berg indicates that Benton, Marian and several other cities are supplied from the Johnson City East field in Williamson County.[32]

2.1.2.7 Groundwater Geology

If Illinois is considered in terms of the availability of ground water, Franklin and Jefferson Counties would rank as the poorest areas of the state. Historically, water has been available in only small quantities. During drought periods it has been hauled from outside the area. The cities of Benton, Mount Vernon and West Frankfort have

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[29] U.S. Department of the Interior, op. cit.

[30] Bond, op. cit.

[31] Ibid.

[32] Van Den Berg, op. cit.

maintained surface water reservoirs for their needs. Only one community in the two counties was using a ground water supply as of 1961. This was Orient in southern Franklin County where water removed as part of a coal mining operation was used.[33] Rend Lake has, to a large degree, eliminated the need for groundwater supplies in the two counties. Only at isolated farm locations is there need for a dependable ground water supply.

Existing Wells

From records at the Illinois State Water Survey, well information was gathered for representative individual and commercial operations in Franklin and Jefferson Counties. Table 2-4 shows water quality data for several of these wells. The typical individual well consists of a large diameter dug pit (2 to 3 feet) which is fairly shallow. In some cases, the well will extend just into bedrock.[34] The records show that most of these dug wells were not over 30 feet in depth. Although seepage to the wells is very slow through the glacial tills and in some cases sand seams, the pit functions as a reservoir to store considerable water for intermittent use.

Other wells in the counties have been drilled into the upper layers of bedrock. Jordan describes the Pennsylvania rocks in this area as being of low yield due to the predominance of shales and low permeability sandstone.[35] Other problems with bedrock wells will be discussed later.

Potential Ground Water Supplies

The ground water resource of the southern Illinois region was extensively studied by Pryor.[36] He indicated that there may be two potential sources of ground water in the counties. These are alluvial sands and gravels in the Big Muddy River valley and the upper sandstone layers in the Pennsylvanian system.

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[33]Hanson, R., Public Ground Water Supplies in Illinois (including Supplements I and II), Bulletin 40, Illinois State Water Survey, Urbana, Illinois, 1961.

[34]Bergstrom, R.E., Geologic Report on Ground Water Possibilities in Jefferson, Franklin, and Hamilton Counties, Illinois State Geological Survey, Urbana, Illinois, 1954.

[35]Jordan, P.R., Availability of Ground Water in the Big Muddy River Basin, Southern Illinois, Big Muddy River Comprehensive Basin Study, Appendix B, U.S. Geological Survey, 1968.

[36]Pryor, W.A., Ground Water Geology in Southern Illinois, A Preliminary Geologic Report, Illinois State Geologic Survey, Circular 212, Urbana, Illinois, 1956.

River Valley Wells

As discussed in the section "Pedology", borings for bridges were obtained from the Illinois Department of Transportation. Several of these are shown in Appendix B-1. In river valley areas, there are normally layers of fine sand and silty sand near the top of the bedrock. There has been little utilization of this source, probably because the sands are generally discontinuous and very fine, requiring well-designed screens and filters. Also, surface supplies are more readily developed. Jordan indicates that extensive coal mining in the area may also have caused draining of some of these deposits.[37]

Bedrock Wells

As was previously indicated, the upper Pennsylvanian bedrock layers beneath Franklin and Jefferson Counties are primarily shales and low permeability sandstones. Adequate municipal and commercial water supplies could not be obtained from these layers or other underlying sandstone and limestone formations for the following reasons: Coal mining operations are widespread in both counties and are expected to continue for many years. Many of the upper Pennsylvanian layers are drained in areas adjacent to these mines. Mineralized waters have been found at shallow depths in the Pennsylvanian System.[38] Water quality tests shown in Table 2-4 verify the existence of saline waters and high mineral contents near the top of bedrock. Extensive oil drilling operations in the Mississippian and Devonian Systems have indicated oil and mineralized water in many of the sandstone and limestone formations.

Csallany indicates that there are some wells in the two counties that are producing individual domestic supplies at depths of 100 to 200 feet.[39] These wells in the upper Pennsylvanian layers should not be considered as indicative of an adequate supply for municipal or industrial uses.

Ground Water Levels

Ground water levels are normally within three feet of the ground surface in the project area. This is due to the low infiltration and high precipitation rates. Excessive water over that which can

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[37]Jordan, op. cit.

[38]Peterson, J.E., Geologic Report on the Ground Water conditions for a Domestic Supply in Section 35, T. 2S., R. 1E., Jefferson County, Illinois. Illinois State Geological Survey, Urbana, Illinois, 1969.

[39]Csallany, S., Yields of Wells in Pennsylvanian and Mississippian Rocks in Illinois, Illinois State Water Survey, Report of Investigation 55, Urbana, Illinois, 1966.

infiltrate, evaporate, or be used by plants maintains the ground water at high levels and in many cases results in ground water discharge at very slow rates to streams and low areas. The high ground water levels cause problems in construction of individual sanitary sewer systems and in access to cropland during the spring.

Summary

Ground water as a resource in the Rend Lake project has little value. In the areas of glacial tills, only very low yield, large diameter wells can be used in the unconsolidated materials. In the valley of the Big Muddy River, it may be possible to develop adequate low capacity wells in the fine sands located near the soil bedrock contact. Wells have been used which penetrate the upper layers of the Pennsylvanian System. However, problems associated with these wells are mineralized water, coal mine drainage, and adequacy of yield. The water supply provided by projects such as the Rend Lake reservoir must be considered as the only long-term dependable resource.

2.1.2.8 Pedology

In this section, all unconsolidated material above the bedrock is discussed. The sequence and mechanics of deposition of these soils in the project area can be inferred from analysis of past glacial events and the erosional and depositional action of wind and water.

Glacial Geology

Essentially all soil formation in this part of Illinois is the result of Pleistocene glacial events and the subsequent erosional activities. Several stages of glaciation advanced into Illinois but only one, the Illinoian, reached the project area. Table 2-5 shows the sequence of events during the Pleistocene and Figure 2-8 shows the limits of the glacial advances in Illinois.

Prior to glaciation, the bedrock surface in the project area was possibly higher, with materials removed during the ice advance. Willman and Frye indicate that the valley of the Big Muddy River existed during pre-Illinoian time.[40] However, it is not clear whether the valley was cut into the bedrock due to glacial runoff during Kansan and Nebraskan ice advances. Some have theorized that these bedrock valleys existed in pre-Nebraskan times.

The advance of the Kansan glacier possibly caused runoff through the area and deposited alluvial materials. In addition, during the

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[40]Willman, H.B. and J.C. Frye, Pleistocene Stratigraphy of Illinois, Bulletin 94, Illinois State Geological Survey, Urbana, Illinois, 1970.

pre-Illinoian period, there was extensive loess deposition. Jordan indicates that as much as ten feet of this loess occurs in portions of the Big Muddy River basin.[41] Borings reviewed for the project area did not reveal the presence of loess. It is likely this material may have been reworked by the advancing glacier and is not apparent as a distinctive layer.

TABLE 2-5

SEQUENCE OF PLEISTOCENE GLACIAL EVENTS IN ILLINOIS

Series	Stage	Substage	Remarks
	Holocene		Present soil development
	Wisconsinan	Valderan Two Creekan Woodfordian Farmdalian Altonian	Period of loess development in project area. Also, Lake Muddy formed. Glacial advance to central Illinois.
Pleistocene	Sangamonian		Interglacial period, soil development.
	Illinoian	Jubileean Monican Liman	Advance to Johnson County
	Yarmouthian		Interglacial soil development
	Kansan		Glacier to So. Central Illinois
	Aftonian		Interglacial
	Nebraskan		Glacial advance to western Illinois only

Source: Flint, R.F., Glacial and Pleistocene Geology: John Wiley & Sons, 1957

The first advance of glacial ice over Franklin and Jefferson Counties occurred during the Illinoian period. The ice advanced from the northeast, originating in the Labradorean center in Canada, and reached its terminus in northern Johnson County, Illinois. In central and southern Illinois, this advance left a nearly level till plain resulting from deposition during stagnation of the ice and the leveling action of runoff. The drift thickness is generally less than 50 feet in the project area.[42]

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[41]Jordan, op. cit.

[42]Willman, op. cit.

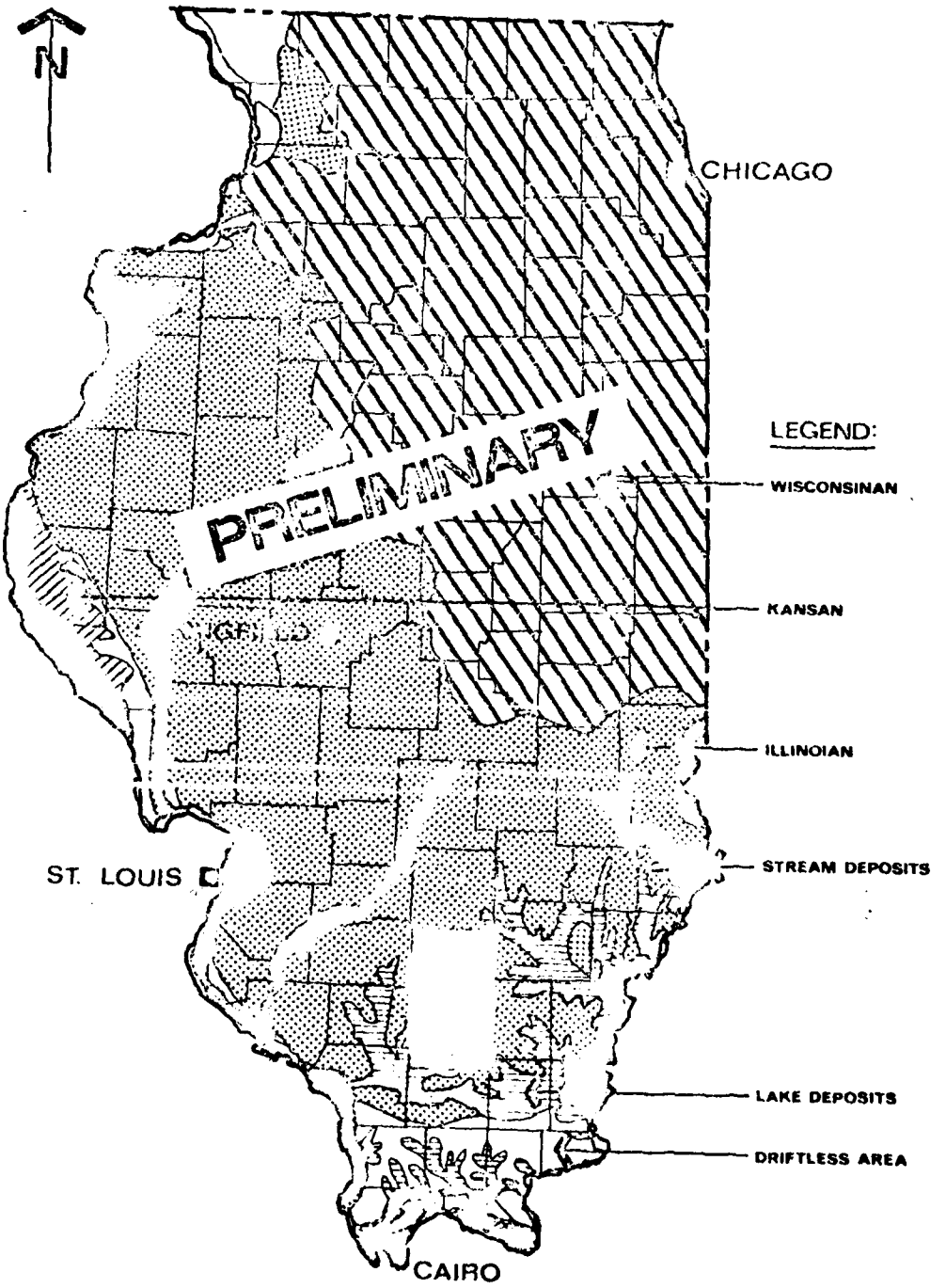

FIGURE 2-8
GLACIAL MAP OF ILLINOIS

After retreat of the Illinoian glaciers and during the warmer inter-glacial Sangamonian Age, topsoil development at the till surface occurred and erosion in the valleys continued to occur. In time, climatic changes resulted in a new glacial stage. This Wisconsinan ice advance did not reach the project area. However, it did cause two significant events to occur in southern Illinois as follows:

a. Wind blown silts originating from the major river valleys were carried across the till plains and deposited uniformly over the land surface. These earlier deposits occurred mainly during the Woodfordian Substage of the Wisconsinan Stage (Peorian Loess). Fehrenbacher et. al. indicates that 40 to 50 inches of loess should exist in Franklin and Jefferson Counties.[43] Most loess was carried to this area from the Mississippi Valley where great amounts of the silt were removed.

b. Lake sediments were deposited in eroded valleys such as the Big Muddy during the late Wisconsinan Stage. The downstream control, the Mississippi River, increased in elevation due to deposition of Wisconsin Valley trains. This caused at least partial damming of the Big Muddy River creating the slack-water Lake Muddy. The lake sediments are primarily well-bedded silts and clays with some fine grained sand. These deposits in southern Illinois are sometimes overlain by the Peorian loess but not to the thickness found in upland areas. This indicates that the loess and lake sediment deposition occurred at approximately the same geologic time.[44]

During the Holocene (recent) Stage, topsoil development has occurred, a mature drainage pattern has developed, and streams have degraded into the broad Lake Muddy plains.

Existing Soils

The U. S. Department of Agriculture, Soil Conservation Service, prepared a report which described the soils of the Rend Lake area.[45] The SCS reports are based on shallow soil borings (about 60 inches)

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[43]Fehrenbacher, J.B., J.L. White, H.P. Ulrick, and R.T. Odell, Loess Distribution in Southeastern Illinois and Southwestern Indiana, Soil Science Society of America Proceedings, Vol. 29, No. 5, Sept.-Oct. 1965, pp. 566-579, Madison, Wisconsin.

[44]Frye, op. cit.

[45]Miles, C.C., and W. D. Parks, Soils of the Rend Lake Area, Illinois, U.S. Department of Agriculture, Soil Conservation Service, Carbondale, Illinois, 1965.

and topographic interpretation and divide the soils into mapping units each having special characteristics. The following discussion separates these soils into two groups, the upland glacial tills and the Big Muddy River Valley deposits.

The upland soils include predominantly four types, Cisne, Hoyleton, Wynoose, and Bluford. A general description of these soils is as follows:

> 1 to 1-1/2 feet of silt loam over 2 feet of silty clay or silty clay loam, underlain by silt loam or silty clay loam glacial till.

Beneath the surface layer, the soils fall into the following classifications:

Unified Soils Classification	ML, CL, CH
AASHO	A-4, A-6, A-7-6

Permeability rates for these soils are generally less than 0.63 inches per hour or quite slow. The water table is high in these soils, normally being within 1 to 3 feet of the surface during wet periods.

The valley deposits in many cases are submerged beneath Rend Lake. In the low areas adjacent to the lake and in valley areas upstream and downstream from the reservoir, the predominant valley soil types noted in the SCS report are Bonnie, Sharon, and Belknap. The general description of these soils show silt loam to the maximum boring depth of 5 feet. The soils are classified as ML (Unified) or A-4 (AASHO). Permeabilities range from 0.063 to 2.00 inches per hour with the lower values being more representative. The water table is near the surface especially in the more common Bonnie and Belknap soils.

Several representative soil borings taken by the Illinois Department of Transportation are shown in Appendix B-1. These borings for bridges were taken to bedrock and show soil characteristics in both upland and valley areas. Additional comments are included in the section "Ground Water Geology".

Engineering properties of these soils which have an effect on the environment are the high water table conditions, permeability and the erodibility. The high water table, combined with low permeability causes difficulties in the construction of individual sewage systems. Domestic wastes discharged to drainfields and filter beds cannot easily seep into the ground and in many cases discharge on the surface.

Cohesive soils being continually wet present problems in the area of road construction. Seasonally soft subgrades and possibly frost heaves can cause breakup of all but very high type roads. This is evident from the appearance of city streets, low volume rural roads,

parking lots, etc. in the Benton and Mount Vernon area.

Erodibility of the loess-derived soils is evident in road ditches, along stream banks, and on the shoreline of Rend Lake. The soils are highly erodible even at low velocities. The lakeshore areas are subject to wave action produced by both wind and boat wake. The lack of any significant coarse fraction (i.e. sands and gravels) in the soils results in poor beach formation along the lake perimeter and, therefore, the need for erosion control.

2.1.3 CLIMATOLOGICAL ELEMENTS

For the Rend Lake area, considerable weather data is available. Information in the following sections is based on U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Data Service publications for Illinois, particularly Class I station data at St. Louis, Missouri; Evansville, Indiana; and Cairo, Illinois. Illinois State Water Survey data including local climatological data for Carbondale, Illinois was also considered. The three nearby precipitation and/or temperature recording stations are at Benton Forest Service, Du Quoin and Mount Vernon.

General

The Southern Illinois area has a typical continental climate, being far removed from the continental limits. Because of the relative flatness of the topography, landform has little effect on climate. Incursion of air masses from several directions and conflicts between these air masses result in the varied climate of the Rend Lake area. Warm moist gulf air brings storms and precipitation, especially during the cool months. Canadian cold air also pushes into the area, as does dry continental air from the southwest and the plains states.

Temperature

Because of the effects of the warm gulf air and Canadian cold air masses, the temperature at Rend Lake is quite variable. Generally July is the warmest month of the year and January the coldest. The maximum temperature recorded at Carbondale was 113°F. on 9 August 1930. The minimum temperature recorded was -24°F. on 13 January 1912. Table 2-6 summarizes temperature information for the site, including mean monthly temperatures. The average number of frost-free days is 191.

Precipitation

The Rend Lake project is subject to considerable rainfall throughout the year. During the summer, showers and thunderstorms generally occur, whereas other seasons normally experience longer, more widespread rainfall events. Snowfall is not great, with the

TABLE 2-6

TEMPERATURE DATA (In Degrees Fahrenheit)
MONTHLY AVERAGE TEMPERATURES

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Du Quoin	33.4	37.0	45.1	57.5	66.3	75.0	78.1	76.6	69.7	59.1	46.0	36.2	57.3
Mount Vernon	32.1	35.6	44.0	56.7	65.8	74.7	78.0	76.5	69.5	58.8	45.1	35.0	56.5

Maximum recorded temperatore (Carbondale)		113
Minimum Recorded temperature (Carbondale)		-24
Mean temperature January:	Maximum	44
	Minimum	26
Mean temperature July:	Maximum	90
	Minimum	66
Daily Range: Colder half of year		18
Warmer half of year		22
Mean annual temperature		57
Total frost free days		191
Average annual heating degree days		4500
Average annual cooling degree days		380

annual average about 13 inches. Table 2-7 summarizes precipitation data for the site.

Other

Winds in the project area average 5 to 15 miles per hour with no set pattern of wind direction. There appears to be no dominant wind direction because the migration of weather systems into this relatively flat area is the governing factor. A wind rose from the Carbondale, Illinois airport is shown in Figure 2-9.

Damaging storms and heavy rainfalls in the area can be expected. Denmark indicates that for the period 1915-1968, over 1,000 persons have been killed by tornadoes in Illinois, 606 of whom were killed in one major event (19 March 1925).[46] The probability of a tornado occurring at a particular point in Illinois is about once in 500 years.

Severe rainfall in the project area can cause flooding damage, erosion and loss of access to agricultural lands. Table 2-8 shows the expected frequency of occurrence for rainfall events at the project site. The values indicate that heavy rainfall can be expected on a rather frequent basis in the area.

Environmental Considerations

The climate of southern Illinois is variable and can be described as healthful and invigorating. Winters are reasonably mild with little long-term accumulation of snow. Below-zero temperatures are uncommon. Summer temperatures are warm and the humidity at times is high. Air conditioning of homes and vehicles is common since night temperatures in some cases remain uncomfortably high. Clear sunshiny days are common, especially during the summer months.

Illinois often experiences pleasant Indian Summer conditions during the late fall.

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[46]Denmark, W.L. 1969, Climate of the States, Illinois, Climatography of the United States No. 60-11, Environmental Data Service, Environmental Science Services Administration, U.S. Department of Commerce.

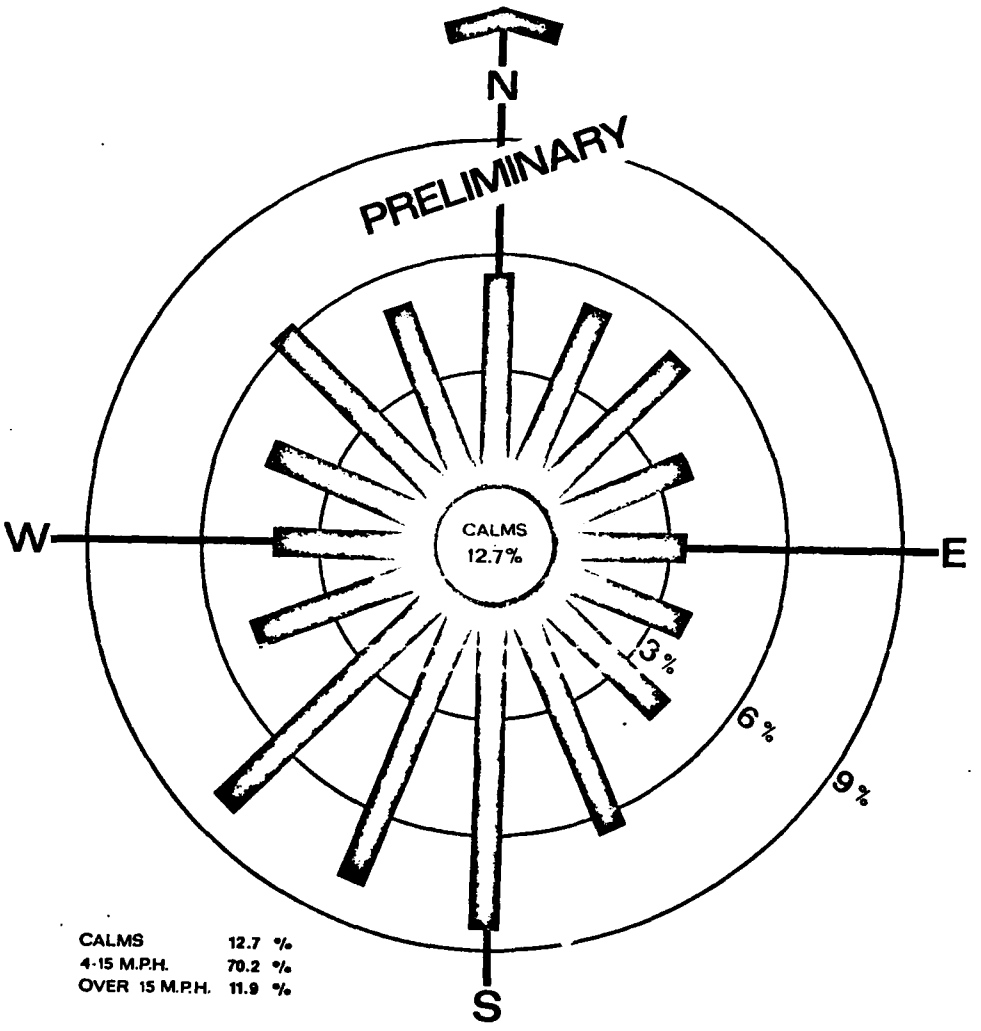
[47]Herschfield, D.M., 1961, Rainfall Frequency of the United States for Durations from 30 minutes to 24 hours and Return Periods from 1 to 100 years. Technical Paper No. 40, U.S. Department of Commerce, Weather Bureau.

TABLE 2-7

PRECIPITATION DATA
MONTHLY AVERAGE PRECIPITATION (inches)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Benton F.S.	3.10	2.76	4.01	4.09	4.18	4.06	3.35	3.86	3.29	3.01	3.11	3.03	41.85
Du Quoin	2.92	2.89	4.08	4.16	4.14	3.95	3.57	3.46	3.15	2.90	3.39	2.95	41.56
Mt. Vernon	2.75	2.58	3.81	4.37	4.36	4.16	3.89	3.53	3.53	2.79	3.32	2.95	42.04

Maximum Annual Precipitation (Carbondale)	74.50 (1945)
Minimum Annual Precipitation (Carbondale)	30.15 (1953)
Average Annual Snowfall Days (1" or more)	4 days
Cloud Cover: Clear days	102 days
Partly cloudy	103 days
Cloudy	160 days
Fog occurrences (annual)	10 to 15 days
Humidity (daily range)	50 - 85%
Thunderstorms (annual)	50
Hail occurrences	3



DATA BASED ON CAIRO, ILL. USWB OBSERVATION- PERIOD OF 5 YEARS, AND FORT SCOTT, ILL. USWB OBSERVATION- PERIOD OF 15 YEARS, SOUTHERN ILLINOIS AIRPORT IS 63 MI. SE OF FT. SCOTT, 50 MI. NORTH OF CAIRO.

FIGURE 2-9
WIND ROSE FOR SOUTHERN ILLINOIS AIRPORT, CARBONDALE

TABLE 2-8

RAINFALL (inches) FOR VARIOUS STORM DURATIONS AND RETURN PERIODS

Return Period	30 min.	1 hr.	2 hr.	3 hr.	6 hr.	12 hr.	24 hr.
1 yr.	1.1	1.3	1.6	1.8	2.1	2.6	3.0
2 hr.	1.3	1.5	1.9	2.1	2.6	3.0	3.5
5 yr.	1.5	1.9	2.3	2.6	3.2	3.7	4.3
10 yr.	1.8	2.2	2.7	3.0	3.6	4.3	4.9
25 yr.	2.0	2.5	3.1	3.4	4.1	4.8	5.6
50 yr.	2.2	2.8	3.4	3.8	4.5	5.4	6.3
100 yr.	2.4	3.1	3.8	4.2	5.0	5.9	6.8

Example: The statistical probability of a 3.4-inch rainfall in a 2-hour period is once in 50 years or a 2 percent chance each year.

2.1.4 HYDROLOGICAL ELEMENTS

2.1.4.1 Surface Water Resources

Available Data Sources

Surface water quantity data in the Rend Lake area is presently being collected by the Corps of Engineers, U.S. Weather Bureau, U.S. Geological Survey and by the State of Illinois, Division of Waterways. Data being collected is primarily in the form of stream flows, reservoir levels, and precipitation. At the present time, precipitation is monitored with a recording gauge at the dam site and with non-monitoring gauges at Mount Vernon, Dix, Ina, Waltonville and Bell Rive, all within the Rend Lake watershed. Stream discharges are measured with recording gauges upstream of the lake in Rayse Creek, Big Muddy River and Casey Fork Creek. In addition, non-recording gauges are located on the two subimpoundment dams. Stream discharge is measured with a recording gauge downstream of the lake at Benton. With the exception of the Benton gauge, all the stream flow measuring stations are new, having been installed as the project was constructed. The nearest evaporation monitoring station is located at Carbondale, approximately 26 miles from the Rend Lake dam site. Hydrologic data collection stations in the Rend Lake watershed are shown in Figure 2-10.

Surface water quality data in the area tributary to Rend Lake is being collected by essentially two agencies; the St. Louis District Corps of Engineers and the Illinois Environmental Protection Agency. The St. Louis District Corps of Engineers has been monitoring the biological, chemical and physical quality of the lake and tributary streams since May 1970. Water quality data for the period May 1970 through August 1973 was available for use in this report. The Illinois Environmental Protection Agency has been collecting water quality data in the Rend Lake Area as part of a statewide water quality monitoring program. The Illinois Environmental Protection Agency's water quality monitoring in the Rend Lake Area has been confined to streams tributary to the reservoir and no water quality samples have been taken from the reservoir by this agency. The location of the Corps of Engineers and the Illinois Environmental Protection Agency's water quality monitoring stations are shown on Figure 2-10. In addition the Illinois Environmental Protection Agency also monitors the effluent quality from permitted wastewater dischargers in the Rend Lake watershed.

Streams

The general surface water resources of the Rend Lake watershed are characterized by a lack of lakes and wetlands and a large number of intermittent creeks contributing runoff to the streams which discharge directly to the lake. The major streams directly tributary to Rend Lake and the size of their watersheds are: Big Muddy River (98.9 sq. mi.), Casey Fork Creek (114.3 sq. mi.), Rayse Creek (97.5 sq. mi.), Gun Creek (45.3 sq. mi.) and Atchison Creek. The watershed area tributary to these five major streams comprises approximately 85 percent of the upland area tributary to Rend Lake. The remaining 15 percent of the watershed is drained by the numerous small creeks which outlet directly into the lake. The five major streams and their drainage areas along with many of the smaller intermittent tributary streams are illustrated on Figure 2-10.

The slope of the Big Muddy River upstream of Rend Lake averages approximately 2 feet per mile with a maximum of 10 feet per mile in the upper reaches and a minimum of one-foot per mile near the dam site. Channel capacity of the Big Muddy River downstream of the lake is 1,000 cfs at Benton and 5,000 cfs at Murphysboro. The Big Muddy has a total length of 155 miles and empties into the Mississippi River approximately 75.5 miles above its confluence with the Ohio River.

Impoundments

The major surface water impoundment in the watershed is, of course, Rend Lake. Smaller impoundments have been constructed as domestic water supply reservoirs for small communities and as water supply and settling basins for coal washing operations. There are no significant natural lakes in the watershed.

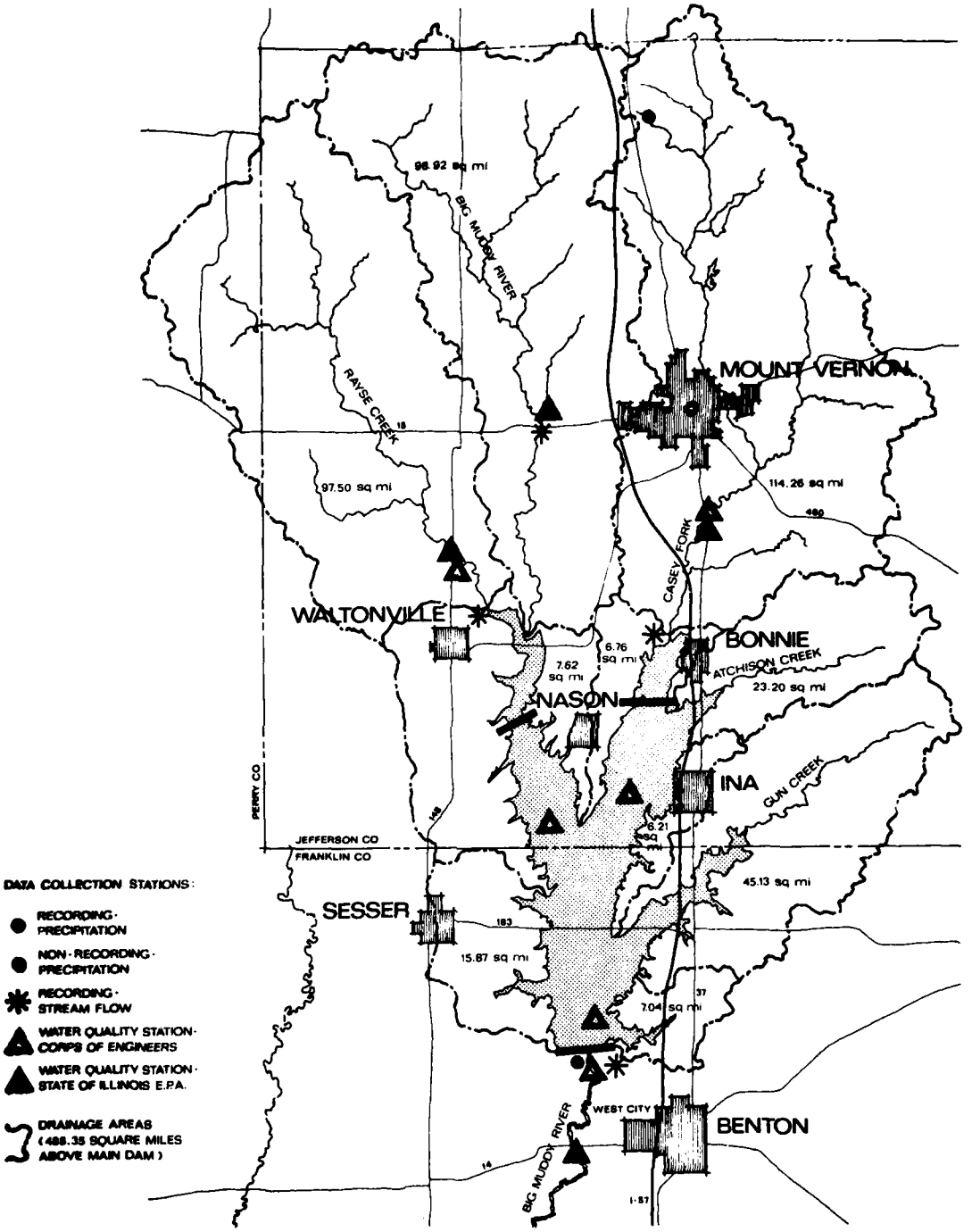


FIGURE 2-10
HYDROLOGIC & WATER QUALITY DATA COLLECTION STATIONS
SHOWING REND LAKE WATERSHED

Water Balance

The average precipitation over the lake area during the period 1946 to 1961 was 44.4 inches with a maximum of 64.2 inches occurring in 1951 and a minimum 29.4 inches occurring in 1953. Average lake evaporation has been estimated to be 38.5 inches.[48] Surface runoff during the period 1946 to 1961 averaged 13.7 inches with a high of 25.8 inches occurring in 1950 and a low of 1.4 inches occurring in 1954. The variable nature of the annual surface runoff is indicative of the lack of surface water storage or ground water storage in the basin. As discussed previously, there are no natural surface water impoundments in the basin. The soils are cohesive and have little ground water storage capacity and are not an important factor in storing water from year to year. The watershed is very susceptible to drought periods brought about by one or more consecutive years of below average precipitation. Likewise, the area is subject to severe flooding during years of high precipitation.

2.1.4.2 Surface Water Quality Assessment

Water Uses and Water Quality Requirements

The surface water in the Rend Lake watershed has been designated by the Illinois Environmental Protection Agency as General Use waters and as waters suitable as Public and Food Processing Water Supply. According to the Water Pollution Regulations of the State of Illinois,[49] General Use Waters are to be maintained at a quality suitable for aquatic life, agricultural use, primary and secondary body contact, and most industrial uses. Waters designated as Public and Food Processing Water Supply Waters must be maintained at a quality appropriate for public water supply and for water supply to the food processing industry.

The portions of the Water Quality Standards most applicable to Rend Lake and tributary waters are summarized in Table 2-9. These standards have been established by the State of Illinois based on data collected by various state and federal regulatory agencies and are considered to be threshold limits which when exceeded will affect the ecological condition of the reservoir to such an extent that the desired uses of the reservoir (aquatic, agricultural, primary and secondary body contact, most industrial uses) will also be affected.

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[48] Lawlor, Walter F., Rend Lake Reservoir Design Memorandum #1, Hydrology and Hydraulic Analyses, U.S. Army Engineer District, 1962.

[49] Illinois Pollution Control Board, Water Pollution Regulations of Illinois, July 1973

TABLE 2-9

CRITICAL ILLINOIS WATER QUALITY STANDARDS APPLICABLE TO REND LAKE AND TRIBUTARIES

General Use Waters

a. Phosphorus shall not exceed .05 mg/l in any reservoir or lake or in any stream where it enters any reservoir or lake.

b. Dissolved oxygen shall not be less than 6.0 mg/l during at least 16 hours of any 24-hour period, nor less than 5.0 mg/l at any time.

c. Based on a minimum of five samples taken over not more than a 30-day period, fecal coliforms shall not exceed a geometric mean of 200 per 100 ml, nor shall more than 10 percent of the samples during any 30-day period exceed 400 per 100 ml.

d. Copper shall not exceed .02 mg/l.

e. Ammonia nitrogen shall not exceed 1.5 mg/l as nitrogen.

Public and Food Processing Water Supply

a. Chlorides shall not exceed 250 mg/l.

b. Oil (hexane soluble or equivalent) shall not exceed .1 mg/l.

c. Sulfates shall not exceed 250 mg/l.

d. Total iron shall not exceed .3 mg/l.

e. Manganese shall not exceed .05 mg/l.

f. Lead shall not exceed .05 mg/l.

Source: State of Illinois Water Pollution Regulations, July, 1973.

The waters tributary to Rend Lake are presently being used for fish and wildlife management as well as a water supply for numerous coal mining facilities. The waters of Rend Lake are being used for public and food processing water supply purposes, fish and wildlife management, primary (swimming) and secondary (water skiing) body contact, and as an aesthetic recreational attraction. The water use designations and accompanying water quality standards adopted by the Illinois Environmental Protection Agency for the waters of Rend Lake are consistent with the actual uses presently being made of the waters.

Tributaries

The tributaries to Rend Lake are characterized by relatively low dissolved oxygen levels. As shown in Figure 2-9A, the Illinois Environmental Protection Agency and the St. Louis District Corps of Engineers maintain water quality monitoring stations on Rayse Creek, Casey Fork Creek and on the Big Muddy River upstream of Rend Lake. All of these sampling stations reported violations of dissolved oxygen, fecal coliform, total iron, total phosphorus, copper and manganese standards during 1972. Other standards which were violated included ammonia (Casey Fork Creek) and lead (Rayse Creek). Unsatisfactory fecal coliform and dissolved oxygen levels are generally attributable to the discharge of inadequately treated municipal wastes. Other potential sources of wastes in the tributary watershed area which can affect these parameters are agricultural activities such as livestock feeding operations. The fact that all the water quality monitoring stations on tributaries to Rend Lake exhibited at least six parameters which violated Illinois water quality standards indicates that the designated use of the streams is being affected. The 1972 water quality data for the six parameters which failed to meet applicable water quality standards is summarized in Table 2-9A. This data was collected by the Illinois Environmental Protection Agency.

Due to the nature of the cohesive soils in the area the streams tributary to Rend Lake carry a high sediment load. No data, however, on suspended solids is being collected by either the State of Illinois or by the Corps of Engineers.

Rend Lake

The water quality data indicates that Rend Lake is acting to improve the general quality of the water in the entering tributaries. The lake acts as a large settling basin and removes sediment thereby decreasing the amount of suspended solids in the water. The lake also acts to remove bacteria. Plankton and wave action tend to aerate the water, thereby elevating oxygen levels especially in the top two or three meters near the lake surface. Oxygen levels near the bottom of the lake are periodically depressed, however, due to the decomposition of organic matter during portions

TABLE 2-9A

TRIBUTARY STREAMS

1972 WATER QUALITY DATA SUMMARY

ILLINOIS WATER QUALITY NETWORK

Station NJ 07 Casey Fork Route 37 Bridge - 3 Miles South of Mt. Vernon

Units in Milligrams Per Liter*

	Dissolved Oxygen	Fecal Coliform	Total Iron	Total Phosphorus	Copper	Manganese
Maximum Value	11.3	14,000	4.0	8.1	.16	1.06
Minimum Value	3.1	80	.4	.4	.05	.40
Median Value	5.1	380	.6	2.4	.06	.55
Illinois Water Quality Standard	>5.0	<200	<1.0	<.05	<.02	<1.00

Station NK 01 Rayse Creek Township Road Bridge - 2 Miles North of Waltonville

	Dissolved Oxygen	Fecal Coliform	Total Iron	Phosphorus	Copper	Manganese
Maximum Value	11.0	27,000	1.5	.41	.07	1.37
Minimum Value	3.9	10	.4	.01	.00	.06
Median Value	6.0	240	1.0	.11	.05	.52
Illinois Water Quality Standard	>5.0	<200	<1.0	<.05	<.02	<1.00

Source: 1972 Summary of Data, Volume 4, Water Quality Network, Illinois Enviornmental Protection Agency.

*Except fecal coliform which is in number of organisms per 100 ml.

> means "greater than" < means "less than"

TABLE 2-9B

DOWNSTREAM RELEASES
WATER QUALITY SUMMARY

Station 1 Big Muddy River Immediately Downstream of Rend Lake*

	Units in Milligrams Per Liter **			
	Dissolved Oxygen	Fecal Coliform	Total Iron	Total Phosphorus
October 1972-September 1973				
Maximum Value	13.3	4	.7	.14
Minimum Value	5.2	<2	.1	.01
Median Value	9.4	3	.3	.02
Standard Value	>5.0	<200	<1.0	N.S.
October 1971-September 1972				
Maximum Value	14.5	100	.37	3.02
Minimum Value	6.2	0	.07	.02
Median Value	9.0	0	.20	.86
Standard Value	>5.0	<200	<1.0	N.S.
October 1970-September 1971				
Maximum Value	11.0	20	.81	1.82
Minimum Value	2.4	0	.18	.03
Median Value	8.4	0	.25	.25
Standard Value	>5.0	<200	<1.0	N.S.
May 1969-September 1970				
Maximum Value	14.5	TNTC	1.5	.090
Minimum Value	5.0	10	1.0	.014
Median Value	6.3		1.2	.050
Standard Value	>5.0	<200	<1.0	N.S.

Station N 06 Big Muddy River Route 14 Bridge - 3 Miles West of Benton***

	Dissolved Oxygen	Fecal Coliform	Total Iron	Total Phosphorus	Copper	Manganese
Maximum Value	11.8	35,000	1.9	2.1	.12	2.72
Minimum Value	4.0	10	.0	.04	.00	.17
Median Value	6.1	430	1.2	.24	.05	.71
Standard Value	>5.0	<200	<1.0	N.S.	<.02	<1.00

Source: * Data taken from Corps of Engineer's Reports, "Water Quality Study of Rend Lake", completed under Contract USDAR-DACW 43-70-C-0178.

** Except fecal coliform which is in number of organisms per 100 ml.

*** 1972 Summary of Data, Volume 4, Water Quality Network, Illinois Environmental Protection Agency

> means "greater than" < means "less than"

N.S. means "no standard since discharge is not into a lake or reservoir"

TNTC means "too numerous to count"

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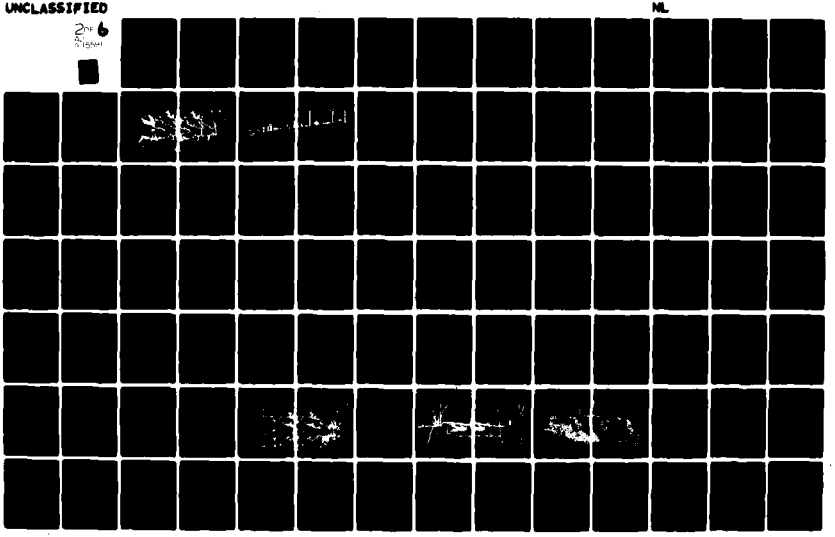

TABLE 2-9C
REND LAKE
WATER QUALITY DATA

Mean values in mg/l (unless otherwise noted)
October 1971 - June 1972

	STA2	STA3	STA4	STA5
Alkalinity	57	53.1	54.6	77.2
Free CO_2	2.3	2.2	2.1	4.5
COD	12.2	14.3	15.6	16.4
Chloride	24.6	20.0	23.9	40.9
Conductivity (Microhms)	336.4	315.2	312.0	543.1
Dissolved Oxygen	9.6	9.2	8.8	7.6
Hardness As ($A CO_3$	109.7	106.0	100.9	158.2
pH (pH units)	7.3	7.1	7.2	7.2
Phosphate	0.03	0.07	0.07	0.09
Sulfate	60.2	61.3	59.1	104.8
Turbidity (JTU)	6.4	22.8	35.6	52.7
Nitrate	0.3	0.2	0.3	0.4
Iron	0.4	1.1	1.9	2.6
Silica	2.3	3.8	4.3	7.9

of the period mid-May through mid-September. The depressed oxygen levels are probably not continuous throughout the mid-May - mid-September period, however, due to the action of wind on the relatively shallow lake which periodically disturbs the thermal stratification.

The water quality data collected by the St. Louis District Corps of Engineers has been summarized in Table 2-9C. The location of the sampling stations is illustrated in Figure 2-10. Turbidity values remain significantly high in the lake, especially north of Highway 183, where turbidity values as high as 220 Jackson Turbidity Units (JTU) were reported in April, 1972. A relationship derived between turbidity and light penetration on the Illinois River[50] indicates that a turbidity of 220 JTU corresponds to a light penetration (measured by the secchi disc reading) of approximately 6 inches (15 cm). Most of the turbidity values in the reservoir north of Highway 183 are in the range 50 JTU to 100 JTU indicating light penetrations approaching 1 foot (31 cm).

[50]Mechalas, et. al., Water Quality Criteria Data Book, Vol. 4, An Investigation into Recreational Water Quality, U.S. Environmental Protection Agency, Project No. 18040 DAZ, April 1972

Phosphorus concentrations in Rend Lake were substantially above the State of Illinois standard of .05 mg/l at one time or another at all lake monitoring stations. The lake has the potential for algae blooms during the summer months. The primary production in the lake, however, is probably limited by the turbid water and the resulting lack of light penetration.

Fecal coliform counts taken in the main lake near what was formerly Casey Fork Creek (Station 3 - Figure 2-10)show fecal coliform counts as high as 20,000 colonies/100 ml which is substantially in excess of Illinois standards. The high counts appear to be a continuation of the extremely high fecal coliform counts measured at the sampling station on Casey Fork Creek north of the lake.

Temperature profiles measured at four locations in Rend Lake suggest that the lake water column does not exhibit the classical epilimnion, thermocline, hypolimnium stratification, typical of deeper lakes in more northern climates. The lake does, however, typically exhibit a temperature differential of 2°C to 4°C between the water surface and reservoir bottom during the summer months. During these periods, the dissolved oxygen levels typically drop below 1 mg/l near the bottom. Wind action across the broad expanse of the lake, plus the relatively shallow nature of the lake, limits true thermal stratification from occurring. The lack of thermal stratification is an indication that the water of the lake is relatively well mixed.

The limnological data available for the lake is summarized in Table 2-9C. This data illustrates the biological condition of Rend Lake and is consistent with the types of uses for the Lake.

Downstream Releases

The water quality records show that the quality of the water immediately downstream of the lake has been significantly improved by the lake. The water quality data is summarized in Table 2-9B. The results from the monitoring station established by the Corps of Engineers immediately downstream of the Rend Lake dam indicates the that downstream releases are meeting all applicable Illinois water quality standards. This represents a monumental improvement over the water quality in the tributaries upstream of the reservoir.

Water quality downstream of the City of Benton, however, is degraded by effluent from the Benton sewage treatment plant. The treatment plant is reportedly overloaded at times and does not always pro-

vide even secondary treatment.[51] During 1972, the water quality monitored at the Illinois Environmental Protection Agency's monitoring station at the Highway 14 crossing of the Big Muddy River, west of Benton, failed to meet the Illinois standards for dissolved oxygen, fecal coliform, copper, manganese and iron. This data is summarized in Table 2-9B. This is not to say, however, that the quality of the water in the Big Muddy River has not been improved by the low flow release from the lake. Water quality data collected by the Illinois Environmental Protection Agency at the Highway 14 crossing of the Big Muddy River indicates that the dissolved oxygen level did not drop below 4.0 mg/l during the summer of 1972, whereas oxygen levels measured as low as 2.9 mg/l were typical of other summers before the lake was constructed.

The low-flow release from the lake of 30 cfs was selected by the U.S. Public Health Service to maintain the dissolved oxygen levels below the dam above a minimum acceptable level of 4.0 mg/l at development expected to occur by the year 2010 and secondary sewage treatment.[52] Since that time the minimum dissolved oxygen standard was first raised to 5 mg/l, then raised again to 6 mg/l. Thirty cfs was found to be an adequate low flow release to maintain a 5 mg/l dissolved oxygen level with development expected to the year 1995 and secondary sewage treatment.[53] The minimum dissolved oxygen standard has recently been raised to 6 mg/l and, even if the Benton sewage treatment plant is upgraded to at least secondary treatment, it is unknown if the 30 cfs low flow release will provide sufficient river flow to meet applicable water quality standards.

2.1.4.3 Waste Sources Tributary to Watershed

Both point and non-point sources contribute waste material to the water tributary to Rend Lake. Point sources are defined as any discrete conveyance such as a pipe, ditch, or channel from which waste may be discharged. Non-point sources are all other sources of waste such as agricultural land runoff and surface runoff from developing areas.

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[51]Teske, M., personal communication with, Illinois Environmental Protection Agency, Marion Regional Office

[52]U.S. 87th Congress 2nd Session, House Document 541, Appendix D, Exhibit 4, 12 September 1962

[53]Federal Water Pollution Control Administration, Big Muddy River Comprehensive Basin Study, Appendix E, Water Use & Stream Quality, 1968, p. 9-8

Point Sources

The most significant point sources of waste discharge in the watershed tributary to Rend Lake are municipal and industrial waste effluents. The Rend Lake watershed contains ten communities with a total population of approximately 20,000 people. Two of the communities, Mount Vernon and Sesser, have municipal wastewater treatment plants. The other communities in the watershed as well as individual homesteads in the outlying areas are served by individual sewage disposal systems of various designs.

Mount Vernon is a community of 16,000 people with 15 industries in a category of employing more than 15 people each.[54] Mount Vernon is served by two wastewater treatment plants. The principal plant, called the Mount Vernon sewage treatment plant, serves the main portion of the community. The effluent from this treatment plant has been a major source of degradation to Casey Fork Creek. The treatment plant was recently upgraded and is producing an effluent which meets the Illinois Environmental Protection Agency standards of 4 mg/l BOD and 5 mg/l suspended solids.[55] The plant uses dual trickling filter treatment with an effluent polishing pond as tertiary treatment. The plant is constructed large enough to accommodate or store combined sewage inflows so it is not necessary to bypass the treatment plant during heavy rainfalls. The second sewage treatment plant in Mount Vernon is referred to as the Fountain Place South plant and serves the Mount Vernon industrial park area. This plant uses a three-stage lagoon system and also produces an effluent in compliance with state standards.[56]

Sesser is a small community with a population of approximately 2,000 people.[57] The town has a small treatment plant with sludge digestion and a trickling filter. The treatment plant is inefficient and produces a very poor quality effluent. The effluent passes through the Old Ben 21 coal mine sedimentation pond and this greatly improves the quality of the Sesser effluent. The effluent from the sedimentation pond is reportedly clear and of good quality.[58] The Sesser Wastewater Treatment Plant is presently required to produce an effluent with

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[54] U.S. Army Corps of Engineers, St. Louis District, Rend Lake Water Quality Report, October 1971-September 1972

[55] Teske, M., op. cit.

[56] Ibid.

[57] U.S. Army Corps of Engineers, St. Louis District, op. cit.

[58] Ibid.

30 mg/l BOD and 37 mg/l suspended solids. Effective 1 January 1975, however, the plant must be upgraded to produce an effluent with a quality of 4 mg/l BOD and a 5 mg/l suspended solids under Illinois Regulations.[59]

Other domestic wastewater treatment plants in the Rend Lake watershed include a small plant at the Rend Lake Junior College and a small tertiary treatment plant operated by the Corps of Engineers to serve the project administration building and adjoining maintenance facilities.

A treatment plant is presently being constructed to serve the community of Woodlawn. This plant will discharge to the Big Muddy River approximately eight miles north of the Big Muddy subimpoundment area. An industrial wastewater treatment plant is being constructed by the General Tire Corporation to serve their new plant in the Mount Vernon area. Both of these new plants are being designed to produce an effluent to meet a 4 mg/l BOD and 5 mg/l suspended solids standard. The Corps of Engineers is enlarging their wastewater treatment facilities at Rend Lake to serve the Sandusky Creek recreation area.

Other domestic and industrial treatment plants in the Rend Lake watershed are located at schools, trailer parks and industries not served by the municipal plants discussed above. These treatment plants are listed in Table 2-10 and constitute a minor source of waste discharge to the lake.

Non-point Waste Sources

Non-point waste sources in the watershed tributary to Rend Lake include runoff from agriculture cropland and animal feedlots, wildlife waste, spillage from oil wells and buried pipelines, coal mining, second surface runoff from developing areas and from urban areas.

Surface runoff from all types of land contributes staggering quantities of sediment to Rend Lake. Runoff from cropland and animal feedlots carries oxygen-demanding organic materials which depress the dissolved oxygen levels in tributary streams and nutrients which will eventually accelerate the growth of algae in Rend Lake. Standards regulating the quality of runoff from feedlots have not been established by the State of Illinois. The wildlife which thrives at Rend Lake, especially the large geese and duck populations, also represent a potential source of nutrients to the lake.

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[59]Illinois Environmental Protection Agency, op. cit.

TABLE 2-10

MISCELLANEOUS WASTE SOURCES

Waste Source	Location
Dix Sewage Lagoon	Dix
Field Community Consolidated School	Jefferson County
Grand Prairie School	Jefferson County
Woodlawn High School	Woodlawn
Woodlawn Grade School	Woodlawn
Archway Trailer Park	Mount Vernon
Bethel Grade School	Mount Vernon
Kerasote	Mount Vernon
McClellan School	Jefferson County
Country Aire Mobile Home Park	Jefferson County
Precision Engineering Company	Mount Vernon
Dodds Community Consolidated School	Jefferson County
Waltonville High School	Waltonville
Waltonville Grade School	Waltonville
Whittington School	Whittington
Old Ben 21 Coal Mine	
Inland Steel Coal Mine	
Old Ben 26 Coal Mine	
Freeman Coal Mine	

Active and inactive coal mining has the potential of contributing sulfates, acid drainage and suspended solids to the streams and lake. All coal mining facilities in the basin utilize recirculating wash-water systems to wash coal. Make-up water for the recirculating systems is appropriated from small impoundment areas maintained by the coal companies. Also, some make-up water is secured from the Rend Lake Intercity Water System. All coal washing operations in the basin have wastewater discharge permits from the Illinois Environmental Protection Agency and must comply with an effluent standard of 4 mg/l BOD and 5 mg/l suspended solids. The coal companies represent a minor source of waste to the lake although the potential for a major discharge of waste from a settling pond failure exists. The State of Illinois has adopted mine land reclamation regulations to help control this source of waste.

Oil wells and oil pipelines dot and criss-cross the watershed tributary to Rend Lake. Oil well leases on public land in the Sandusky Recreation Area have been extended to 1978. Potential sources of pollution from oil pumping facilities include oil, oil residues in soil and brines from water flooding. According to the 1971-1972 Corps of Engineers Water Quality Report[60], the oil fields in the Marcum Branch spilled oil, and surface runoff from the area

[60] U. S. Army Corps of Engineers, op cit

carried oil into the lake. This was the only documented case of an oil field problem found in the literature. The literature concluded, in general, that oil pollution was not a significant problem in the watershed.[61]

Surface runoff from construction areas represent a source of sediment to the lake. This potential is made acute by the small particle size of the soils and by the large surface runoff which occurs. Likewise, the runoff from urbanized land has been shown to be a significant source of oxygen-demanding organic material and suspended solids rivaling secondary sewage effluent in strength.[62]

2.1.4.4 Use of Water Supplies - Problems, Potentials

Prior to construction of Rend Lake, public water supplies were generally obtained from small municipal surface water impoundments. The development of surface water supplies was necessitated because ground water supplies were generally not capable of providing sufficient yields to serve community needs. Ground water supplies in the basin are mainly limited to wells for individual homes. During drought periods many of these wells dried up. Extensive coal mining has also led to depletion of ground water supplies by removing water from shallow aquifers. In addition, the quality of the ground water supply is characterized by high hardness and high iron content necessitating treatment to reduce these two characteristics.

The small community surface water impoundments experienced serious problems during the drought of the mid 1950's. Many communities became fearful that water supplies would not be adequate to supply community needs. In addition, homes had been constructed around many of the impoundments and fears were expressed that poorly functioning individual sewage disposal systems were contaminating the already meager water supply.

The drought of the mid 1950's, along with the potential for water quality problems on the smaller impoundments, led to the formation of the Rend Lake Conservancy District to supply water to the municipalities and to the eventual construction of Rend Lake. Other major surface water reservoirs such as the Kincaid Lake reservoir and the Cedar Lake reservoir are being constructed adjacent to the Rend Lake basin. Present projections envision the tying together of these three reservoirs to create interconnected water supply systems adequate for the future needs of the area. The large surface water reservoirs have removed the lack of water supply as a constraint on development.

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[61] Federal Water Pollution Control Administration, op. cit., p. 7-6

[62] University of Cincinnati, EPA Research Grant 11024 DQU, Urban Runoff Characteristics, October 1970.

2.1.5 AESTHETIC EARTH RESOURCES

2.1.5.1 General Descriptions

The land surrounding the lake is flat to slightly rolling, the lake covering the broad but shallow flood plain of the Big Muddy. This once was a heavily wooded bottomland similar to that now existent below the dam. The trees found around the periphery of the lake are mostly the edges and remnants of that bottomland timber. As one moves away from the flood plain the amount of woodland decreases, the timber being found mainly in scattered woodlots and along stream beds.

Most of the land surrounding the lake is cropland or vacant. The area has no major topographic or other spectacular features. Thus, the wooded areas take on additional value: for contrast and variety, for framing views, creating spaces, and screening less attractive areas. Further, the trees mark the change of seasons, and are unusually attractive in the prolonged autumn typical of southern Illinois.

Major tree masses are in bottomland areas below the dam and north of the Big Muddy and Casey Fork subimpoundment dams. Additional timber concentrations lie along the tributary streams of Gun Creek and Atchison Creek and along much of the east shore. The major timber areas and smaller woodlots presently cover 56% of the land area of the project. Generally, the wetland species are willow, cottonwood, and birch in the flood plains, grading to beech, maple and gum trees in the lowlands, while oak and hickory tend to predominate in upland areas. (See Section 2.2, "Biological Elements".)

The wooded areas are quite dense stands of mature trees, tightly spaced, and forming a visually solid screen even when not in leaf. Brush and scrub is confined mostly to the periphery of the woodlots. An area of younger growth is found around Ward Branch, mostly of the willow-cottonwood type. The trees are small here, but also quite dense, looking like the margin of a freshwater marsh.

The remainder of the land on the project not used for intensive recreational use is either planted in grains for waterfowl use, or left vacant for secondary succession, in which land gradually reverts to forest through stages of annual weeds, perennial herbs and grasses, shrubs, then trees. The succession in the "go-back" or reverting fields has progressed only about as far as the weed stage, but it has a rather attractive, shaggy look. While the land-scape is generally uniform in topography and appearance, ample variety can be found. The east shore near the freeway and the Nason Peninsula are the flattest and most heavily cultivated, giving long, open views, while around Waltonville, and back from the flat west shore of the lake, a different texture becomes evident, composed of smaller fields divided by tree lines, wood lots or brush along fence lines. These elements,

plus a more irregular topography, characteristic of the Mount Vernon hill country to the north, give a better sense of spatial enclosure. The coal mines on the west side, however, break up the horizon and the continuity of the landscape.

Other distinct areas include the flood plain timber environment below the main dam; the Ina Peninsula at mid-lake jutting out from the east shore, virtually flat with a checkerboard of woodlots and timber concentrations along its west edge; and the many inlets at Sandusky Creek and north along the west shore, which will develop a marshland appearance.

2.1.5.2 Visual Elements

Native Areas

The original landscape was almost entirely forested, but little remains due to clearing for agriculture, and a long period of lumbering for houses and tools, crates and railroad ties, then finally for mine props. (See Section 2.2.4.)

The remaining timber is largely second and third growth except in the nearly inaccessible river bottoms, where the species found are less desirable for lumber. While the majority of the land is used for agriculture, if left alone it would mostly revert to forest, a process which would take not less than sixty years at the least, and probably a century.

Two areas in particular appear to be relatively unaltered: the bottomland and flood plain woods below the dam are fairly well preserved and still subject to flooding; and an area some 900 acres in extent, at the junction of Rayse Creek and the Big Muddy, between State Highway 148 and the Missouri Pacific tracks, just northeast of Waltonville, has been identified as being a close approximation to a native flood plain area.[63] Located in a designated wildlife management area, the latter should remain undeveloped. Virtually the entire 900-acre tract lies between elevations 410 and 415, so possibly 30 to 40% of it will be subject to longer than natural inundation, probably with some loss of plant species less tolerant to flooding, and a greater proportion of drowned timber. Densely wooded in a mile-wide strip along the river, it is accessible only by foot or small boat, and would provide the visitor a feeling of complete solitude and isolation. Leaving the flood plain, the woods end with a sharp line and the croplands begin.

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[63]Schwegman, John, letter, *Illinois Department of Conservation*, 27 July 1973

Shoreline

The lake itself is the largest, strongest visual element in the area, though physically and visually divided into an upper and lower lake by the causeway of State Highway 183. Due to the predominantly flat topography the character of the shoreline edge takes on increased visual importance. The shoreline along the main lake tends to be a series of broad, open, gentle slopes with scattered areas of trees. Within the branches the shoreline becomes more irregular, consisting of a series of small varied slopes forming a series of fingers and inlets. Some timber in these areas is subject to flooding. A wooded shoreline is intermittent, but where existing it is the basic element giving the lake its character and dimension, by adding contrast to the flatness of the land, setting up a visual rhythm, and helping the lake look less like a shallow dish. A shortage of massive trees is the chief visual deficiency of the lake, so any substantial loss of tree cover would be acutely felt. The shoreline trees should thus be treated as a valuable commodity.

Skyline

The lake is the dominant visual element of the skyline, creating broad, open views several miles in depth. The longest views possible are from the dam, the two overlook areas at the east and west ends of the dam, and from the Highway 183 causeway bisecting the lake.

Approaching the lake from the north, it will be seen first in glimpses through the trees from Interstate 57. From the west on Highway 183, an impressive view opens from the higher ground above the west shore, taking in nearly the entire lake. The first view of the lake might be from the dam if driving from the south. From any point, the timber shapes the skyline by its presence or absence. The heaviest concentration of timber is below the dam, but the skyline is further punctuated by the headworks and GOB piles of the five mines closest to the lake, four in the open land west of the lake, and one a bit more concealed behind trees southeast of the dam.

The Lower Lake

The lower Lake has the longest, most open views, with a parklike appearance provided by the many public access areas. The irregular shoreline, particularly as viewed from land, is the key visual factor noted, since in these areas the shoreline is mostly open, with trees found farther back from shore, except in the more wooded Marcum Branch access areas.

The bays and inlets of Sandusky Creek, Marcum Branch, and Gun Creek are attractive from virtually any viewing point, though Sandusky Creek, more rolling in topography, has the better-defined banks.

During periods of heavy visitor use the attractive parklike appearance of the access areas will be intruded upon by hundreds of vehicles. These will be fairly well dispersed and partly concealed behind knolls and trees.

The Upper Lake

The Upper Lake is currently undeveloped and has a different visual character. Except for the open area near the causeway, the predominant impression is of large expanses of flooded timber on the east and north arms, and of flooded farmland on the Nason Peninsula and along the west shore. The land falls so slightly that there are few discernible banks; the roads, fields, woods and fence lines extend gradually into the lake until completely submerged. Trees were not removed so as to create valuable fish and wildlife habitat within the joint use pool.

The appearance is that of a temporary flood, normal enough in itself, but false here because of the permanency of the impoundment.

2.1.5.3 Development Areas

Wayne Fitzgerrell State Park

The State Park will be a future visual factor, as the state's plan is quite extensive and will generally resemble the Corps of Engineers' present public access areas.

The park occupies most of the Ina Peninsula, bounded by the Upper Lake on the west, crossing the causeway on the south, and bounded by the Gun Creek Inlet and the Rend Lake Junior College on the east.

Gun Creek

The most intensive development will be the Gun Creek recreation complex in the Upper Lake, probably commercially the most desirable, most accessible site on the lake. It will be developed under the aegis of the Conservancy District. The skyline is so regular and level that any object rising significantly above it, such as the proposed resort-convention motor hotel, will become a strong focal point. The area is presently undeveloped, closed to the public, and attractively wooded.

Wildlife Management Areas

A major proportion of the shoreline of the Upper Lake is reserved in wildlife refuge or management areas, including the upper portions of Gun Creek, all of Casey Fork and Atchison Creek surrounding Bonnie, the Nason Peninsula, and all of the Big Muddy Arm except for the first few miles above the causeway. These areas have no development and while the public access areas are visually attractive, the very absence of shoreline development also has highly positive aesthetic value.

2.1.5.4 Visual Intrusions

The principal intrusion on the viewscape is the causeway carrying State Highway 183, a solid visual barrier bisecting the lake, cutting the view from the Dam from 10-1/2 miles deep to less than four. It is relatively low lying, and sometimes obscured by haze.

The mines form the second major visual intrusion, in varying degrees of visibility, from Old Ben No. 21, close to the lake, with a Gob pile, buildings and coal-washing operations. Old Ben No. 24 south of the main dam is less intrusive because it is opposite the view of the lake from most points, and somewhat screened by woods. The Freeman, Inland Steel and Old Ben No. 26 mines have more modern, clean headworks, but, of course, are attended by Gob piles, settling ponds, stockpiles, and waste from continuing construction and maintenance. The Old Ben No. 21 spoilpile is immediately adjacent to the lake with no timber screening available.

2.2 BIOLOGICAL ELEMENTS

Rend Lake is located in the Big Muddy River Basin, approximately 103 miles upstream from the Big Muddy's confluence with the Mississippi. The lake averages 12 feet in depth. At its upper end two subimpoundments spread water over 3,000 acres of flood plain at elevation 412.0 m.s.l. The lower portion of the lake totals 18,900 surface acres at an elevation of about 405.0 m.s.l.

The Rend Lake study area has been arbitrarily extended to one mile from the maximum flood pool of the lake. This encompasses a total of 89,404 acres which may be classified as follows:

	Within Project	Within 1 Mile (Approx.)	Total
1. Open Water	23,330	---	23,440
2. Wetland Timber	7,038	1,634	8,672
3. Upland Woods	1,262	4,250	5,512
4. Go-back Land & Pasture	4,481	2,604	7,085
5. Cropland	3,602	36,473	40,075
6. Urban	0	697	697
7. Industrial-Institutional	0	3,923	3,923
	39,713	49,691	89,404

Most of the cropland within the study area was principally created by clearing the forest which dominated Franklin and Jefferson Counties. Early descriptions[64] show that during the early days of settlement several types of forest occupied the same type of habitat in which their remnants are found today.

The make up of forests has changed with time, and some species are now scarce or locally eliminated while other weedier kinds have increased and spread. The less-cultivated, hillier sections and the bottomlands were least affected, and it is in these locations where most species of wildlife are found albeit the adjoining croplands provide important sources of food.

The establishment of aquatic and emergent vegetation in Rend Lake will follow a series of steps or stages termed ecological succession; the total organized development of these changes is called a sere. The development of vegetation in a water situation is termed a hydrosere. A generalized succession of hydrosere may be predicted for Rend Lake.[65] (See Figure 2-12)

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[64]Vestal, A.G., Forests of Time of Settlement, Atlas of Illinois Resources, Section 3, 1958

[65]Voight, John W. and Robert H. Mollenbrock, Plant Communities of Southern Illinois, Southern Illinois University Press, 1964

In the uplands where native vegetation has been removed by cultivation, fire and overgrazing, and other causes, the land is being repopulated by secondary succession. Some 7,085 acres fit this category. A probable secondary succession for uplands at Rend Lake is:

a. Annual Weed Stage (usually 1 to 3 or 5 years)
   - Annual Ragweed
   - Biennial Primrose
   - Annual Panic Grass
   - Brome Grass

b. Perennial Weed Stage (usually 3 to 10 years)
   - Frost Aster
   - Broomsedge
   - Goldenrod
   - Bluegrass

c. Shrub Stage or Shrub and Bramble Stage (usually 7 to 15 years)
   - Poison Ivy
   - Sumac
   - Dewberry
   - Blackberry

d. Pioneer Tree Stage (usually 10 to 25 years or before)
   - Persimmon
   - Sassafras
   - Black Locust
   - Pignut Hickory

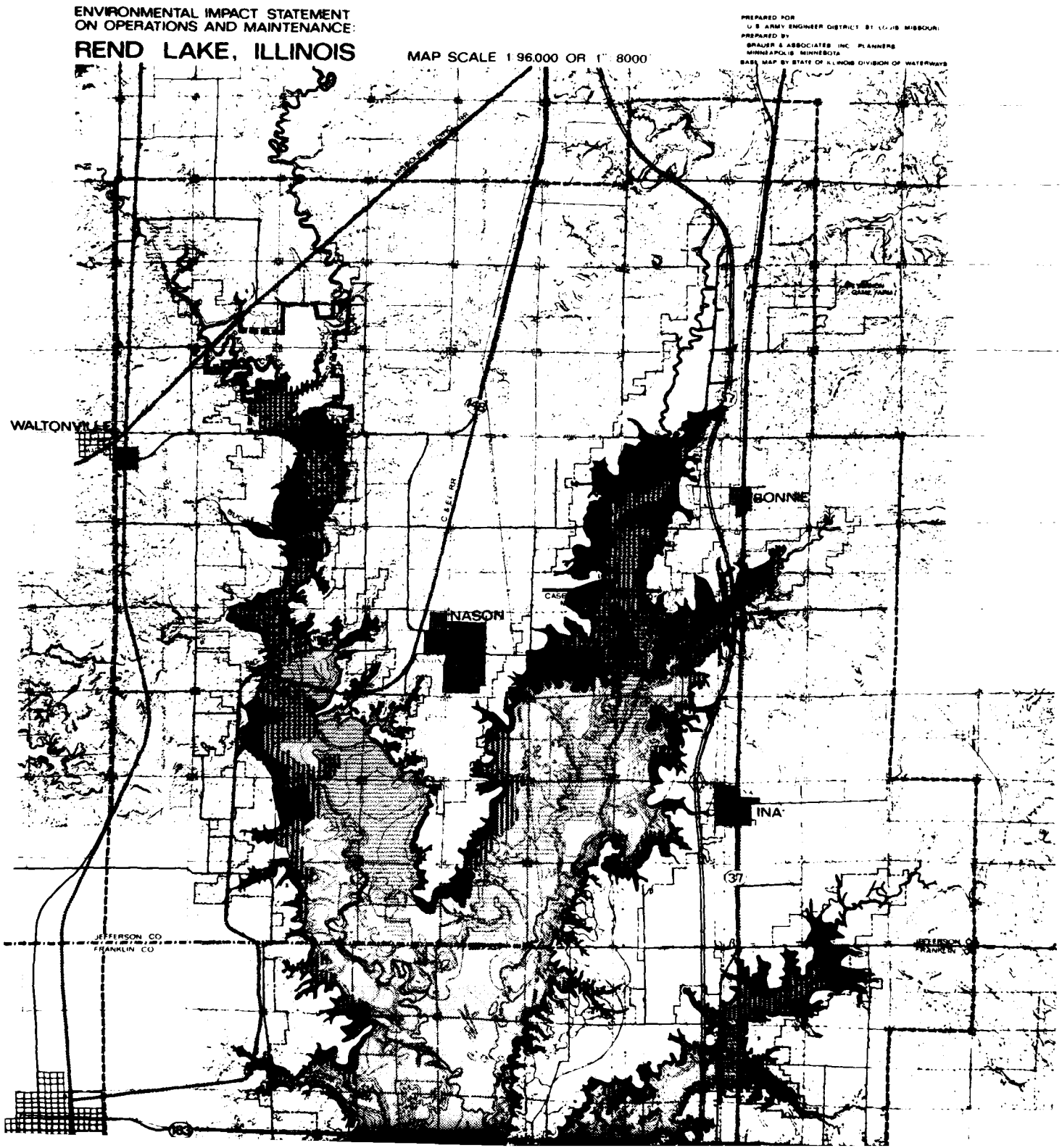
e. Later Tree Stage (usually after 30 years)
   - Red Oak
   - White Oak
   - Black Oak

Direction of succession by alteration of these natural conditions is the essence of wildlife management as well as other land management practices such as agriculture, forestry, etc. Thus, management of plant communities is based upon our knowledge of community compositions and their successional behavior under various natural and artificial influences.

2.2.1 BIOLOGICAL COMMUNITIES

Four biological communities are found within the project boundary:

a. Aquatic
b. Wetlands (includes bottomland timber)
c. Uplands
d. Upland timber


ENVIRONMENTAL IMPACT STATEMENT
ON OPERATIONS AND MAINTENANCE:
REND LAKE, ILLINOIS
MAP SCALE 1 96,000 OR 1" 8000'
PREPARED FOR
U S ARMY ENGINEER DISTRICT ST LOUIS MISSOURI
PREPARED BY
BRAUER & ASSOCIATES INC PLANNERS
MINNEAPOLIS MINNESOTA
BASE MAP BY STATE OF ILLINOIS DIVISION OF WATERWAYS
WALTONVILLE
BONNIE
INASON
INA
37
JEFFERSON CO
FRANKLIN CO
183

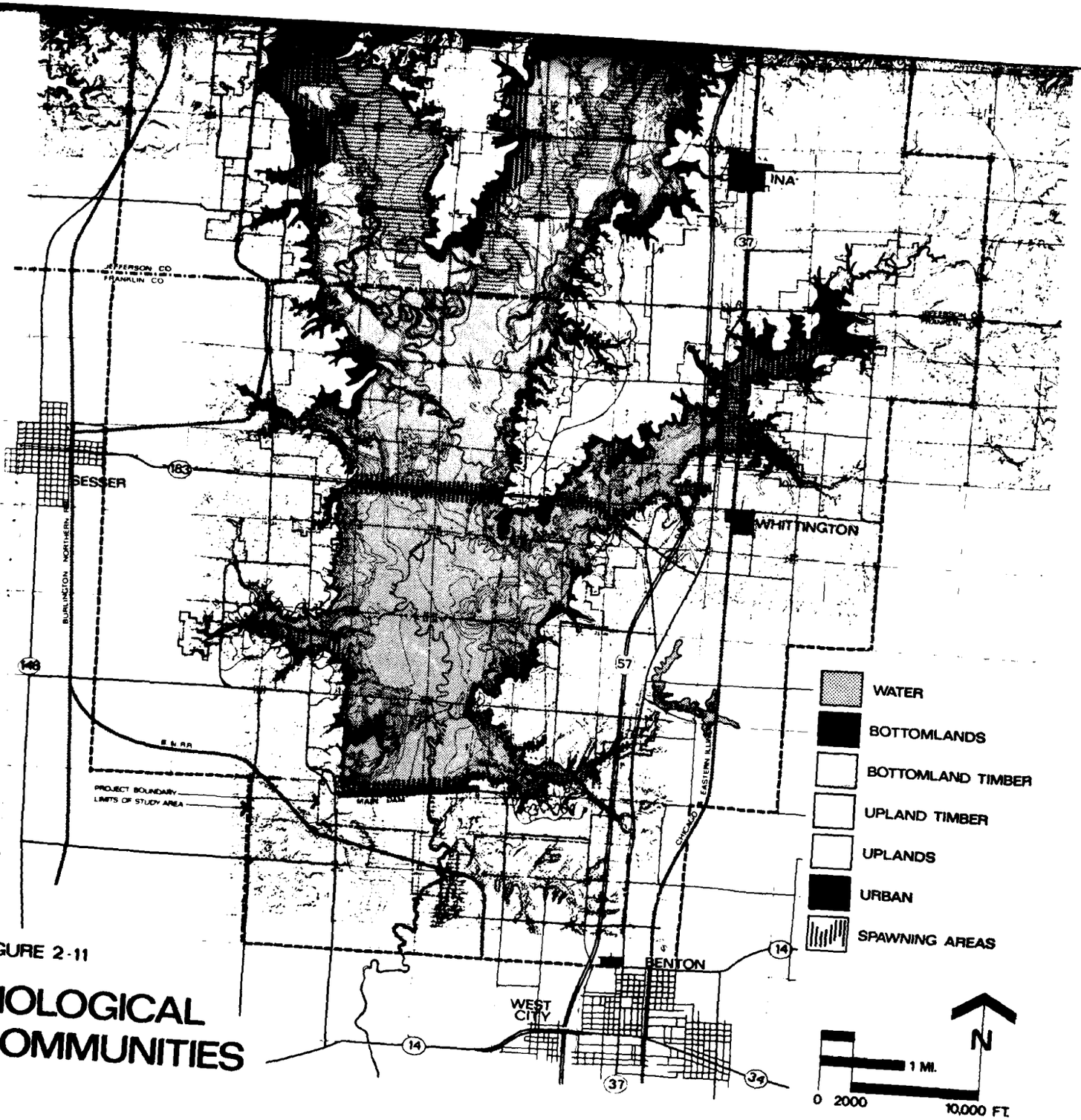
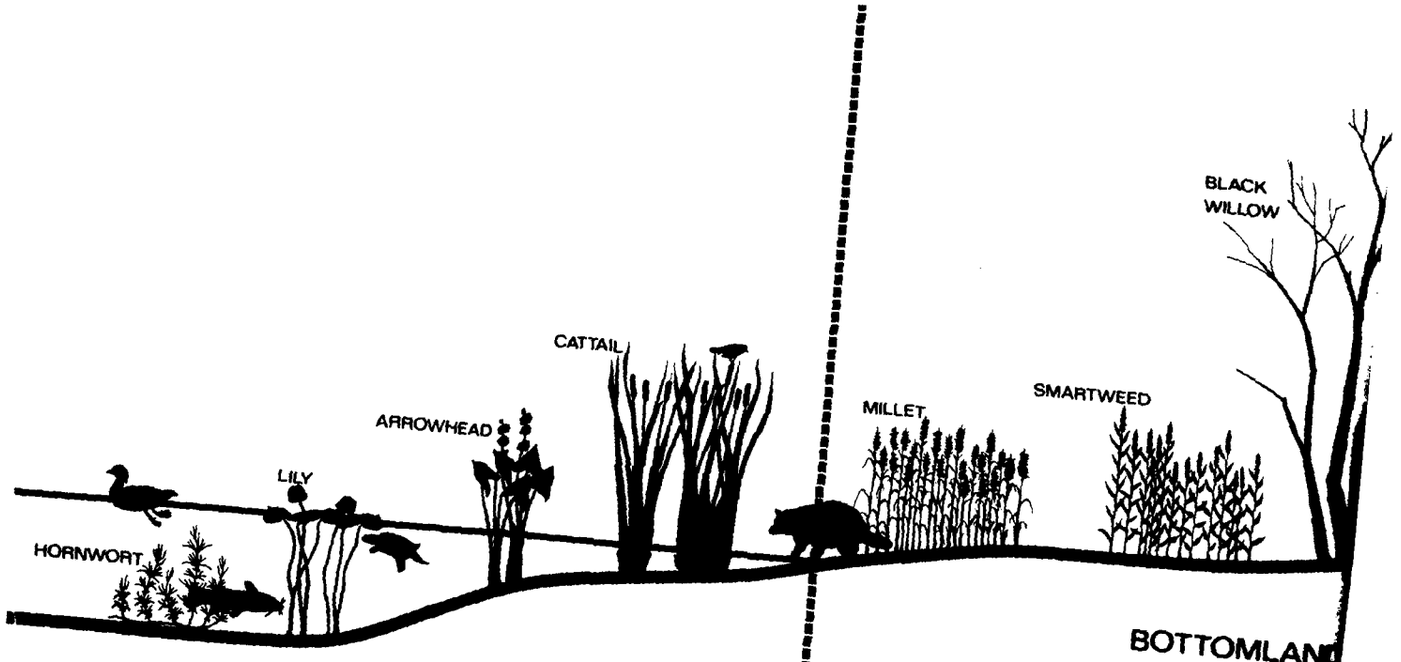


FIGURE 2-11

BIOLOGICAL COMMUNITIES



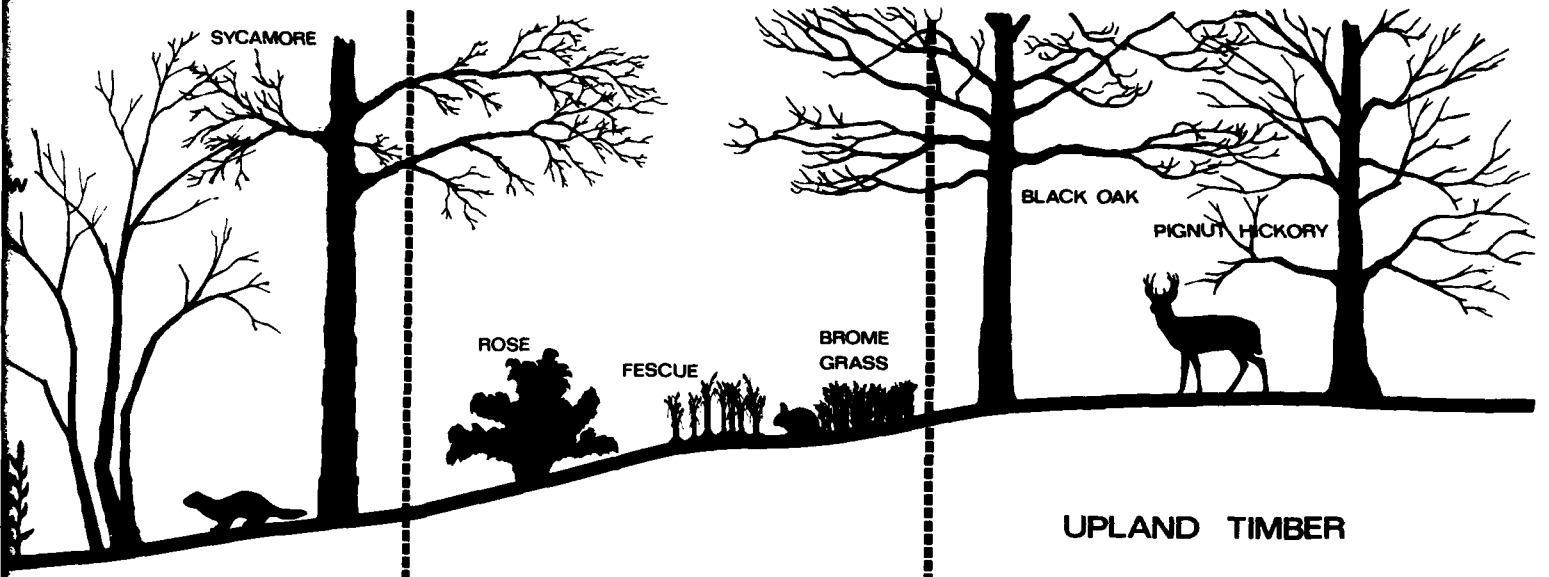
AQUATIC

BLACK BULLHEAD
BLUEGILL
CARP
LARGEMOUTH BASS
NORTHERN PIKE
WHITE & BLACK CRAPPIES
YELLOW BULLHEAD

AMERICAN WIGEON
BLUE-WINGED TEAL
CANADA GOOSE
GREEN-WINGED TEAL
MALLARD
RINGNECKED DUCK
SCAUP
WOOD DUCK

BOTTOMLAND

BEAVER
MINK
MUSKRAT
RACCOON



MLANDS

UPLANDS

BOBWHITE
MOURNING DOVE
SONG BIRDS

COTTONTAIL

UPLAND TIMBER

LONG-TAILED WEASEL
OPOSSUM
RED & GRAY FOX
RED & GRAY SQUIRRELS
STRIPED SKUNK
WHITE-TAILED DEER

FIGURE 2-12
ZONATION OF A HYDROSERE SEGMENTED TO SHOW BIOLOGICAL COMMUNITIES AT REND LAKE

The map (Figure 2-11) shows the biological communities as they occur within the project boundary. The woodland symbol within the pool area shows those timbered lands which were submerged rather than removed. (This was done for the benefit of wildlife habitat within the pool). A brief description of each community follows and more complete check lists of the flora and fauna will be found in Appendices B-2, B-3, B-4, and B-5.

2.2.1.1. Aquatic Communities

Because the 18,900-acre lake is newly formed, aquatic vegetation is not yet completely established. However, the clarity and quality of the water favor early growth of submerged and emergent plants. It follows that numerous species of invertebrates will develop in concert with these plants forming an important part of the food supply for fishes of all kinds.

No detailed aquatic plant surveys have been made. Submergents present are leafy pondweed (Potamogeton foliosus), southern naiad (Najas guadalupensis), and bottle naiad (N. minor). At present, none of the above species have spread to any extent.

An emergent aquatic plant that appears to be spreading is creeping water primrose (Jussiaea repens). Of low food value for wildlife, this plant may become a nuisance to boaters and fishermen who ply the shallows. Control of this plant is difficult.

Other floaters and emergents include duckweed (Lemna spp.) other pondweeds (Potamogeton spp.), cat-tail (Typha latifolia) and water smartweed (Polygonum punctatum).

Sampling and analysis of the Rend Lake benthos and plankton surveys have been underway since 1970 by Southern Illinois University biologists. Generally the data to date shows that from year to year diversity of species present in both the bottom sediment samples and the floating communities has been increasing.

Typically found in benthic samples are oligochaetes, Chaoborus larvae, chironomid larvae, Ceratopogonidae larvae and snails. The wide diversity of these organisms in Rend Lake samples indicates that waters are in good condition. Plankton surveys also show increasing diversity of floating organisms indicating favorable water quality conditions.

2.2.1.2 Wetlands

A wetlands community totaling approximately 8,000 acres has been created by varying water levels between the elevation of 405.0 and 412.0 m.s.l. This wetlands is further regulated for management purposes in the subimpoundments on a seasonal basis mainly for enhancing waterfowl habitat. The Big Muddy River flood plain area downstream from the Main Dam is also a part of this community.

In total acreage, the majority of the wetlands are timbered. That part of the wetlands composed of the belt of land around the shoreline, however, is largely reverted agriculture and pasture lands. The timbered areas are often dominated by an even aged stand of pin oak with scattered groupings of swamp cottonwood, black willow, river birch, elm, soft maple, and sycamore. The understory supports a variety of species. Some of the principals are smartweed, buttonbush, wild millet (or foxtails), rushes, sedges, and an occasional community of cane.

2.2.1.3 Upland Timber

Upland timber is of the oak-hickory association. Typical of cut-over stands is black oak in small diameter classes with white oak and pignut hickory. The understory is mainly dogwood. At the edges sumac, blackberry, Virginia creeper, poison ivy and sassafras are common.

Most of the merchantable trees in the upland timber were cut and sold by former landowners. The remaining large diameter trees were left, either because they were inaccessible or poorly formed. These now make up the only source of den trees for wildlife in upland timber.

2.2.1.4 Uplands

Uplands within the project boundary make up a total of 8,100 acres of mostly gently rolling land. Of this total, 3,600 acres is cropland where soybeans, millet, sorghums and standover crops of red and ladino clover are grown. About 500 acres of this land are leased by the Corps to private individuals for cash cropping.

The 4,500-acre balance is in old fields in a "go-back" status. These fields are dominated by a monotypic stand of fescue which was planted by the former owners for pasture and which has been used to some extent in the recreation areas for ground cover (erosion control). Fescue is of low value for wildlife.

The "go-back" fields are in a stage of secondary succession as evidenced by the appearance of perennial herbs and a number of woody plants such as greenbrier, black raspberry, honeylocust, rose sassafras, sumac and wild plum. These fields appear to be in approximately the 6 to 10-year stage of secondary succession.

2.2.2 FISH AND WILDLIFE INVENTORY

2.2.2.1 Wildlife Resources

Wildlife species of recreational importance fall into two broad categories: 1) Resident or indigenous forms, and 2) Migrants, both game and non-game species.

Principal resident species are cottontails, bobwhites, red and gray squirrels, and white-tailed deer. They are found on lands undergoing secondary succession, both uplands and bottomlands (Figure 2-12).

Of the migrant species, ducks and geese are most prominent. Illinois, in the heart of the Mississippi Flyway, is frequented by hundreds of thousands of waterfowl during the fall and spring migrations and in winter.[66] Rend Lake with 16,000 acres licensed to the state for management becomes an important adjunct to the total of 66,000 additional habitat acres managed by county, state and federal agencies. Mourning doves are also an important game species.

Of the ducks only the wood duck, blue-winged teal and an occasional mallard nest at Rend Lake. The more common migrants are: mallard, pintail, American wigeon, green-winged and blue-winged teal. Lesser scaup and ring-necked are the most numerous ducks. The Canada goose sometimes outnumbers all of the ducks, especially during the winter months. A complete check list of waterfowl plus other marsh and water birds will be found in the Appendix B-4.

Including waterfowl, a total of 238 species of birds will be found in the check list. More than 200 of these are non-game species that play a prominent role in the use and enjoyment of Rend Lake. Many bird watchers visit the area. Many of these people keep a "life list", and the rich ecological diversity of the project area serves well in broadening the variety of birds found there year-round.

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66 Bellrose, Frank C. and Harold C. Hanson, Atlas of Illinois Resources, Section 3, Waterfowl, 1963

Fur bearers are present in the area. Most prominent are: beaver, muskrat, mink, raccoon, striped skunk, long-tailed weasel, and red and gray foxes. While not of great economic significance, all of these animals are eagerly sought by trappers and there are no more enthusiastic folks than the fox and 'coon hunters.

The beaver has historically had a profound affect on the basin through the dams they built. Water was impounded and conserved. As they cut down trees for food, openings were created, all of which had a significant impact on the ecology of the basin. Their lodges are dome shaped, 8 to 10 feet wide and high enough so that the main chamber is above the water line. These spectacular structures are of immense interest to visitors.

The white-tailed deer may be regarded as the most important big game animal of the North American continent. As such, it represents an economic and recreational asset of the highest value.[67]

White-tails at Rend Lake have quickly established themselves, and are commonly seen, mainly near the wooded areas which are used for cover. However, the agricultural fields provide the bulk of their food, and they relish soybeans and grain of all kinds. It is probable that the Rend Lake area harbors a herd of 300 deer. Management of the deer herd is discussed in Section 4.

2.2.2.2. Fishery Resources

Complete standing crop and diversity estimates are not available, however, the following summaries were compiled by the Fish and Wild-Life Service: (Ref: U.S. Department of the Interior, Fish and Wildlife Service, *Rend Lake Reservoir, Illinois, A Special Report on Fish and Wildlife Resources*, 1961).

Big Muddy River - The main stem of the river was sampled at five stations. Fish habitats were noted as less than desirable due to stream dredging, siltation, and pollution. Fisherman usage of the main stem of the river is rated as from nil to moderate as progression is made from the upper to lower section of the river. Primarily, the fishes caught by both commercial and sport gear are carp and catfishes. Public access is limited to points of governmental roadway crossings. Combined data collected at all stations shows forage fishes (60 percent) leading in numbers of fishes collected, followed

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[67]Taylor, Walter P., Editor, The Deer of North America, 1956

by game fishes (37 percent), and commercial fishes (3 percent). By weight, commercial fishes accounted for 47 percent of the total weight, followed by game fishes (43 percent), and forage fishes (10 percent). Longear sunfish, bluegill, orangespotted sunfish, and pirate perch were the most abundant fish, exclusive of minnows. Sunfish populations were represented by fishes of various size ranges indicating favorable reproduction. This was also true for carp and suckers at a lesser degree.

Casey Fork - This stream was sampled in the middle section. Oil pollution was noticed on the shoreline vegetation. Fisherman usage is limited with access present at only governmental road crossings. Forage fishes (65 percent) led numberwise in fishes collected, followed by game fishes (34 percent), and commercial fishes (1 percent). By weight, game fishes accounted for 57 percent, followed by forage fishes (42 percent), and commercial fishes (1 percent). Green sunfish were the most abundant fish, exclusive of the minnows. Limited successful reproduction, as noted by the presence of various size groups of fishes collected, was prevalent.

Rend Lake Basin - Four stations in the Rend Lake Drainage Basin were sampled in 1964 (Inventory of the Fishes of Four River Basins in Illinois, 1964, Special Fisheries Report Eight, January 1965, Illinois Department of Conservation, Division of Fisheries). Stations No. 1, 18, 19, and 20 are located within the drainage of the proposed lake. Combining data collected at these four stations shows forage fishes predominate numberwise (60 percent), followed by game fishes (36 percent), and commercial fishes (4 percent). By weight, commercial fishes led with 55 percent, followed by game fishes with 24 percent, and forage fishes 21 percent of the total weight of fishes collected.

Generally it can be said that little fishing was done, and most fish caught were small and of low quality, carp, bowfin, small sunfish, bullheads (bullheads and sunfish are considered game fish in Illinois). Access was limited to county bridge areas. Stream pollution was previously quite common in the Rend Lake Basin.

There is no way to determine the degree of improvement in the fishery of Rend Lake as compared to the stream fishery prior to the construction of Rend Lake except to say that the fishing opportunities (and probably the fishing) have been vastly improved.

The following species are presently found in Rend Lake:

Paddlefish
Spotted gar
Longnose gar
Shortnose gar
Bowfin
American eel
Gizzard shad
Central mudminnow
Grass Pickerel
Northern Pike
Goldfish
Carp
Silvery minnow
Golden shiner
Pugnose minnow
Red shiner
Sand shiner
Redfin shiner
Bluntnose minnow
Flathead minnow
Creek chub
River carpsucker
Quillback
Highfin carpsucker
White sucke
Creek chubsucker
Smallmouth buffalo
Bigmouth buffalo
Black buffalo
Spotted sucker
Golden redhorse
Black bullhead
Yellow bullhead
Channel catfish
Tadpole madtom
Flathead catfish
Pirate perch
Blackstripe topminnow
Blackspotted topminnow
Mosquitofish
White bass
Yellow bass
Flier
Green Sunfish
Warmouth
Orangespotted sunfish
Bluegill
Central longear sunfish
Redear sunfish
Spotted bass
Largemouth bass
White crappie
Black crappie
Mud darter
Bluntnose darter
Slough darter
Johnny darter
Blackside darter
Freshwater drum

Illinois Department of Conservation

A check list of the fish in the Big Muddy Basin is found in the Appendix.

2.2.2.3 Pestiferous Species

The Big Muddy River bottomland provides favorable habitat for an abundant mosquito population. Species indigenous to the Big Muddy Basin and their primary habitat were inventoried by the U.S. Public Health Service in 1963 prior to Rend Lake's construction. The partial list below was paraphrased from Rend Lake Design Memorandum #2, U. S. Army Corps of Engineers, St. Louis District.

Major Mosquito Species

Eight species of mosquitos in the Franklin and Jefferson county area are of major importance because they are either vectors of disease, i.e., Anopheles quadrimaculatus (malaria) and Culex pipiens (St. Louis encephalitis), or they constitute a real nuisance because of their biting habits. Species in the latter category are Aedes canadensis, Aedes sollicitans, Aedes stricticus, Aedes trivittatus, Aedes vexans, and Culex erraticus. Breeding places for these species may be classified thusly: 1) floodwater habitats, 2) saltwater pools, 3) woodland pools, 4) impounded water areas, and 5) polluted waters.

Concerns

Mosquitos are of concern because of their ability to act as vectors to transmit diseases to man. Prior to Rend Lake's construction, the following disease concerns were felt.

Malaria and Encephalitis

Reported cases of malaria during the period 1940-1962 for the two counties contiguous to the lake show that no cases of this disease were reported in the two counties from 1951 to 1961, but that one case was reported in Jefferson County in 1962.

The lake area also would appear to be in the "encephalitis belt" since the disease has occurred at Paris, Illinois; and the greatest outbreak of St. Louis encephalitis of record occurred in St. Louis and St. Louis County, Missouri, in 1933, when over 1,100 human cases were reported in the city and county. No outbreaks of encephalitis are known to have occurred within the two-county area.

Section 4 discusses the current situation with Rend Lake's mosquito populations.

Pests

Prior to Rend Lake's construction a significant limiting factor to use of the Big Muddy Basin for recreational purposes was the abundance of insects which during summer months swarmed in great numbers. Rend Lake has eliminated many of the former breeding grounds for mosquitos and other insects, although nuisance insects are still present in noticeable numbers including: wasps, bees, hornets, ticks, chiggers, ants and black flies as the most common.

2.2.3 CRITICAL BIOLOGICAL ELEMENTS

2.2.3.1 Rare and Endangered Species

There have been no observations or reports of rare or endangered species of plants or animals occurring at Rend Lake.

2.2.3.2 Downstream - LaRue Swamp

The LaRue Swamp, a unique, distinctive community containing several rare species of plants and fishes, is located 100 miles downstream at the confluence of the Big Muddy and the Mississippi in Union County, Illinois. The swamp is recognized statewide and nationally and has been proposed as a Wilderness Area.

Concern was felt about the effect on LaRue Swamp of the downstream release of 30 c.f.s. from Rend Lake and Rend Lake flood control operation.

The swamp is maintained by springs at the base of a bluff to the east of the swamp and drains southward. The Big Muddy flows westward at this location, independently from the swamp between dikes.

2.2.3.3 "Natural" Areas

In 1973, the Illinois Department of Conservation set aside for preservation a "natural" area typical of the bottomland plant communities in the Big Muddy Basin. The area is shown in Figure 2-11 and comprises about 900 acres lying north of State Route 148 and east of the Missouri-Pacific Railroad.

The area is second-growth timberland which has been previously logged. Typical trees of the bottomland forest are pin oak, sweetgum, red maple, green ash, swamp-white oak, Shumard oak and hickory. A few trees of the original forest are still standing, some reaching three feet in diameter, having been passed over because of poor shape.

Rayse Creek joins the Big Muddy along with several other small rills and creeks. These small streams have meandered over the flood plain leaving several small ponds.

2.2.4 INFLUENCE OF SETTLEMENT BY MAN

2.2.4.1 Early Settlement

Before the arrival of European settlers, the Rend Lake area remained almost entirely untouched, except for limited use of fire by

Indians for clearing land or driving game. Exploration and settlement during the 1700's was confined almost entirely to the bottomlands of the Mississippi and Ohio Rivers, bypassing more remote reaches, such as the Big Muddy Basin.

It encompasses a near-climax forest of oak and hickory in the upland and beech, maple, sourgum and sweetgum in the lowlands, with black willow, swamp cottonwood and river birch predominant in the flood plains and occasional pecan and walnut. Scattered areas of prairie were interspersed with the forest, but supported few if any bison.

The beaver exerted profound influence on the ecology of the bottomlands, for its dam-building created ponds which affected soil deposition, fishery, and provided aquatic habitat for other species such as the wood duck and common fur bearers, raccoon, mink and muskrat. Within the forest were white-tailed deer, wild turkey, passenger pigeons, quail, ruffed grouse, rabbits and squirrels.

Man's first incursion was fur trapping in the mid-1700's. Beaver populations were soon obliterated, and the loss of its soil and water conservation work resulted in accelerated soil erosion and river siltation.

By early 1800's, permanent settlement and clearing of wooded lands began. Crop cultivation changed the soil profoundly, altering its organic content, nutrients and structure through leaching, runoff and erosion. Soil productivity was marginal at best, so that by the end of the Civil War, large sections of farmland became quite unproductive and were often abandoned. Weedy annual plants then took over the land, succeeded by perennial grasses and herbs, with shrubs and trees eventually returning after 20-60 years.

2.2.4.2 Post Civil War

In the 1870's the reviving forests were stripped by timber thieves and burned by occasional wild fires. Soil erosion and stream siltation were greatly accelerated by increased runoff from cleared lands. Many of the small wetland and forest animals were diminished in numbers, and the passenger pigeon was in a decline to extinction due to over-hunting for the market and habitat losses.

A positive response to large-scale lumbering came with deer populations which thrived on the vastly improved habitat of cutover lands.

With the expanded deer population and substantial flocks of wintering ducks and geese, market hunting took heavy toll, and by 1900 deer and waterfowl were scarce.

From 1904 to 1924 the coal boom encouraged harvest of most of the remaining second growth timber for mine props.

2.2.4.3 Depression to Rend Lake Inception

Since the depression of the 1930's, the area has been in difficult economic straits. Farming has been marginal, and soil conservation measures inadequate. Along with the loss of forests, the effects of soil erosion, siltation and increased runoff have aggravated flooding in the Big Muddy Basin.

Since 1900, improved management practices and well-conceived and enforced game laws have gone far in reestablishing deer and waterfowl numbers in southern Illinois, such that white-tailed deer populations in the Big Muddy Basin (and the nation) are undoubtedly greater than when settlers first arrived. Figure 2-13, a Biological Continuum, briefly summarizes activities which have altered the area's biological balance.

2.3 CULTURAL ELEMENTS

2.3.1 ARCHEOLOGICAL AND HISTORICAL SITE INVENTORY

2.3.1.1 Archeological Survey

An archeological survey was carried out during 1963, identifying 146 sites, and a salvage program was started in 1964 under direction of Karl Kiefer. Following evaluation of the survey report, excavation of the Delaney site southeast of Waltonville paralleled Melbye's work on the Bodine No. 1 and No. 2 sites on Casey Fork with both efforts yielding evidence of an early Woodland Indian complex within the Big Muddy region. In order to suggest the relative importance of the Rend Lake sites, some definition and chronology must be presented.

Chronology

The last glacial sheet north of Rend Lake retreated about 10,000 B.C., followed by the appearance of small bands of big-game hunters identified as Paleo-Indians. Shortly after 8,000 B.C. the game herds and most of the hunters disappeared due to extensive ecological changes. Tribes of the Archaic tradition descended from remnants of the Paleo-Indians, and in turn became the ancestors of all modern Indians. The rather lengthy Archaic tradition is subdivided into three phases:

Archaic Occupation (8,000-7,000 B.C.) inhabitants typically using every available animal resource;
Local Adaptation (7,000-3,500 B.C.) reflecting specialization of the subsistence pattern; and
Specialized Adaptation (3,500-2,000 B.C.) in which camps were occupied on a seasonal basis

The transition into the early Woodland culture of about 2,500-500 B.C. was barely perceptible, as life remained similar in style. The Indians were still principally hunters but had developed pottery. This period seems to be the best represented at Rend Lake sites. (The frequent absence of pottery artifacts confuses the assignments to a cultural period and presents the possibility that remains of the late Archaic period have been found instead of the early Woodland.)

The middle Woodland, or Hopewell culture, (500 B.C. - 400 A.D.) is characterized by development of agriculture, artwork, and building of large settlements. During the late Woodland period of 200-900 A.D., skills and communities dwindled and the people returned to the forests.

The Mississippian culture of 900-1500 A.D. was a sort of golden age of the Indians with a return to agriculture, the building of immense temple mounds, and again an urban concentration of population in thatched roof, matted houses or domed log cabins.

The coming of the Spanish devastated the Indians of the south and central states with European diseases, causing them to flee into the wilderness and setting off a pattern of continental migration climaxed by their subjugation and deportation by whites in the last century.

Site Characteristics

Some 409 sites have been identified in the Big Muddy River Basin up to 1968. Of these, 161 are considered Archaic, 147 are early Woodland and 109 are undetermined. Examples of all other periods total 108.

The 146 identified sites within the Rend Lake project area are almost exclusively Archaic and early Woodland. Work at the Bodine sites uncovered material resembling that of the Woodland Crab Orchard focus, named by Maxwell in 1939, and characterized by thick-walled conoidal, flat-bottomed pottery with fabric markings; by shallow cylindrical refuse pits; and by antler tools, shell pendants, and various projectile points. As the ceramics lacked influences of the later Hopewell culture, Melbye assigned the sites to the early Woodland period and suggested the existence of a local (Sugar Hill) focus. A 1966 report of work at the Delaney site, and the Kash site where Gun Creek joined the Big Muddy, confirmed the existence of a distinct Sugar Hill focus.

FIGURE 2-13

- INFLUENCE OF MAN'S SETTLEMENT -

A BIOLOGICAL CONTINUUM

Warming of climate after glacial period. (ca. 10,000 B.C.)

Succession to near-climax forest of lowland Beech-Maple, upland Oak-Hickory.

Prevalence of beaver dams, creating wetlands, controlling siltation.
Deer, turkey, wildfowl, passenger pigeon, smaller carnivores, rodents.
Minor clearing and burning by Indians.
Floods unrecorded, presumed frequent.

French exploration.

1700

French fur trade with Indians; intensive trapping, decline of beaver and its soil/water conservation work.
Erosion of soil; early loss of fish habitat.
Regional settlements by French; none in local area.

Incursions by British colonials.

Area passes to British rule. Colonization prohibited to retain fur trade monopoly. Settlement limited to Mississippi and Ohio River valleys.

1800

First land sales and settlement in area; clearing of forests for farming... wheat, small grains.

Severe floods, crops lost.

Cotton tried briefly as crop; fruit growing started.
Deer populations flourished. Passenger pigeon declining.
Forests stripped for timber. Further soil erosion and stream turbidity; runoff increased, floods aggravated; wildlife declines from habitat loss, market hunting. Passenger pigeon extinction.

1900

Second-growth timber taken for mine props. Deer and waterfowl numbers restored with improved management.

Federal government initiates soil and water conservation studies. Big Muddy Basin not high priority.

Severe, continuing drought. Fair waterfowl and bottomland game hunting in area.
Rend Lake Reservoir filled.
Conservation and wildlife management programs begun.

Problems of selection of sites for excavation were encountered due to uniformity of size and inventory and to lack of structural features. Four more sites: Reid, Conner, Humphres, and Brum Swamp were plowed and mapped in 1966. The dam site had been damaged by survey and construction work on the dam, and another site was dropped after proving to be unproductive.

In addition to the campsites identified in the Rend Lake area, a conical mound was identified, suspected to be a well-preserved Indian mound of the Woodland period.

Summary

The early Woodland occupation of the area was probably the most extensive and intensive, differing little from the late Archaic. The sites probably were only seasonally occupied. Later development of cultures is very unclear, and advanced influences did not penetrate farther up the Big Muddy than to its middle region. Denny points out that either the area was vacated by inhabitants who were drawn into a more advanced Hopewellian culture located elsewhere, or it remained an aboriginal backwater unaware of or resistant to cultural development.

Archeologists feel that the development of Archaic populations throughout the East and Midwest needs much more study. The abundance of very similar early Woodland sites offers ample opportunity for study. The whole regional archeology is poorly understood and virtually nothing is known about late Woodland cultures. The regional survey is inadequate, except for the site concentrations identified around Rend Lake and Carbondale. Current lack of data makes the cultural history very difficult to interpret.

Rend Lake Survey

In accordance with the laws existing at the time of construction, the original Rend Lake archeological survey was restricted to areas below flood pool level. As development of project lands has taken place, however, the potential for destruction of unknown archeological sites above flood pool areas has increased. In order to deal with this problem a number of actions have been taken. An archeological coordinator has been designated at Rend Lake; this individual is charged with reducing conflicts between development and known archeological resources on project lands. Since, however, not a great deal is known about archeological sites above the lake's flood pool level, additional archeological surveys for these will be conducted. Initial surveys will concentrate on critical points

where development is now occurring and on other areas where destruction potential is high, e.g., shoreline areas where waves and erosion may wash out sites. Timing of studies will be dependent on budgetary capabilities.

2.3.1.2 Historic Site Survey

Rend Lake was planned and constructed before many of the historic preservation laws now in existence were enacted or well-defined (e.g., Historic Preservation Law of 1966, Executive Order 11593, NEPA, Archeological and Historical Data Conservation Act of 1974). Prior to enactment of these laws Corps of Engineers standard procedure in construction of lakes consisted of demolishing all standing structures on project lands; consequently, no structures now remain at Rend Lake. This section therefore consists of a description of historic structures in the vicinity of the project.

The state's Historical Landmark Survey for the area has not yet been completed; however, the Old Nason Mine in the vicinity of the lake may be designated as a landmark.

The old Bell & Zoller coal mine at Nason, closed in 1952, has a large powerhouse, stack and other related structures. The entire town of Nason was laid out as a model city, similar to nearby Ziegler, but neither town nor mine grew to anticipated size. At present the Nason school is in ruins, and little remains but the sidewalks, boulevard trees, and a few houses and taverns.

Other Sites

Also near the lake and of potential interest are a fine log barn, well south of the dam, and the site of Ewing College, a small academy built in 1867 at Ewing, some miles east of Rend Lake. Closed in 1925, the buildings are now being used for other purposes.

Conclusions

While the Rend Lake area has seen white settlement for 170 years, regrettably little remains for preservation or study. Aside from the few structures noted, the rest have been demolished or allowed to fall in ruins. The Old Keller Mine building near Sesser, for instance, serves as a hog barn, and the stack has collapsed. None of these structures lie within the immediate project boundary. A check of the most recent listing of the National Register of Historic Places (February 1976) revealed no properties now on or declared eligible to be on the National Register in the vicinity of Rend Lake.

2.3.2 CULTURAL DEVELOPMENT

2.3.2.1 Regional Setting and Scope of Study

Rend Lake lies across two counties, Franklin and Jefferson, located in the southern portion of Illinois, long recognized as a distinct region with a range of economic and social characteristics that set it apart from the remainder of the state and most of the nation.

Southern Illinois is generally defined as that portion of the state lying south of an east-west line through St. Louis. It includes most of the economically depressed counties of the state and has been characterized by declining population, high rate of out-migration, and rates of unemployment considerably above national and state averages. Jefferson and Franklin Counties have historically shared this condition. Although there are important common denominators in the region, there is also considerable economic and geographic diversity - ranging from Cairo and the Ohio River towns in the south to the counties and towns directly within the influence of metropolitan St. Louis. The regional nickname of "Egypt" or "Little Egypt" comes from popular tradition, but overlaps into other states, and is too non-specific for use here.

With southern Illinois as a background for perspective, a more limited study area has been identified which includes the five counties of the Greater Egypt Regional Planning and Development Commission, plus Hamilton and Washington Counties (See Figure 1-1). This seven-county region corresponds to the identifiable limits of the direct economic influence exerted by Rend Lake. It contains the communities now receiving water supply from the lake and includes most of the local recreational market within a 25-mile driving distance. All major water recreation areas competing with Rend Lake fall within this regional definition. In studying the impact of Rend Lake on the social, economic and cultural environment we found it desirable to evaluate the project against an understanding of this seven-county region.

2.3.2.2 Historical Narrative

Exploration and Initial Settlement

The Spaniards never penetrated to the Upper Mississippi, so the written history of the region began with the French explorations of Marquette and Joliet in 1673. Jesuits and fur traders followed close behind the explorer parties, but no organized settlement in southern Illinois was established until 1718, upon organization of the territory by the French Mississippi Company. Lead and silver mining began in 1719, with much of the work done by slave labor. Indian revolts and financial depression bankrupted the company in less than 15 years.

A thousand colonists remained in five villages in the Mississippi bottomlands southeast of St. Louis, soon isolated by a British shipping blockade, and losing trade to the aggressive, better-established English colonists of the Atlantic Coast.

The Loss of French America

Mutual British and French encroachment led to the French-Indian War, carried out irregularly during 1754-60. The result was the cession to Britain of all land east of the Mississippi, except for a few small Canadian enclaves. Settlement was expressly forbidden to ensure a trade monopoly. Colonel Wilkins, the Illinois Administrator, busied himself with seizure of French holdings and making of land grants. The political climate on the East Coast changed drastically in a few years, for the colonists were subjected to extreme pettiness in taxation and trade policy, and a revolt was imminent.

The American Revolution

When the War of Independence started in 1775, defense of Illinois was undertaken by its title holder, the State of Virginia, whose spies reported that the British regulars left to regroup in Canada. A force of militia remained, and the Indians were set against the colonists. In early summer, 1778, George Rogers Clark's small colonial force debarked from flatboats on the Ohio and crossed southern Illinois from Fort Massac via Crab Orchard Creek and the Big Muddy, taking Kaskaskia without a fight. Clark's capture of Vincennes the following winter secured the West for the United States.

Territorial Organization

After the war, Virginia ceded its extensive holdings north of the Ohio to the Federal Government. The Northwest Ordinance of 1787 provided for organization when the territorial population should reach 5,000 male whites, which occurred in 1798. Southern Illinois was impoverished, its few thousand settlers having provisioned much of Clark's expedition for payment in scrip. Repeated floods and crop losses also added to the settlers' burden.

Ohio, Indiana and Michigan lay mostly vacant, yet the sale of Illinois public land was promoted as a means of redeeming war bonds held by creditors of the states.

Illinois became part of Indiana territory in 1800, but was separated in 1809 for administrative convenience. Land offices, established in 1804, were too involved with resolution of conflicts among French deeds, British grants, war bounties, Indian reservations, and squatter claims to make any public sales for several years. Speculators made most of the initial purchases when land was first offered, at $1,280 per mile-square section, and a down payment of 25 percent.

The territorial status of Illinois was revised in 1812, the year a second war with Britian began. Again the British set the Indians against the 12,000 settlers in southern Illinois, the only populous portion of Illinois territory. The threat was put down quickly, and the militia then engaged in deporting the remaining French. Occasional Indian uprisings continued until 1832, when all Indian claims in Illinois were relinquished after the Black Hawk War.

Initial Immigration

Three factors could be noted as promoting the great migration after the War of 1812: protection of land claims and sales; improved transportation in the form of roads and the new river steamboats; and rapid organization of civil government. The postwar business depression caused many Easterners to move West, joined by Britons escaping inflation, crop failure, and post-industrial unemployment.

Early Industry

A small amount of coal was mined from outcrop along the Mississippi as early as 1810, its importance limited by lack of bulk transportation until steamboats were developed. Mining remained confined to areas near navigable rivers until the railroad-building mania of the 1850's. Another cash industry of the early years was salt production from saline spring water, done by rented slaves. The French introduced slavery in 1720, and while outlawed in the territory, it was unofficially tolerated. Many settlers were slave owners, for it took a great deal of manual labor to clear the forest and cultivate the land. Slavery ended shortly after the constitutional referendum of 1824, with the slaves being sold in Missouri.

Though little money changed hands, the chief occupation was farming, with more wheat produced than corn, as the latter was thought somewhat inferior and required better soil.

Frontier Life

Frontier schools were few and crude, and dwellings were generally built of horizontal logs, often without chimneys, usually without window glass. A family might live in a lean-to or a three-walled shed for months until the cabin was built. Even well-chinked log walls were hardly proof against insects, so the settler filled the house with smoke before attempting to sleep. The poorer families wore only ankle-length shirts and went barefoot. Those better off wore deerskin clothing or bought commercial cloth. Craftwork was done as time permitted, since farming, cooking and preserving, soap-boiling and toolmaking took most of the waking hours. Home distilling was popular, as it cost virtually nothing, and the tradition of house raising survived for generations. The Bible was the only book in most families; and in the days before travelling shows, the chief public amusements were dancing, horse racing, and fist fighting.

Law and order, when imposed, was harsh: horse theft was one of five hanging offenses; disobedient children could be turned over to the authorities for public lashing; branding, ear-cropping and hamstringing were resorted to occasionally. Those unable to pay fines were rented for a term of involuntary servitude under direction of the sheriff. Punishment was almost entirely physical until the growth of correctional institutions.

The state of a settler's health was precarious: In mosquito season he was likely to contract malaria, and suppressed it with daily doses of quinine. In the autumn, the "milksick" felled cattle and humans alike, and there was smallpox in the winter. Life expectancy was short, and infant mortality high. Sanitation was poorly understood and difficult to practice.

There was rarely tranquility on the frontier. First the Mormons were harrassed and driven out, then rising lawlessness was met with vigilantism. The various bands of counterfeiters, riverboat robbers, murderers, kidnappers and slave stealers who survived moved to new fields of plunder in Missouri and the far West.

Until a transportation network developed, the overland trails established by Indians were widely used. When they became mail routes, the stores, houses, and towns tended to follow. The Big Muddy River was considered navigable by flatboat to Fishtrap Shoals above Murphysboro, where coal was loaded for the 40-mile trip to steamboat docks at Grand Tower Island. Normally, the river was low and sluggish, but it could back up 60 miles and rise 30 feet during a Mississippi flood, allowing steamboats to travel upriver.

Franklin and Jefferson Counties

Franklin County was organized in 1818, the year of Illinois statehood. It was the practice to organize a county if there were only a few dozen families resident, for the benefits of government would be within a reasonable walk or ride. The first recorded settlers came about 1804, a mill was put up in 1810, and a ferry installed on the Big Muddy the following year. The county courthouse was a private home until 1826, when a building with a jail went up at Frankfort. The seat moved to the future site of Benton in 1839. Jefferson County, settled about 1817, was populous enough to warrant organization two years later.

The Railroad Era

The Illinois Central Railroad is most intimately connected with the growth of the state as it built the greatest route mileage and tapped the most undeveloped land. After intense lobbying in Washington, Senator Douglas's Land Grant Bill of 1847 obtained in 1850 a prodigious grant of public land - every even-numbered section in a 12-mile wide strip from Chicago to the Gulf, plus sections up to 15 miles from the tracks if closer ones were not vacant. The fate of whole towns was thought to be dependent on rail service, so agitation for favorable route locations was very spirited. When built, the main line missed Jefferson and Franklin Counties, running through Centralia, DuQuoin and Carbondale, stimulating the latter's coal industry.

Contractors required a minimum labor force of 6,000 to 10,000 on a line to meet their completion schedule, and recruited European immigrants, as Illinois farmers weren't interested in construction labor. Despite intense competition for labor from other lines, the longest railroad of the time was completed in 1856. To finance construction the Illinois Central sold most of its bonds in Europe and eventually passed into foreign ownership. To meet obligations, a

program of townsite promotion was initiated, with a lavish advertising campaign in Europe. A few prospects were lost to anti-emigration groups, more to competing railroad recruiters, and a large number were lost to Canada because of rumors of impending civil war.

Southern Illinois increased rather little in population during the westward expansion, in comparison with the state as a whole, for there was little effort made to sell land. Northern propaganda gave potential settlers the idea that cholera and malaria were endemic, the soil was poor, the residents hostile, and educational facilities were lacking.

The Civil War

Fighting began a few miles south of Cairo, which was secured by Union forces and grew to be a major supply point and boat building center in the West. After initial blundering and failure by both sides, the North began to move, fanning out in a huge semi-circle from southern Illinois. A great number of refugees from the South poured into Illinois looking for new homes, overwhelming the relief agencies but stimulating land sales. Still more abandoned everything, and had to homestead on free land in the West. For southern Illinoians the victory was hollow and traumatic, draining men and resources, bringing bitterness and recrimination. Few Southern refugees settled permanently, and the wartime cotton boom went sour when the Southern fields came back into production. Only fruit production turned excellent profits, though it took venture capital that could wait years for the apple, pear, and peach trees to bear.

Pressure on the Railroads

A larger problem was seen in the land-grant holdings of the railroads, as these represented a vast amount of land never put on the tax rolls in southern Illinois. A suit against the Illinois Central failed in the Supreme Court, but public opinion was beginning to turn. Illinois was raided by emigration agents for railroads west of the Mississippi, and by 1880 some 358,000 left the state. Homesteading free land was a factor, but the railroads held the best land not yet sold, provided transportation, and offered the best credit terms available. Recruitment of foreign settlers failed to fulfill expectations so the Illinois Central turned this activity over to colony organizers, curtailed its land offices, and worked with real estate agents on a commission basis. The long-time leniency against delinquent accounts ended as pressure to sell out increased. Some of the colonies so carefully recruited were victims of mass foreclosures, which led to an increase in squatting but put better land on the market.

A multitude of hostile squatters remained on railroad land in southern Illinois, and by 1880, timber theft had become an industry with the Illinois Central the principal victim. The local market for

saw logs had previously been nominal; about enough was needed for home building, crates and tools. Now there was a huge demand for railroad ties, so the railroad's hardwood stands were stolen for competing lines. Many arrests of timber thieves were made, but local juries returned few convictions.

Thereafter, when railroad agents appeared in sufficient force, they either burned out the squatters and timber thieves or forced them to buy the land on the spot.

The Growth of Unionism

In the 1880's, temperance was the major issue of the socially conscious. Labor organization lagged far behind that of Europe. After the panic of 1873, wages dropped for years on end across the nation, accompanied by frequent strikes and widespread violence.

Unions were building practical organization methods, but management was becoming better organized against unions, making wide use of lockouts and refusing arbitration. Labor had not yet gained power and respectability, but the United Mine Workers of America, founded in 1890, noted for their toughness and solidarity, soon became a major factor in the Illinois coal industry.

Local Development of Coal Mining

It is axiomatic that coal mining needs cheap transportation to be worth developing, so it developed near rivers or followed the rail routes. It came rather late to Franklin and Jefferson Counties, for in 1904 there was but a single mine, which produced 4,200 tons for local heating.

In 1911, production had increased to over 2,350,000 tons from 14 mines worked by 3,732 men and boys in 176 days (Smith, p. 468). Illinois coal, not in demand for steelmaking, had to compete with cheaper West Virginia and Kentucky coals for heating, railroad, and electric power markets, driving prices down, decreasing profits, and thus meeting the needs of neither labor nor management.

Unions wisely enlisted the support of the mining communities before approaching the mine operators. After tiring of strikes and lost revenues, most owners statewide had signed work agreements by the late 1890's except in nearby Carterville, where Brush paid above scale rather than recognize the union. He sold out after eight years of guerilla warfare, and by using exclusively black strikebreakers, introduced an entirely unnecessary racial element to the conflict. The Leiter mine was struck immediately upon its opening, was fortified, and used strikebreakers, militia and federal marshalls to run the blockade. A series of fatal disasters led to the mine's sale.

Events were more placid in Franklin County though its miners were certainly aware of the violence at Herrin, a few miles to the south. By the 1920's the entire southern Illinois coal industry was unionized, solidly backed by editors, public officials, and other trades.

The county coal production went from zero in 1900 to first in the state in 1917. In a little over ten years production had doubled statewide while the number of mines dropped 20 percent to about 800, for mechanization increased markedly after 1900. The implications for reduced employment were obvious, and since Illinois coal was subject to seasonal demand for heat and light, even miners with jobs tended to be underemployed.

Economic Stagnation and Decline

In less than five years, coal slid from a booming industry to a sick one. Bad national publicity following the Herrin massacre of 1922 was blamed for the local decline in mining and trade, but the World War was over and the consumers were turning to gas and oil fuels. The market was now too small to absorb production, and Illinois coal continued to be undersold by non-union mines in the East. One after another, the mines in Franklin and neighboring Williamson County closed or went on part time.

There were no other sources of work for the unemployed, for the region had never developed manufacturing industries. No urban centers grew with the mining boom to carry the region during a decline. To a large extent, the mineral wealth was never retained within the region, no satellite industries were developed to use the coal, and sales tax revenues went to the home office rather than the source of the coal.

Lack of major commercial centers, of easy access and of industrial water supply acted to severely isolate southern Illinois economically. The region remained largely rural with the soils of the region almost universally poor for agricultural production.

With coal on the decline, agricultural employment offering little, and with no other industrial or commercial activity to absorb them, many who found themselves out of work in the 1920's had no choice but to leave.

Over the years the area developed an image which in itself became a deterrent to industry and economic relief. With the exception of its mining boom the area had never been wealthy, and this picture built upon itself in many ways. It had a history of violent individualism extending back into frontier times; it became bitterly divided before and during the Civil War.

The area was depicted by upstaters and competing railroads as an area of malarial swampland and violence, a union stronghold. The

industries that did move into the area were those normally attracted to depressed areas: leather goods and other sewing industries looking for a low-wage, labor-intensive work force.

The Great Depression: 1930-Mid 1950

After the crash of 1929 the demand for coal dropped to a fraction of its former size. Non-union mines to the east undercut sales, and miners began working one or two days a week, then not at all. Unemployment in Franklin and Williamson Counties hovered near 60 percent, local business virtually stopped, people had little to do but walk the streets. Banks within the two counties went from forty to three. Public relief became the region's largest industry, with over half the county's residents on relief. Observers of the time noted that without public relief, actual starvation was imminent.

World War II brought slight improvement, but the region did not participate fully in the wartime economic boom. Many residents went in service or left to find work elsewhere and didn't return. Although the war years slowed the decline briefly, a new low was reached in the 1950's when the rest of the nation was experiencing a new prosperity.

Coal mining jobs were cut in half and railroad employment dropped. Severe drought heightened water supply problems to crisis levels.

With no other jobs available, conditions triggered another wave of migration from the region. Over 29,000 people left the region during this period alone. Unemployment levels more than doubled that of the state. Hard times extended to a degree into the early 1960's, and the region still bears visible imprints of depression.

The Upturn

Evidence indicates that an economic reversal is beginning within the region. Much early impetus came from Southern Illinois University in Carbondale, growing from 3,000 students in 1950 to over 18,000 students in the 1960's. The school also has introduced thousands of students, visitors and faculty to the area, with Jackson County historically showing the only consistent population and employment gains within the region.

In the last two decades both state and federal governments have made massive investments in the region. In 1961, what is now the Greater Egypt Regional Planning and Development Commission was established as an economic development district of four counties - Franklin, Jackson, Perry and Williamson. Jefferson County was added in 1967. This was the first Economic Development Administration district in the state, under which program the E.D.A. district is eligible for Title I and Title IV federal redevelopment assistance.

Most significantly, the Commission was organized to meet economic problems on a regional basis. Considerable planning has been done, and over the 13-year life of the Commission substantial amounts of federal and state money have been channeled into the region for planning studies, public works, education and industrial development.

Of equal importance are the federal outlays expended to build three interstate highways, particularly I-57 which runs north-south through the whole region, and the construction of Rend Lake by the Corps of Engineers. The effect of these investments have just begun to be felt.

As subsequent review will show, Franklin and Jefferson Counties have been caught up in the regional pattern of economic decay, but have recently slowed these trends and appear to be on the edge of reversing it.

Origin of Rend Lake

The problem of water supply in Franklin and Jefferson counties became critical during the drought of the early 1950's. Active citizen work by the Rend Lake Association, formed for the purpose of economic growth and construction of a reservoir, helped win the 1955 referendum for a Conservancy District, a governmental entity with many powers of a municipality.

The Conservancy District obtained a study grant from the state for reservoir investigation, but obtained little initial interest from the Corps of Engineers, whose concern lay with flood control and navigation. The Bureau of Public Roads was asked to plan for raising the contemplated I-57 to accommodate a reservoir, and the State Highway Department was contacted regarding raising of its existing routes.

The Soil Conservation Service was asked to build sub-impoundment dams; the State Parks Division was urged to buy shoreline acreage for development. A manager was hired, and contacts with related local and regional organizations were expanded for the support and advice to be gained from them.

By the late 1950's the Rend Lake project had progressed to a low priority category in the House Public Works Committee. Senator Dirksen and Governor Kerner added their support in 1960, but probably the catalytic act occurred during Senator John F. Kennedy's campaign visit to the area in 1960, when he found the area bannered and billboarded for the Rend Lake project. Kennedy's host, Senator Paul Douglas, explained the project as desperately needed, and was assured that his area redevelopment bill would be approved by Congress. The bill became law three months after the Kennedy inauguration.

Authorization and Funding

The Rend Lake project remained with the Area Redevelopment Administration through the summer of 1961, after which the President directed that a Corps of Engineers' feasibility study be made of Rend Lake. The normal process was drastically telescoped in time to meet his deadline of January 1, 1962. Bipartisan work by Congressman Grey and Illinois' two senators helped accomplish both authorization and funding of Rend Lake later in 1962.

The reservoir design retained most of the concepts of a 1957 Illinois study but due to Congressional cost-benefit policy, the reservoir must be a joint-use flood control and water supply project, not single-purpose project the Rend Lake Association had envisioned: a 24,900-acre pool would be reached at times of high runoff but normal pool size would be 18,900 acres, reducing available water for consumption and increasing the percentage of shallow water. Normal shoreline was reduced from 219 miles to 162 miles, while flood control purposes necessitated buying the same amount of land, so no cost savings were possible with the reduced normal pool due to joint-use requirements.

Contracts were let for reservoir construction in late 1967, following a $45 million appropriation and an accelerated 5-year design effort. The Conservancy District's intercity water system went into operation in 1971, ending the necessity for hauling water into the area.

Construction work was complete enough to occasion a gala dedication of the dam and lake on 27 May 1972, preceded by a week of parades, banquets and concerts, with attendance estimated at 30,000.

2.3.3 SOCIO-ECONOMIC BACKGROUND

The same basic pattern will quickly become apparent in this section and it will extend across virtually every aspect of the economic and social vitality of the area and Franklin and Jefferson counties. The pattern will be: a growth in population and economic well being into the 1920's, a continuous decline for nearly 35 years accelerating rapidly into the 1950's, but followed by indications of slowing or even a tentative reversal of this depression cycle between 1960 and 1970.

2.3.3.1 Demographics

Population Trends - Region

The population of the seven-county region declined by 38,000 from 1920 to 1960 (see Table 2-11). The decline was continual with a net

FIGURE 2-14

AN HISTORICAL CONTINUUM

SOUTHERN ILLINOIS - REND LAKE AREA		NATIONAL EVENTS
French fur trade with Indians.	1700	
French Settlement - Lead mining.		Colonial period.
Approx. 1,000 white settlers in region.		King George's War.
Illinois passes to British rule.		French-Indian War. French loss of New France.
Illinois passes to State of Virginia Clark captures Kaskaskia. Illinois becomes public land.		American Revolution. Formation of Northwest Territory.
Organized as Indiana Territory. Opening of land offices. Organized as Illinois Territory. Deportation of French settlers. Small-scale coal mining. First settlement in Rend Lake area. Slavery convention defeated.	1800	French Revolution. Napoleonic Wars. Invention of steamboat. War of 1812.
Last Indian scare, sale of all remaining Indian lands. Increased immigration. Steamboats on Big Muddy River.		Illinois granted statehood. Industrialization. Jackson elected President. First railroads. Black Hawk War. Westward expansion begins.
Railroad land grant passed, start of construction. Lincoln-Douglas debates. Refugee immigration Emigration to western states.		Mexican War. Commercial expansion, height of clipper-ship era. Gold rush. Slavery, states rights disputes. Lincoln elected. Civil War. Reconstruction.
Expansion of regional coal mining. Large-scale timber theft. Chartering of Southern Illinois University.		Panic of 1873, commercial decline. Labor strikes and riots. Transcontinental Railroad. Growth of unionism.
Sale of last railroad lands. Near-complete unionization of mines.	1900	
First coal mining in Franklin County.		Columbian Exposition. Spanish-American War. Klondike Gold Rush. Philippine Revolt. First aircraft. Growth of automobiles. First World War. Chinese Revolutions. Nicaraguan intervention. Airmail. Stock crash, Great Depression. Airship success and disasters. Military aid, neutrality patrol. World War II. Atomic Bomb.
Peak production in local mining. Mine layoffs and cutbacks, labor strife, depression of local economy, severe hardship, outmigration. Introduction of Public Works Programs.		
Defense work, increase in mining. Recruitment of light industry. Three-year drought.		Korean War. Kennedy elected. Area Redevelopment Act.
Formation of Rend Lake Association and Conservancy District. Authorization and funding of Rend Lake; planning, construction.		
Dedication of Rend Lake.		Vietnam War.

loss evident for each 10-year census interval. The peak in this decline came in the 1950's. The magnitude of the regional decline is apparent when comparing it with growth of the nation and the state during the same period. For example, while the region was losing nearly 8 percent of its people between 1950 and 1960, the nation as a whole experienced an 18.5 percent increase in population - one of the highest gains on record. During this 40-year period, the region lost 15.9 percent of its peak population compared to a gain of 55.5 percent and 69.1 percent for the state and nation respectively.

The downward trend was reversed between 1960 and 1970 during which time the population of the region increased by nearly 14,000 persons. However, the overall regional statistics are somewhat deceiving. Most of the increase was contributed by Jackson County which grew by nearly 13,000 people between 1960 and 1970. Most of the Jackson County's growth has been attributed to the tremendous growth of Southern Illinois University in Carbondale. This county now contains over one-fourth of the population of the area. In contrast, the least populous county, Hamilton County, continues to show the greatest rate of decline - 13 percent for the 1960 to 1970 period. If Jackson County were removed from the regional summary, the remaining six counties would show a net increase of only 522 people or 0.3 percent compared to the national increase of 13.3 percent from 1960 to 1970.

TABLE 2-11

POPULATION OF U.S., ILLINOIS AND BIG MUDDY BASIN COUNTIES - 1920 TO 1970*

	1920	1930	% Change 1920-1930	1940	% Change 1930-1940	1950	% Change 1940-1950	1960	% Change 1950-1960	1970	% Change 1960-1970
U.S.	106,021,568	123,202,660	16.2	132,165,129	7.3	151,325,798	14.5	179,323,175	18.5	203,184,772	13.3
Illinois	6,485,280	7,630,654	17.7	7,897,241	3.5	8,712,176	10.3	10,081,158	15.7	11,113,976	10.2
Franklin	57,293	59,442	3.8	53,137	-10.6	48,685	- 8.4	39,281	-19.3	38,329	- 2.4
Hamilton	15,920	12,995	-18.4	13,454	3.5	12,256	- 8.9	10,010	-18.3	8,665	-13.4
Jackson	37,091	35,680	- 3.8	37,920	6.3	38,124	.5	42,151	10.6	55,008	30.5
Jefferson	28,480	31,034	9.0	34,375	10.8	35,892	4.4	32,315	-10.0	31,446	- 2.7
Perry	22,901	22,767	- .6	23,438	2.9	21,684	- 7.5	19,184	-11.5	19,757	3.0
Washington	18,035	16,286	- 9.7	15,801	- 3.0	14,460	- 8.5	13,669	- 6.2	13,780	1.6
Williamson	61,092	53,880	-11.8	51,424	- 4.6	48,621	- 5.5	46,117	- 5.2	49,021	6.3
7-County	240,812	232,084	- 3.6	229,549	- 1.1	219,722	- 4.3	202,627	- 7.8	216,006	6.6

*Percentages less than (.1) are shown by a dash.

Source: U.S. Census of Population - and S.I.U. study - 2 county area

Population Trends - County

Franklin County was initially settled about 1804 and was organized as a county in 1818, the year Illinois became a state. Jefferson County was settled later, about 1817, and was organized as a county two years later.

To a large degree residents of the counties depended upon agriculture as a source of livelihood during the period of initial settlement. This dependence continued up to the turn of the century. Past that point they developed quite differently.

TABLE 2-12

POPULATION 1870-1970

	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970
Franklin County	12,652	16,129	17,138	19,675	25,943	57,293	59,442	53,137	48,685	39,281	38,329
Jefferson County	17,864	20,686	22,590	28,133	29,111	28,480	31,034	34,375	35,892	32,315	31,446

Source: U.S. Census

Franklin County became one of the leading coal producing counties in the state, and its population directly reflects the fortunes of the mining industry. From one mine of four employees in 1880, the Franklin coal industry grew to include 10 mines employing 2,630 people by 1910. By 1920, there were 26 mines employing over 12,000 people. The county ranked first in the state in coal production. The peak came in 1923, at least in terms of employment, with over 16,000 people employed in the mines. The population reflects this boom, more than doubling between 1910 and 1920 alone. Production leveled off in the late 1920's and began to drop somewhat in the 1930's, and the number of jobs fell with it.

From 1930 the county has experienced a steady decline in both coal mining production, employment and total population. To some degree production has held more constant than employment; increased mechanization has made it possible for fewer people to produce the same amount of coal. The most severe decline came in the 1950's when coal production dropped from 13,000,000 tons in 1948 to 4,000,000 in 1958. The employment dropped even more drastically, from 7,000 miners in 1948 to 1,500 in 1958. While the national population grew 18 percent during the 50's, Franklin County lost 19 percent of its people.

Jefferson County has remained largely agricultural with a fair degree of railroad employment. Its population growth patterns have been much more regular than Franklin, showing a small, but steady increase in population to the 1950-1960 period when Jefferson also lost roughly 10 percent of its population. This can probably be attributed to the severe drought conditions experienced in the 1950's acting on a primarily agricultural economy.

It is interesting to note that since 1969 employment in the coal mining industry has more than doubled in Jefferson County, jumping from 800 employees in 1970 to 1,800 in 1973. The county has become the second leading coal producer in the state.

Both counties continued to lose population from 1960 to 1970, but the rate of decline has slowed.

Migration

As a whole, the seven-county region has experienced a severe and steady outmigration, losing over 100,000 people between 1920 and 1960. While some of these people may have moved within the region, the figure is quite astonishing when compared with the growth of the nation as a whole. It clearly underlines the dependence of the area on the mining industry and agriculture, and it is an even clearer indication that as jobs were lost in these industries, there was no other employment available within the region.

TABLE 2-13

NET MIGRATION

	1920-1930 % of 1920 POPULATION	1930-1940 % of 1930 POPULATION	1940-1950 % of 1940 POPULATION	1950-1960 % of 1950 POPULATION	1960-1970 % of 1960 POPULATION
Franklin	-6.5%	-17.7%	-15.9%	-21.2%	-0.2%
Jefferson	-1.5%	+4.7%	-7.3%	-18.8%	-5.3%
Hamilton	-25.2%	-3.8%	-19.8%	-22.2%	-9.3%
Williamson	-24.1%	-10.6%	-11.5%	-9.8%	+3.3%
Jackson	-12.0%	-.9%	-9.0%	+1.4%	+19.0%
Perry	-10.5%	-4.3%	-18.7%	-18.0%	-0.8%
Washington	-19.0%	-6.7%	-14.5%	-10.6%	+2.1%
Total					

Source: Majidi, Ali, Ph.D. "An Evaluation of the Impact of Federal Economic Assistance Programs in Depressed Areas: A Case Study of Southern Illinois" Southern Illinois University July 1971.

Perhaps the most significant migration figure is the reversal between the 1950-1960 period and the 1960-1970 period. The region showed its first net inmigration within 40 years, going from a net loss of nearly 30,000 people in the 1950's to a net gain of nearly 8,000 people in the 1960's. Even removing Jackson County from these figures it can be seen that for the first time the region has at least held its ground.

In looking at the two counties again, a divergent pattern is evident. Franklin County is perhaps the best example of the reduction in outmigration characteristic of the whole region. As Table 2-13 indicates, during the decades 1930-40, 1940-50, and 1950-60, Franklin County experienced heavy outmigration. During the 1960-70 decade, outmigration amounted to only 0.2 percent of the 1960 population. Much of the change that is noted can be attributed to the increased emphasis on coal mining in the area.

Jefferson County, on the other hand, offers a bit of a paradox. It experienced a somewhat steady increase in population from 1920 to 1950 with a net outmigration occurring during the 1920's, a net in-migration during the 1930's and a net outmigration again during the 1940's. Net outmigration reached a peak of 18.8 percent during the 1950's - a loss of 6,700 people - and while outmigration declined to 5.3 percent - 1,700 people - during the 1960's, this loss during the 1960's was the greatest of any of the seven counties.

Age Distribution

The age distribution within the region shows the effects of the outmigration experienced since 1930. The most graphic illustration is the percentage of the total population included in the two older age breakdowns (45-64 and 65 and over) shown in Table 2-14 compared to that of the state and nation.

TABLE 2-14

POPULATION BY AGE GROUP
AS A PERCENT OF TOTAL POPULATION
FOR U.S., ILLINOIS, AND SOUTHERN ILLINOIS
COUNTIES FOR SELECTED YEARS 1930-1970

	1930	1940	1950	1960	1970
0-19 Age Group					
U.S.	39.0	34.4	33.9	38.5	37.0
Illinois	34.8	30.1	30.2	36.5	37.6
Franklin	44.5	36.6	32.6	31.4	30.1
Hamilton	41.1	36.1	34.4	33.0	30.7
Jackson	40,8	35.8	34.3	37.2	35.5
Jefferson	39.7	35.1	33.9	35.7	34.9
Perry	40.8	36.2	34.0	34.0	33.9
Washington	38.9	33.6	30.3	32.0	32.1
Williamson	42.2	35.3	32.8	33.3	32.8
20-44 Age Group					
U.S.	38.3	39.0	37.7	32.1	31.5
Illinois	41.2	40.6	38.4	32.3	31.4
Franklin	35.9	35.2	32.8	25.5	25.0
Hamilton	29.4	32.6	30.8	25.7	24.6
Jackson	34.7	36.5	35.0	31.9	39.9
Jefferson	34.3	37.6	34.7	28.1	26.5
Perry	34.4	35.4	32.5	27.0	26.5
Washington	31.8	32.9	31.1	26.1	24.4
Williamson	34.9	35.4	33.1	29.3	29.7

TABLE 2-14 (Continued)

45-64 Age Group	1930	1940	1950	1960	1970
U.S.	17.5	19.8	20.3	20.2	20.5
Illinois	18.4	22.1	22.7	21.5	21.0
Franklin	15.9	22.2	23.9	25.9	26.3
Hamilton	20.1	20.6	22.2	25.0	25.8
Jackson	18.2	19.7	20.7	20.0	15.4
Jefferson	18.5	19.2	20.5	23.3	23.8
Perry	18.1	20.5	22.8	24.5	24.0
Washington	20.3	22.7	24.7	24.6	24.6
Williamson	17.6	21.6	22.8	23.0	23.1
65 and Over Age Group					
U.S.	5.4	6.8	8.1	9.2	9.9
Illinois	5.5	7.2	8.7	9.6	9.9
Franklin	3.7	6.1	10.6	17.1	18.7
Hamilton	9.4	10.7	12.6	16.3	18.9
Jackson	6.2	8.0	9.9	10.9	9.2
Jefferson	7.3	8.1	10.0	12.9	14.5
Perry	6.6	7.9	10.6	14.5	15.7
Washington	8.9	10.7	13.7	17.3	19.0
Williamson	5.3	7.7	11.3	14.4	14.0

Computed from: U. S. Census of Population

Franklin County statistics give the most vivid example. In 1930, 3.7 percent of the population was over 65, less than the state and national averages. By 1950, the proportion had grown to 10.6 percent, slightly over the corresponding national and state figures. During the following decade the figure jumped to 17.1 percent of the total population, almost double that found within the rest of the state and the nation. The over 65 fraction has grown to 18.6 percent in 1970, still almost more than double the national average.

For the most part, the rest of the counties exhibit the same pattern: a slow increase in older residents until the 1950's, then a jump in the percentage of the population over 65 as younger people left the area to find employment. In most counties this segment of the population has increased slightly since 1960. Again, the only exception is Jackson County with its high percentage of college students.

To a lesser degree, the same trend is evident in the 45-64 age group fraction of the total population. The percentage runs very close to the state and national averages up to 1950 where it increases somewhat. By 1960, it reached a fairly uniform level at 6 percent or 7 percent larger than the state and national averages. According to 1970 figures, this trend has continued.

Many of those who left the area were the younger working families and persons reaching maturity and finding a lack of good job opportunities. These are also the members of the population who are in their prime earning years. The heavy unbalance in population and age distribution expresses itself in many ways. Typically, the older residents receive a lower level of income as they are dependent, at least partially, upon social security and pension payments. Even those not at retirement age are often not able to adapt to new requirements in the job market and remain in low-paying jobs or become unemployed.

A work force of this type is hardly attractive to potential employers. A high percentage of low-income persons in the area can contribute to a lower tax base and to reduced buying power affecting the market for goods and services. The region has experienced a high level of public assistance payments in the form of old age and poverty assistance.

Population Distribution

Franklin and Jefferson counties are markedly different in the distribution of their population. Roughly half of the total population of Jefferson County is in Mount Vernon. No other Jefferson County community has more than 500 persons. Franklin County has two major communities, Benton and West Frankfort, and quite a number of smaller communities, grouped primarily in the southwest corner of Franklin County downstream from the lake.

The rural areas of the counties have been losing population more rapidly than the urban areas. This, of course, is happening throughout the nation as farm sizes increase and farm population drops. Jefferson County shows a loss (1960-1970) in rural population double that of either Franklin County or the State of Illinois. This can probably be attributed in part to the lack of rural communities within Jefferson County. As noted, the ones that do exist are extremely small and probably offer little in the way of community services and amenities to attract persons leaving the farm. A more direct comparison of urban and rural growth can be seen in Table 2-16.

TABLE 2-15

POPULATION OF MUNICIPALITIES IN FRANKLIN AND JEFFERSON COUNTIES

Municipality	1970 Pop.	1960 Pop.	Percent Change
Franklin County			
Benton-C	6,833	7,023	-2.7
Buckner-V	489	610	-19.8
Christopher-C	2,910	2,854	2.0
Ewing-V	220	250	-12.0
Hanaford-V	289	289	--
Macedonia-V	86	96	-10.4
North City-V	356	362	-1.7
Orient-C	502	588	-14.6
*Royalton-V	1,166	1,225	-4.8
Sesser-C	2,125	1,764	20.5
*Thompsonville-V	449	428	4.9
*Urbain-V	49	54	-9.3
Valier-V	628	649	-3.2
West City-V	637	814	-21.7
*West Frankfort-C	8,854	9,027	-1.9
Zeigler-C	1,940	2,133	-9.0
Jefferson County			
*Belle Rive-V	279	303	-7.9
*Bluford-V	465	388	19.8
Bonnie-V	314	215	46.0
*Dix(Rome)-V	167	181	-7.7
Ina-V	333	332	0.3
Mt. Vernon-C	16,382	15,566	5.2
Nason City-C	186	188	-1.1
Waltonville-V	381	394	-3.3
*Woodlawn-V	308	241	27.8

* Net within immediate Rend Lake area

Source: Greater Egypt Regional Planning & Development Commission, "1970 Census Data for the Greater Egypt Region"

Between 1960 and 1970, Mount Vernon added 1,634 persons through annexation but lost 1,240 in its existing urban areas. Benton had no annexation gains and lost 190 persons. West Frankfort added 56 persons by annexation but lost 247 from the existing city.

TABLE 2-16

URBAN AND RURAL POPULATION AND LAND AREA: 1970 AND 1960

	Land area in square miles 1970	1970 population									1960 population		
		Total		Urban				Rural					
		Number	Per square mile	Total	Percent of total	Urbanized areas	Other urban	Total	Places of 1,000 to 2,500	Other rural	Total	Urban	Rural
Illinois	55,748	11,113,976	199.4	9,229,821	83.0	7,873,782	1,356,039	1,884,155	357,589	1,526,566	10,081,158	8,140,315	1,940,843
Franklin	434	38,329	88.3	18,579	48.5	-	18,579	19,750	5,231	14,519	39,281	16,904	20,377
Jefferson	573	31,446	54.9	15,980	50.8	-	15,980	15,466	-	15,466	32,315	15,566	16,749

Source: 1970 Census Data for the Greater Egypt Region.

Minority Populations

The region has never had a large minority population and this situation exists even today. For the most part the percentage of the population that is non-white is far below the state or national level. Franklin County has only 76 non-white persons in the county or less than 1 percent. Jefferson County has over 1,000 constituting roughly 4 percent of the population. The only exception, again, is Jackson County where the City of Carbondale and S.I.U. have a higher percentage of negro and other non-white residents.

The historical narrative section (Section 2.3.2.2) gives a more detailed look at the immigration and settlement patterns in the area. A study was not made of the extent and depth of ethnic background in the area. A review of the literature available and inquiries into the subject revealed no major, well-defined ethnic segments of the population which would directly affect the operations plan for the lake.

Educational Levels

Traditionally, the area has had a lower level of educational attainment in its population than that of the state or the nation as a whole. Table 2-19 shows the comparative situations for 1960 and 1970.

TABLE 2-19

COMPARATIVE EDUCATIONAL STATISTICS

	No Education		Primary 1 - 8		High School 1 - 3		High School 4		College 1 - 3		College 4		Medium School Years Completed	
	1960	1970	1960	1970	1960	1970	1960	1970	1960	1970	1960	1970	1960	1970
Franklin	2.2	1.0	59.4	46.4	13.2	14.8	17.9	25.4	4.2	2.9	2.2	5.2	8.7	9.5
Jefferson	0.2	0.5	56.0	43.6	14.2	13.6	19.5	26.6	5.8	7.6	4.3	8.2	8.9	10.2
Illinois	1.7	1.3	38.3	27.3	19.6	20.0	24.5	34.0	8.6	11.0	7.3	6.4	11.1	12.1
U.S.	*	1.6	*	26.7	19.2	19.4	24.6	31.1	8.8	10.6	7.7	10.7	10.4	12.1

*U.S. 1960 No Education/1-4 years = 8.3%
5-8 years = 31.3%
Source: 1970 & 1960 U.S. Census.

In 1960 nearly 60 percent of Franklin and Jefferson Counties' residents had only an 8th grade education. Less than 20 percent of the residents had graduated from high school. Both these figures were well below the normal levels of attainment in the nation. During the 1960's, progress was made with over 25 percent of the population in both counties receiving high school diplomas and an evidence of a marked increase of college graduates in the area.

The low level of educational attainment is probably largely a result of the high number of older citizens within the two counties who grew up when education was not readily available to everyone, particularly in rural areas. To some degree the situation may also be a symptom of the economic ill-health of the area. Illinois' economically depressed counties have had to rely heavily upon local resources in terms of tax base to support their schools. Due to the high number of unemployed, older persons and others with low incomes, the levels of public support in terms of average expenditure per pupil within the region have consistently been below state and national levels.

Lack of education together with the comparatively older age found in the region have, no doubt, contributed to the relatively higher proportion of unskilled and semiskilled components of the labor force. Migration took many of the younger people who went on to higher education or better paying job opportunities beyond the region.

Crime

Crime is a problem in almost every segment of society. The number and severity of criminal incidents, however, are indicators of how extensive the problem is. Table 2-20 shows the criminal incidents per 1,000 population for the year 1972 and as can be seen, the rate for Franklin and Jefferson Counties is substantially less than that of the State of Illinois or the United States.

TABLE 2-20

CRIMINAL INCIDENTS - 1972

	Murder Mansl.	Forcible Rape	Robbery	Agrv. Assault	Brdg./ Entering	Larceny	Auto Theft	% Non-violent Crimes	Crime Rate/ 1,000 Pop.
Franklin Co.	0	1	5	31	67	121	8	84.1	6.23
Jefferson Co.	0	0	11	5	255	290	26	97.3	18.63
Illinois	985	2,623	29,267	24,287	95,190	77,260	49,843	79.5	24.83
United States	-	-	-	-	-	-	-	-	28.29

Source: State of Illinois, Department of Law Enforcement, Annual Crime Report

Non-violent crimes are classified as auto theft, larceny, breaking and entering; and Table 2-20 shows that both Franklin and Jefferson Counties experience a higher percentage of non-violent crimes and, therefore, a lower percentage of those considered violent. The two-county area has in the most recent past experienced not only a lower crime rate than that experienced in the State of Illinois but also a lower percentage of violent criminal incidents.

In the immediate Rend Lake area acts of violence or vandalism were few. In fact, during 1973 seven acts of vandalism occurred representing the total cost to the U.S. Corps of Engineers of $126.00. In conversation with various law enforcement agencies in the area, however, it is generally felt that with an increase in population and activity and an increase in transcient population associated with recreation, a greater number of criminal incidents may occur.

2.3.3.2 Income, Labor and Industry

Per Capita Income

Per capita income is a commonly used measure of the economic well-being of the residents within a given area. An indication of change can be observed by comparing income levels from different periods and per capita income of Franklin and Jefferson Counties can be compared to state and national levels to indicate a relative economic position.

TABLE 2-21

PER CAPITA PERSONAL INCOME

	1950	1960	1970
Franklin County	$2,037	$2,023	$3,005
Jefferson County	$1,992	$2,457	3,596

Source: County Economic Profiles, State of Illinois Department of Business and Economic Development

Table 2-21 shows the actual growth of personal income for Franklin and Jefferson Counties. Franklin County showed a slight decrease in per capita income between 1950 and 1960, the years of the most severe outmigration. Jefferson County experienced some increase during this period. However, both counties have demonstrated substantial gain in per capita income between 1960 and 1970, approximating a 30 percent growth.

Table 2-22 shows per capita income as a percentage of the national average. The two counties during the year have consistently remained below the national average.

TABLE 2-22

PER CAPITA PERSONAL INCOME AS A PERCENT OF NATIONAL AVERAGE IN SELECTED YEARS

	1929	1940	1950	1959	1965	1970
State of Illinois	136	127	122	119	120	112
Franklin County	66	78	81	70	70	75
Jefferson County	70	76	82	85	78	82

Source: Impact of Federal Assistance Programs in Depressed Areas, 1970 Census of Population

While per capita income levels have been inadequate in the two counties for a period of 30 to 35 years, we find in recent years levels have begun some slight movement towards equaling the national average. This new trend may reflect expenditures in the area for Rend Lake and highway construction during the late 60's.

Income Distribution

While per capita income is an indication of the overall well-being of the two counties, it says little about how the income is distributed among the residents.

In comparison with U. S. and Illinois averages, the two counties have proportionately more families with extremely low incomes, below $5,000.00 - and substantially fewer families with more than $15,000.00 in annual income.

TABLE 2-23

INCOME DISTRIBUTION

1970 INCOME OF FAMILIES

	0 - $4,999		$5,000 - 9,999		$10,000 - 14,999		$15,000 - 24,999		$25,000 +	
Franklin County	4,013	36.5%	3,877	35.3%	2,283	20.8%	700	6.4%	114	1.0%
Jefferson County	2,702	30.9%	3,313	37.9%	1,783	20.4%	703	8.1%	236	2.7%
Illinois	418,639	15.0%	792,557	28.3%	845,811	30.3%	574,299	20.6%	162,888	5.8%
United States	2,848,100	26.1%	4,026,214	36.8%	2,595,748	23.8%	1,165,167	10.7%	284,746	2.6%

Source: 1970 Census

Using the 1970 Census definition of poverty level, the following comparison can be made for the two counties.

TABLE 2-24

1970 INCOME LESS THAN POVERTY LEVEL

	Percent Families
Franklin County	17.1
Jefferson County	15.4
State of Illinois	7.7
United States	10.7

Source: 1970 Census of Population

The poverty level within the two counties is substantially above that of the United States and more than double that of the State of Illinois as a whole. While the overall regional and two-county economic picture may be brightening, there are many persons still living on relatively low incomes consistently well below state and

national levels. A direct comparison such as this is probably somewhat misleading as both living costs and wages are higher in Chicago and other metropolitan areas included in the state and national medians.

TABLE 2-26

MEDIAN EARNINGS IN 1969 OF PERSONS IN EXPERIENCED CIVILIAN LABOR FORCE FOR SELECTED OCCUPATION GROUPS

	U.S.	Illinois	Franklin	Jefferson
Male, 16 years old and over with earnings	$ 7,610	$ 8,563	$6,794	$6,621
Professional and kindred workers	10,735	11,073	8,500	9,543
Managers and administrators	11,277	12,732		
Craftsmen, foremen and kindred workers	8,172	9,416	7,732	7,185
Operatives, except transport	6,730	7,465	6,866	6,076
Transport and equipment operators	6,903	8,201		
Laborers, except farm	4,617	5,769	4,005	4,462
Farmers and farm managers	4,822	6,156	2,200	3,585
Farm laborers and farm foremen	2,570	2,719	.....	1,673
Female, 16 years old and over with earnings	$ 3,649	$ 4,103	$3,282	$3,191
Clerical and kindred workers	4,232	4,515	3,761	3,927
Operatives, except transport	3,635	4,172	3,453	3,367
Transport and equipment operators	2,574	2,869		

Source: 1970 U.S. Census

Labor Force Participation

TABLE 2-27

LABOR FORCE PARTICIPATION 14 YEARS AND OVER

	Total Population		Labor Force		Participation Rate	
	1960	1970	1960	1970		
Franklin County	30,210	28,898	12,899	13,088	42.7	45.3
Jefferson County	23,656	22,533	11,435	11,659	48.3	51.7
Illinois	7,219,230	8,161,810	4,124,547	4,695,799	51.1	57.5
United States	126,276,516	149,398,189	69,877,476	82,897,433	55.3	55.5

Source: 1960 and 1970 Census of Population

Table 2-27 shows that the participation rate has increased between 1960 and 1970 to a level nearly approximating that of state and national levels. The difference between the rates can indicate that a degree of underemployment may exist in the labor force, yet it is difficult to determine the level of skills available within the work force.

Available census data does break down the county population by occupation. Some limited kinds of observations can be made concerning the background of the work force by comparing to state and national figures. In doing so we note a slightly lower percentage of professional and managerial occupations within the two-county area and a slightly

higher percent of labor and general service occupations than the state and national level. This could indicate both a lack of highly-educated professional people and a lack of available white-collar jobs in the area. Beyond this point it is difficult to make any meaningful conclusions from the census data as the categories include a wide range of skill levels within each category.

Seeking a qualitative view of skill levels, General Planning and Resource Consultants, in 1969 conducted extensive interviews of employers within the two counties and the surrounding region. Their findings can be summarized as follows: There was an availability of unskilled labor in the immediate area and practically no skilled labor available. The feeling was that the unskilled labor available would need limited training for factory work but extensive training for jobs requiring skilled and semiskilled qualifications. The employment turnover was termed high in lower paying jobs. There is a high incidence of seasonal employment with employees annually leaving their manufacturing jobs going into the higher paying construction jobs for summer and fall employment. Many of the newer industries in the area, particularly those with low pay rates under $2.00 per hour (1969) were hiring female help.[68]

As an example, this lack of skill level was recently deemed partially responsible for the construction of the General Tire facility being nearly a year behind schedule. The available work force simply didn't have enough experience for specialized construction skills. However, the firm feels that there would be no problem in training available applicants to do the factory work required once the plant goes into operation.

The skill picture appears to be brightening in terms of education and training. The most important factor will be the eventual development of a network of community colleges within the Rend Lake area as well as the Vocational Training Institute in Carbondale which has existed for quite a few years. These are commuter colleges whose enrollment is almost entirely made up of students from within the immediate region and will offer a substantial range of vocational-educational programs. This availability of training more than anything else may affect the distribution of skills and occupation available within the labor force. In the past, persons who have received training have had to leave the area to find challenging work; however, with the anticipated industrial growth, it is reasonable to assume that the area economy will be able to absorb many of the vocational-educational program graduates.

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[68]General Planning & Resource Consultants, Recreation and Development Program, Rend Lake Area, Southern Illinois, TA-1 Proj.No. 06-6-09182 1971

Unemployment

Rate of unemployment is another commonly used measure of economic health within an area. Looking at Table 2-28 in the two counties, the unemployment rate has been substantially higher than in the United States States as a whole. Other data shows that this has been generally true for the entire seven-county region and has been a continuous fact of economic life for these past 30 or 40 years. During the early 1930's reports indicated that unemployment reached nearly 60 percent of persons on public relief.

TABLE 2-28

UNEMPLOYMENT TRENDS

	1950	1960	1970
Franklin County	8.6%	12.7%	6.8%
Jefferson County	9.3%	7.4%	6.2%
State of Illinois	5.4%	4.6%	
United States	5.3%	5.6%	4.5%

Source: U.S. Census

A substantial rate of improvement in the unemployment rate is demonstrated between the years 1960 and 1970. In fact, the unemployment rate in Franklin County was cut in half and in 1970 was only 2.3 percent higher than that of the national average. These trends are another indication that there is an improvement in employment opportunities and in the overall economic situation in the region.

A drop in the rate of unemployment can indicate two things. First, it can mean an actual improvement in employment opportunities. Secondly, it can show that due to a lack of jobs, working people are moving out of the area, thus reducing the percentage of people without work remaining in that area. Both of these things happened from 1960-1970 in the region. Thus, this "improvement" in unemployment is as much a function of the number of people leaving, a negative factor, as it is the number of jobs being increased, a positive sign of general economic improvement.

Studies of unemployment in the area have generally confined themselves to overall percentage figures and have generally not surveyed those out of work concerning the underlying causes of the problem.

Underemployment level is also an indication of economic health although it is very difficult to measure. Underemployment is defined as inability of the local economy to absorb or utilize potential work force. Examples are: persons working at jobs below their skill level or potential rate of earning; persons working only part-time or

seasonally or people able to enter the work force but finding no jobs. While no firm figures are available, there is evidence that substantial underemployment has existed within the region in the past, as evidenced by a large amount of seasonal employment in coal mining and part-time farming. This situation can be also somewhat deceiving in that persons who find no jobs commensurate with their skill levels or expected income will leave the area.

In summary, the counties have been characterized by a high rate of unemployment reflecting a generally unhealthy economic situation. On the other hand, the rate of improvement has been encouraging, with the unemployment level more closely approximating that of the United States in recent years.

Employment

Table 2-29 is a summary of employment distribution within the two counties for 1960 and 1970 and a comparison of this distribution with that of the State of Illinois and the United States. Each of these major breakdowns will be discussed in subsequent sections.

TABLE 2-29

EMPLOYMENT DISTRIBUTION

	Franklin County		Jefferson County		Illinois		U.S.	
	1960	1970	1960	1970	1960	1970	1960	1970
Agriculture	6.7	2.6	11.6	6.2	3.5	2.5	6.7	3.5
Mining	14.7	16.0	4.1	4.1	0.6	0.5	1.0	0.8
Manufacturing	16.3	18.3	18.9	19.0	31.8	28.1	27.1	24.4
Construction	5.0	7.2	3.8	6.7	4.9	4.6	5.9	5.5
Transportation/Communication	6.8	5.2	8.7	6.4	8.0	6.9	6.9	6.3
Wholesale/Retail	21.4	20.0	19.8	23.2	18.0	18.9	18.2	18.9
Finance/Insurance/Real Estate	2.2	2.7	3.8	5.2	4.4	4.9	4.2	4.7
Service and Other	13.8	24.6	16.0	26.1	15.4	29.4	22.7	27.8

Source: 1960-1970 Census of Population

Agriculture

The earliest economy in the region was based almost entirely on agriculture. The early farms were relatively small and little was produced for commercial sale. Near the turn of the century the industrial base in Franklin County became predominantly coal mining, while Jefferson County remained largely agricultural. The percentage of total employment in the two-county area engaged in agriculture has diminished steadily over the past 40 years.

TABLE 2-30

PROPORTION OF AGRICULTURAL EMPLOYMENT FOR THE LABOR FORCE

	1940	1950	1960	1970
Franklin	9.8%	9.0%	6.7%	2.6%
Jefferson	25.5%	20.0%	11.6%	6.2%
Illinois	9.9%	6.8%	4.2%	2.5%
U.S.	17.1%	11.9%	8.1%	3.7

Source: 1940-1970 Census of Population

This decline is consistent with the national trends since agriculture has diminished as an employment source throughout the United States since the depression years.

Franklin and Jefferson Counties, like the rest of the nation are experiencing changes in the makeup of the number and size of farms. There is a trend toward an increase in the average acreage per farm and a decrease in the total number of farms.

TABLE 2-31

AVERAGE SIZE FARMS

FRANKLIN COUNTY

Year	# of Farms	Total Acreage	Average Size
1968	1751	187,040	107
1969	1697	189,237	112
1970	1687	187,671	111
1971	1666	191,083	114
1972	1590	192,507	121

JEFFERSON COUNTY

Year	# of Farms	Total Acreage	Average Size
1968	2048	287,488	140
1969	1824	279,128	153
1970	1816	268,597	148
1971	1817	273,046	150
1972	1708	265,690	155

ILLINOIS

Year	# of Farms	Average Size	% Dec. in # of Farms
1968	133,800	222	-3%
1969	128,700	229	-4%
1970	124,900	235	-3%
1971	122,200	242	-3%
1972	115,465	249	-6%

Source: Illinois Agricultural Statistics - Assessor's Annual Form Census

Although Table 2-31 points out that the average-size Franklin or Jefferson County farm is steadily increasing, it also shows the average remains 100 to 130 acres per farm less than the state averages. This small farm size matched against the area's infertile soils gives some insight to a primary cause of the region's poor farm economy.

The poor productivity of the soils is best illustrated by comparing crop yields from two county area farms against those of upstate counties. For example, corn crop yields in McLean and Macon Counties as well as the State of Illinois have generally been one and one-half to three times those seen in Franklin and Jefferson Counties. The Rend Lake counties in 1970 were experiencing 34 and 36 bushels per acre yields of corn; Macon and McLean Counties were experiencing 89 bushels per acre of corn. Low yields in the two counties are also seen in soybean, wheat, oat, barley, rye and hay production figure comparisons.

Low yields are largely why part-time farming in the region is common. Fifty-three percent of the farmers in Franklin County and 54 percent of those in Jefferson County work one or more days off the farm to supplement their income. Table 2-32, noting that approximately 40 percent of all farmers work 200 days or more during the year to supplement their farm income, shows the extent of part-time farming.

TABLE 2-32

PART-TIME FARMING

Franklin Co.

Farm Operators Reporting Days of Work Off Farm

1 - 49 days	74
50 - 99 days	35
100 - 199 days	89
200 days and over	361
	559

$\frac{559}{\text{Total Farms Reporting}} = \frac{559}{888} = 63\%$

Jefferson Co.

1 - 49 days	129
50 - 99 days	46
100 - 199 days	169
200 days and over	575
	919

$\frac{919}{\text{Total Farms Reporting}} = \frac{919}{1,428} = 64\%$

Source: Census of Agriculture 1969

Other indications of the problems in agriculture production for this area are evidenced in a lower quality of machinery used on each farm and a lower average dollar production per farm compared to the state and nation as a whole. This cannot be construed as a direct indication of conditions.

While the amount of land used for farming has decreased and the farm employment has been declining, the amount of agricultural products will not necessarily go down and, in fact, the market value of all agricultural products sold in the two counties has increased between 1964 and 1969.

TABLE 2-33

MARKET VALUE OF ALL AGRICULTURAL PRODUCTS SOLD

	Franklin County		Jefferson County	
	1964	1969	1964	1969
Crops	3,749,439	3,252,736	5,040,381	4,585,139
Forestry Products	40,218	27,792	23,150	18,324
Livestock/Poultry	2,730,450	3,960,195	4,826,470	7,140,047
Total Sales	6,520,107	7,240,723	9,890,001	11,743,510

Source: Illinois Agricultural Statistics-
Assessor's Annual Form Census

In summary, agriculture has declined as a source of employment and has been less productive than the remainder of the state. Since two-county area economy has not been able to absorb or transfer the young people coming off the farm to other segments, they have left for other areas, contributing substantially to the large outmigration rate.

Coal and Oil Production

The coal mining industry plays an important role in the economy of both Franklin and Jefferson Counties. A measure of the degree of importance of an industry is its location quotient which is a comparison of the industry's role in a given locality against that industry's role in the national economy. (The location quotient also gives a crude indication of the fraction of production exported from the given area.) The formula used for determining location quotient is:

$$L.Q. = \frac{\#\text{ employees in industry, area}/\#\text{ employees in labor force, area}}{\#\text{ employees in industry, nation}/\#\text{ employees in labor force, nation}}$$

In applying this formula to coal mining in the two-county study area, we find the industry's current location quotient to be 5.1 for Jefferson County and 20.0 for Franklin County. Whenever the quotient is greater than one, that industry plays a larger role in the economy of the area than it generally plays in the nation. Further, an estimate of the amount of that product that is exported from the area can be obtained. In the case of Franklin County, 95 percent of the coal that is mined is shipped out of the general area (1.00 - (1÷20) = .95).

In this formula, one (1) represents the amount of coal that would normally be consumed in Franklin County; however, it was determined that 20 times that amount was mined. Therefore, the percentage obtained by dividing 1 by 20 (5 percent) and subtracting it from 100% represents that amount which is exported from Franklin County. The location quotient method of analysis is only a rough measure and for that reason (also, there is not enough disparity in other local industries) no other application was used in this report.

In taking a closer look at mining in each, it is important to note that there are two measures of the economic value of mining; the first being coal production levels, the second, the number of people employed in the industry. Table 2-34 shows a considerable difference between the two counties in terms of coal production.

TABLE 2-34

COAL PRODUCTION/MINING EMPLOYMENT

	Franklin County			Jefferson County		
Year	No. of Mines	Total Production	Employees	No. of Mines	Total Production	Employees
1890	1	700	4	5	2,100	13
1910	10	2,071,143	2,630	2	8,517	37
1920	26	11,299,280	12,261	-	-	-
1923	27	12,240,925	16,231*	1	47,820	146
1930	16	11,997,347	10,670	-	-	-
1940	12	9,231,757	6,395	5	232,599	191
1944	13	18,173,694*	7,017	2	623,677	311
1950	11	9,154,688	6,887	2	499,042	628
1960	6	4,128,672	1,482	2	2,960,094	636
1970	4	8,558,322	1,176	4	6,442,612	1,395
1973	3	6,482,077	1,234	4	7,289,076*	1,817*

* Indicates peak production or employment.

Source: State of Illinois, Department of Mines & Minerals, Unpublished records.

In one 50-year period between 1923 and 1973, 15,000 Franklin County jobs were lost in an economy that could not replace them with other work. Two factors have contributed to reduced employment: the decline of coal production, particularly since World War II, and an improvement in mining technology resulting in mechanization of the mines. This became most apparent in the 1950's when over 5,000 jobs were lost. Between 1954 and 1956 coal production per employee went from less than 10 tons per shift per man to more than 22 tons per shift per man. At the present, production and employment seem to have leveled off in Franklin County.

In Jefferson County, coal mining has historically played a minor role within the overall county economy. This changed abruptly in the late 1960's. Today Jefferson County is the second largest coal producing county in the state, employing approximately 1,800 persons during the early 1970's. It appears, based on the trend of the last ten years' performance, that coal mining will continue to be an important segment of Jefferson's economy.

The bright future for coal appears to be insured by the very large coal reserves still available and the increasing national importance of coal due to what may prove to be a persistent petroleum

shortage. Section 2.1.2.6, "Economic Geology", discusses the coal reserve picture.

Petroleum is also found in the two-county area. Production of oil in the recent years has declined and, in fact, the reserves that were estimated in 1960 to have existed in Jefferson County, have been for the most part extracted. Unless new pools of oil are discovered, which seems unlikely, oil production does not appear to have a large role in the area economy. Section 2.1.2.6 discusses oil reserves.

Manufacturing

The major components of the existing manufacturing economy are: 1) manufacturing of food and kindred products, 2) metal fabrication, metal products, machinery, etc., and 3) production of apparel and other finished products made from fabrics, leather, and similar materials. To some extent, these industries have been attracted by and made use of the low wage scales and unskilled labor force available in the area. Also, these industries are not heavy water users.

Since the Rend Lake completion, the water supply problem has been solved and the manufacturing picture has changed considerably. Franklin and Jefferson Counties seem to have been put on an equal competitive basis with other parts of the country in attracting manufacturing firms. In addition to now having a water supply, the two counties have been traversed by an extensive freeway system with direct connections to most of the metropolitan markets within the region.

The single greatest example of the increased ability of the region to attract manufacturing and employment to the area is the location of General Tire in the industrial park south of Mount Vernon. Construction is underway at the present time and the plant expects to open in 1974.

Initially, 100 people will be employed at the plant with eventual employment reaching 800 persons. Other firms have also recently been attracted to the region. The extent of this trend, largely triggered by the implementation of Rend Lake's water supply purpose, will be examined in Section IV.

Construction

Construction has not played a major role in the economy of the counties. This situation is to be expected in an area which has experienced a long period of economic depression and out-migration. There has been little demand for new residential development or commercial construction within the area. However, the industry has shown a substantial increase between 1960 and 1970 to the point where it is now somewhat higher than the state and national averages. This is

probably partially due to construction of Rend Lake and tne interstate highway system.

Transportation and Communication

The transportation industry as a percentage of the total economy parallels that of the state and the nation. The area's newly improved road system has been the primary influence upon its recent growth. Figures 2-16, 2-17 show the substantial changes that have occurred in the interstate highway system in the last few years.

In summary, it can be said that the area went from one having marginal access to metropolitan markets in the midwest to one of having an excellent transportation system and excellent access to virtually all the major metropolitan areas.

Two new trucking companies have located terminals in the City of Mount Vernon in the last two years. Interviews with officials from Roadway Express and McLean Trucking Company, indicated two primary reasons for location in this area: 1) favorable outlook for future growth and an expanding market for hauling goods, and 2) strategic location with respect to major commercial areas and freeway intersections.

Wholesale/Retail Industry

Wholesale/retail segment of the economy is generally proportional to that within the United States and the State of Illinois. It could be expected that these industries would gain strength, particularly wholesale, if Mount Vernon becomes a major distribution point for freeway oriented trucking companies.

Sales data is available from the Bureau of Census, Census of Business for the years of 1963 and 1967. For the purposes of this discussion, we have obtained sales figures for 1972 from the "Sales Management Magazine." The sales figures in that magazine are available for the county and state, and some analysis can be made from that information.

Jefferson and Franklin Counties increased their sales between 63 and 67 by 24 percent respectively. During this same period, the State of Illinois increased sales by 17.9 percent. Although there is a difference between county and state rates, they are reasonably close.

TABLE 2-35

SALES

	1963		1967		1972		% Change	% Change
	# of Estab.	Sales	# of Estab.	Sales	# of Estab.	Sales	1963-1967	1963-1967
Jefferson Co.	401	53,277	394	66,262	--	76,891[1]	24.4%	16.0%
Mount Vernon	317	45,985	283	56,247	--	--	--	--
Remainder of County	84	7,292	111	10,011	--	--	--	--
Franklin Co.	550	52,141	536	64,081	--	73,355[1]	22.9%	14.5%
Benton	146	16,391	136	19,391	--	--	--	--
Christopher	52	5,387	55	6,100	--	--	--	--
W. Frankfort	161	20,731	166	23,182	--	--	--	--
Remainder of County	191	9,633	179	15,396	--	--	--	--
Illinois	--	20,445,929	--	24,103,992	--	25,891,375[1]	17.9%	7.4%

[1]Sales Management Magazine, Census of Business 1963, 1967
Note: All figures adjusted to 1972 dollars
Source: U.S. Dept. of Commerce, Census of Business, 1963 and 1967

A marked difference, however, appears between the period of 1967 and 1972. As you will note, Jefferson and Franklin Counties increased their sales at a rate twice that of the State of Illinois. This is positive indication of increased activity in this particular area.

Service

The service industry has shown the most startling increase in percentage of employment within the region. Not only in Franklin and Jefferson Counties, but also the State of Illinois has shown tremendous growth in this industrial area. This increase is parallel with general trends within the nation which reflect an increased demand for services in recent years. The service industry could be expected to increase at an even greater rate in the two-county area as tourism and interstate travel within the two-county area increase.

Financial Insurance and Real Estate

Percent of the labor force employment in these fields parallels closely that found in the United States and the State of Illinois. Some activity is evident in the financial field and increased real estate activity is apparent around the Rend Lake area as well and in Mount Vernon. This is perhaps indicative of the optimistic outlook for the area.

Lake Moses, a 1,000-acre home site development by U. S. Steel, is the biggest example.

2.3.3.3 Housing

Housing surveys within Franklin and Jefferson show a high proportion of older homes, many of which are in poor condition. This situation is to be expected in an area which has suffered a steady out-migration of its population for 40 years.

Figures measuring the number of "unsound" housing units were tabulated from 1960 census data. While this particular category has since 1960 been eliminated from the census due to inconsistencies in determining the degree of unit soundness, the figures give some grasp of the scope of the housing problem. (Two approaches have been used- "satisfactory" and "unsound" and both of these are summarized from the Greater Regional Planning Commission Study, 1967.) The 1960 census statistics indicate that: Franklin County had 71.3 percent of its housing units in satisfactory condition, Jefferson County had 63.9 percent compared to 84.6 percent for the state and 80.4 percent for the United States. Using the Office of Economic Opportunity standards, Franklin and Jefferson Counties had 46.9 percent and 50 percent of their housing units unsound compared to 22 percent for the State of Illinois as a whole.

Part of the problem is due to the age of the structure. Table 2-36 indicates a breakdown of housing age.

TABLE 2-36

AGE OF HOUSING STRUCTURE
(# of Units)

Year Built	Benton		Mount Vernon		Franklin Co.		Jefferson Co.		Illinois	
1960-March, 1970	381	13.5%	889	14.7%	1,871	11.8%	1,694	14.4%	764,181	20.4%
1950-1959	206	7.3	937	15.6	676	4.2	1,678	14.3	681,183	18.4
1940-1949	200	7.1	981	16.3	1,030	6.5	1,736	14.8	388,816	10.5
1939-earlier	2,027	72.1	3,223	53.4	12,337	77.5	6,639	56.6	1,858,267	50.6
Total	2,814		6,030		15,914		11,747		3,692,447	

Source: 1970 Illinois and U.S. Census

Jefferson County had 56 percent of its housing built before World War II while Franklin County has 78 percent of its housing dating back before World War II (Illinois 50.6 percent). This, of course, dates back to the time when Franklin had 50,000 people and before the decline of the coal mining industry. Only 12 percent of the homes in Franklin County and 14 percent in Jefferson County have been built since 1960 compared to 20 percent for the state.

Age is not the only consideration in an area that has been economically depressed as long as this one. Money is simply not often available to spend on improving housing conditions.

Out of 15,914 total housing units in Franklin County in 1970, roughly 10 percent were vacant and half of these vacancies were in rural areas of the county. Jefferson County had over 941 vacant homes and again rural areas accounted for most of the vacant homes, or approximately 8 percent of the total. This differentiation between quality of urban and rural housing is consistent, with the rural housing being older, of a poorer quality, and having less in the way of "modern" convenience facilities in the home. Table 2-37 shows that 10.8 percent of the homes in Franklin County lack all plumbing facilities, three-fourths of these being rural. 10.8 Percent of the homes in Jefferson County lack all plumbing facilities and again approximately three-fourths of these are in rural areas.

TABLE 2-37

SEWER FACILITIES - HOUSING

(# of Units)

Sewage Disposal Method	Benton		Mount Vernon		Franklin Co.		Jefferson Co.		Illinois	
Public sewer	2,660	94.2%	5,674	94.2%	9,832	61.8%	5,829	49.6%	3,072,266	83.2%
Septic tank or cesspool	106	3.8%	273	4.5%	4,369	27.4%	4,661	39.6%	554,603	15.0%
Other	58	2.0%	79	1.3%	1,718	10.8%	1,266	10.8%	65,080	1.8%
Total	2,824		6,026		15,919		11,756		3,691,949	

Source: Greater Egypt Regional Planning and Develcpment Commission
1970 Illinois Census

A high percentage of homes in the two counties are not part of a municipal sewage treatment system, but rely upon septic tanks, cesspools or other means of disposing their waste. This points out a potential water quality problem considering the extremely poor suitability of the soils in the region for septic field operation. Ninety-seven percent of all homes connected to the sewage treatment system in Jefferson County are located in Mount Vernon.

TABLE 2-38

1970 FINANCIAL CHARACTERISTICS - HOUSING

	Benton		Mount Vernon		Franklin Co.		Jefferson Co.		Illinois	
Specified Owner Occupied	1,759		2,412		9 118		5,611		1,661,243	
Less than $14,999	1,383	79.2%	732	30.3%	7,963	87.3%	4,169	74.3%	513,917	30.9%
$15,000 - $24,999	293	16.7	961	39.8	893	9.8	977	17.4	618,523	37.2
$25,000 or more	73	4.1	719	39.8	262	2.9	465	8.3	528,803	31.8
Median	$9,100		$19,900		$6.900		$9,100		$17,143	

Source: 1970 U.S. and Illinois Census.

Table 2-38 compares the assessed value of homes within the two counties against state averages. It indicates that the assessed value of the homes in the two counties is greatly lower than the rest of the state, and perhaps this is one attraction of the area to retired persons out-migrating from high-cost housing areas such as St. Louis and Chicago. This low valuation may be as much a factor of low housing demand and outdated assessments as it is of the value of the housing itself.

Poor housing has several effects upon the communities: it can substantially reduce their available tax base and resource and as such their ability to construct or upgrade other public service facilities. It can prove a deterrent to the attraction of new industry and new residences in the area. It can be assumed that conditions have improved within the last decade. The Greater Egypt Regional Planning and Development Commission has recently completed a survey on housing and the degree of improvement should be known in the near future.

2.3.4 LAND USE

2.3.4.1 Regional Land Use

Most of the land use within the region is committed to rural uses such as crop land, timber and some pasture. Farms are small and often operated on a part-time basis. Primary crops are corn and soybeans. Considerable land is owned or has been owned by coal mining companies within the region. There has been extensive strip mining west and south of the lake. However, all the mines near Rend Lake are shaft mines, and there are no strip mines in the Rend Lake watershed. A concentration of small communities has developed within 25 miles of Rend Lake between Carbondale to the south and Mount Vernon on the north. This pattern of growth has led to the term "dispersed city" describing the region.

There is some evidence that the region does interact as a common economic unit. Internal roads are good and commuting is common. People travel routinely from one community to another for work, shopping, and even school. As a reference, it is interesting to note that travel distances are often no more than those faced by most metropolitan dwellers in terms of reaching work, entertainment or shopping. Past traffic and marketing studies tend to support this dispersed city concept.[69]

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[69]Greater Egypt Regional Planning and Development Commission and Southern Illinois University, Economic Development Program, Report on Data Collection, Document 1, GERP

With the completion of Interstate 57 running through the region some new patterns of development are emerging. Growth along the Highway 13 corridor between Marion and Carbondale is increasing and one day may become a continuous commercial urbanized corridor. Mount Vernon to the north is also growing toward the freeway and appears to be a growth center for the northern portion of the Greater Egypt region. With the completion of I-64 east of St. Louis, development in Mount Vernon should be accelerated. The same should be true somewhat later when I-24 (eventually reaching Miami) will be connected to I-57 south of Marion.

Franklin and Jefferson Counties

Land in the two counties is also generally committed to rural use, most of this in crop land. There are some large areas of timber, primarily along the Big Muddy bottom land. Urbanized areas are distributed somewhat differently within each of the two counties. Nearly one-half of Jefferson County's population lives in Mount Vernon while none of Jefferson's other eight communities have a population in an excess of 500 persons. Franklin County has two larger communities, Benton and West Frankfort, containing nearly one-half the total population. Franklin also includes a group of smaller communities of somewhat larger size grouped in the southwest corner of the county, corresponding to the area of early coal mining activity. Most of these communities are located downstream from Rend Lake and as such will have little impact upon the water quality and visual appearance of the lake.

The GERP Commission is currently updating its land use inventories and the actual changes between 1964 and the present can be determined.

2.3.4.2 Rend Lake Area

Watershed Land Use

One of the areas of greatest direct influence on the lake is the upstream watershed draining directly into it. In 1969 the Big Muddy Basin Study surveyed the land use and summarized it as shown in Table 2-39.

These land uses were tabulated for different purposes, but serve to illustrate the high proportion of rural usage particularly in crop land (approximately 50%). Mount Vernon is the only major city within the watershed and constitutes about 12.5 square miles of urban development. The City of Benton actually falls outside the direct drainage pattern to the lake and within sub-drainage patterns emptying into the downstream watersheds, and Lake Benton and Lake Moses northeast of the city.

TABLE 2-39

WATERSHED LAND USE[1]- 1970 AVERAGES

Subwatershed	Cropland	Pasture Land	Forest Land	Other[3]	Total
Upper Big Muddy	84,120	25,580	17,870	26,450	154,020
Gun Creek	17,310	4,680	4,890	4,480	31,360
Casey Fork	54,030	18,930	11,760	19,600	104,320
Central Big Muddy[2]	8,504	1,759	3,226	1,173	14,662
Total	163,964	50,949	37,746	51,703	304,362

Note:

1. Big Muddy Basin Study
2. Includes only the portion of the watershed draining into Rend Lake
3. Includes urban, industrial areas, state and federal lands (including public owned forests), farmstead, roads and other miscellaneous land

Site Study Area

Rend Lake will inevitably attract development. The character that adjacent land use takes over the years can greatly affect the value of the lake for recreational users and can potentially affect its physical properties as well. Conversely, the way project land is developed will inevitably affect development around the lake. In order to examine these relationships a peripheral land use study area has been established around the Corps of Engineers, state and Conservancy District land holdings. Figure 2-15 shows existing land use within the study area.

There are no major natural features which clearly define limits of this study area. Therefore, determination has been made arbitrarily that a minimum one-mile strip of land beyond the project boundaries be included within the study area. While this definition is admittedly arbitrary, it does include most of the area that will visually affect the recreational user on the site and includes Interstate 57, Highway 37 on the east and Highway 148 on the west side of the lake which form somewhat definable limits to the south.

Land Use

Originally the lake was Big Muddy Bottomland similar to that found immediately downstream from the dam. The edges of this timber bottom land are now evident around the lake and extend up most of the tributary streams. The two areas to the north of the lake as well as the Gun Creek branch east of the freeway and a Marcum branch east of the freeway are heavily timbered. The rest of the land is mainly agricultural with scattered patches of upland timber. The lake is only a

few years old, and the bulk of the land around the lake still remains in the rural state found prior to construction of the lake.

Table 2-40 summarizes the land use in the study area:

TABLE 2-40

LAND USE DATA

	Within Project Boundary	Acres Within Land Study Area	Total Acres
Open Water	23,330	110.25	23,440
Wetland timber	7,838	1,634	8,672
Upland woods	1,262	4,250	5,512
Go-back and pasture	4,481	2,604	7,085
Cropland	3,602	36,473	40,075
Urban	0	697	697
Industrial institutional	0	3,923	3,923
Total	39,713	49,691	89,404

Acreages were based on aerial photography dated March 22, 1973, with the lake elevation at 407 MSL

1. Area within project boundary; 39,713 acres
2. Area within one mile but outside of general project boundary; 49,691 acres

Source: Brauer & Assoc., 1974

The major physical and land use features of the study area can be summarized as follows:

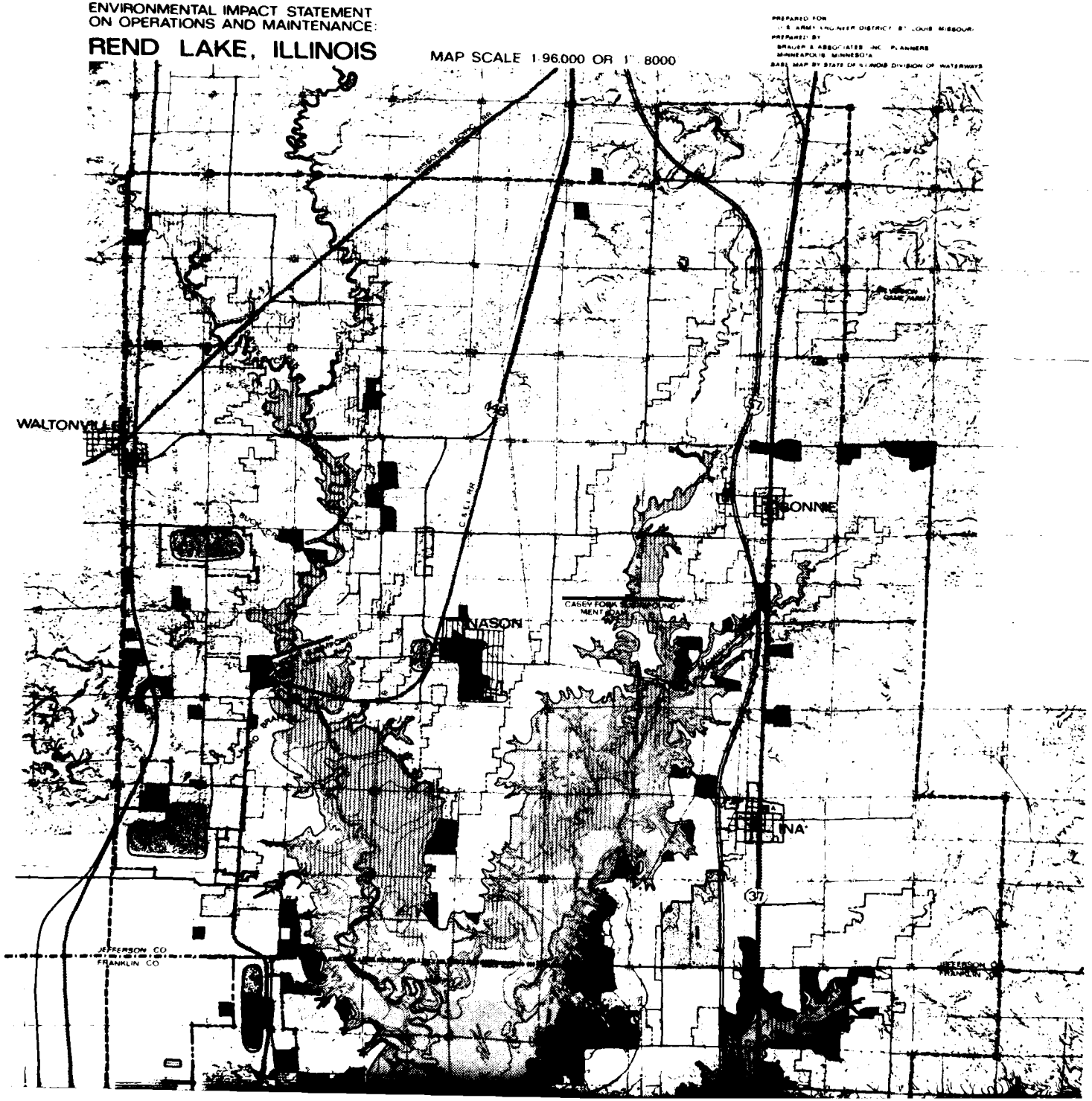
Interstate 57 parallels the lake on the east cutting across two of the major tributaries, Marcum Branch and Gun Creek. The freeway constitutes a severe barrier both visually and in terms of physical access to the lake edge. It also marks a clear definition of proposed use. East of the freeway the land is timbered and used for wildlife management purposes and west of the freeway to the lake extensive boating and recreational activities are planned or under construction.

All land holdings between the lake and freeway are owned either by Rend Lake Conservancy District or the Rend Lake Junior College. Some land is leased to the Conservancy District although the Corps of Engineers owns a flowage easement at the lake shore (See Ownership Map Figure 1-2). Pursuant to the development of Rend Lake the Conservancy District formulated a plan for the development of the parcel northeast of the 183-I-57 interchange which would include an extensive resort, restaurant, marina complex and a convention center-museum complex south of 183. The proposed golf course is located just to the south of this site. Many of the elements in the initial plan, Figure 2-18, have been altered and since the whole plan is in the process of being revised, Figure 2-18 is obsolete. It is included, nevertheless, because at the time of this writing (early 1976) the revised development plan is unavailable.

ENVIRONMENTAL IMPACT STATEMENT
ON OPERATIONS AND MAINTENANCE:

REND LAKE, ILLINOIS

MAP SCALE 1:96,000 OR 1" = 8000



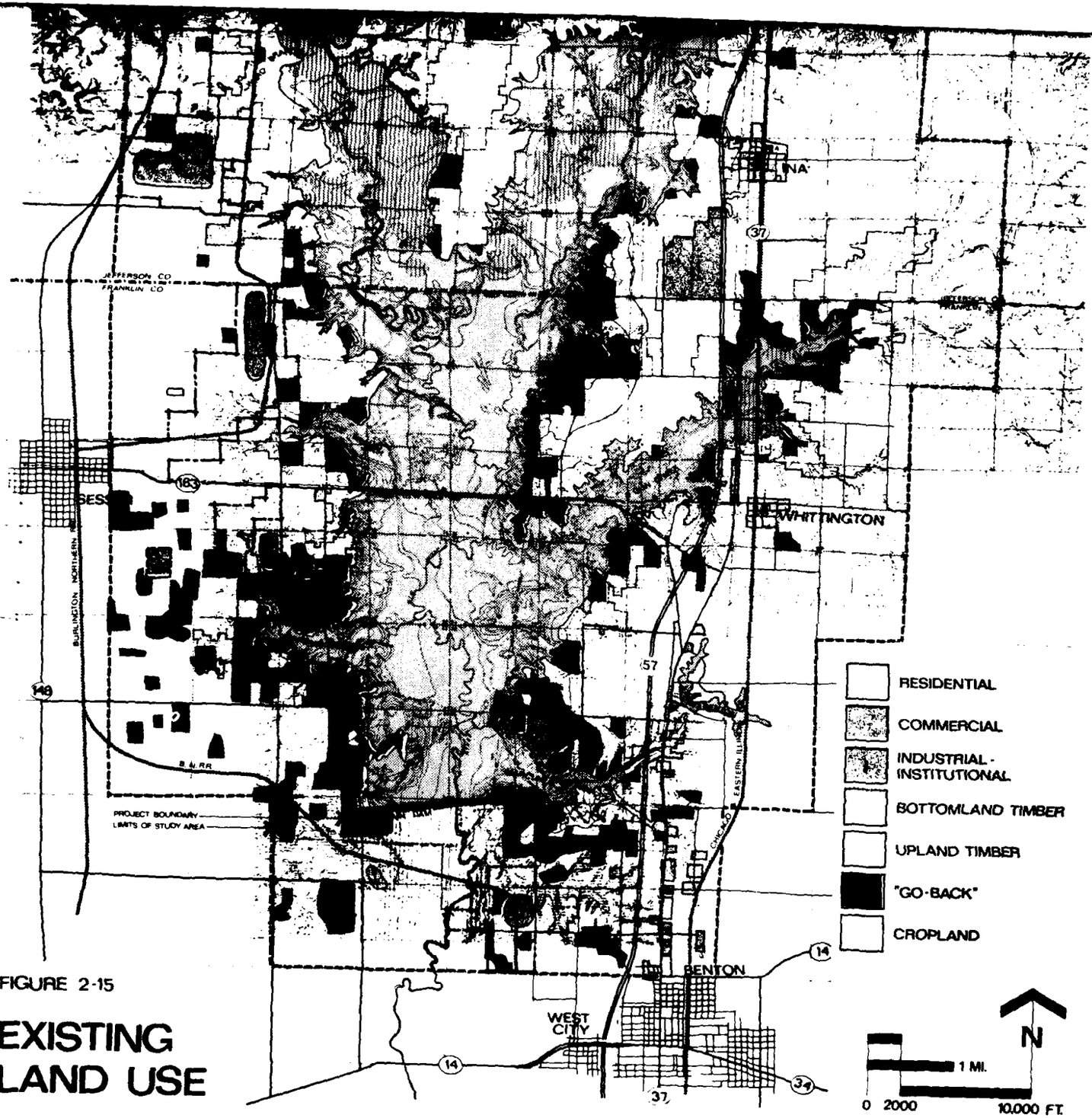


FIGURE 2-15

EXISTING LAND USE

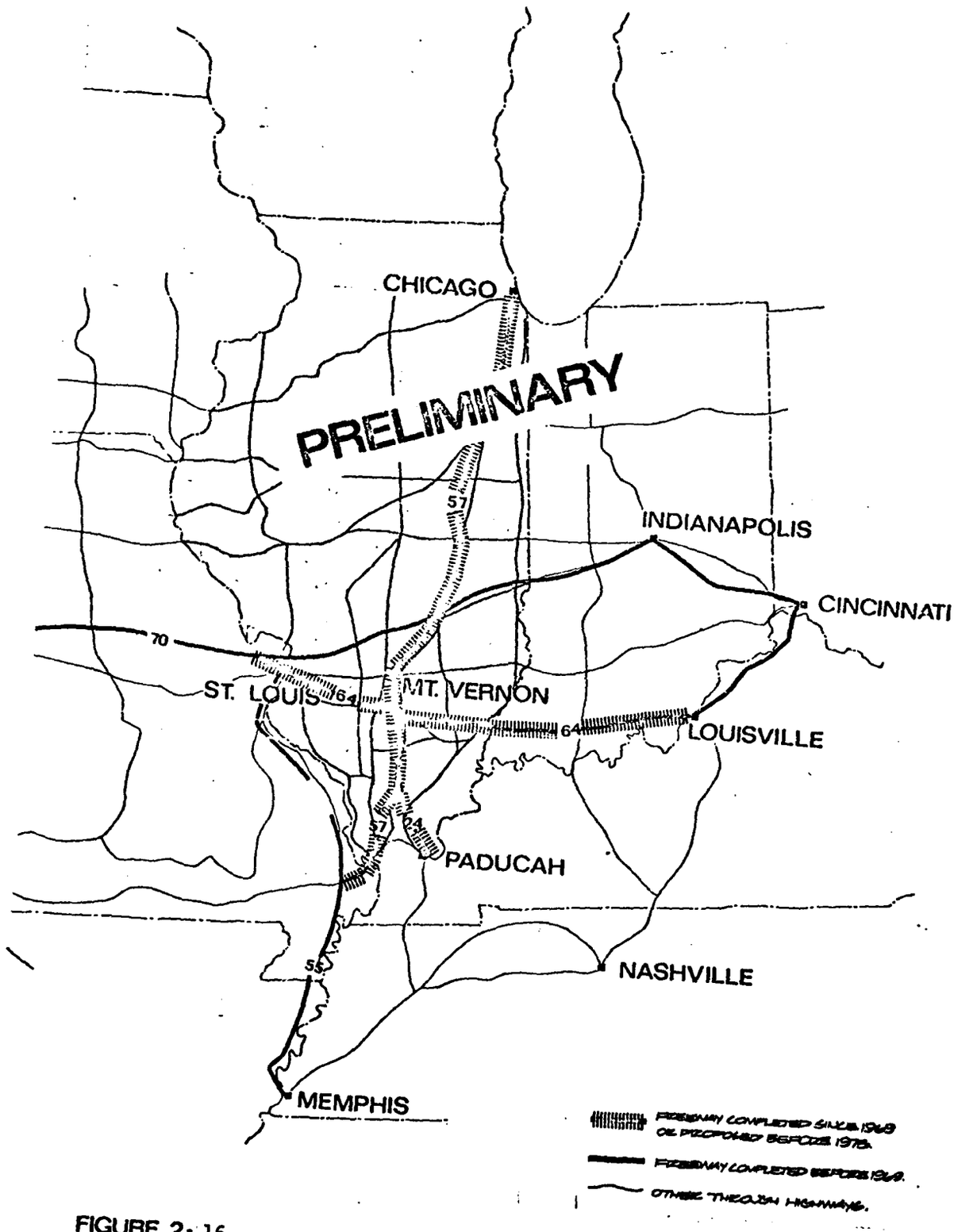
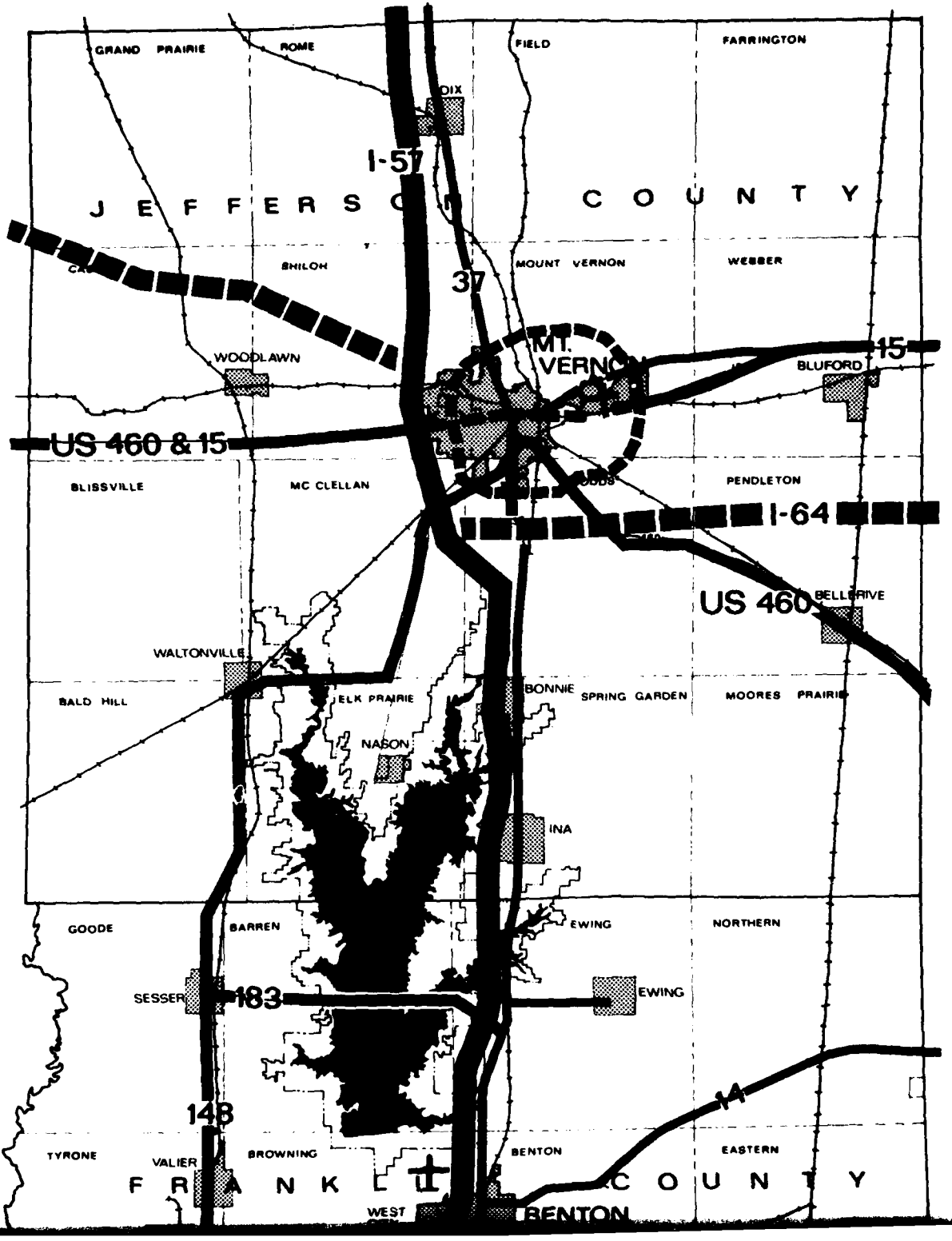
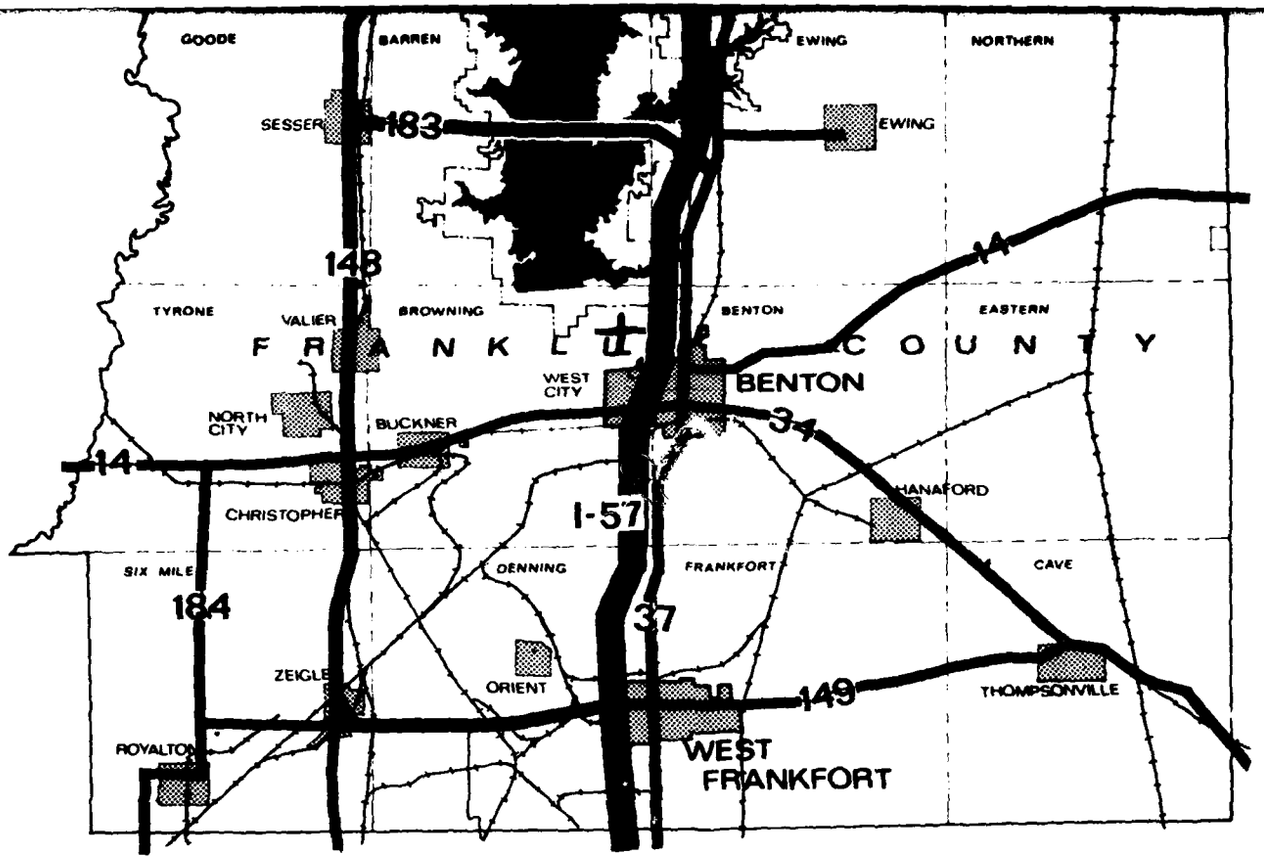


FIGURE 2-16
INTERSTATE HIGHWAY NETWORK


GRAND PRAIRIE
ROME
FIELD
FARRINGTON
DIX
I-57
JEFFERSON COUNTY
SHILOH
MOUNT VERNON
WEBBER
37
WOODLAWN
MT. VERNON
BLUFORD
15
US 460 & 15
BLISSVILLE
MC CLELLAN
PENDLETON
I-64
US 460
BELLE RIVE
WALTONVILLE
BALD HILL
ELK PRAIRIE
BONNIE
SPRING GARDEN
MOORES PRAIRIE
NASON
INA
GOODE
BARREN
EWING
NORTHERN
SESSER
183
EWING
14
148
TYRONE
VALIER
BROWNING
BENTON
EASTERN
FRANKLIN COUNTY
WEST
BENTON



LEGEND

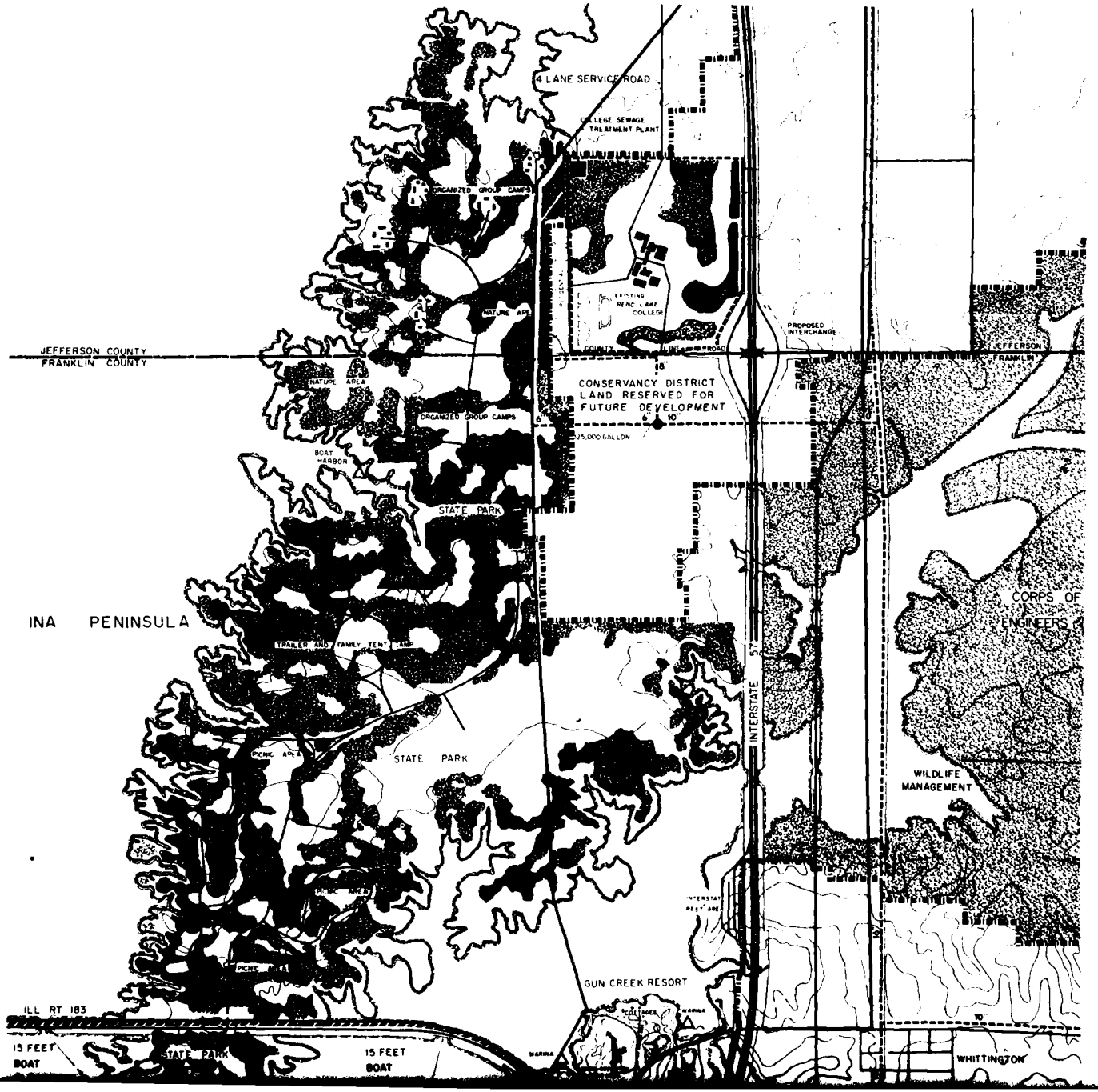
- INTERSTATE FREEWAYS
- AREA SERVICE HIGHWAYS
- COLLECTOR HIGHWAYS
- PROPOSED PRIMARY URBAN THOROUGHFARE
- AIRPORT

N

0 1 3 6 MI

FIGURE 2-17

LOCAL TRANSPORTATION SYSTEM


4 LANE SERVICE ROAD
COLLEGE SEWAGE TREATMENT PLANT
ORGANIZED GROUP CAMPS
NATURE AREA
EXISTING RENO LAKE COLLEGE
PROPOSED INTERCHANGE
JEFFERSON COUNTY
FRANKLIN COUNTY
JEFFERSON
FRANKLIN
CONSERVANCY DISTRICT LAND RESERVED FOR FUTURE DEVELOPMENT
25,000 GALLON
BOAT HARBOR
STATE PARK
INA PENINSULA
TRAILER AND FAMILY TENT CAMP
PICNIC AREA
INTERSTATE 57
CORPS OF ENGINEERS
WILDLIFE MANAGEMENT
INTERSTATE REST AREA
GUN CREEK RESORT
ILL RT 183
15 FEET
BOAT
STATE PARK
WARNA
WHITTINGTON

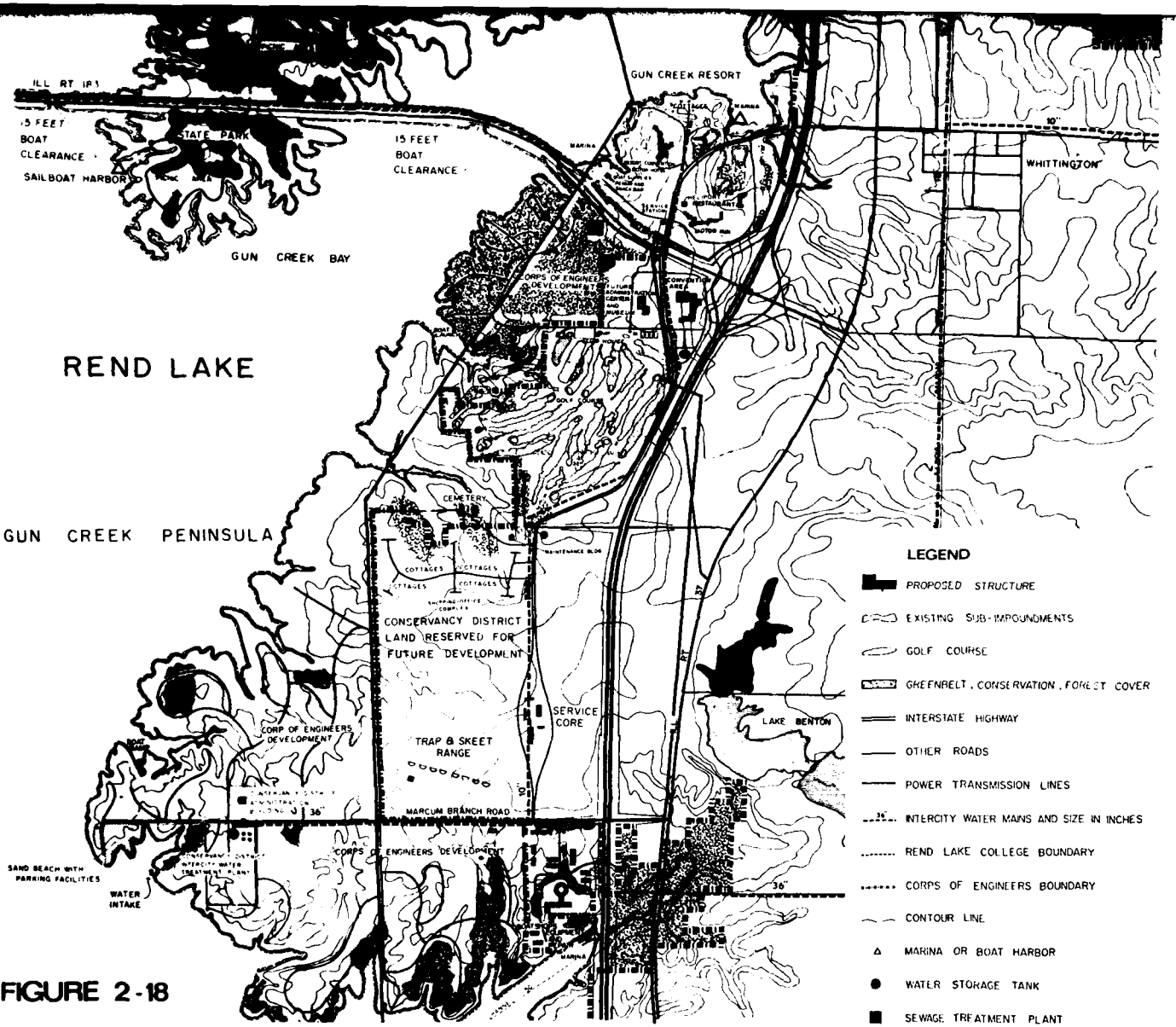


FIGURE 2-18

PROPOSED DEVELOPMENT

INA & GUN CREEK PENINSULA AREAS, REND LAKE CONSERVANCY DISTRICT

1600 800 0 800 1600

JULY 1971

THE PREPARATION OF THIS MAP WAS FINANCED BY THE ECONOMIC DEVELOPMENT ADMINISTRATION CONTRACT NO. 9-35160 PROJECT NO 06-6-09182 (TA-1)

GENERAL PLANNING AND RESOURCE CONSULTANTS
730 DE MUN AVENUE ST LOUIS, MISSOURI 63105

The Junior College is now completing the first phase of its new campus begun in 1972. The campus itself takes up only the central portion of the site and they have no immediate plans for expansion. The campus itself is new and attractive.

Wayne Fitzgerrell State Park is planned to provide a range of camping, boating and wildlife areas.

A capsule description of communities and important highway corridors follows.

Benton

This is the largest community near Rend Lake and has the best access to the recreation areas now under development. Benton's existing urban area falls outside the study area and will not be described in this study. Areas of concern near Benton are the strip developments that follow State Highway 37 north from Benton and State Highway 14 below the dam going west from West City and Benton.

Highway 37 Corridor

This area appears to have originally been developed as a strip of scattered residential homes north of Benton. In the recent past a wide range of commercial uses has developed and today it presents an almost classic picture of a mixed land use. Supermarket, car dealership, construction firm, boat and fishing shops, oil wells and a new campground are now mixed in with some homes. The State forestry service has a land holding and has developed a small tourist stop within the strip. The quality of homes ranges widely from relatively new, well-built homes to older homes which are in a poor state of repair. This strip extends approximately four miles north of the city closely following Highway 37. Developments around Lake Benton are a concentration of larger homes, many of which are developed on lots leased to the homeowners by the City. In the past the City had a developed recreational area at the lake including a swimming beach, but this has been discontinued with the construction of the Corps of Engineers' facilities at Rend Lake.

Whittington - A small village of a couple dozen houses on Highway 37 and the road to Ewing. There are a few small businesses on 37.

Ina - A farm town, smaller; well-kept, older houses; new bank and funeral home; farm stores on 37, post office, grocery, general store - several new commercial buildings, mostly prefab.

Bonnie - Four or five stores, houses, many of which are old and often not in the best repair; quite a few mobile homes on town lots, reflecting need for new housing and present means of meeting it. Church camp west of town, on county road to Nason and Casey Fork public access area. Like Ina, there are paved streets and sidewalks, ditches for storm sewer. Visual intrusions are a small open dump at the edge of town on 37, and an auto junk yard with open burning northeast of town.

Mount Vernon Game Farm - State conservation area with picnic ground, office, shops; two miles north of Bonnie on 37. District Wildlife Resources Office, approximately 900 acres; raises geese, quail for release elsewhere.

South of Mount Vernon

Just south of Mount Vernon on Highway 37 is an asphalt batch plant on approximately 40 acres, with piles of limestone, etc. Not a very large operation, but in a small residential area . . . houses are found all along 37 in small clusters from Bonnie to Mount Vernon.

North and West Project Area

Nason - Laid out as a model town, but was largely abandoned with the mine in 1952 - many streets and sidewalks, boulevard trees, but most houses are gone. School is in ruins, the abandoned mine is a potential historic site . . . housing is quite scattered. A tiny subdivision of 5-6 houses has started in the middle of town and a few other new homes are also going up in and around town. The only businesses are a few bars and a poolroom. The only new store is vacant.

Waltonville - Near three mines but seems to be a farm town. Dairy and farm stores are active, but many other large buildings are half vacant. A few new stores and houses, plus some mobile houses; a consolidated school is nearby on Highway I-48 between Sesser and Mount Vernon.

Sesser - An old mining town of about 2,200. One gets a strong sense of this history; bars with names like the Coal Inn and Devil's Den; a vacant opera house, high sidewalks in an old business district. There are the usual hardware stores and supermarkets, plus a large printing plant and a tombstone factory; some quite large older houses, a few churches and a new municipal building. They have recently completed a face lift of the business district.

Highway 14 Corridor - Some strip area development is also evident here. The land use is mixed, combining homes with an assortment of commercial firms, including feed/grain stores and trailer/mobile home sales.

Below the Dam

The area northeast of Benton below the dam is rural and a few

small farms remain but the land is reverting to a non-farm land usage or succession land dominated by large amount of upland timber extending into the wetland bottoms of the Big Muddy River. There is evidence of the hard times experienced by residents in this area. Farms are small and most homes are old and appear to be in fair to poor condition. The area is dotted with small isolated cemeteries, with head stones dating back beyond the turn of the century. Roads are narrow; ditches and fields are heavily overgrown with ground cover and second growth timber.

Just west of Interstate 57 where the primary access road enters Benton, a small pocket of mixed land use has developed. Included in this area are Benton Airport, packing plant, sewage treatment plant, and a new commercial campground located just downhill from the packing plant and several homes.

Mining Lands

Five mines are located in the area of Rend Lake constituting a total land holding of nearly 4,000 acres. These are all underground shaft mines and consist of essentially the same elements: shaft headworks, conveyors, coal piles and a railroad spur; slag piles and a large holding lagoon; an office, shop facilities and parking lot for the miners. The land holdings are not entirely used for mining purposes. Typically, there is land that is either vacant land showing stands of secondary succession, timber or farm cropland. The mine areas are summarized as follows:

Old Ben 21 - This is the oldest mine in the area and has the most extensive underground workings, presently working some 2 1/2 to 3 miles under the middle of the lake. It is almost immediately adjacent to the lake itself and enormous slag piles are easily visible from the shoreline. It is also the dirtiest mine in the area visually and the least attractive. Although meeting EPA air pollution standards it belches large quantities of particle matter and vapor which hangs over the northern part of the lake for extended periods of time during calm days.

Freeman Orient Number 6 - Located near Waltonville, this mine does not have immediate visual impact on the main lake but is adjacent to the Big Muddy Refuge area.

Old Ben 26 - This is the area's newest mine located just north of the Sandusky access area. It too is not a visual asset, but does not have the degree of visibility of Old Ben 21, particularly the views into the wash pond area.

Inland Steel - This is a relatively new mine and is regarded as a model facility by its owners. The buildings are new and they and the grounds are well kept. The settling pond drains into the lake via a ditch parallel a county road. The water quality apparently is satisfactory but the drainage is taking substantial amounts of soil out of the ditch and there is some danger that the adjacent road will eventually wash out.

Old Ben 24 - Located south of the dam and northeast of Benton in a highly wooded area of old farms and timber. Head works are visible from the lake but the operations are well screened by tree growth.

2.3.5 GOVERNMENTAL JURISDICTION AND REGULATIONS

2.3.5.1 Comprehensive Plans (See Section 3.1.1)

2.3.5.2 Land Use Regulations (See Section 3.1.3)

2.3.5.3 Rend Lake Conservancy District

The Rend Lake Conservancy District sells treated water impounded by the dam and distributes it to nearly 50 communities and several water districts in a six-county region. The extent of its water supply service is continually expanding. Also, the District owns several thousand acres of prime land, next to the lake, and plans to develop it for commercial recreational use. Thus the district has in its hands both the water supply necessary for regional industrial and economic growth and, to a large degree the visual, environmental and economic future of the lake.

Scope of Power

The Rend Lake Conservancy District, the first such district in Illinois, was created by a referendum of its residents in 1955. Under the Illinois River Conservancy District Act the district is deemed a municipal corporation and as such has a broad reach of powers and resources available to it.

In 1964 a "Summary Report on Land Management Policies for the Rend Lake Conservancy District" was prepared by General Planning and Resource Consultants outlining the scope of powers available to the district. The following summaries and quotations are taken from that report.

The district has two distinct objectives:

- To sell water
- To develop commercial recreational facilities

The District is formed under the guidelines of the Illinois River Conservancy District Act[70] to provide water to its area by getting the lake built.

In interpreting the act the district has the power to:

- Sell water from an impoundment
- Acquire (buy and sell) land rights and land both inside and outside district boundaries, or acquire easements for right-of-way holding for any necessary purpose including development of recreational facilities.
- Raise money through general obligation or revenue corporation purposes or special assessments for specific purposes.
- Borrow money through general obligation or revenue bonds, the debt limit being 5 percent of the assessed value of the district.
- Hire employee staff members or contract for work including the ability to appoint and maintain police force to enforce the district's water pollution control ordinances.

Limitations on district powers include:

- They may not abridge or in any manner curtail existing water power rights or other rights
- They may not operate recreational facilities or programs that would interfere with drainage or other use of reservoirs in the district
- Rates for water sale must cover all fixed charges in cost of maintenance and operation and any profits from water sale are limited at least to the extension of improvement of its water works.
- Special assessments can be levied only for specific purposes, although the range of purposes is quite wide including construction of drains, sewers, water pipes, streets, roads, shore improvements "together with all necessary adjuncts thereto and including dams, channel improvements, stream bed and bank shoreline improvements.

Water Supply Powers

The district can sell water to anyone inside or outside the district limits. The only limitation is that it cannot sell to individual users within municipal corporate limits. Basically, the objective of the water supply policy is to wholesale water to communities or other user districts who will in turn retail to the individual users.

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[70] Illinois, State of, An Act to Create River Conservancy Districts for River Control, Sanitation, Development of Water Supply, Navigation and Protection of Fish Life, Illinois Statute, Chapter 42, 1925 Laws, page 346, July 11, 1925.

No real criteria appear to have been established in determining where water should be sold and where not and on what grounds. This could be of some consequence since the supply of water in the area is perhaps the largest single determinant in controlling land use and development patterns. Description of the water distribution system water supply policies and impacts created by them are covered with another section of this report.

Land Use and Development

The 1964 report interpreted the district's role and land use and development as follows:

> . . . "It appears from this analysis that the district must acquire appropriate rights in the land over which it expects to exercise control of use. It has no power to impose zoning regulations or subdivision controls. Since control (of key areas, especially) will be a necessity if the harmonious development of uses yielding, together, the maximum public benefit is to be realized, it appears that the circumstances of the nature of the lake area and the terms of the Act define only one role for the Rend Lake Conservancy District Board. It must act as a land development corporation; this is a role it can legally fill without altering itself or the district in any way, and the limitations which prevent it from directly regulating land uses except where it has purchased the right to do so have left it no other way of discharging its duties to the public. In summary, the Rend Lake Conservancy District must act almost entirely as a non-municipal corporation, except in the case of stream pollution, over which it does have some police power, and except for its support by tax funds, its public purpose, and its power of eminent domain . . ."

Under these guidelines the district has acquired land on the lake and is in the initial stages of developing a major resort complex in the Gun Creek area (see land use and new and continuing construction). It is both the development corporation and the government body which reviews the development plan.

In 1969, General Planning and Resource Consultants prepared an extensive planning report, "Recreational and Development Program for the Rend Lake Area". The report led to the Gun Creek Development proposals and to general land use recommendations around the lake, encompassing the plans of the Corps of Engineers and the State of Illinois.

On land outside its ownership, the district's ability to influence or control land use is limited. It has no zoning or subdivision powers. It can, however, enter into joint agreement to obtain ease-

ments, aesthetic conservation or water control that may in its judgment improve or maintain the quality of the environment around the lake. It has the legal obligation (and power to enforce) to preserve the quality of its water supply. In some instances this power could be invoked to control or regulate existing sources of pollution outside district boundaries.

The district has worked with the counties and the Greater Egypt Regional Planning Agency in attempting to establish zoning around the lake. To date the district has not, however, involved itself in environmental planning, leaving these matters to the state.

2.3.6 PUBLIC FACILITIES

To this point this study has summarized the social, economic, and government background of the area and how this history has affected present circumstances. The public facilities available in the area, both for regional and community support, reflect these overall conditions and will, in turn, have an effect upon the rate and type of economic growth that will occur within the region. A wide range of public facilities and services are available within the two counties, offered by a proliferation of individual governmental agencies. In many cases, there is only a peripheral relationship to lake development. It is not within the scope of this study to compile a list of those facilities available or to define the individual problems or deficiencies available within the area. However, many of the problems are common and we will comment as to their impact on or impact due to Rend Lake operations and in a more general sense, their potential effect on local economic growth.

In fact, the quality of these facilities, both regionally and locally, will be related to the lake and the development it attracts. In some cases such as police, fire and health protection as the numbers of people increase the responsibility to provide more extensive and perhaps better quality services and facilities will be required. In other cases, such as utility services, it may affect the lake itself and the development around it.

The Greater Egypt Regional Planning studies[71] have commented upon the general inadequacy of the community facilities within the region, particularly those available in small communities of less than 2,000 or 3,000 population. These facilities are minimal and the financial ability of the communities seriously impairs their ability to improve them. Services are better in a major growth center such as Mount Vernon where adequate tax and financial bases are established to pay for the facilities required.

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[71] Greater Egypt Regional Planning Commission, The Comprehensive Plan, 1964.

2.3.6.1 Governmental

There are 120 individual taxing units within the two counties consisting of:

2 counties
28 townships and road districts
26 municipalities (8 cities, 18 villages)
52 school districts (including a junior college)
4 fire districts
2 special park districts
1 mosquito abatement district
1 airport district
1 hospital district
3 conservancy/water districts

In addition to the taxing units, there are soil conservation districts and public health districts. Much of this is due to the concentration of the large number of small communities within the area. The result is inefficiency and higher costs resultant from a fragmentation and dispersal of these services that must be provided by the various municipalities.

2.3.6.2 Transportation

Presently two major interstate highways, nine railroads, and several federal, state and county roadways as well as two airports provide for movement of goods, services and people in the Rend Lake region (Figure 2-17).

Interstate Highways (Figure 2-16)

With the completion of I-57 in the early 70's, major interstate access was achieved from Chicago to Cairo in the southernmost boundary of the state; it extends south to New Orleans. I-64 from St. Louis to Mount Vernon is completed, and provides direct traffic access from the St. Louis metropolitan area to Rend Lake vicinity. Figure 2-16 depicts the extent of the recent additions to the interstate highway system. I-24 will connect to I-57 south of Marion eventually connecting St. Louis and the Midwest to Miami and the South. This concentration of freeways should be a tremendous economic asset to the area in terms of industrial development, tourism and lake visitation.

Federal and State Highways

Federal highways serve local area traffic and relatively good accessibility to Missouri, Indiana, Tennessee and upstate Illinois.

Major state highways in the area include Routes 37, 127 and 13. Overall the area will change from one somewhat bypassed by the major highway corridors to a major distribution/collection point for the interstate system.

Local Roads

Generally access between the many small cities in the area is good. Some of the minor roads are in poor surface conditions and some access roads on the east and north side of the lake may not meet the demands of lake visitation. Highway 37, north of Benton, may become congested and overloaded, resulting in cost to the city and inconvenience to residents.

Railroad Systems

The Rend Lake area has an excellent railway-transportation system. The two counties are connected to markets in the north and south by Illinois Central, and the Chicago and Eastern Railroads. The east and west service is maintained by means of the Louisville and Nashville Railroads, Southern Railway, Missouri and Pacific and the Burlington Northern Railways. In the past, these railway systems carried enormous amounts of coal from the area and the fact that they are located here indicates a great potential for shipping raw materials into the area and finished goods out.[72] (See Figure 2-17)

Air Transportation

At the present time the only major air transit facility available within 25 miles of Rend Lake is located at Mount Vernon and Marion in Jefferson and Williamson counties respectively. Both are reporting significant increases in passenger and freight service. In addition to those two major airports, Benton has a small community airport which serves private operators within the area, and represents an opportunity for small craft recreationalists to use the airport facilities located within ten minutes of the lake.

2.3.6.3 Utilities

Water Supply

Rend Lake impounds the water for Rend Lake Conservancy District's supply system feeding nearly 50 communities and several rural water districts. Essentially, it is the water supply system for the two counties and much of the surrounding region. A description of the supply treatment and distribution systems, as well as the policies regarding this distribution and sale, are included in the water supply sections of this report and some of the consequences of these policies are discussed in the area redevelopment section, 3.2.6.

Before the development of the Rend Lake inter-city water system, the bulk of the communities in the two counties and the region

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[72] General Planning and Resource Consultants, op. cit.

depended upon individually developed surface water reservoirs for water supply. Ground water resources are generally inadequate in the region, and the potential for communities to tap this resource for municipal water was virtually non-existent. Even for individual, rural or farm users, the supply and quality of water available from ground water resources is extremely marginal. Had it not been for the completion of the Rend Lake inter-city water system, a high proportion of the communities within the two counties and the region would have faced severe problems in attempting to meet basic domestic needs.

Sewer Facilities

Deficient sewage facilities in the watershed upstream from the lake can directly affect lake water quality. Ten communities are within the watershed. Two of them, Mount Vernon and Sesser, have sewer systems. They contain roughly 18,000 of the watershed's approximately 34,000 people. The City of Woodlawn is currently building a treatment plant. General Tire and Rend Lake Junior College have their own private systems and the Conservancy District has plans to build a treatment facility to serve its current development proposals. Benton has a sewer system and a treatment plant and the presence of the system and its extension policies can affect the quality and rate of development around the lake. However, the treatment plant discharges downstream from the dam. West City has no sewer facilities. (An inventory of public and private sewage plants is given in Section 2.1.4.3.)

Most of the sewer deficiencies are in the small communities within the area and most of these have applied for state funding for construction of sewage treatment plants but are presently quite low on the state list of priorities. Lack of facilities and/or plans for their future provisions is a critical factor in future lake area development.

Storm Sewers

The only two communities in the watershed for which data is available on storm sewer systems are Mount Vernon and Sesser. The Interim Water Quality Management Plan for the Big Muddy River Basin, published by the Illinois Environmental Protection Agency, indicates that sewers in Mount Vernon are approximately 80 percent separate and 20 percent combined and are subject to an excessive storm water entering and surcharging. The Management Plan also indicates that the town of Sesser has some combined storm sewer systems and this has an effect on the sewage treatment plant. Combined storm sewer systems (sewers which carry both sanitary and storm water) result in storm water being carried to the treatment plant. Due to the high rate of storm water inflow during rainfall periods, the sewage treatment plant must bypass sewage during peak runoff periods, thereby polluting surface water

supply. The town of Mount Vernon, however, has solved this problem by building storage sites to temporarily store the storm water/sewage mixture so that all the storm water which is carried to the treatment plant receives adequate treatment. The town of Sesser, on the other hand, bypasses their treatment plant when storm water flows into the sewer systems and the treatment of the combined storm water/sewage in Sesser is essentially zero.

Most other communities handle storm water runoff with ditches and cross-culverts underneath driveways and roadways. Mount Vernon is the only community large enough to have a formal storm sewer system with storm sewer conduits.

Solid Waste Disposal

There are two landfills in the area adjacent to Rend Lake which have operation permits from the Illinois Environmental Protection Agency. These are the only two landfills which are currently authorized to dispose of solid waste from the area. The first landfill is in Jefferson County south and west of the Village of Woodlawn. It is located adjacent to the flood plain of a small tributary to Rayse Creek along Highway 460 on the N 1/2, SE 1/4 Section 35 south of Highway 460. The second landfill is located in Franklin County southwest of the Village of Benton. This landfill is outside the Rend Lake Watershed. There are no particular operational problems with this landfill.

Solid waste from the recreational, maintenance and administrative facilities at Rend Lake is delivered to the Franklin County landfill. Solid waste is collected from the Corps of Engineers' property by a private contractor.

Solid waste from the rest of the watershed primarily goes to the Jefferson County site. As stated previously, both of these sites are being regulated by the Illinois Environmental Protection Agency and both are in conformance with Illinois Solid Waste Disposal Regulations.

2.3.6.4 Public Education, Health and Safety

School Systems

The proliferation of individual governmental bodies is evident in the local school systems with 52 separate districts existing in the two counties. This number is due primarily to the retention of the dual district system for education, still used in both counties. Essentially the system has remained unchanged for 40 or 50 years and is common throughout much of southern Illinois, whereas the northern

portion of the state has largely converted to the system of larger consolidated school districts.

Due to the number of districts, some of them are quite small. An extreme example of this is the Flatts District near Old Ben Mine No. 24 in the study area. It has 10 to 12 students and 2 to 3 teachers. They receive no state aid and don't want any. This desire for independence is quite common within the area and is a partial cause for the large number of individual school districts.

The economic history of the area is reflected in its school systems. Traditionally the per capita expenditure per student per education has been consistently below state levels and educational attainment levels on a whole have been quite low in the area. Much of this can be attributed to the low assessed valuation within the districts, resulting in an inability to raise sufficient property tax to support the school systems.

Greater Egypt Planning Commission has done extensive studies in its plans outlining facilities needed in the future. We mention this only in terms of what may happen when development occurs and people begin to move into the area. Schools will have a major determining factor on how and where people live. Parents commonly look for the best available eductional facility programs in determining place of residence. Poor quality districts will be avoided and good ones will attract development. It is probable that both people migrating into the area and increasing numbers of young people staying in the area may have different standards for educational programs than those which have traditionally been available in the area. As population growth and in-migration occurs, schools may be required to grow and levy additional taxes to pay for increased staff and facilities demands. Some of the smaller districts could be hard pressed to generate enough additional tax base to pay for these requirements. In general, the larger communities such as Mount Vernon, Benton, etc. appear to be the best situated to accept growth and increased demand on their school facilities.

The Rend Lake Junior College could be a large asset to the area. It provides college education and vocational skill programs at a local level and could encourage young people to stay in the area and raise the level of job skills within the work force.

Public Health

Franklin County is part of a bi-county health district, combining services with Williamson County. This agency employs a full-time staff and is concerned with basic services, communicable diseases, immunizations, sanitation, refuse disposal, and so forth. Jefferson County, on the other hand, does not have a county health department but instead is covered by the State Health Department located in

Marion, Illinois. It is generally felt that this arrangement is not totally adequate to cover the needs of the people living in Jefferson County.

There are three hospitals located in Franklin County, The Franklin Hospital, The Miner's Hospital, and the United Mine Workers' Union Hospital which are located in Benton, Christopher, and West Frankfort respectively. Jefferson County has two hospitals, The Jefferson County Good Samaritan Hospital and The Jefferson County Memorial Hospital which are both located in Mount Vernon. In addition, the Mount Vernon State Tuberculosis Sanitarium is located in Mount Vernon; however, it is questionable at this time as to whether that particular facility will remain operational. To date, there is only one nursing center for the elderly and that facility is associated with The Franklin County Hospital in Benton, Illinois.

Public Safety

There are a number of agencies in the two-county area which operate together for the purpose of maintaining law and order. Those agencies are as follows:

a. Illinois State Highway Patrol - the state police primarily responsible for state and federal highways.

b. Illinois Department of Conservation - Conservation Department primarily is in charge of patrolling fish and wildlife areas in addition to enforcing boat safety on Rend Lake.

c. County Sheriff Department - the County Sheriff Department in Franklin and Jefferson Counties are in charge of covering all unincorporated areas within the county and further to provide assistance to any law enforcement agency in the two counties that may require it.

d. City Police Departments - Mount Vernon is the only city in Jefferson County which has a Police Department. In Franklin County several cities have a variety of city enforcement agencies such as Benton, West Frankfort, Chr stopher, Zeigler, Sesser and Royalton. In all cases the city Police Departments cooperate with the county in coverage of areas around Rend Lake.

e. Army Corps of Engineers - The Corps, of course, is not a full-fledged law enforcement agency although they do have regulatory authority on public lands surrounding Rend Lake.

Fire protection for the Rend Lake vicinity is provided by memorandum of understanding with various state and local fire organizations. The following is a list of those agencies which have fire plans and fire fighting equipment:

. State Division of Forestry
. State Forest Fire Warden for Franklin and Jefferson counties
. State Department of Game, Department of Conservation
. State Division of Parks and Memorials, Department of Conservation
. Sesser Fire Protection District
. Jefferson Fire Protection District (three stations)

In addition, the Corps of Engineers maintains personnel and equipment in the maintenance area for use in the event of a fire. Equipment located at the project includes: International dozer, grader, 100-gallon water tank, and one four-man firebox containing hand equipment.

To date there have been no significant fire incidents in the immediate Rend Lake vicinity; however, it has been pointed out earlier in this report that as the result of the lake there will be in the future an increase in the number of facilities around the lake. This increased activity will require that fire protection plans and equipment be continually updated. Certainly this will be a primary concern for the Conservancy District in their plans to implement recreational development.

2.4 RECREATION

2.4.1 REGIONAL RECREATION

Several studies have specifically analyzed and surveyed the recreational picture in southern Illinois and the Midwest. Existing and projected population, population distribution, recreational demand, leisure trends and life styles have been analyzed. The available recreational facilities and resource base available have been compared to the pressures on them. While it is not intended to duplicate these studies, we feel that it is important that the reader obtain a general overview of the regional recreation situation as it concerns Southern Illinois in general and specifically the plans at Rend Lake.

For more detailed information, the reader is referred to: The Upper Mississippi Comprehensive Plan, 1970; The Big Muddy River Basin Study, Appendix H; Recreational and Development Program Rend Lake Area, E.D.A. Technical Assistance Project, 1971; 1972 Illinois Outdoor Recreation Plan.

These studies provide regional overviews of varying scope and perspective and define the role of southern Illinois and Rend Lake in the regional Midwestern recreational picture. The studies are basically consistent in that they see southern Illinois as possessing an excellent natural resource base for recreation which is only now becoming tapped. Much of the regional recreational demand is generated within the urban areas of the Midwest where there are great population densities and dwindling natural resource bases.

According to the 1970 census statistics, the State of Illinois alone had over 11,000,000 residents, making it the fifth most populated state in the nation. It contained (in 1970) 5.5 percent of the national population and only 1.5 percent of the land. The census sub-region containing Illinois, Indiana, Ohio, Michigan and Wisconsin contained nearly 20 percent of the nation's population. Most of this population is concentrated in large metropolitan or urbanized areas. This is particularly evident in Illinois where the Chicago S.M.S.A. (Standard Metropolitan Statistical Area) contains over 60 percent of the total state population.

These metropolitan areas are also experiencing the greatest rate of population increase. The sprawling growth of urbanization has eroded the natural resource base available for recreation or open space in the metropolitan areas. While the statistics may vary somewhat in other urban centers such as St. Louis or Indianapolis, the problems of growing populations and dwindling resources are common.

The situation in Illinois, and to some degree in Indiana, is further aggravated by the fact that the northern and central portions of the state have very little natural resource base suitable or attractive for outdoor recreational use, i.e. lakes, mountains, forests, etc. As a result, Illinois as well as the urbanized states around it, have traditionally been major generators of interstate tourism and recreational use, as their residents were forced to go elsewhere to meet their recreational needs. Greater emphasis, particularly at the state level, in recreational planning has been placed upon serving the needs of these urban residents.

Southern Illinois presents the opposite picture; not many people and a relative wealth of natural resources. Until recently, however, much of the recreational potential was untapped. The Shawnee National Forest and Crab Orchard Lake have been the major recreational attractions within southern Illinois. However, within the last decade several interstate systems have linked the region to the midwest metropolitan areas and the construction of Carlyle, Shelbyville, Rend Lake and Kincaid reservoirs has been completed. Southern Illinois appears to be on its way to becoming a major recreational center within this sub-region of the United States, and should be able to meet many of the needs of urban residents as well as its own population.

2.4.1.1 Regional Recreation Facilities

Much of the success of Rend Lake will depend upon a continuing emergence of southern Illinois as a recognizable and well-known recreational attraction. The other facilities in the region will act both as re-enforcement of Rend Lake's appeal and a competition for recreation users. It is anticipated that southern Illinois will become known as a recreational area which will attract visitors who will in turn select an itinerary of stops within the region, i.e. the Rocky Mountains or Black Hills, etc. In 1971, the Rend Lake

Conservancy District commissioned a study (financed by E.D.A. funds) which specifically reviewed recreational facilities within southern Illinois and others as far away as Ohio and Michigan. The facilities in the immediate southern Illinois region (50 miles, shown on Table 2-41) are briefly summarized here.

Shawnee National Forest

Under control of the U. S. Department of Agriculture Forest Service, the Shawnee National Forest contains 211,000 acres within the Ozark Shawnee Hills of southern Illinois. Together with adjoining state and private parks, it virtually spans the state from the Ohio to Mississippi River valleys and has preserved some of the most scenic land in the state. The land is largely preserved in a nearly natural state and forms the core of the natural resource base in southern Illinois.

A wide and diverse range of recreation facilities are offered: all types of camping, swimming, boating, picnicking, group facilities, hiking trails, horseback riding, and observation lookout points. Driving for pleasure has proven to be a major attraction within the area.

Yearly visitation has gone from 327,000 visitors in 1960 to 711,000 in 1968 and 757,000 in 1972. The majority of the visitors were from Illinois and traveled less than 100 miles to the National Forest. Officials at the forest feel the current facilities are being used to their capacity and could be overused unless controls are established or more facilities constructed. There are several major recreation areas adjoining or near the Shawnee National Forest. They act as a part of the same overall recreational resource. In summary they are:

Crab Orchard National Wildlife Refuge

Just outside Carbondale, south of Rend Lake, Crab Orchard National Wildlife Refuge is one of the oldest national wildlife refuges controlled by the Bureau of Sport Fisheries and Wildlife. It contains 44,000 acres adjacent to the Shawnee National Forest. Three lakes (Crab Orchard, Little Grassy, Devil's Kitchen) within the boundaries of the refuge offer 8,800 acres of water surface. The refuge has gained a national reputation for its provision of winter refuge for over 75,000 Canada geese. Although roughly one-half of the land is closed to public use, an extensive range of public recreational facilities is offered: picnic sites, boat docks and launches, public beaches, marinas, camping facilities. In addition, the refuge has been extensively used for hunting and fishing. The facilities are heavily used by local residents of Carbondale, Murphysboro, Marion, etc. Surveys indicate that 90 percent of all

visitors were from the State of Illinois, most of them from the immediate region. Of those coming from beyond the region, St. Louis and Chicago were the most common origin points. Total annual visitation, including hunting and fishing use, has reached nearly 2,000,000 visitor days per year. Refuge managers plan to hold visitation at this level to prevent possible overuse of the resource.

The State of Illinois operates four facilities near or adjoining the Shawnee National Forest.

Giant City State Park

The park contains 2,200 acres adjacent to Crab Orchard Wildlife Refuge nine miles south of Carbondale. It is known for its large trees and stone formations. Recreational facilities include campsites, picnic areas, playgrounds, hiking and nature trails, lodge, and a nature tour/interpretive program and staff. Annual visitation was 732,000 in 1968 and increased to 1,115,000 in 1972.

Dixon Spring State Park

The park is located 25 miles south of Harrisburg and contains 400 acres. Once a resort it is known for its scenic beauty. Recreational facilities include campsites, picnic areas, swimming pool, playground areas, nature trails, facilities for organized camping groups. 1968 visitation was 249,000 visitor days which dropped slightly to 239,000 visitor days in 1972.

Lake Murphysboro State Park

The park is located west of Murphysboro and contains 920 acres of heavily wooded terrain. Recreational facilities include campsites, picnic areas, scenic and nature trails, swimming, fishing facilities. 1968 visitation was 283,000; 1972 visitation was 359,000 visitor days.

Ferne Cliff State Park

The park contains 1,100 acres 12 miles south of Marion. Recreational facilities include campsites, picnic facilities, playgrounds and a trail system. At the time of this writing a preliminary draft outlining proposed expansion of the park and its programs is being prepared by the State of Illinois. The proposals would allow coordination of program and facilities, particularly trails, with Shawnee National Forest. 1968 visitation was 68,000 but nearly doubled by 1972, reaching 119,000 visitors.

Three-fourths of the visitors to these state parks were residents of Illinois and the majority of them lived within 50 miles of the park they visited.

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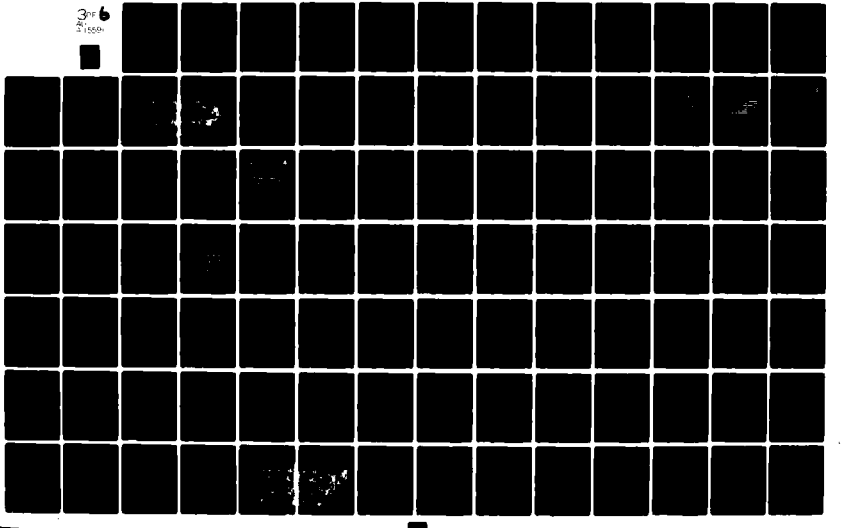

Lake of Egypt

This lake is also just south of Marion; east of Interstate 57. It was originally constructed to supply cooling water for the southern Illinois Co-op Power Generating Plant. The lake itself contains 2,300 acres of surface water. Much of the lower portion of the lake is within the Shawnee National Forest and has some camping, picnicking, swimming, fishing, etc., facilities. The north portion of the lake is primarily developed for private home sites and vacation homes.

Other recreation areas in the region:

Cave-in Rock State Park
Ft. Massac State Park
Ft. Defiance - Salim County Conservation Area
Mermet Lake Conservation Area
Horseshoe Lake Conservation Area
Union County Conservation Area
Union County State Forest
Shawnee town memorial
Washington County Conservation Area

Several other large bodies of water have been created within the southern Illinois area within the last decade. These are:

Kincaid Lake Reservoir

Located southwest of Rend Lake, approximately 15 miles northwest of Carbondale. Kincaid Lake is part of the Shawnee National Forest chain of recreational resources and contains approximately 3,200 acres of surface water. The total development program will involve the local conservation district, the U.S. Forest Service, and the State of Illinois. The Conservancy District is proposing a role and developing resort facilities quite similar in nature to those proposed by the Rend Lake Conservancy District. The lake will in addition, serve as a source of water supply for surrounding communities. Recreational facilities will include extensive boating, fishing, camping, swimming areas in addition to hiking and nature trails. Resort facilities are also proposed.

Carlyle Lake

Carlyle Lake is located northwest of Rend Lake, roughly 50 miles east of St. Louis on the Kaskaskia River. Completed in 1966-1967, it contains 26,000 acres of surface water. In many respects it is similar, both in size and facilities to Rend Lake. An extensive range of camp sites, picnic areas, boat launching, swimming beaches, and concessionaire facilities are being developed by both the Corps of Engineers and the State of Illinois. Subimpoundment areas for intensive waterfowl management, constructed by the State of Illinois, are located at the northern end of the lake.

Total visitation was 1,563,877 visitors in 1968 and rose to 2,534,267 in 1973, 2,658,564 in 1974, and 2,360,561 in 1975. It is expected that the lake will attract 2,590,000 people by 1980.

Lake Shelbyville

The reservoir is located approximately 85 miles north of Rend Lake also on the Kaskaskia River. It is actually more of a central Illinois recreational facility than part of the southern Illinois recreational area. Opened in 1970-71, it contains approximately 11,100 acres of surface water. Although somewhat smaller than Carlyle and Rend Lake, it is also quite similar in the extensive nature of recreation offered by the Corps of Engineers and the State of Illinois: trailer and tent camp sites, group facilities, picnic areas, boat launches, swimming, and fishing. Land is available for resort-type concessionaires. Approximately 6,000 acres will be retained by the State of Illinois for wildfowl management purposes.

Shelbyville recorded a 2,627,697 visitor attendance in 1971, its first complete year of operation. In 1973, visitation had reached 2,803,458 making the lake area the most visited recreation area in southern Illinois.

Summary

All of these reservoirs can be classified as direct competitors for much of the Rend Lake regional market. Carlyle and Shelbyville have particularly good access to the St. Louis-Central Illinois population centers. Neither, however, should benefit as much from the close identification with the Shawnee National Forest/Southern Illinois recreational area. Kincaid Lake is more related to the National Forest and perhaps is a less commercial, less vehicular oriented resource. It could be considered a complementary facility as much as a competitive one. Visitors attracted to the southern Illinois area could place both lakes on their itinerary of stops within the area.

2.4.1.2 Location and Access

Rend Lake is approximately 100 miles southeast of metropolitan St. Louis. Chicago is 250 miles to the north. Memphis, Nashville, Louisville, Indianapolis are within 175-200 miles of the lake.

The lake is located near the intersection of three interstate highways providing it with unusually excellent regional access. Interstate I-57 connecting Chicago to New Orleans and Texas, runs within one mile of the lake and actually crosses it in several places. I-64 from St. Louis to Mount Vernon is now complete. It intersects with I-57 at Mount Vernon and eventually will

run east to Louisville. Sixty miles further north I-70 runs from St. Louis to Indianapolis. I-24, now under construction, will also tie in to I-57, south of Marion and will link southern Illinois to Atlanta, Miami and the south. Within a 125-mile driving distance, the lake can draw from a population of 1,275,000 (1970 Census) within southern Illinois. The local population within 25 miles is 102,000. If a strong market appeal can extend to Chicago and Indianapolis, several million persons could be added to the market. All projections indicated that the population within these Midwestern markets will continue to grow rapidly and pressure upon recreational facilities will increase correspondingly.

2.4.1.3 Regional Demand

According to the limited available participant surveys taken at Rend Lake, the regional attraction of the lake at this time is generally contained within 125-mile travel radius and centered within southern Illinois. However, as more recreational areas open at the lake and it begins to establish a reputation, it could be expected to broaden its appeal. All research in the leisure/life style fields indicate the demands for water oriented recreation are increasing with the amount of discretionary time and income available within the population. It is, of course, too early to determine what the results of gasoline prices and continuing inflation may have upon these shorter and fewer recreation trips of short duration, with longer trip duration in a general recreational area.

Within a metropolitan area - such as the St. Louis SMSA, it is estimated that 60 percent of all demand for outdoor recreation is generally served within a 40-mile travel radius from the center of the largest city, 30 percent is served within a 40 to 125-mile travel radius from the city center and the 10 percent remainder would be served outside of this 125-mile area.[73]

The first zone (0-40 miles) is considered an area for day use activities,
The second zone (40 to 125 miles) generally provides weekend activities,
The third zone (beyond 125 miles) serves extended trips or vacations.

These zone definitions were utilized to determine SMSA demand areas in the Upper Mississippi River Comprehensive Basin Study compiled by the Bureau of Outdoor Recreation, 1970.

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[73] U.S. Department of Agriculture, Big Muddy River Comprehensive Basin Study, Appendix K, 1968

TABLE 2-41

SUMMARY: RECREATION AREAS WITHIN SOUTHERN ILLINOIS

	Land Acreage	Water Acreage	Camping	Picnicking	Boating	Docks & Ramps	Marina	Swimming	Fishing	Hunting	Hiking Trail	Nature Trail	Observation Points	Horseback Riding	Playground	Concession	Lodge	1968 Visitation	1972 Visitation
Shawnee National Forest	193,000	18,000	X	X	X			X	X	X	X	X	X	X				711,000	757,600
Crab Orchard National Wildlife Refuge	35,200	8,800	X	X	X	X	X	X	X	X	X		X	X				1,700,000	N.A.
Giant City State Park	2,200		X	X							X	X	X		X	X	X	732,240	1,114,963
Ferne Cliff State Park	1,100		X	X							X		X		X			68,491	119,571
Dixon Springs State Park	400		X	X								X			X	X		249,023	239,223
Lake Murphysboro State Park	920	17	X	X				X	X		X	X	X			X		283,278	359,280
Carlyle Lake	19,200	26,000	X	X	X	X	X	X	X	X			X			X		1,563,877	2,262,449
Kincaid Creek Reservoir	2,500	2,700	X	X	X	X	X		X	X		X	X	X		X	X		N.A.
Lake Shelbyville		11,100	X	X	X	X	X		X	X					X			2,627,000 (1971-1st yr)	3,900,834

Source: Inventories, Big Muddy Comprehensive Plan, Appendix H, 1970. Inventories Rend Lake Recreational Development Program, 1971. Annual Summary, State Department of Conservation, Division of Parks, 1973.

These urban areas with their concentration of people constitute a significant demand for outdoor recreation in the midwest. For southern Illinois, the St. Louis SMSA is the single greatest potential market area. It is located approximately 100 miles east of Rend Lake and this distance factor eliminates Rend Lake from the St. Louis day use recreation demand and a portion of the weekend use demand. The strongest influence Rend Lake has on St. Louis SMSA is weekend and extended trip/vacation attraction. It is anticipated that Rend Lake could attract as much as 6 percent of this market area based upon a local study analysis.[74]

The Evansville, Indiana SMSA also lies within 100 miles of Rend Lake. This area as well could contribute significantly to weekend and extended trip/vacation use of the lake. The completion of I-64 east of Mount Vernon and through southern Indiana will increase the potential for this market attraction. The Springfield SMSA is approximately 125 miles driving distance from Rend Lake and the Nashville SMSA, approximately 200 miles southeast of the lake. These areas are generally outside of the weekend use radius.

Although Rend Lake and southern Illinois also attract visitation from the Chicago SMSA area, the distance of 250 to 300 miles makes extended trips and vacations most practical. Visitor surveys do not indicate the actual percentage from this area; however, it appears that approximately 5 to 10 percent of the summer vacation trips have been coming from this area with destinations in southern Illinois.

Distance is only one factor in shaping the recreation market. Potential recreational users south of Rend Lake have far more recreational resources available to choose from and the market appeal of the lake would appear to be limited. Central Illinois residents have far less local resources and could be expected to drive further for outdoor activities. St. Louis residents will also be attracted by the huge Missouri-Arkansas Ozark region and the Meramec River Basin lakes complex just south of the metropolitan area. Chicago area residents have traditionally gone to Wisconsin for much of their outdoor and water based recreation needs. The Wisconsin areas would provide substantial competition to southern Illinois particularly during the hot mid-summer months. However, southern Illinois' climate is milder and the recreational season is longer which could be an asset especially in the spring and fall.

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[74]General Planning & Research Recreation and Development, op. cit.

Rend Lake can keep expecting to draw the majority of its non-local recreational users from southern Illinois and the following regional markets: the St. Louis metropolitan area; central Illinois population centers, Springfield, Bloomington, Champaign, Urbana, etc.; southern Indiana population centers, Evansville, Vincennes, etc. A great deal of reliance has been placed particularly upon the appeal to the St. Louis market in most of the recreational demand studies and in talking with people involved in lake recreation. At this time a large advertising campaign is planned in the St. Louis newspapers this spring and summer to promote Rend Lake and other southern Illinois recreational regions.

2.4.2 REND LAKE RECREATION

Rend Lake, Crab Orchard Refuge, Kincaid Lake and a portion of the Shawnee National Forest fall within the planning jurisdiction of the five-county Greater Egypt Regional Planning and Development Commission. In its Comprehensive Plan (1964) the commission describes the roles of the three major water resources:

> Kincaid Lake, due to its direct relationship to the Shawnee National Forest and its natural character, is to be the least intensely developed and the most nearly preserved in a natural state. It would attract users who prefer a more natural environment; hiking, sailing, and fishing would be encouraged opposed to active motor boating, intensive commercial recreation, etc.
>
> Rend Lake is foreseen as a large scale commercial, intensely-developed water resource for the region. It is to be oriented to active boating, vehicular camping and extensive resort development.
>
> Crab Orchard Refuge with its unique contrast of urban proximity and refuge operations is to be the middle ground between the two providing both types of activities.

This view of Rend Lake is generally consistent with that expressed in the Big Muddy Comprehensive Plan. The Recreational and Development Program for the Rend Lake Area (1971) deals more specifically and in great detail with Rend Lake development. That view of the lake, while more detailed in defining resort development potential, is really just as general in that it recommends, in essence, something for everyone; from commercial resort operations to preservation and wildlife management.

It should be understood that from the regional viewpoint, Rend Lake is seen as a primary economic stimulus for the region which will assist in reversing an historically declining economic situation in southern Illinois. Thus, from a recreational standpoint the lake has two primary purposes:

. to provide a range of recreational opportunities for as many people as possible, and
. to bring outside dollars into the local economy.

The economic role of the lake is also discussed in some detail in the area redevelopment section and the reader is directed to those sections. It should be noted then, that the primary purposes of the lake appear to be provision of intense recreational use and economic benefit rather than preservation of natural resources of unique quality or of major regional significance. This is not to suggest that recreational development and economic benefit should necessarily occur at the expense of environmental quality, but to provide some insight into the stated objectives of the reservoir and its local expectations.

2.4.3 RECREATIONAL ACTIVITIES

2.4.3.1 Setting

The Lake covers what was once heavily wooded bottomland of the Big Muddy River. The lake has approximately 18,900 (normal joint pool) to 24,800 (flood control pool) acres of surface water and is for the most part quite shallow. Of this surface water area 12,000 to 16,000 (dependent upon water level) acres are available for boating. The remainder is part of wildlife management or refuge areas, separated from the main lake by roads, or covered with flooded timber. Tree cover around the lake is only intermittent consisting primarily of the remnants and edges of the bottomland timber.

The lake is physically divided into two portions by the highway causeway near the midpoint of the lake. Two sub-impoundment dams at the north end of the lake contain masses of flooded timber used to support an extensive wildlife management area. The causeway also divides the lake somewhat functionally: the south part, intensely developed for active recreation use; the northern portion, either undeveloped or used primarily for wildlife management. The natural resource base and its restrictions are more fully described in Section 2.1.5 (Aesthetic Earth Resources) and most comments in this section are applicable to the recreation setting section as well. The lack of mature tree cover is probably the single greatest limitation to recreation use and enjoyment at the lake. Many campsites have no shade and often little screening or visual buffer zones are available to provide privacy or shield potential commercial development around the lake.

2.4.3.2 Activities

For the last quarter of a century the nation's participation in outdoor recreation has steadily grown. Increases in leisure time, discretionary income, life expectancy and mobility have fueled the

increased participation. Leisure and recreation-related industries have become a major force in the nation's economy. Pressure upon existing recreational resources, some of which are overloaded, and the demand for new resources continues to increase. Southern Illinois' drawing power in recreational resource should increase and Rend Lake also can be expected to attract more people from a wider market area.

The recreational users attracted to the lake can be broken down into three basic types:

- local users: those who use the lake due to its convenience as a resource on a regular basis perhaps for variety purposes, picnic, swimming, boating, etc.

- destination users - people who travel specifically to Rend Lake for recreation, or in another sense those people who travel specifically to southern Illinois for recreation and include Rend Lake on their itinerary. Regardless of the distance traveled to the lake, these people are primarily resource oriented, attracted by the lake and its ability to provide the recreational activities they want.

- transient users: people who use the lake area and facilities as a stop-over on a longer trip. The reputation of the area, quality of facilities and the ease of access to transportation routes would be the primary considerations to these people.

The mobility of recreationists and their willingness to travel as part of their recreational plans has become one of the primary determinants of success of recreational areas. With the increasing concentration of population in urban areas the role of travel and recreation is even more important. The State of Illinois terms this willingness to travel, "transfer tolerance" or "the willingness to translocate oneself in order to participate in some outdoor activity". The transfer tolerance is dependent upon the degree of commitment by the user and the type of activity. Some activities will draw people from large distances while others are primarily local in nature. The other primary factor is the relative quality of the resource base. A reservoir in northern Wisconsin or Minnesota is not a regional attraction; one in Arizona is a unique resource as it attracts boaters from hundreds of miles. The quality of the overall resource base such as the Rocky Mountains will also attract large numbers of users who then chose between the individual recreational attractions available in the area.

The concept of transfer tolerance applies primarily to destination users who travel specifically to an area for certain recreational activities. People in Illinois who want to backpack or wilderness camp will have to travel to southern Illinois, the Ozarks or Wisconsin

due to the lack of suitable resources in other portions of the state. On the other hand the urbanite who wants to get out of the city will be satisfied closer to home. For these people concern about the resource base will be outweighed by convenience of the attraction.

Rend Lake offers or will offer a range of activities found at large reservoir recreation areas such as fishing, boating, camping, swimming, hiking, and other trail related activities, hunting, pleasure driving, nature interpretation. A visit at the lake usually includes participation in several of these activities.

The basic recreation resource at Rend Lake is the large body of open water. Water related activities, boating, fishing, waterfowl hunting, and camping form the basis for recreational use. Recreation users would be those attracted by these activities. The range of supporting recreational facilities developed around the lake should also prove to be an attraction in itself. Each individual recreational area generally contains all the basic water and camp oriented facilities. Rend Lake can also be considered a resource in a different light as part of the overall southern Illinois recreational area. Its presence as a water resource in an area where there are no natural lakes adds substantially to the southern Illinois recreational package.

The goose flock is the other attraction now capable of attracting hunters and sightseers outside the region. When the Gun Creek Resort is completed its facilities on the lake should also prove to be a major regional attraction.

On the other hand, Rend Lake would not be considered an attractive resource for activities such as wilderness camping, or hiking where the flat terrain and lack of screening from surrounding people and development would make it much less attractive than the Shawnee National Forest area to the south.

Even within individual fields of recreational interest such as hunting, a wide diversity of attractions exists. Hunters will drive large distances to hunt geese or deer but small upland game hunting is a local pastime. Camping can appeal to all types of recreational users from those who are attracted to the resource to those who use it because it's convenient.

Activities such as fishing, picnicking and swimming should prove to be largely local and a substantial degree of boaters and campers at the lake will also be local people (within 25 to 50 miles). Large numbers of transient users should be expected to use its vehicular camping areas once more if these areas are developed and their availability becomes more widely known. The access to the freeway systems is good and people on extended vacation trips can be expected to stay overnight at the lake.

Fishing

In 1973 participant records indicate that fishing was the most popular activity at the lake. To all present indications the lake should be an excellent fishing resource. From an initial fish stocking in 1970 plus the indiginous species found in the Big Muddy Basin, substantial catch successes have been recorded and are attracting fishermen from an increasing area. If bass fishing success continues or improves, it could even become a more popular attraction. Fishing can be either a destination use, the reason for the visit to the lake, or casual secondary use such as bank fishing from the camping area. Currently fishermen can launch their boats at either the marina or the two boat launches in the Sandusky area.

To date, the most successful boat fishing has been recorded around Nason point, south of the subimpoundment dams and the most successful bank fishing is at the spillway of the main dam site. Fishing has been popular in the Sandusky Creek area due to its convenience to the launch sites and the campsite and picnic areas. However, due to boat traffic and intrusions from the nearby recreational developments, many fishermen choose other less heavily used areas out of the way. This conflict will continue as the other recreational access areas open all around the lake and many of the good fishing areas in the smaller inlets are used for boat launching and recreational areas. Fishermen who value the setting and solitude as much as an essential element of fishing will probably move into the northern and more undeveloped portions of the lake.

Boating

Water for pleasure or fishing is probably the backbone of the entire recreational picture of the lake. All types of boating will be available; pleasure boating, water skiing, fishing, sailing and canoeing. Until this summer (1974) access points have been limited to two boat ramps and a marina in the Sandusky area. In the next several years facilities for boating will be greatly expanded at the lake. A launch area or launch areas will be available at both south and north Marcum recreation areas, a harbor will be available at the Gun Creek area as well as a launching ramp. The State of Illinois plans a harbor in their Fitzgerrell State Park development on Ina peninsula, and a sailboat harbor just south of the Highway 183 crossway. On the west side of the lake the Corps of Engineers plans to develop a harbor at the Jackie Branch recreational area. The Waltonville, Nason and Bonnie access areas of the northern part of the lake will also be substantially upgraded. The summary of these facilities and their location is included on the accompanying graphics.

It is estimated that 2,250 to 2,475 boat slips will ultimately be developed at the lake.[74] It is harder to estimate the capacity of boat ramp launch areas; it appears that approximately an additional 1,000 to 1,100 boats could be added to the lake population.

Total surface water at the lake is 18,900 (normal joint use pool) to 24,800 (flood control pool) acres. Eliminating the sub-impoundment areas, refuge area and flooded timber 12,000 to 16,000 acres are open for boating. An additional 1,000 to 2,000 acres would further be removed to accommodate a 150 to 200 foot no-wake area around the shoreline, harbor and launch areas. In all, approximately 1,000 to 2,000 boats could be accommodated on the lake. Gun Creek Resort will eventually add three marinas with 350 to 800 slips and extensive support facilities.

There are some hazards to boating at the lake. The lakes in southern Illinois are quite shallow and are not sheltered from the wind by either topographic feature or wooded shoreline. The shallow bottom and wind exposure result in heavy chops and wave action during even moderate winds. Rend Lake is similar to Carlyle Lake, in particular, which has a reputation for this condition.

Camping

Both vehicular (camper) and walk-in camping facilities are offered in almost all recreation areas at the lake. They represent the bulk of the on-land recreational development in the access areas. Campsite developments are oriented toward family camping, providing convenient access to a complete range of facilities: boating, play areas, restrooms and shelter facilities. The emphasis by the Corps of Engineers has been upon vehicular camping. The State of Illinois at the Fitzgerrell State Park is providing an additional 250 vehicular camping sites plus more extensive walk-in camping areas. Typically these vehicular campsites have clusters of asphalt parking pads and either herringbone or circle ring patterns. Each pad (parking) has a concrete picnic table, and a charcoal broiler. The pads are spaced from 20' to 80' apart. In most cases the camper can drive literally to the water's edge and look out over the lake. Parking is generally adjacent to the walk-in areas and no substantial hikes are required by the camper. In many cases, the boat can be pulled up directly in front of the campsite. No primitive or wilderness camping is provided at the lake at

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[74]General Planning and Research Recreation and Development, op. cit.

this time. The closest thing to it is a walk-in camp area in the pine plantation in the Sandusky area and in some northern reaches of the Fitzgerrell State Park.

The quality of the campsites ranges markedly with the amount of tree cover and the density of camper concentration. The lack of mature canopy trees to shade the camping areas is a limiting use factor particularly during the hot summer months typical of southern Illinois.

Picnic and Day-Use Areas

Picnic or day-use areas are also located within most all recreation areas. Typically picnic tables, charcoal grills, restrooms, shelter buildings and maintained free play areas are provided. In the Sandusky area, wood creative play areas have been installed. Again, these areas for the most part are close to the shoreline and boats can be pulled up near the picnic area. Generally one or more large shelters are provided within each recreation area to accommodate larger groups. These are somewhat separated from the other picnic areas so the possible impact from noises and activity generated by larger groups does not annoy others using the area. Picnicking has a low transfer tolerance and most people would be expected to come from the local area. Picnicking is generally developed as a support activity for people coming to the lake primarily for boating, fishing, etc.

Swimming

Swimming is often a spontaneous activity, but designated swimming areas are developed and planned. One swimming beach was opened at the South Sandusky Picnic Area in 1972. A new beach area will open in the Marcum north recreation area in 1975. Sand is hauled in to make a beach. The swimming area is defined and patrolled frequently by ranger personnel. Bathhouse, restrooms and parking are provided within each beach area. The one beach was well used last year leading to an expansion of the Sandusky area. There are few swimming pools in the local communities around the lake and it fills the demand for swimming. Most swimmers probably come from a local area or are with groups which come to the lake for other recreational activities.

Two more swimming areas are planned. The State has plans for a beach sometime in the future for Fitzgerrell State Park, but as yet has not even located the swimming area on their master plan. The Conservancy District shows a beach area on their Gun Creek master plan. However, the resort will undoubtedly have extensive pool swimming and the beach will be somewhat secondary. In any event, the proposed area will not meet much of the swimming demand. The beach area is small, located at the bottom of a wooded north-facing slope. Boat traffic

from the marinas will keep the water fairly turbid. Existing trees in the area will have to be cut and some fill extended out into the lake or it will be a poor quality beach.

Trail Related Facilities

The State of Illinois has developed a somewhat different approach in the Fitzgerrell State Park and it appears to accommodate a far greater variety of walking trails within the park. Walk-in camping sites appear to be further from the parking areas and overall less reliance is placed on the automobile within the park. A stable and equestrian facilities are planned and horse trails would undoubtedly be developed as part of the program. Some sort of trails would probably occur in the nature interpretive area. The Conservancy District relies almost entirely upon the automobile for access between its recreational activities.

Pleasure Driving, Sightseeing

Two overlook areas will be available at either end of the dam, in the Dam West and South Marcum recreation areas. An overlook tower is proposed in the south Marcum area. Probably most of the sightseeing trips will occur across the dam and Highway 183 causeway area. For the most part, the rest of the lake is not well suited for pleasure driving. No consistent roadway system exists on either the north of the east side of the lake. All the recreational areas are essentially closed loop systems with one access point and many facilities located between the lake and the vehicle.

Hunting

Rend Lake has the potential to become one of the best waterfowl hunting areas in Illinois. Management goals are 100,000 geese and 50,000 ducks wintering in the area. It appears the goals are attainable given the current food production, wildlife areas and management policies of the lake. The open hunting policy on public hunting lands in the northern reaches of the lake has added to the popularity. No prearranged reservation for blinds or maximum limits on hunters are now imposed at the lake. These restrictions may be required as hunting pressure increases. The season runs from October into December, when other recreational uses have dropped off. Land owners around the northern portion of the lake have installed some rental blinds near the refuge. (This subject and others related to hunting are primarily covered in Section 2.2.2 Fish and Wildlife Resources and 4.2.5 Fish and Wildlife in this report and reference is made here for completeness.) Duck hunting is also available at the lake, but the duck

population is not nearly as great. Goose hunting can be expected to draw hunters from greater distances as the reputation of Rend Lake and southern Illinois as major goose refuge areas become established.

Deer and upland game are also hunted on and around the lake lands. Deer hunting success on lake lands was excellent in 1973 and 1974, accounting for 21 percent of the total two-county deer harvest. Upland game success is also popular, but hard to quantify as this hunting is done more on a casual basis by local residents.

The State of Illinois conducts a "put and take" pheasant hunt every year which has proven successful in the past. It will continue in a portion of the State Park. Last year deer and game hunting was allowed in the state park. As the lake and the surrounding area becomes increasingly developed for recreation and supporting urban use, the hunting resource (i.e., the wildlife) can be expected to diminish and will thus be more important to preserve.

2.4.3.3 Summary of Recreational Areas and Development Patterns

Corps of Engineers

The Corps of Engineers has developed seven recreational areas around the lake (See Figure 2-19 for location.).

North and South Sandusky Access Areas - located northwest of the dam on both sides of Sandusky Bay. These areas were the first large scale recreational developments to open at the lake (1973). Both areas contain boat launch facilities, extensive vehicular camping areas, picnic/day-use areas, and walk-in camping areas. Maintained playgrounds and totlot facilities are included in both areas.

The Shoreline is made up of a series of small fingers extending into the lake. Vehicular campsite clusters have been developed on these fingers with a road running down the center and asphalt camper pads extending in herringbone patterns on either side. Pads are spaced 30' to 60'. An asphalt turn-around is constructed at the end of each finger of land.

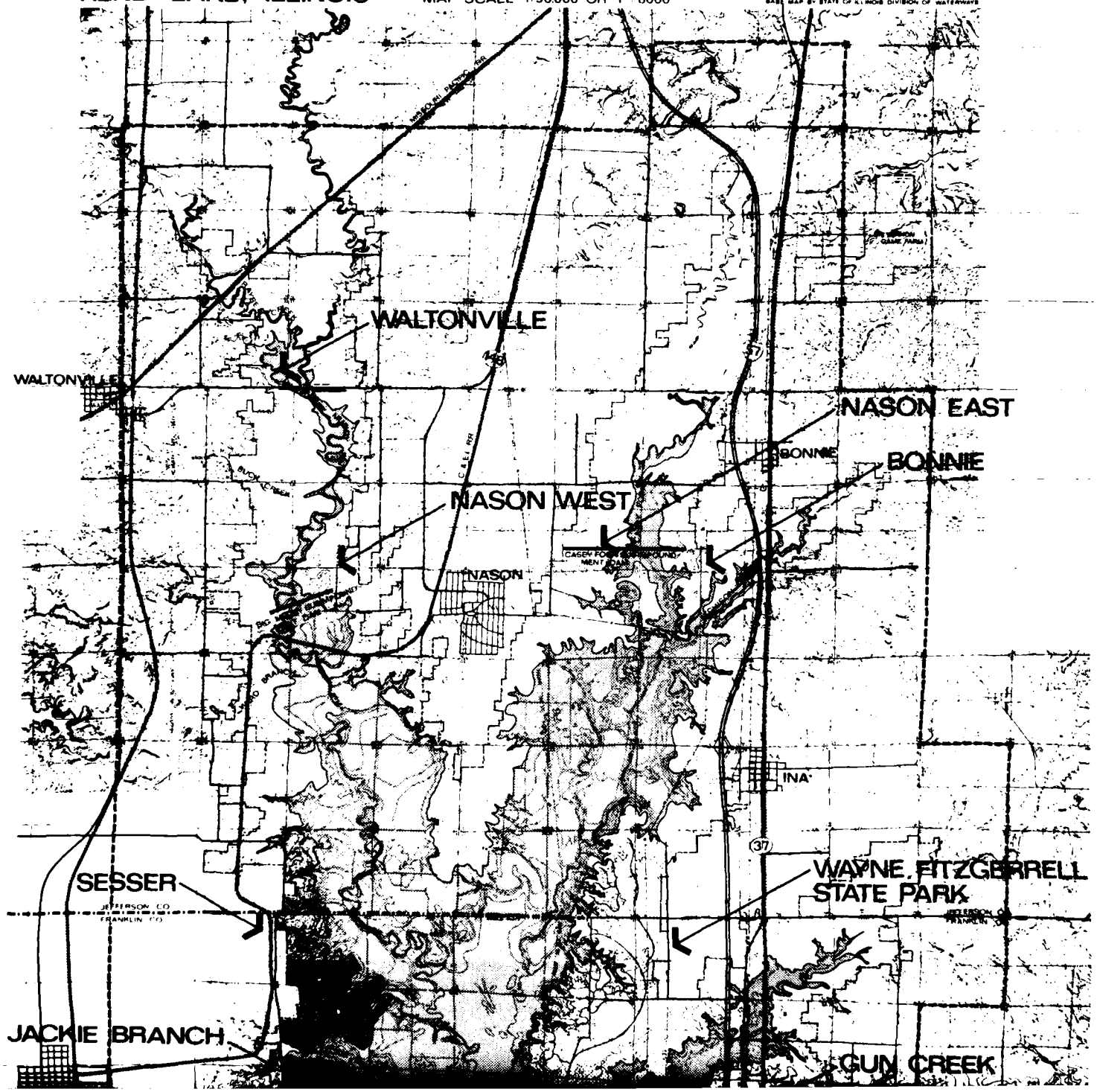
The vehicular camping areas were upgraded in 1974 to provide electrical outlets at each pad. Central water and sewer systems will be installed within the area replacing the vault-type sewage disposal system now being used.

ENVIRONMENTAL IMPACT STATEMENT
ON OPERATIONS AND MAINTENANCE

REND LAKE, ILLINOIS

MAP SCALE 1:96,000 OR 1" 8000

PREPARED FOR
U S ARMY ENGINEER DISTRICT ST LOUIS MISSOURI
PREPARED BY
BRAUER & ASSOCIATES INC PLANNERS
MINNEAPOLIS MINNESOTA
BASE MAP BY STATE OF ILLINOIS DIVISION OF WATERWAYS



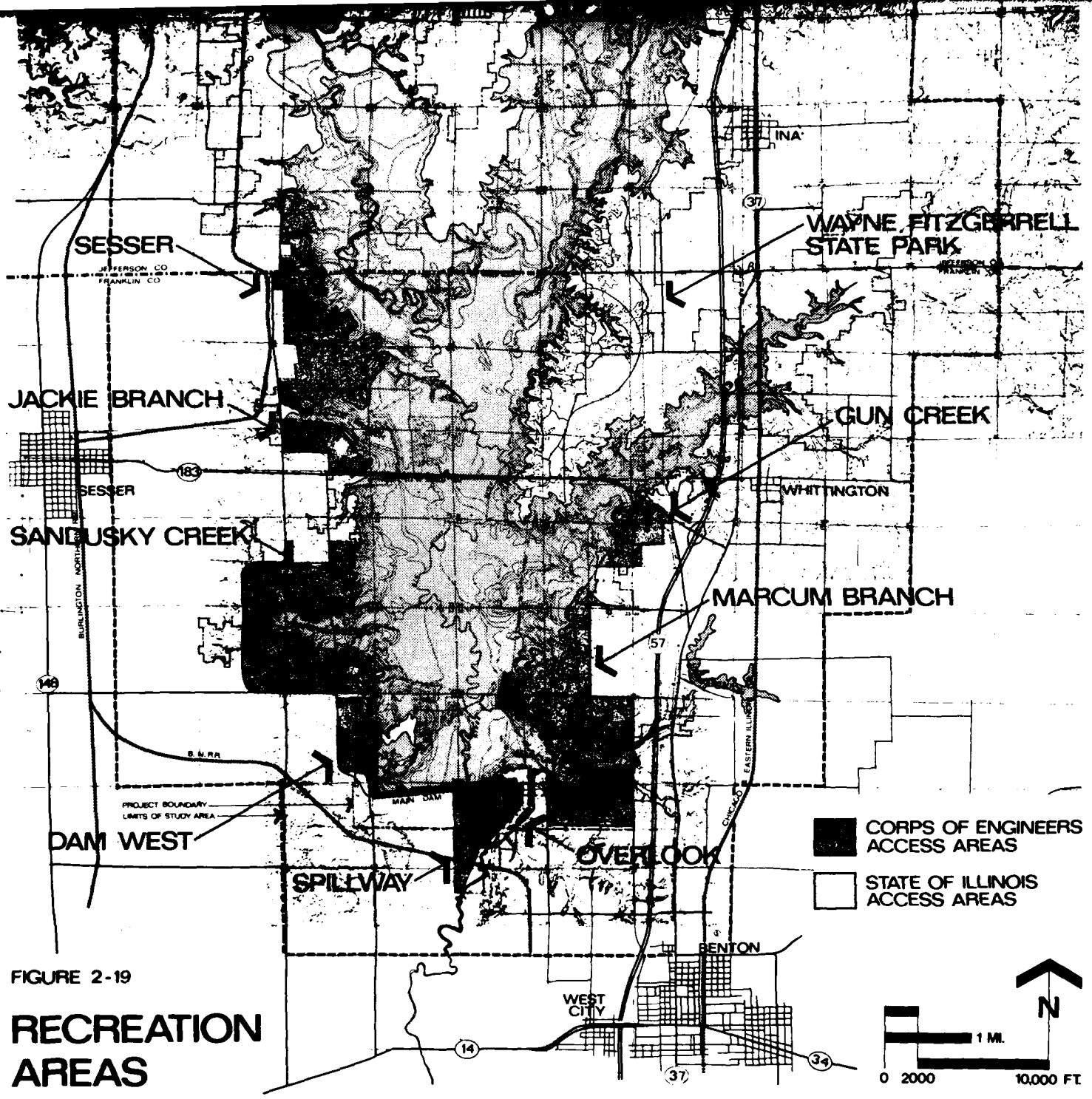


FIGURE 2-19

RECREATION AREAS

Dam West - This area extends north from the dam to the Sandusky access areas. The marina is operated by a concessionaire who now has approximately 113 boat slips. He also provides support services in terms of boat sales and rentals, service, gasoline, parts and accessory supply. There are plans to expand the number of slips available at the marina in the future and probably add some type of food concession.

North and South Marcum Branch/East Dam Access Areas - The Marcum areas opened for use in 1975. The type of facilities and activities offered are virtually the same as those in the Sandusky recreational areas. Here again, however, a complete range of recreational facilities and opportunities is provided within each of the areas. The landscape is flatter here with broad shallow slopes into the water. Fewer tree masses are available and generally the appearance is more open. Both areas have closed loop road systems with one control access point. The two areas are not connected by a roadway system and a visitor must drive back near Benton or to Highway 37 to go from one access area to the other.

The North Marcum area has swimming beach facilities. South Marcum/East Dam area has plans for an overlook sightseeing tower facility near the dam. Vehicular campsites are laid out in a somewhat different manner in North Marcum using a series of circle ring clusters. Campsite pads are grouped around the circle, spaced between 30 and 40 feet apart. Between these circle ring clusters a traditional herringbone layout is used.

In the South Marcum area the campsites are laid out linearly along the road pattern and the spacing is more generous between the camp pads. In both areas vehicular camping, boating, swimming and day-use tent camping areas each have their own road system and are segregated from the other types of use, having their own restroom and parking facilities.

Gun Creek Access Area - This area is just south of the Highway 183 causeway and north of the Marcum Branch areas. It includes the same range of facilities found at Marcum and Sandusky. The layout is quite similar in concept to that in the North Marcum area. A harbor breakwater has been constructed just south of Highway 183, and marina facilities will be developed in this area with access directed from Highway 183 segregated from the rest of the camping areas. This area will be managed by the Rend Lake Conservancy District.

State of Illinois

Fitzgerrell State Park - The park encompasses most of the Ina Peninsula. The land is generally quite flat with only a few areas of major tree massing and a scattering of intermittent tree lines following old fence rows in the area. The land in the southwestern portion of the peninsula in particular is flat and due to the shallow topography, extensive areas are subject to intermittent flooding with the fluctuation of the lake water levels. Much of the land in the southwestern portion of the peninsula is farmed and used for feed for the goose population. The remainder is now left in natural succession. Construction is to begin this summer (1974). Access will be controlled through a single entrance off of Highway 183, Facilities include: 250 vehicular campsites, a boat harbor and launching area, several day picnic areas, and substantial tent camping. The state plans to leave extensive areas of the park relatively untouched as wildlife areas and will include a nature interpretive center and program within the park. A sailboat harbor is proposed on a small tip of the peninsula that extends south of Highway 183.

The state also has five public access areas on the northern portions of the lake near the two sub-impoundment dams. They are unimproved now but plans are to be upgraded in the next two recreation seasons (1973 and 1974). They will include boat launch ramps and parking for a total of 300 cars and trailers within the five access areas.

Local Recreation

Casey Fork Park Reserve District - Ninety-four acres of land on the east side of the lake near Ina have been leased to the Casey Fork Park Reserve District. This district was established March 1, 1974 and includes portions of two townships and the Village of Ina. Existing facilities include a rock road constructed by the Corps. Proposed are a boat marina, cabin sites and a resort development. Implementation is pending, waiting upon state funding and possibly some federal assistance.

Conservancy District - The Rend Lake Conservancy District in addition to its water supply function also owns most of the land each side of the lake outside of the Corps holdings. They plan extensive commercial recreational development on their land aimed at resort/vacationer/ convention groups. The first phase of development is planned in the

Gun Creek peninsula adjacent to the I-57 Highway 183 intersection. It will include 160 to 250 room resort, hotel, championship golf course, three marinas with 350 to 800 slips, an additional motel and restaurant, a major convention center and display hall, and 25 to 125 rental cottages plus assorted swimming pools, beaches, eating facilities, etc. Longer-range plans while not defined include the possibility of private campgrounds, skeet shooting area, mobile home park, vacation home developments, an amusement park and a pony race track.

2.4.4 RECREATION SUPPLY AND DEMAND

2.4.4.1 Regional Supply and Demand

The State of Illinois Department breaks the state into five regions in analyzing the recreational needs and resources within the state. Rend Lake and southern Illinois are located in Region 5. Table 2-42 summarizes the supply and demand of recreational facilities in the region as they were formulated in 1972.

The facilities now provided at the lake would appear to balance the supply/demand ratios in camping, boating, sailboating, fishing and picnicking resource base to the point where the region could meet the projected 1985 demands.

TABLE 2-42

PRESENT SUPPLY vs. DEMAND FOR RECREATION FACILITIES

REGION FIVE, 1970, 1975 and 1985*

Activity	Recreation Days/Typical Seasonal Weekend Day			
	Present Supply 1970	Present Demand 1970	Future Demand 1975	Future Demand 1985
Picnicking	28,152	24,216	26,560	31,962
Camping	20,512	12,252	15,045	21,876
Hunting	40,711	8,694	8,064	7,087
Horseback riding	There is Presently No Reliable Inventory of These Facilities	4,936	5,418	6,503
Hiking and Back Pack Camping		9,100	11,032	15,763
Nature Walks		6,916	8,392	13,505
Fishing	18,319	17,159	17,840	19,555
Swimming	24,752	56,375	70,493	105,826
Water Skiing	2,060	2,792	3,771	6,394
Power Boating	13,755	9,540	11,365	15,224
Sailboating	14,155	9,814	14,894	29,964

*1972 Illinois Outdoor Recreation Plan, Illinois Department of Conservation, Springfield, Illinois.

It appears that there should now be a surplus of these resources in the region. However, interviews with officials at Shawnee National Forest and Crab Orchard National Refuge show that they feel the use of these areas has reached the capacity of their resource base (given the present facilities). Annual attendance at Crab Orchard has dropped as a result of management attempts to curtail and prevent overuse of the area. Carlyle and Shelbyville reservoirs are also heavily used. Thus the total demand upon recreational facilities in the region may be heavier than indicated in Table 2-42.

2.4.4.2 Visitation and Demand at Rend Lake

Rend Lake gates were officially closed in 1970, and the first recreation area opened in the Sandusky Creek during May, 1972. During that initial month a visitor survey was taken identifying participant activities and approximate distance traveled to Rend Lake. Of these initial visitors, approximately 25 percent were fishermen and 75 percent were sightseers inspecting the new area. Almost three-fourths of these visitors came from within 25 miles although during this month approximately 15 percent had driven from more than 100 miles directly to the lake or through the area with a stop-over visit to Sandusky.

In surveys taken in October 1972 and May 1972, it was found that of all recreation visits approximately 70 percent were for sightseeing while approximately 25 percent were for fishing. Of the total visitors during these two months, 60 to 75 percent came from within 50 miles while approximately 15 percent came from distances greater than 100 miles. In an August 1973 survey boating, picnicking, and sightseeing each accounted for approximately 30 percent of all recreation visits.

The total visitation to project lands were 518,100 in 1972 (May-Dec), 835,470 in 1973, 760,614 in 1974 and 1,058,944 in 1975. The monthly figures are presented in the following table. The decrease noted in 1974 was apparently due to the gas shortage crisis that affected vacation behavior during that year.

	1972	1973	1974	1975
January	0	9,251	7,246	10,507
February	0	8,410	16,907	10,434
March	0	21,865	45,229	38,941
April	0	60,550	76,487	67,805
May*	51,000	136,238	118,013	132,559
June	79,000	126,146	143,004	178,648
July	122,000	155,580	147,663	190,419
August	111,500	170,718	86,031	127,978
September	79,500	78,211	39,749	103,924
October	47,400	47,095	33,276	79,358
November	20,000	19,342	28,993	66,565
December	7,600	2,564	21,871	51,806
TOTAL RECREATION VISITS	518,100	835,470	760,513	1,058,944

Source: Annual Summary, Rend Lake, Corps of Engineers

*Visitor counts and survey began by the Corps in April, 1972

Of the recorded 835,470 total visits during 1973, 500,000 to 600,000 were generated by visitors from within 50 miles of the lake with over half ot his number coming from within 25 miles of the lake.

During 1974 about 52 percent of the total visitors were from within 25 miles of the lake while another 16 percent were from 26 to 50 miles away. Approximately 22 percent came from further than 100 miles. In 1974 the average camper stayed 5.2 days while all others stayed an average of 4.4 hours.

The monthly visitation figures for the four years, 1972-1975 are presented in graph form in Figure 2-20. This graph illustrates the peak seasons and seasonal use of the lake. As is generally true with outdoor recreation areas, peak months of visitation at Rend Lake are recorded during the May through September general recreation season. Fishing and sightseeing are predominant activities during the spring and fall seasons. During the fall months, the influx of hunters increases the visitor numbers with the arrival of waterfowl and the hunting season.

Activity Patterns

Figure 2-21 illustrates the peak recreation periods for the activities offered at the lake. As would be expected, May through August constitutes the peak seasons for most boating and camping activities. Fishing starts a little earlier in the spring and extends further into the fall. When these activities drop off the various hunting seasons open with October and November and early December being the peak use periods. The percentages of participation in the various activities for the years 1974 and 1975 are presented below.

Activity	Percentage of Recreation Days	
	1974	1975
Sightseeing	35%	31%
Fishing	36	34
Swimming	8	15
Picnicking	12	12
Boating	14	18
Camping	13	9
Waterskiing	4	5
Other (Hunting)	4	4

The columns total more than 100 percent since a particular person usually engages in more than one activity. The figures for 1972 and 1973 are not included since, at that time, the reporting procedure was to have the figures total 100 percent by only recording one activity (assumedly the major one) for each visitor. Because of this change in recording procedure it would be impossible to compare the earlier two years with the two most recent years. All of the activities remained relatively constant in percentage use during the two recent years with the exception of swimming which nearly doubled in percent and boating which decreased by about a third.

Projected Visitation

The total annual visits are projected to nearly 2,700,000 by 1980-(81) and 3,150,000 by 1990-(91). It is estimated that by the year 3,000 attendance will reach the capacity of the lake facilities, approximately 3,300,000 visits.[77]

These projections do not include the Gun Creek Resort Complex or other more distant Conservancy District developments. It is projected that the Gun Creek Complex will attract an annual visitation of 150,000 to 200,000 people.[78] The resort will appeal to a different type of recreation market than most of the rest of the recreation areas. Most of its visitors can be expected to come from 50 to 100 miles or farther from the lake. Extended vacations or conventions by St. Louis and Chicago residents would not be uncommon. The resort may well become known as an attractive overnight stop for vacationers or travelers passing through the area. The market study[79] further projects that the resort may attract people from the metropolitan area for shorter (long weekend type) vacations in the spring and fall, outside the normal peak vacation months.

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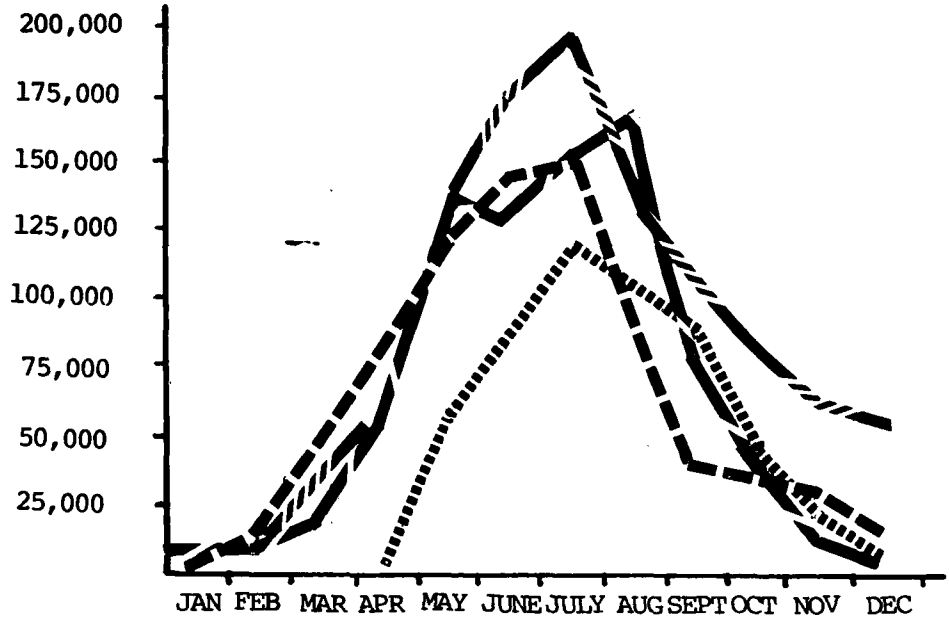
[77]General Planning and Research Recreation and Development, op. cit.

[78]Ibid.

[79]Ibid.



Note: 1972 graph represents total monthly visitation of all Corps recreation areas from May through December 1972. 1973-1975 graphs represent total monthly visitation at all project recreation areas during the calendar year.

Source: 1972-1975 Annual Reports, St. Louis District, U.S. Army Corps of Engineers.

LEGEND

1972

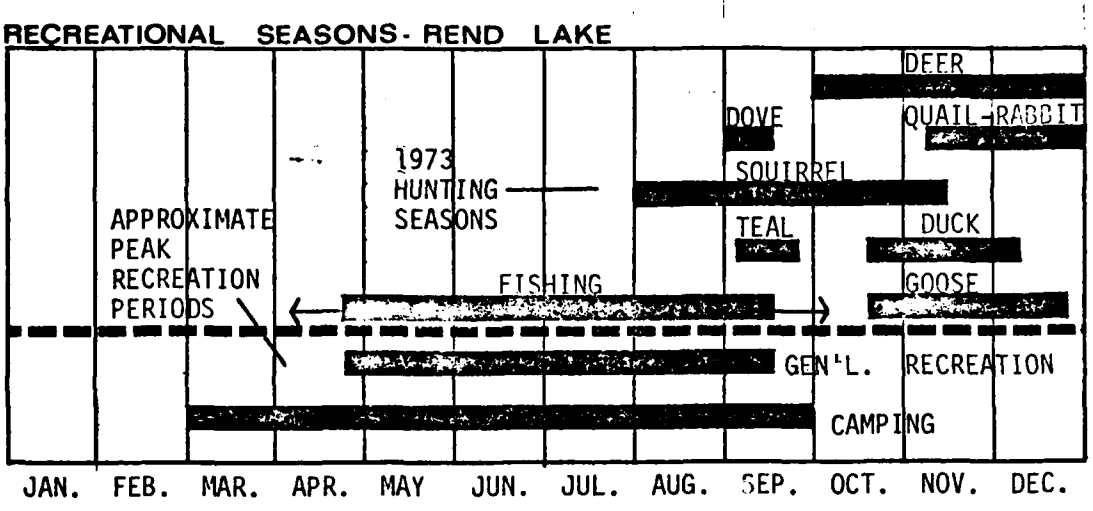
1973

1974

1975

FIGURE 2-20
RECREATION DAYS OF USE:
MONTHLY TOTALS-1972-1975

FIGURE 2-2



Source: U.S. Corps of Engineers, Annual Survey Reports, Rend Lake

State of Illinois Department of Conservation, Division of Fish and Wildlife.

REND LAKE

3

SECTION 3:

RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS

Section 3

RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS

3.1 Existing Land Use Plans and Regulations

3.1.1 Comprehensive Plans

The Greater Egypt region contains a concentration of small and medium-sized communities within a relatively small area. Studies indicated[1, 2] that these communities tended to act as a single economic area, characterized by a high degree of computing and inter-community economic activity. From this the basic concept for the comprehensive plan developed. Termed "The Concept of Dispersed Concentration" or the "Dispersed City", it states that the area should be viewed as a single entity and development and commercial and industrial growth is to be concentrated in areas of maximum potential growth. Regional transportation networks would link the centers and local communities providing access by residents to jobs and services within the region. The larger communities would become the financial, retail and employment centers for the overall region and the smaller communities would serve as residential areas. would allow large expanses of open space and agricultural land to be retained between the communities and would hopefully prevent the growth of scattered developments. Mount Vernon is the growth center in the north portion of the Greater Egypt district and the Carbondale-Marion corridor is the southern center.

Rend Lake has been incorporated into many federal and state plans for various developments. In almost all cases Rend Lake is viewed as a major regional commercial recreational asset with high hopes expressed for its economic impact on the area. Section 1.7 discussed the most important of these plans in detail and Section 3 comments on how these might affect Rend Lake resource management.

3.1.2 Local Planning - Comprehensive Plans

Mount Vernon, Benton, Sesser, Waltonville and Ewing are communities around the lake that have completed Comprehensive Plans. The plans are uniform in their recommendation that the 1 1/2 mile extra-territorial limit be maintained in agricultural or rural uses to prevent premature growth of these areas. Sesser, Waltonville and Ewing are seen to be primarily residential communities in the future.[3, 4, 5, 6]

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[1] Greater Egypt Regional Planning Commission, The Comprehensive Plan for the Greater Egypt Region, A summary, The Auth., 1964

[2] Greater Egypt Regional Planning and Development Commission & Southern Illinois University, op. cit.

3.1.3 Land Use Regulations

County Zoning

Neither Franklin nor Jefferson county has adopted a zoning ordinance. The need for zoning has been raised as an issue in nearly every report dealing with the Lake, almost from the inception of its plans. Several times the mention has been made that zoning appears to be imminent. To this date, no action has been taken. The Greater Egypt Planning Commission has recognized the need and worked closely with both counties in attempting to develop ordinances, but to date has been unsuccessful.

Much of the opposition appears to be due to the rural interests of the county who feel that their personal freedoms may be diminished by the ability of the county to zone land. However, at the time of this writing, conversations in the area indicate that zoning may be adopted within the year for Franklin County.

Subdivision Ordinances

In May, 1973 Jefferson County adopted a Subdivision Ordinance. It sets minimum standards for development, concerning itself primarily with utility easements and construction standards for roads. It apparently provides for review by the Jefferson County Soil and Water Conservation District and their comments are to be made a part of the plat when it is recorded. Lot sizes are not established nor are standards for sanitary sewer or storm water control.[7]

Nason, Bonnie, Ina, Ewing and West City have not adopted zoning ordinances at this time.

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[3]Greater Egypt Regional Planning Commission, The Comprehensive Plan for Benton, Illinois, 1964

[4]Greater Egypt Regional Planning Commission, The Comprehensive Plan for Ewing, Illinois, 1964

[5]Greater Egypt Regional Planning Commission, The Comprehensive Plan for Sesser, Illinois, 1964

[6]Greater Egypt Regional Planning Commission, The Comprehensive Plan for Waltonville, Illinois 1970-1990, 1969

[7]Jefferson County, Illinois, Subdivision Ordinance, 1972, and Amendment, 1973, the Author.

All local governments also have the authority to acquire land rights by easement as well as by purchase and fee to enter into joint use agreements. Thus, if they choose, the various communities around the lake could take steps to preserve certain scenic aesthetic or environmental areas of critical concern.

3.2 Compliance with Local and Regional Plans

While Rend Lake has been completed within the last three years, it should be understood that it has been in the public eye for nearly 20 years. It is really not a case of Rend Lake conforming to local and regional plans as much as it has been a matter of these plans being adopted around the anticipated lake. The Lake has been long anticipated both as a recreational amenity and a generator of economic growth through its water supply system.

The regional and local comprehensive plans and studies that have been conducted in the area and their recommendations regarding Rend Lake are outlined in Section 2 of this report. However, a few general comments regarding compliance with the regional plans are in order here. Two basic planning concepts should be understood:

a. Rend Lake is regarded as a regional recreational area aimed at attracting money and people from regional metropolitan areas into the local market. Local recreational needs are secondary.

b. Rend Lake is seen as the most highly developed recreation-intensive lake within the region and is not regarded as a wilderness area.

Current development to date and known future plans correspond almost completely with this concept. The lake is seen by the State of Illinois Conservation Department in a somewhat different light as a major reservoir of wildlife management and a refuge for the major goose population within the region. Thus, it is seen as a major regional wildlife area. These plans and goals are also being implemented at the lake, particularly in the northern portion in the sub-impoundment areas and the major tributaries.

To date, there has been little conflict between the two uses, perhaps due to the relative newness of the lake. It appears that with careful planning and zoning of the lake activities both of these goals can be maintained in the future.

Land use in the communities and area around the lake has also been generally defined within the Comprehensive Plans. The patterns shown generally correspond to those that should develop around the lake, although one cannot be as optimistic about orderly growth given the existing set of land use regulations. All the communities have comprehensive plans around the lake and most have recognized the pres-

ence of Rend Lake as a growth generator. For the most part, however, little attention has been given to the manner in which the lake may distort the desired or projected growth patterns of growth for the community and how the communities might control or accept these influences to their best advantage.

For the most part, development by the Corps of Engineers, the State of Illinois and the Rend Lake Conservancy District is in compliance with the spirit of the regional planning objectives. The lake is being developed as a major regional recreation facility aimed at attracting users from outside the local area; primarily from major metropolitan areas, St. Louis, Chicago, Springfield, etc. To a remarkable degree, development around the lake has followed the planning guidelines established both in initial studies by the Corps and the general guidelines established in subsequent planning studies by other agencies.

The water supply function of the lake has also followed and, if anything, surpassed its projected role within the region. The service area has expanded beyond original expectations and shows every evidence of continuing this expansion. Eventually, its role will be combined and coordinated with that of other reservoirs; Carlyle, Crab Orchard and Kincaid within the region to provide an overall water supply network for the region. Harza Engineering of Chicago is currently engaged in this study.

REND LAKE

4

SECTION 4:

ENVIRONMENTAL IMPACT OF OPERATION & MAINTENANCE ACTIVITIES

Section 4

ENVIRONMENTAL IMPACT OF OPERATION AND MAINTENANCE ACTIVITIES

4.1 ENVIRONMENTAL IMPACT OF OPERATION AND MAINTENANCE ACTIVITIES

Various maintenance, operation and management programs have been devised, the objectives of which are to implement Rend Lake's purposes such as fish and wildlife management; operation of structures to provide flood control and low flow augmentation; withdrawal, treatment and distribution of water; maintenance and management of recreation areas, etc.

Operation, maintenance and management activities devoted directly toward implementation of project purposes produce impacts categorized as:

a. Impacts or effects which directly enhance or impair the project purposes.

b. Impacts or effects which will change or influence other systems (human, natural, cultural, social, etc.)

In summary, this section defines the impact by management activity and/or objective rather than by category or type of impact.

4.2 PROJECT PURPOSE IMPLEMENTATION

4.2.1 FLOOD CONTROL STORAGE

In order to provide some measure of downstream flood stage reduction, the portion of Rend Lake between elevations 405 and 410 representing a storage volume of 109,000 acre feet has been set aside as the flood control storage pool. To obtain maximum storage benefit the pool level should be at 405 (or lower) in early spring.

As snow and rainfall cause increased flow in the Upper Big Muddy and its tributaries, the lake water level "bounces" or rises as inflow rate exceeds the outflow rate through the spillway notch, which allows only a 31-foot wide section of dam spillway to discharge between the 405 and 410 levels. Above the 410 level, floodwaters may pass over the considerably longer 435-foot main spillway crest. Due to the relatively larger discharge capacity of the 435-foot spillway, the lake water level will not rise as rapidly with flood inflows when above the 410 level as it will between the 405 and 410 elevation operating range of the constricted spillway notch.

In evaluating operation and maintenance environmental impacts of the flood control purpose we must consider not only the positive and negative results downstream but also side effects which occur within the land and water of the project as a result of providing flood storage behind the dam.

4.2.1.1 Downstream Natural Systems

River Stages and Discharges Downstream

No quantitative data is available on the effect of the lake on reducing downstream river stages. The flood control pool and the low flow notch will reduce the flood discharges and provide a more continuous flow of water in the Big Muddy River downstream of Rend Lake. The flood control pool on the lake is between elevation 405.0 and 410.0. The flood storage volume in this pool is 109,000 acre-feet. The discharge from the pool is through a 31-foot wide notch with zero flow through the notch occurring below 405 and approximately 1,000 cfs occurring with the lake at elevation 410. Assuming that the flood control pool is at elevation 410 and that the average discharge from the pool through the notch is 500 cfs, it will take approximately 100 days to empty the flood control pool. Under natural conditions, 109,000 acre-feet of flood water would have been passed down the river in much less time.

This illustrates how flood peaks are spread out over a longer time than would be the case in the original channel. With this reduction in peaks and extended flood flow duration, the net effect is that:

a. Some areas formerly on the higher portions of the flood plain will be generally "drier" than the pre-lake flood flows.

b. Areas in the lowerlying portions of the flood plain may remain flooded longer than they were originally.

c. The project design flood at Rend Lake results in a peak flow at the damsite of 14,740 cfs. The peak outflow from the lake for the design flood would be 1030 cfs. The lake would therefore effect a stage reduction at the damsite of 2.8 feet.

Downstream Water Quality

With the lake level between elevation 405 and 410, a more continuous release of downstream flood flows will result from the project. This more continuous flow will aid general water quality of the stream by further dilution of the sewage flows from Benton and other downstream communities for a longer period of time. The more continuous flow in the stream as well as the improved water quality will aid such recreational uses of the stream as canoeing, fishing and aesthetic enjoyment.

Water released downstream is drawn from near the top of the lake surface. The upper regime of the lake is the area of highest water quality in terms of high dissolved oxygen levels due to the wind action and biological productivity, low bacteria counts due to the ultraviolet sunlight rays and low turbidities and nutrient concentrations. For this reason, downstream water quality will be enhanced by the upper lake water withdrawal.

The presence of Rend Lake traps the large sediment load carried by the Big Muddy River into the lake. The loss in sediment load will increase the rate of channel scour downstream of the dam. This, in turn, will have an effect on water quality as the stream becomes progressively more turbid as it flows downstream. Overall, however, the turbidity in the stream will be improved over pre- lake conditions. The degradation of the river channel downstream of the dam may result in increased bank erosion and bank instabilities, scour around bridge piers and highway crossing culverts.

As discussed in Section 2.1.4.2, the lake and subsequent downstream releases have also increased the downstream dissolved oxygen levels in the Big Muddy River over pre-lake conditions. The existance of the lake and downstream releases have also decreased the fecal coliform bacteria counts, nutrient and metals concentrations over pre-lake conditions.

Downstream Flow Alteration on Vegetation

The flood stage/frequency relationship downstream of Rend Lake was altered by the construction of the lake. Flood plain elevations for a specific frequency occurrence will be changed. This change will cause an alteration in the vegetation downstream of the lake. Areas which formally supported flood plain types of vegetation and are no longer in the flood plain will be altered. Although some areas of the flood plain will experience less flooding due to reduced peak discharge, other areas of the flood plain will be inundated for a longer time period due to the extended duration of flood flow discharges. This may result in the loss of some trees now growing in these areas and an increase in wetland plant growth such as sedge, bur-reed, and marsh fern. There also may be a tendency toward greater wetland tree growth such as cottonwood, willow and birch.

Fish and Wildlife

The presence of Rend Lake has improved downstream water quality. Dissolved oxygen has been increased and turbidity and suspended solids have been reduced. This has resulted in a marked improvement in the aquatic environment in the river

immediately downstream of the project. The most significant impact has been to fishing and recreational opportunity afforded by this resource. However, the inefficient sewage treatment provided by the Benton sewage treatment plant degrades the quality of the river downstream of Benton and not as much recreational use is being made of the river downstream of Benton.

Groundwater

The reduction in flood peaks and the more continuous nature of flood flow downstream of the lake will not significantly affect the groundwater system. Due to the fine nature of the soils in the flood plain, the water table is close to the ground surface and seepage into or out of the soils proceeds at a very slow rate.

4.2.1.2 Economic Impact Downstream

A positive impact of flood storage is the reduction in downstream flood levels. The flood control pool is limited to protecting the area downstream of the dam to floods not exceeding 5-year frequency of occurrence, because additional flood control storage volume could not be economically justified in the original design.[1] The flood history (included in Appendix C-1) indicated that the Rend Lake reservoir and dam, as constructed, would have decreased the stages from major floods at Murphysboro by an average of 4 to 5 feet. To estimate downstream flood damage, reductions varied from 14 to 100 percent with most values being between 60 to 90 percent. These data indicate that substantial flood damage reductions are not limited to floods with frequencies less than the 5-year frequency design limit.

The original project document[2] states that the design flood control storage of 109,000 acre-feet from 405 to 410 and long-crest discharge at 410 would provide flood control during the standard project flood to the following extent:

a. 4,920 Acres of cropland would be flooded without the lake in place. With the lake in place, approximately 2,500 acres of cropland are flooded for a reduction of 2,420 acres.

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[1]U.S. Army Engineer District, St. Louis, Upper Mississippi River Basin Big Muddy River Basin, Illinois - Rend Lake Regulation Manual, October 1973.

[2]U.S. 87th Congress 2nd Session, House Document 541, Appendix D, Exhibit 4, September 12, 1962.

b. Rural property damage reduced by construction of the lake from $21,800/year to $10,700/year for a reduction of $11,000/year.

c. Urban damage reduced by construction of the lake from $78,100/year to $36,400/year for a net $41,700 reduction.

Computations in 1972[3] show the estimated total average annual downstream flood control benefits to be $463,900 broken down as follows:

Category	Amount
Crop Loss Reduction	$ 82,800
Non-Crop Loss Reduction	95,300
Cleared Land Enhancement	167,300
Wooded Land Enhancement	112,500
Urban Land Enhancement	0
Mississippi River Flood Control	6,000
Total Average Annual Benefit	$463,900

4.2.1.3 Impacts of Flood Control Storage on Lake Management

The use of Rend Lake for downstream flood control requires that the lake water level be allowed to fluctuate during flood periods. The lake levels can be expected, during any given year, to fluctuate frequently between elevation 405 and elevation 410. Levels will less frequently reach and exceed elevation 410. A water level fluctuation to elevation 410 will occur on the average of once every three years. Seasonal level fluctuations will affect bank stability, shoreline recreational activities, fish spawning within the lake and vegetation growth along the shoreline.

Bank Stability

Bank erosion is caused by waves generated naturally by the wind or artifically by such activities as power boating. Fluctuating water levels, however, will accelerate bank stability problems by providing breaking waves an opportunity to strike different portions of the reservoir banks. This impact is discussed more fully in Section 3.3.3.

Recreational Use of the Shoreline

Fluctuating lake water levels have the potential to affect the use of the lake shoreline by inundating trails as well as

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[3]U.S. Army Corps of Engineers, St. Louis District, Form 23, 1972.

camping and picnic areas. Section 4.2.4 discusses this problem in greater detail.

Shoreline Vegetation

Fluctuating water levels will result in the establishment of wetland plant communities around the lake. Plant growth associated with this environment will provide habitat for wildlife adapted to it.

Fish Spawning

Receding water levels during the fish spawning season, especially levels receding at a rate greater than .1 foot per day, have the potential to affect fish spawning. A study of the projected lake fluctuations during the years 1946 and 1970 indicated that falling lake levels during the spawning period could be expected virtually every year. During many of the years, the lake levels receded at a rate greater than .1 foot per day indicating that the potential for significantly affecting spawning exists and that some interference can be expected.

Section 4.2.5.6 "Fisheries Management Assessment" discusses fishing maintenance in greater detail. Some control over water levels can be exerted by the subimpoundment dams, thereby providing at least some means of protecting upstream spawning areas. Nursery ponds have also been proposed.

4.2.2 DOWNSTREAM LOW-FLOW AUGMENTATION

To implement the project purpose of improving water quality downstream from the Rend Lake dam, a constant flow of 30 cfs is released from the lake when the level drops below elevation 405. This practice insures that the minimum flow in the Lower Big Muddy is at least 30 cfs. As is the case with flood control, this release has an impact on the river system downstream and upon the reservoir itself.

4.2.2.1 Downstream Impact of Low-Flow Releases

River Flows

The 30 cfs release at lake levels below elevation 405 has the effect of supplying additional flow at times when the river flow was less than 30 cfs. Before the reservoir was constructed, flows below 30 cfs did occur with the minimum measured discharge being 0.1 cfs. The lake also has the effect of reducing the river

discharge over natural conditions when the lake inflow is greater than 30 cfs but the lake level is below elevation 405. The lake inflow above the 30 cfs low-flow release will go into storage and only 30 cfs will be released.

Water Quality Improvement Effectiveness

Review of reservoir water quality data (See Section 2.1.4.2 "Surface Water Quality Assessment") indicates that water released from the lake to augment low flows meets all applicable Illinois water quality standards. Low-flow augmentation release improves downstream water quality by mixing with other poorer quality river inflows such as those from sewage plants and polluted tributaries. Mixing "dilutes" pollutants and the increased flow rate of 30 cfs theoretically helps increase the rate of reaeration in the river.

Between 1961 and 1968, the Illinois stream water quality standards were upgraded to provide that a minimum of 5 mg/l dissolved oxygen had to be maintained in the Big Muddy River. This upgrading of standards makes the 30 cfs low flow release from Rend Lake less effective in meeting standards under future sewage loadings. Appendix E of the Big Muddy River Comprehensive Basin Study[4] contains an analysis of necessary low-flow augmentations on the Big Muddy River to maintain a 5 mg/l dissolved oxygen level under anticipated future development conditions. Where a 30 cfs release was sufficient to maintain 4 mg/l dissolved oxygen levels downstream of Benton and Murphysboro to the year 2010, the analysis indicates that the following low-flow releases were required to maintain 5 mg/l dissolved oxygen:

TABLE 4-1

LOW FLOWS TO MAINTAIN 5MG/L DISSOLVED OXYGEN

Reach	Low Flow Release	Design Year
Benton Downstream	30 cfs	1995
Benton Downstream	40 cfs	2010
Murphysboro Downstream	30 cfs	1985
Murphysboro Downstream	47 cfs	2010

Recently, the standards have again been upgraded, this time to a minimum of 5 mg/l during 15 hours of any 24-hour period. This means that the 30 cfs low flow discharge is even less adequate in maintaining minimum dissolved oxygen levels under future development conditons. Data is not yet available to estimate the adequacy of the 30 cfs low flow release to maintain 5 mg/l dissolved oxygen, but the problem is scheduled for study. Under Section 303 of the

[4]Federal Water Pollution Control Administration, Big Muddy River Comprehensive Basin Study, Appendix E, Water Use and Stream Quality, 1968.

1972 Amendments to the Federal Water Quality Act, states are required to investigate the impact of secondary treated effluent on stream water quality. If secondary treated effluent will not maintain the required water quality standards, then additional treatment or some other improvement must be implemented. Thus, the problem will receive study in the next year or two and the most cost effective method of meeting the standards, be it advanced waste treatment, additional low flow releases or some other method, will be identified.

Although the low flow releases from the lake comply with all Illinois water quality standards at the point of release, after mixing with the sewage from the City of Benton, the river flow failed to comply with the state dissolved oxygen and coliform standards at one time or another during 1972. The reason for violating the standards is undoubtedly the relatively poor degree of treatment provided by the Benton sewage treatment plant. During 1972, the minimum measured dissolved oxygen level at the Highway 14 bridge downstream of the Benton Sewage Treatment Plant was 4.0 mg/l, which is sufficient to maintain a rough fish population, over the long run.

Improvement to Recreation Downstream

In terms of canoeing, the 30 cfs release will insure the ability to canoe at all times of the year, but the canoeing experience associated with variable stream flows will be diminished, but not eliminated since variable river flow will occur when the pool elevation is above elevation 405. Pool elevations above elevation 405 can be expected to occur every year; however, pool levels below elevation 405 can be expected approximately 20 percent of the time.

The water quality downstream of the lake has been significantly improved by the low flow release. Fishing immediately downstream of the lake is improved and is now a recreational attraction. Although downstream of the Benton sewage treatment plant the water quality does not always meet state standards, recreational use is probably only slightly affected at the present time; the effect being in the form of a stress on game fish species. Odors should not be a problem and canoeing should not be impaired by present water quality. Once the Benton treatment plant is upgraded, the river should be able to support a game fish population at least until some time in the 1980's or 1990's when the dissolved oxygen level will probably again approach 4 mg/l.

In summary, the fishery immediately below the dam will continue to be good. Below the Benton sewage treatment plant, the recreational benefits derived from the low flow releases will depend upon the upgrading of the Benton sewage treatment plant. (See also Section 4.2.5.6 "Fisheries Management Assessment")

Fish Kills in Downstream Stilling Basin

Immediately downstream of the main spillway of the Rend Lake dam is a stilling basin used to reduce the velocity of the water after is passes over the spillway crest. The velocities are reduced through turbulence in the stilling basin. When the water is released downstream, the velocity is low enough to eliminate problems with erosion and scour. In the design of the stilling basin, an end sill was placed completely across the downstream end of of the basin. This sill, in effect, traps water in the basin. As the lake falls below elevation 405 and water stops entering the basin, water and fish are trapped in the basin and cannot leave. Dissolved oxygen level quickly falls to a lethal level for fish life. A a result, fish are killed. However, a large number of live fish were netted and dumped back into the pool by Corps and State personnel.

During 1973, the estimated fish kill was 3,000 pounds of fish. Considerable time and effort was spent by Corps personnel in burying the fish to eliminate the odors. The odors probably had an effect on downstream recreational use, as the area downstream of the stilling basin is used for fishing. Fish killed in the basin were mostly the rough fish variety--carp, buffalo, and bullheads. The area fisheries manager for the State of Illinois did not consider the loss of fish as a significant impact, since fish were of the rough fish species and were quickly replaced through natural reproduction.

A variety of the plans have been discussed and evaluated to eliminate this problem. These plans include:

a. Construction of a siphon to bring fresh water to the stilling basin from the lake on a continuous basis. The small amount of water necessary to maintain the dissolved oxygen levels would not affect the hydrologic balance of the lake.

b. Construct a pipe through the dam to continuously bring a supply of fresh water to the basin.

c. Construct a narrow opening through the downstream end sill of the basin to allow an escape route for fish and allow for the basin to be drained.

At the present time alternative a. is being employed and the problem of fish kills has been alleviated.

4.2.2.2 Problems Within the Lake

Conflict With Water Supply Demand

The 30 cfs low flow release is the top priority water appropriation from the lake. Under existing agreement, the Corps of Engineers has the authority to release 30 cfs for downstream water quality at all lake levels and reservoir inflow conditions while, under certain conditions, withdrawals for water supply purposes by Rend Lake Conservancy District can be limited.

The droughts and resulting projected lake levels which occurred during the period 1946-1970 were investigated to estimate the frequency with which the water supply withdrawal could be expected to be curtailed. The analysis indicated that water supply could be expected to be threatened so infrequently so as not to warrant further consideration. (See Section 4.2.3 "Water Supply")

Contribution to Lake Water Level Fluctuations

The low flow release does, to a small degree, accentuate low lake level problems which occur during extended dry periods. With the lake at elevation 405, a 30 cfs discharge over a 90-day period results in 5,400 acre-feet of water or approximately 3.5 inches of water on the lake surface at elevation 405. This added fluctuation in lake level is not considered to be significant in terms of aesthetic qualities and would probably not coincide with the fish spawning period.

4.2.3 WATER SUPPLY

4.2.3.1 Redevelopment Stimulus

Development of a reliable water supply system has had the immediate and direct effect of encouraging commercial and industrial development. This has been documented by interviews with officials of various new industries most of whom cited water supply as a key reason for their relocation to the area (See Section 4.2.6.2 "Economic Growth - Franklin & Jefferson Counties"). Further sections deal with the impact of this continuation of redevelopment.

Another highly desirable impact of maintaining a reliable water supply and distribution system is removal of a threat to public health. In view of the demonstrated effect of severe drought on the previous water supply methods (small surface impoundments) and the near total lack of potable groundwater, the benefit of Rend Lake is obvious. Where the many small supplies were once highly vulnerable to pollution and contamination, Rend Lake and the water treatment system insure "safe" water.

4.2.3.2 Removal of a Major Constraint to Development

One great impact of the reliability of the Rend Lake impoundment and the Conservancy District water treatment and distribution system is the removal of a major constraint on area development. This, of course, gives the desired result of spurring industrial development; however, growth is now totally uncontrolled in the absence of other legal constraints such as zoning.

Two primary concerns are evident: extension of water service to areas without capable sewage disposal facilities and, due to certain oddities in governmental systems elimination of an effective administrative tool for controlling spurious development.

Impact: Water System Outrunning Sewage Systems

Water supply is being made available in the lake area without a corresponding sewage treatment system. Development in these areas must rely upon septic fields or small individual systems for sewage treatment. Soils in the area are poorly suited for septic treatment, experiencing close to 90 percent rate of failure. The problem is one of soil impermeability with rapid failure of sand fields causing effluent to run over the surface. Lot sizes are not regulated, and the concentration of homes installed by a developer could create a severe local health problem. Examples are common within the area, and documented cases exist around the Crab Orchard Reservoir in similar soils.

Normally, water supply and sewer systems are extended to a developing area simultaneously. However, this is not the case in the lake area where each are under control of a series of different single-purpose districts apparently with little coordination between them. The highly reliable and plentiful water supply has aggravated the situation as people,previously water frugal because of their dependence upon wells for supply, have increased their per capita usage of water. This has, in turn, greatly increased the failure rate of the septic fields. As density of development increases, the problem will increase. All drainage within the Rend Lake watershed eventually arrives at Rend Lake. Figure 4-1 shows the extent of the water distribution system.

An overall discussion of this impact on the lake water quality can be found in Section 3.3.4. However, impairment of water quality within localized areas around the lake may be more severe than the overall situation indicates. Development around areas of recreational use may create localized areas of severe effluent concentration finding its way into the lake. Obviously, development will tend to occur around these areas of heavy recreation, and these areas are the ones in which possible pollution is the most critical.

More than a health problem, it may also create local conditions of unattractive water quality as algae and other aquatic plant growths are stimulated by the heavy nutrient loads.

Impact: Elimination of an Effective Development Control Tool

A basic tool which can be used by communities to control growth and development is the provision or refusal of community services, particularly sewer and water supply, to developers. In the case of the Rend Lake area, the lack of available groundwater makes this a particularly potent tool for controlled land use. Without the supply of water, the rapid spread of scattered development in rural areas is greatly curtailed. The land development control tool which has been so effective elsewhere is rendered ineffective in the Rend Lake area because water supply can be provided on three levels of government:

a. The Conservancy District sells water on a wholesale basis to communities within their region and to certain individual industries and some retail users.

b. The communities can, in turn, retail or resell water to other communities, individuals, developers, or water districts as they choose.

c. Rural water districts can sell water in a designated area outside boundaries of organized communities.

In short, there is no overall management criteria balancing sale of water with the general well-being of the county or community. Using the west side of the lake as an example, the situation can be illustrated as follows: A developer or industry can petition for water supply to the Conservancy District from their line running up the west side of the lake. The petitioner must be willing to either build his own distribution system or guarantee its construction cost. If this is done, the district has no criteria by which to agree to sell or deny water, however reluctant they may feel about doing so. (A precedent for retail sales has already been established, and if the district sells to one developer, they probably must sell to others.)

Assuming for now that the petitioner is refused, the same petitioner can then petition the nearest towns for water supply. In order to increase their revenue, the community may agree, although they cannot furnish corresponding sewer or other community facilities. The single line if built by the petitioner or community to an individual user, may open up a whole new area for additional construction and development. Precedence is set, and no policy is established; therefore, if "he got water, why not us?" becomes a difficult question to answer.

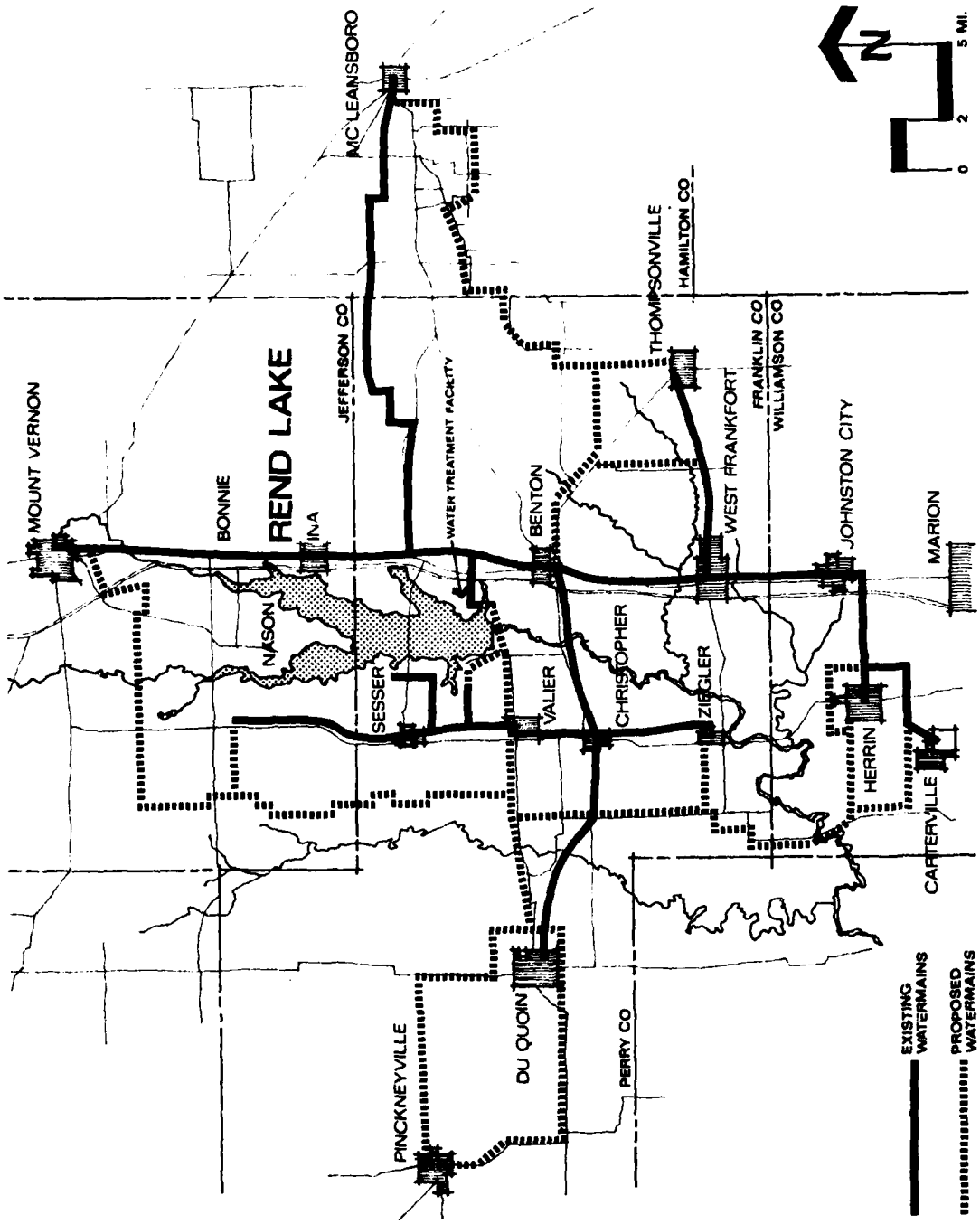

FIGURE 4-1
REND LAKE CONSERVANCY DISTRICT
WATER SYSTEM

Still another option exists: a rural water district could be established by petition and could install a distribution system through which any variety of users could subscribe. The consequence of this action would probably be even worse. The systems, having no standards to meet, might end up being minimal single-line systems sprawling over a large area and developed with little regard for overall water resource planning or orderly growth for either the petitioner's system or the adjacent area. Such rural districts can have considerable local political muscle, and once established, it is difficult for the Conservancy District to deny or limit service to them.

Section 4.2.6.4 discusses some of the more serious consequences of uncontrolled development.

4.2.3.3 Adequacy of Supply

The question of the adequacy of the water supply has been raised in the community. Several reports by the Rend Lake Conservancy District and others have dealt with this issue and in reviewing these it was found that water requirements of the area have been consistently underestimated. The possible implications are that ultimate year 2020 demand calculated by the U.S. Public Health Service of 40 mgd (or 62 cubic feet per second) may be short.[5]

These underestimations also may not reflect actual long run demand since most estimates assume that recent growth rates will continue indefinitely or will approximate future rates. The actual situation, which is not unlikely, could be that recent growth trends reflect highly active development generated by initial enthusiasm for the Rend Lake project. This initial flurry of activity has been seen frequently elsewhere and could well even off at original estimates.

It is beyond the scope of this study to arrive at any conclusion as to anticipated demand and the ability of Rend Lake to supply that estimate. The Greater Egypt Regional Planning and Development Commission has underway a regional study toward that end; yet with the figures readily available and given the potency of the issue, one must attempt at least an order of magnitude guess at the reliability of the supply from Rend Lake's joint use pool.

Appendix 4-2 details this analysis. The results show that given the current official ultimate requirement of 62 cfs (40 mgd) that the average probability of curtailment of the water supply by drought is less than once in 1,000 years, in other words, very unlikely and

[5]U.S. 87th Congress, 2nd Session, op. cit.

therefore very reliable. If this demand or withdrawal rate were as much as doubled to 125 cfs (80 mgd) the probability of curtailment of water supply by drought would no doubt increase.

Note that water quality control releases of 30 cfs take precedence over water supply withdrawal. If the water supply were threatened with crutailment by drought, this might become a potent political issue.

Efficiency of Treatment

Adequate treatment is being provided and furnished water is well within current standards. Although raw water quality does vary, treatment plant operational flexibility has maintained a consistent quality of treated water output.

4.2.3.4 Impact of Water Supply Operations on Rend Lake

In providing ample water some side effects are invariably created which affect the lake in various ways.

Water Level Fluctuations

The withdrawal of water from Rend Lake for water supply purposes does increase the magnitude of the fluctuations in the lake. The increase in fluctuations is particularly significant below elevation 405. Predictions of what the lake levels would have been with the lake in place during the period 1946-1970 have been made. Two conditions have been analyzed, one with a 10 cfs water supply withdrawal and one with a 62 cfs water supply withdrawal. The lowest reservoir level for both water supply withdrawal conditions occurred in 1954. With a 10 cfs water supply withdrawal, the minimum water elevation in 1954 would have been 402.7 while, with a 62 cfs water supply withdrawal, the minimum water surface elevation in 1954 would have been 399.1. This is a difference of approximately 3.5 feet and illustrates the effect that water supply withdrawals can have on lake fluctuations. The impacts of fluctuating water levels are discussed in other sections.

Creation of Waste Disposal Problem

Sludge from water treatment plant operation is presently stored and dewatered in lagoons on Conservancy District lands. As these lagoons have filled, new lagoons have been created. Rate of filling depends almost directly on raw water turbidity so that any action which increases lake turbidity increases water treatment sludge production.

There is no immediate threat to lake water quality from these wastes; however, lagoons are not particularly attractive and cover a large surface area.

It is assumed that at sometime in the future dried sludge will be removed and disposed of elsewhere.

The exact location of the sludge disposal areas are not known at the present time although it can be assumed that the disposal areas will be adjacent to the water treatment plant and therefore within the watershed tributary to Rend Lake.

Water Quality

Section 4.3.4 and 2.1.4.2 discuss area water quality problems.

4.2.4 RECREATION

4.2.4.1 Introduction

The future character of the lake is just beginning to emerge. Until recently, it has been a large expanse of water with a shoreline in nearly a totally rural or natural character. In 1974 three recreational areas opened which almost totally ring the lower lake. Within five and possibly three years, the Gun Creek resort complex will be developed, the 2,800-acre Fitzgerrell State Park now open with limited facilities will be completely open, and the traffic during weekends will be quite heavy.

4.2.4.2 Quality and Scope of Recreational Development

The character of the lower lake is established by the Corps of Engineers recreational access areas. At this time the Sandusky areas, Marcum Branch and Gun Creek areas are open. All of the major recreation areas are similar in scope and the type of facilities offered. They are essentially self-contained, each area offering most of the recreational needs of a weekend camper or fisherman and his family.

The areas are basically well designed and laid out. All access to an area is through one control point, and the number of users can be controlled to prevent overuse of the area. Each area is separated from the others preventing sightseers from driving through the areas where people are playing or camping. The primary activities: vehicular camping, day use (sometimes combined with tent or walk-in camping) and boat launch areas are well zoned.

Each activity area has its own roadway loop, parking and restroom facilities. People involved in one activity do not greatly intrude upon others. The roadways generally fit the topography.

It appears that few trees on the site were lost during construction and extensive planting programs are undertaken as part of the initial construction phase. Many of the plant materials, in addition to their visual impact, are native to the area and some provide food and habitat for birds and small wildlife in the area.

Potable water and restroom facilities are available in all areas. Restrooms and shelter buildings are of wood construction and finish and are generally well sited. The signs and graphics are consistent and functional. The Sandusky area has two handsome tot lot play areas.

4.2.4.3 Maintenance

The use of these areas vary seasonally being heaviest in the summer months and lightest throughout the winter. However, a consistent effort is made to keep the areas clean and well maintained as a good portion of their appeal comes from this quality.

4.2.4.4 Design Program

All of the areas offer the same basic inventory and scope of facilities. While a visitor has a selection of recreational options within each area, they are essentially the same choices. Very little variety is offered by the lake landscape itself, and the similarity of development reinforces the lack of choice offered in terms of recreational experiences. (The exception is in the old tree farm area in Sandusky which provides some excellent campsites.) All the areas not only function the same, they also look alike. Very few facilities for walking or biking are provided. Most transportation is oriented to boat or automobile traffic.

Heavy emphasis has been placed upon vehicular camping. A cluster of campsites is a primary element of each recreational area. The degree of emphasis can be seen by comparing the total number of vehicular campsites (1,070) with the number of tent or walk-in campsites (approximately 175).

These areas are separated physically in the site plan with separate roads and parking, but due to the openness of the landscape and the density of development, they are highly visible throughout the area, particularly from the water. One or more major areas could have been set aside for day use and tent camping without imposing vehicular camping on the area. The campsites could have been added to other vehicular camping areas or the total number of these campsites reduced. The resulting space could have been devoted to other activities.

It appears that no design program development methods exist which provide criteria such as number of campsites, campsite mix and ratios, boating launch and marina facilities, how much is enough, how much is too much, capacity of a given area as influenced by tree cover, slopes, regional and local demands, etc. Rather, recreational area planning focuses on duplicating other known areas.

There is an inordinate number of vehicular campsites to the exclusion of other camping opportunities. Particularly from a visual standpoint, the concentrations of campers are intrusive to other users. The density of camper sites within the clusters in quite high with individual pads generally 25 to 50 feet apart. One concrete pad, picnic table and grill per unit are provided between the trailers. In most areas no trees are located between the units and spacing is constant regardless of tree cover or screening.

This spacing is probably more than adequate for overnight stays or in commercial campgrounds where a return on investment is required. However, in an area where people may come for a weekend or extended stay, the quality of recreational experience is as important as the quantity of users. Under heavy use conditions, some of these areas will seem more like trailer parks than weekend retreats. In a sense, the areas are set up so that their successful use--a full capacity of campers--creates the least desirable environment for the users. The campers will probably sort out the actual use density themselves, looking around for the least crowded conditions.

4.2.4.5 Campsite Development

The density of development is aggravated by the soil conditions in the region. It is highly erodible and not particularly well suited for maintaining turf or grass under heavy use conditions. There is some evidence at Sandusky where the grasses around the best campsites have been worn off by use patterns.

Due to the short spring season, campers do not have much option of moving to cooler areas. Once the grass cover is removed, soil erosion may make it necessary to take the campsite out of operation until turf can be reestablished. Perhaps a hardier species of grasses

would solve or head off the problem. If not, the reservoir management staff will be faced with three options: 1. Provide crowded, dirt surfaced campsites to the public, 2. Periodically close campsites or rotate their use to allow grasses to become reestablished, or 3. Provide artificial surfacing as bark chips. Thus, while 1,245 campsites may be programmed for the lake, actual capacity could be considerably less.

4.2.4.6 Shoreline

Many of these campsites are located immediately adjacent to the water (but above the 400 foot elevation) which provides excellent views of the lake. However, the view looking from the lake to the shoreline in many places takes on the appearance of a small trailer court. Due to their proximity to shoreline and lack of heavy tree cover, the campsites become prominent visual elements.

The pattern is somewhat analogous to the old systems of stringing the edge of a lake with waterfront lots until the natural shoreline is lost. The situation is not nearly so serious here, but the principle is the same. The campsites could be pulled back from the edge of the lake with a band of open space and large tree planting established around the lake. Walking trails and supplementary picnic areas could be constructed so that campers could still see the lake through a canopy of trees. Thus, the appearance of the shoreline would be strengthened rather than diminished.

Intrusion of campsite development is worse in the Sandusky areas. On both sides of the inlet the shoreline is composed of a series of fingers. A road has been constructed down the high point of each finger and a series of camper pads built off each side. At the end of each finger, closest to the lake, an asphalt cul-de-sac with metal bumpers has been installed. Views from the campsite are of more trailers on the next finger or across the bay. Later developments are somewhat less intrusive. The layout and density in the South Marcum Branch area, in particular, appears to be better conceived. However, most of the areas have already been constructed.

4.2.4.7 State of Illinois

The State of Illinois is also planning extensive recreational development on its 2,800-acre Fitzgerrell State Park holdings. Only preliminary master plans are available at this time. The state is also constructing 250 campsites (defined in lease agreements from the Corps) but has clustered them within one general area. They do not appear to impose on the shoreline character as others at the lake.

A greater range of activities is offered including equestrian trails, sailboat facilities, and a nature interpretive program is being developed. Comparatively, greater areas of the park are planned for less intensive recreational use: walk-in camping, picnicking and day use. Large areas have been set aside for wildlife. These should complement the state's interpretive program and extensive wildlife management activities at the lake. It also appears that more trail activities, walking and horseback riding, are planned.

4.2.4.8 Boating

Section 2 of this report offers a rough inventory of the proposed boating facilities: marinas, harbors, and trailer launching. An estimated 2,250 to 2,475 marina slips will ultimately be available if all of the proposed plans are implemented. It is more difficult to project what is a realistic capacity for trailer launch areas, but by using both an average capacity of 40 boats per day per launching area, and the number of proposed parking spaces available at the launching areas, it appears that an additional 900 to 1,100 boats could be put in the water.

The lake has a gross surface water area ranging from 18,900 acres (elevation 391 - 405 joint use pool), 24,800 acres (flood control pool) to 34,200 acres (elevation 405 - 411, standard project pool). If the subimpoundment areas, inlet areas cut off by roads, flooded timber, refuge areas, harbors, swimming areas, and a shallow water zone bordering the shore are subtracted, roughly 11,000 acres to 23,000 acres of open water would be available for boating.

Comparing the number of boats against the available surface water, it appears that 3.2 and 6.8 acres of water per boat would be available. Probably 5 to 6 acres per boat would be a representative figure for peak day or weekend use. Near those levels the lake would become congested and would not be enjoyable for most users. To use an example: The Bureau of Outdoor Recreation has published an "Outdoor Recreation Space Standards" guidelines which is a collection of standards employed for design and programming by agencies throughout the country. The range of suggested standards are:

Power Boats

Soil Conservation Service	3 acres per boat
Wisconsin Comprehensive Plan	20 acres per boat
Louisiana Parks & Recreation Commission	20 acres per boat

Water Skiing

Soil Conservation Service	5 acres per boat
Wisconsin Comprehensive Plan	20 acres per boat (40 acres desirable)
Louisiana Parks & Recreation Commission	40 acres per boat

Fishing

Soil Conservation Service	2 to 7 boats per acre
Wisconsin Comprehensive Plan	8 acres per boat
Louisiana Parks & Recreation Commission	8 acres per boat

Obviously, a range of criteria exist, and other sources show varying desired ratios and capacities. Further, the concept of crowding is subjective, depending upon the type of boating activity and the tolerance of the individual user. Sailing and power boating are often not compatible in crowded conditions, and separate sailing areas are set aside. The location of many launch and marina areas is a function of convenience to the boater as much as it is an indication of desired lake capacity. There may be some difference of opinion as to what constitutes usable open water or how to best determine the capacity of a boat ramp.

In spite of all these quality factors, it appears evident that the ultimate proposed plans for the lake could push the boating density to the point or past the point of overcrowding for many users. It is foolish to consciously plan facilities that will overload the lake or even push it too close to this point. For this reason a study is currently (March 1976) being conducted which will provide more realistic guidelines for the development of boating facilities at Rend Lake. This study will develop objectives and goals to meet the optimum level of development as per utilization of the lake and recreational demands of the area. Thus a more viable approach to recreational development will exist as an alternative to the present maximum development plan.

4.2.4.9 Natural Qualities Affecting Recreation

Soil

The soil in the Rend Lake region is both highly erodible and, as demonstrated by crop yields, below average for plant productivity. In areas of heavy use, such as campsites, the ground cover wears off and the soil quickly erodes. It is difficult to reestablish turf or plant materials to check the erosion.

The erosion problem is more severe during construction. Open land erodes quickly, and localized problems of turbidity could occur near the construction area. This could be a problem if con-

struction occurs near existing recreational areas. This was evident in the north Marcum Branch area and the Conservancy District construction in the winter of 1974.

Storm water runoff from parking and roads is handled by a series of ditches and culverts. Just in the time period during construction, substantial erosion was evident in the ditches. In critical areas of heavy runoff more extensive storm water systems or at best sodding the ditches could prevent erosion from getting a start. At present, no sediment control practices are specified or enforced. This should be done before the Gun Creek resort construction begins. Dredging near recreation facilities and procedures for disposing of dredge material have not been developed as of this report.

Water

Due to the shallowness of the lake and the lack of protective tree cover on the shoreline, winds can create severe wave action. Inexperienced or careless boaters could easily capsize or lose control. The problem has not been serious to date, probably due to the relatively small number of boats at the lake. The controlling agencies have recognized the problem and have set up guidelines for boat warnings, boat rescue and emergency programs. The Corps of Engineers has established a boat safety program, and lectures are given to school and civic groups to alert them to the problem.

A no-wake policy has been established in some bays and along the shoreline. At this time no buoys define the limits and again, due to the limited use, it has not been a serious problem. As the number of boats increases, well defined limits in the bays and a means of enforcement will be needed. The problem is made more acute by broad shallow water areas and the high degree of siltation experienced at the reservoir. Uncontrolled boat traffic can create turbid and unattractive water conditions near the heavily used recreational areas.

Vegetation

The reservoir has only scattered areas of tree cover. Many of the campsites lack shade, and this will reduce their use during hotter summer weekends. The lack of mature shoreline trees intensifies the wind fetch hazards.

The Corps has established an extensive planting program concurrent with the construction of the recreation area. Most of the stock, however, is relatively small and it will be years before its impact will be felt. An alternate policy would be the planting of fewer, more mature trees, sometimes even before construction in designated "no build" and shoreline setback zones. Additional plantings could be added periodically, or on a yearly priority basis.

4.2.4.10 Summary of Recreation Management Impact

There are three major points that serve to highlight the general recreational impact of Rend Lake management activities:

a. There is little question that recreation management will serve to increase economic activity in what has been called an economically depressed area for many years. From that standpoint the project should fulfill all expectations and contribute to the social/economic well being of the communities.

b. During discussion in Section 4.2.4 several minor conflicts and suggested adjustments have been made which should increase recreational benefit.

c. The potential does exist for future conflict between consumptive and non-consumptive recreational uses of the resource unless control or restrictive steps are taken to balance activities. Section 6 of this study discusses the necessity of developing a comprehensive, balanced management plan for the resource and the need for administrative methods to make the required day-to-day trade-offs as use of Rend Lake intensifies.

4.2.5 FISH AND WILDLIFE

4.2.5.1 Waterfowl Management Assessment

Of the 16,000 acres of Rend Lake project lands licensed to the State of Illinois for wildlife management, 70 percent is managed for waterfowl; the remainder for upland game species. This block of waterfowl habitat is of significance to continental populations of ducks and geese during their migrations. It is also used by wintering Canada geese.

Bellrose and Hanson state, "An indispensable means of managing waterfowl in the state are the refuges or management areas established to preserve and improve habitat and better distribute waterfowl populations and kill. Sixteen refuge or management areas aggregating 66,000 acres have been established by county, state and federal agencies.[6]

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[6]Bellrose, Frank C. and Harold C. Hanson, Atlas of Illinois Resources, Section 4 - Waterfowl, 1963.

"In the extreme southern part of the state, 15,000 acres of water and 20,000 acres of land have been developed primarily for Canada geese and secondarily for ducks. As a result of improved food conditions (plus control of the kill), the locally wintering goose population increased from a few thousand to over 200,000 within a span of 30 years.[7] Recently, this region has attracted the greatest wintering concentration of Canada geese in North America. In addition to the geese, from 100,000 to 300,000 ducks spend part of the fall and most of the winter in the area."

In view of the decline in waterfowl habitat throughout the Mississippi flyway, the addition of 16,000 acres of this type of habitat at Rend Lake will benefit the resource and add to its use and enjoyment by many people.

Duck Flock Management Objectives

The state's objective for duck management is to provide 40,000 to 50,000 man-days of duck hunting annually, with a harvest of 20,000 to 25,000 birds per year.

In view of the extremely limited supply of mallards currently being experienced in the Mississippi flyway, a goal of 15,000 to 20,000 man-days of hunting with a yield of 7,500 to 10,000 birds is much more realistic. Figure 4-4 depicts a potential time span for duck use based on an average annual population of 50,000. The state reported a 58 percent increase in the use of Rend Lake for duck hunting in 1973 over 1972 or 3,800 hunting efforts in 1972 compared to 6,013 in 1973; the harvest increased from 3,534 to 3,798 over the same period which reflects the scarcity of mallards in 1973.

Species Expected

The most common species of duck at which the management program is aimed is the mallard (Anas platyrhynchos). Over 2,000,000 mallards may occur in the state during migration, and intensively managed habitat of the type at Rend Lake should prove attractive to mallards. Other ducks that should visit the area in significant numbers are: pintail (Anas acuta), blue-winged teal (Anas discors), green-winged teal (Anas carolinensis), wood duck (Aix sponsa), American widgeon (Mareca americana), greater scaup (Aythya marila), lesser scaup (Aythya affinis), and ring-necked duck (Aythya collaris).

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[7] Now totals about 300,000 in a span of 35 years. (Figure 4-3)

Existing Management Program

The state's management program for ducks at Rend Lake is centered on the two sub-impoundments: Casey Fork and Big Muddy. These have permanent water levels comprising 300 and 700 surface acres, respectively, at elevation 405.0. At spillway elevation 412.0' Casey Fork totals 1,300 surface acres and Big Muddy 1,700 surface acres. Thus, it is possible to flood a total of 3,000 acres, of which 2,000 may be periodically drained for food production. Pin oak occurs on two-thirds of this acreage and mast is the principal food produced for both waterfowl and forest game species. The remaining wetlands are farmed by the state in crops such as buckwheat and millets. All of the standing crop is left in the field. While some fertilizers are used, no standover crops can be grown where annual flooding takes place. However, silt deposition improves productivity, and it has been possible to produce a satisfactory amount of food using this management technique.

Management Critique

Of minor concern are the following observations relating to management. The wood duck is a common nester at Rend Lake. Local production plus migrants probably total between 2,000 and 5,000 early in the fall, well in advance of the arrival of the other migrant species. While these birds have probably mostly moved out by the onset of the duck season, they nevertheless play an important role in the duck hunters' bag flyway-wide.

While the greentree reservoir type management in the sub-impoundments is basically sound and productive, its effectiveness is directly related to the capability for flooding. In drought years a pumping station capable of filling the sub-impoundments would spell the difference between successful waterfowl management and a complete failure. This would be true for both migrant waterfowl and resident wood ducks.

The oak trees found in the sub-impoundments are growing in a nearly pure, even-aged stand. Thinning should improve mast production. Individual trees in a large diameter class with rigorous growth and a large crown will usually produce a large seed crop. Individual trees are often consistent in their level of productivity; those

that produce abundantly one year are likely to produce abundantly in other years.[8] Thinning should logically be accomplished by removing all non-mast producing trees, except den trees. These openings can then be planted to millets, thereby augmenting the total food crop.

If the sub-impoundments are heavily hunted, there will be an accumulation of spent shot in the water. This may be ingested by waterfowl, causing lead poisoning. This factor is of serious proportion in many greentree reservoirs. One remedy is to pull the water off immediately after duck season which induces the birds to leave the area.

Summary, Duck Management

In summary, the creation of migration habitat for ducks within the Casey Fork and Big Muddy sub-impoundments has resulted in the addition of valuable living space for wildlife, a factor of both national and international significance in the perpetuation of the waterfowl resource. The waterfowl project also has added to the economic worth of the Rend Lake community and is well utilized and enjoyed by people in that vicinity.

Goose Flock Management Objectives

It is important to distinguish between management for ducks as opposed to geese, in this case Canada geese (*Branta canadensis interior*). Within the migration and wintering area under discussion are also found scattered groups of giant Canada geese (Branta canadensis maxima).

Briefly stated, the 300,000 Canada geese that winter in Southern Illinois represent a population that uses a well-defined nesting grounds in the Hudson Bay Lowlands of Ontario, from the south end of James Bay north and west to about the Manitoba border. Presently, their migration route is principally through Wisconsin and Illinois, with a major stopover at the Horicon National Wildlife Refuge in southeast Wisconsin.

Approximately 1,100 acres are farmed within the Rend Lake refuge, mainly for geese. This includes 180 acres farmed by the State of Illinois plus 165 acres that are sharecropped; on sharecropped land 25 percent of the standing crop is left in the field for wildlife. Crops grown are millet, sorghum, corn and buckwheat. Grain crops are supplemented with seedings of ladino clover and winter wheat. Liming and fertilizing are practiced. Grain and

[8]Wildlife Management Institute, Wood Ducks Management and Research Symposium, 1966.

forage are produced using a four-year rotation: two years clover, one year of grain with a catch crop of wheat and clover the fourth year.

In summary, the Rend Lake project area (1973) produced approximately 21,500 bushels of grain and 2,000,000 pounds of forage on the sanctuary, of crucial importance for goose feed during the hunting season. It is generally agreed by goose managers that daily food requirements average only half-pound per goose. The capability of the refuge for feeding geese was approximately 100,000 geese during November and December. (Figure 4-2). Food supply was supplemented, of course, by off refuge flights during this period. When not disturbed by hunters, Canada geese often fly several miles to a favored field. When hunting season closed, an immense area of private land in Franklin and Jefferson Counties thus became available for feeding.

In the two years the goose management program has been in force at Rend Lake there has been an encouraging response from both geese and hunters. Peak goose counts were: 3,800 in 1972, 13,000 in 1973, and 36,000 in 1974. Counts were made in the winter. The harvest in 1973 in Franklin and Jefferson Counties was estimated at 232 geese.

Management Critique

The goose management plan at Rend Lake is closely coordinated with Mississippi Flyway Council goals and objectives. For this reason impacts of the program have been largely beneficial. The main objectives met by the Rend Lake program as well as the impacts of each follow:

Objective: Improving goose distribution and more fully utilizing potential nesting grounds.

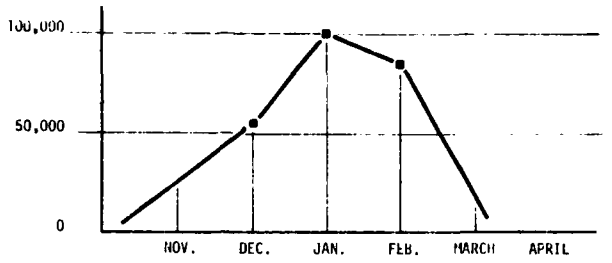
Impacts: By increasing the dispersion of the flocks throughout the flyway the Canada geese are less vulnerable to natural catastrophic occurences such as outbreaks of disease. Also habitat areas such as Rend Lake with the potential for greater development are needed to meet the future goals (in sheer numbers) of the Flyway Council.

Objective: Improving the quality of the recreation provided by these birds, and more fully utilizing recreational opportunity by providing a wider choice of stopping places.

Impacts: Greater recreational opportunities exist for a larger number of people as a result of geese dispersion, and increased goose management in a given area will improve conditions not only for the geese but also for the recreational alternatives provided by these birds.

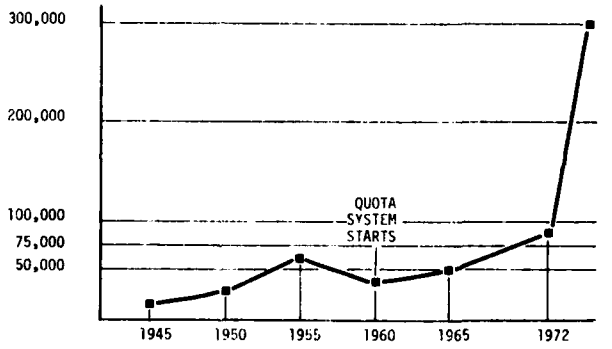
FIGURE 4-2

PROJECTED WATERFOWL USE · REND LAKE · · CANADA GEESE



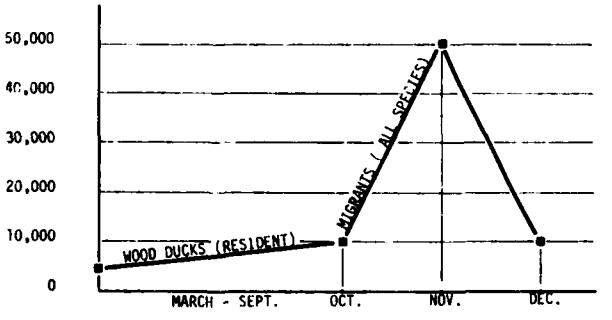
4-3

NUMBERS OF CANADA GEESE - SOUTHERN ILLINOIS



4-4

PROJECTED WATERFOWL USE · REND LAKE · · DUCKS



FIGURES 4-2, 3 4

Objective: Reduce "short-stopping" of the geese.

Impacts: The Rend Lake goose management program represents a further expansion and dispersion of the traditional Southern Illinois Birds. The addition of goose management at Rend Lake has encouraged development of the Southern Illinois Flock and resulted in "spill-over" into other areas especially Kentucky and Tennessee.

4.2.5.2 Deer Population Management Problems

The management objective for white-tailed deer at Rend Lake, as promulgated by the state and the Corps is to increase the herd to the full capability of existing habitat.

Deer utilize the forested tracts on the project for cover and browse. Much of their food is taken from adjoining grain fields, with corn and soybeans being favored items. There are 9,100 acres of forest plus 8,000 acres of crop and "go-back" lands within the project boundary which, depending upon water levels, constitute good to excellent deer habitat. The density of deer in Franklin and Jefferson Counties has been estimated at 5 to 10 animals per square mile. Population density is probably higher on the Rend Lake project area because of the habitat provided.

In 1973 a total of 1,219 deer hunting permits were issued in Franklin and Jefferson Counties; 252 deer were checked in by hunters and 53 were taken at Rend Lake. While the Rend Lake project comprises only six percent of the two-county area, a little more than 21 percent of the total kill occurred there. This is a reflection of the quality of deer habitat at Rend Lake, as well as the sanctuary it affords.

Projected Overpopulation

A total of 5,400 acres comprised of recreation and development areas are closed to deer hunting. Deer immediately go into these closed areas as soon as hunting starts. The carry-over of deer as a result of these closures is a highly significant factor in the rate of increase, owing to the fact that the deer in the refuge area are approximately 75 percent does.

Some insight into the rapid increase of deer may be gained by examining the dynamics of deer reproduction. Under the circumstances just described, the deer herd at Rend Lake may be expected to attain an annual rate of replacement of 35 to 45 percent. Most does have twins, but another factor, often overlooked, is that 75 percent of the fawns will mature sexually the same year they are born and will also reproduce. For example, assuming the project deer herd to have

been 300 before hunting season, and subtracting the kill of 53, leaves 247 deer. Given a 40 percent replacement (which takes into account other mortality such as highway kills, disease, etc.), next year's herd should total 346. Over a ten-year span it is obvious that the herd may grossly exceed management objectives, leading to excessive crop depredation, highway accidents with resultant property damage, personal injuries and worse, plus a strong emotional reaction from the public when control measures are proposed.

A prime example of the result of overprotecting deer is found at the nearby Crab Orchard National Wildlife Refuge. With its inception in 1946, an 18,000-acre sanctuary was established in which deer were protected. Despite controlled deer hunts in recent years, by the summer of 1973, the herd was estimated at 2,800, occupying about 16,000 acres of usable habitat or 112 deer per square mile.

Even though the number of deer at Rend Lake is now probably well within the capability of the habitat, it should be clearly recognized that pressure will develop for having enough deer on the area so that recreationists can readily see deer in the course of driving through, or while fishing or camping. When this stage is reached, it usually means that they are overabundant.

Of more immediate concern are the extensive tree and shrub plantings being placed out in the recreation areas. If these areas continue to be closed to deer hunting, the deer will probably destroy most of the plantings long before the vegetation can develop sufficiently to withstand heavy browsing. At least 10 years is considered necessary for most of these plantings to grow enough to become firmly established.

Summary

In summary, Rend Lake provides 17,100 acres (9,100 forested plus 8,000 cropland and upland) of excellent deer habitat. This resource is currently enjoyed by both hunters and non-hunters. Closely coordinated efforts between the Corps and the State of Illinois will be needed to keep the deer herd in balance with its surroundings.

4.2.5.3 Upland Game Potential

Several species of upland game are now common on the area. They are cottontail rabbits, fox and gray squirrels, bobwhite quail and mourning doves. Pheasants have been introduced but are not common.

Habitat for upland game falls into the following categories:

1.	Old agricultural fields	4,481 acres
2.	Field borders	400 acres
3.	Timber	1,262 acres
4.	Recreation areas	5,409 acres
5.	Agricultural fields	3,602 acres

Most of the agricultural fields are in a "go back" status. This secondary succession has reached the perennial plant stage. In some fields, woody plant species are invading. These include greenbrier, poison ivy, black raspberry, sassafras and locust. Timber areas are largely second growth but they afford a fair number of den trees from species such as sycamore and soft maple. Good mast crops are produced from the even-aged stand of pin oaks in the bottoms, as well as from small stands of black oaks in the uplands. Much of the merchantable timber was cut and sold just prior to the inception of the Rend Lake project, thus many trees of sufficient diameter to afford den sites are gone.

Despite these limitations, there are better than average numbers of game birds and animals present, and the area is well used by hunters.

Management Critique

Both the Corps and Illinois Department of Conservation have plans for intensively managing upland game, thereby improving the productivity of the uplands. In the meantime, in their present state of succession, these lands will continue to provide better than average hunting.

According to harvest data gathered by the state for the years 1956-1969,[9] the combined average kill of doves, pheasants, bobwhites, gray and fox squirrels averaged 310 animals per 1,000 acres. Eleven counties yielded a harvest of over 500 animals per 1,000 acres. Franklin was the highest with 728. Four counties, including Franklin, recorded harvests greater than 200,000 upland game animals per year. Because the Rend Lake project obviously embraces a large fraction of the upland game habitat in Franklin and Jefferson Counties, we conclude that it offers some of the best upland game hunting in the state.

A total of 1,300,000 hunter trips per year was generated in Franklin and Jefferson Counties, of which about 75 percent were by county residents. Taking a look at the status of hunting with respect to each species of upland game found on the project area, the pheasant is hunted only on a put-and-take (for fee) basis on the Wayne

[9]Preno, William L. and Ronald F. Labisky, Abundance and Harvest of Doves, Pheasants, Bobwhites, Squirrels and Cottontails in Illinois 1956-69, 1971.

Fitzgerrell State Park area. Doves averaged more than four per hunter trip, well above the state average. Bobwhites averaged a yield of over three birds per hunter trip, close to the highest in the state. Fox and gray squirrels averaged over two per hunter trip which is above the state average. Cottontails were far above the state average with about two per hunter trip.

Summing up, approximately 10,000 upland acres are open to public hunting for doves, bobwhites, squirrels and cottontails. Most of the field habitat is in secondary succession and will require intensive management within the next two years if good numbers of these species of upland game are to be maintained. Estimates of harvest by hunters at Rend Lake are equal to or greater than anywhere in the state.

4.2.5.4 Furbearers

Several furbearer species range mainly along the shoreline in the wetland community. Mink, muskrat, and beaver are all semi-aquatic in their habits. Others also found in bottom-lands but which range into the uplands as well are: raccoon, opossum, striped skunk long-tailed weasel, red fox and gray fox. These animals occur over approximately 9,100 acres within the project boundary but are generally most numerous in or near the sub-impoundment areas.

It is Corps policy to permit harvest of furbearing animals in accordance with state laws and regulations. Accordingly, local trappers are permitted to enter the project on a first-come, first-served basis. Raccoon hunting with dogs is also permitted at night.

This activity serves an important role for the local people, It provides high quality recreation as well as some economic return. It also helps compensate the young people in their adjustment to government taking of the lands needed for the lake.

4.2.5.5 Non-Game Species

Upwards of 200 species of birds and small mammals (Appendices B-4 and B-5) are found as residents or migrants within the "go back" fields, forests and bottomlands on the project. The fact that this high-quality habitat is attractive to game species makes it equally appealing to non-game varieties of wildlife.

The interpretive values of non-game species for viewing are discussed in Sections 2 and 6.

4.2.5.6 Fisheries Management Assessment

The principal objective of the fishery management program is to develop and maintain a high quality sport fishery. Additionally, as the program develops, a significant commercial fishery may emerge which should supplement the sport fishery. Responsibility for fisheries management lies with the Illinois Department of Conservation.

Management Results

Angling success for largemouth bass was very good throughout the 1973 fishing season. During the spring and early summer, limit catches of one to two-pound bass was a regular occurrence. Bottom fishermen caught good numbers of carp and bullheads. Crappie fishing never materialized until late August. The young crappies apparently grew well as a result of the good hatch of gizzard shad, resulting in some sizeable catches of 8 to 11-inch crappies during the fall months. Those anglers who fished specifically for bluegill did very well during late May and June, the spawning season. Northern pike were not numerous but fulfilled the role of a trophy or bonus fish.

A sport fishermen creel census was conducted by the Illinois Department of Conservation, Division of Fisheries from April 1 to September 30, 1974. This survey provided information regarding catch and harvest rates, catch composition (types, lengths, and weights), and the additional data necessary for projection of the creel census data. Results of this survey are being used to improve fishery management programs.

Water Level Management Problems

Management of water levels during the spawning season is the key to reproduction which will insure future fishing. In February and March 1973 an experiment was tried with Northern Pike. Once the breeder pike were introduced, the critical spawning factor was a rise in pool level during February which would inundate a large area of terrestrial or marsh grasses. This did not occur during the critical time period, thus few or no Northern Pike were produced and the fishery for this species will eventually disappear. Fry stocking cannot be expected to maintain the species in the face of an established fish population.

Stable pool levels in May and June are essential for the successful spawning of other desirable lake species.

Nursery Pond Potential

Nursery ponds near the lake have been proposed as a fishery management technique for improving the size and number of fish released in a given stocking. The fish to be stocked would be held in these ponds until they attained sufficient growth, then released directly into the lake. The pond could be immediately refilled after emptying its fish into the lake. It could be used for demonstration and

interpretive purposes as well as for fishery management. Such a "model marsh" at a site well located near the dam and recreation areas would receive heavy use by visitors.

Downstream Fishery

Prior to construction of Rend Lake, the Upper Big Muddy was assessed by Smith[10] as a problem area for fish populations due to oil well and domestic waste pollution, heavy siltation and severe desiccation within the basin during drought. Quoting Smith, "the low-quality water supports only the most ecologically tolerant and tenacious species of fishes in the middle and upper parts of the basin."

The low-flow augmentation release will substantially improve downstream water quality (see Section 4.2.2) and it is anticipated that the dam tailwater fishery will be excellent with the establishment of such species as crappies, bluegills, a few bass along with the catfish and bottom feeders.

Some problems had been seen with fish kills within the stilling basin below the dam (see Section 4.2.2.1) during periods of zero flow over the spillway. (During zero flow basin water was not circulated and dissolved oxygen dropped to lethal levels.) Corrective action has been taken by the Corps to eliminate this problem.

The establishment of Rend Lake eliminated the river fishery habitat which was marginal for a number of species. The existance of the dam prevents movement of migratory fish to the upper reaches of the Big Muddy, thereby eliminating such species if suitable upstream spawning habitat is not available.

The reservoir fishery represents a tremendous gain over that area of the stream habitat which was lost; substantial numbers of game fish are in evidence and a larger variety of habitat types will be available in the lake. The reservoir also will serve to buffer impact of pollutional loads carried by the upper Big Muddy Basin streams on

[10] Smith, Philip W., Illinois Streams: A Classification Based on Their Fishes and an Analysis of Factors Responsible for Disappearance of Native Species, Bilogical Notes No. 76, Illinois Natural History Survey, Urbana, Illinois, November 1971.

the downstream fishery. This, along with the low-flow improvement, will mean a significant betterment of the rating of the Big Muddy fishery given by Smith of "...good in the lower reaches, very poor upstream from Murphysboro."[11]

4.2.5.7 Conflicts Between Other Resource Management Activities and Fish and Wildlife Management

Water Levels

The water level fluctuations within Rend Lake have not as yet presented significant problems to maintenance of fish and wildlife habitat. Prolonged periods of high water levels do not normally occur during critical times for tree growth. Nor are there extensive, unattractive mud flats as a result of high water levels which gradually recede over an extended period during the summer.

The response by waterfowl and other species of wildlife to these changes wrought by water management have so far been outstanding. An excellent sport fishery has also developed.

It is probable however, that if water levels fall rapidly during spawning periods, it could have a significant effect on future sport fishing.

Water Quality

Present water quality within the reservoir is apparently sufficient to support the establishment of various fish and aquatic plant species. Potential problems do exist with various pollution sources within the upper Big Muddy Basin. The sources are discussed in Section 2 and later portions of Section 4. Considering the expected urbanization, existing poor soils, uncontrolled animal wastes as well as the lack of sewerage systems within the basin, it appears that storm water runoff could pose a bigger threat to water quality than the inadequate municipal waste systems.

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[11] Ibid.

Boating

While boating is well controlled by regulation, during the hunting season, if not carefully checked, fishermen may intrude on the refuge area so important to Canada geese and ducks at that time.

Wood duck nesting and brooding coincide with a period of intensive use by fishermen in the same area in April and May. The adults should not be disturbed during the courtship and nesting period and the young require the use of cover for security after they leave the nest. If disturbed by fishermen, they often become more vulnerable to predators.

Camping

Camping in the recreation areas during the deer season has in the past prevented opening these areas to deer hunting. The effect of closing the recreation areas to deer hunting is to afford a huge sanctuary for deer, resulting in a carryover of too many deer in terms of available habitat. An alternate is discussed in Section 5 which would relieve this conflict.

Coal Mine Subsidence

If subsidence occurs generally under the sub-impoundments, the pin oaks will die. They now provide a major portion of the food for waterfowl and other game species using these areas. Depending upon the degree of subsidence and slope created in the basin, it may be possible to modify the structures for increased water storage. This would be coupled with planting more pin oaks on the additional area to be managed as a greentree reservoir.

Urban Development

The extensive urban development which has been proposed contemplates the use of lands now being cropped. With the planned expansion of use by waterfowl plus a large deer herd, both of which hinge on availability of cultivated crops, it is likely that land will be taken for use by industry and housing which is needed for food production for wildlife.

Noise

Noisey industry and traffic noise from the busy freeway would seem to be limiting factors in the choice of homesites by wildlife. Yet this statement is refuted by the inspiring sight of thousands of Canada geese resting and preening in the backwater near I-57 just south of Mount Vernon. The beaver lodge in a similar location north of Benton demonstrates this mammal's disregard for traffic

noise since many wildlife species seem to prefer to locate their homes near the highway. The degree to which noise influences the use of living space is indeterminate for wildlife depending on the degree to which a species associates noise with security or perhaps a supply of food.

Undesirable Plants

When fields used for clean farming are allowed to revert to a natural plant succession for wildlife habitat purposes, some pest species of plants will inevitably appear. These usually tend to grow in a dense monotypic stand and are not palatable to livestock. Their seeds are wind disseminated. An example is Canadian thistle. It follows that a stand of thistle near the project boundary would produce seed that would blow over onto privately-owned lands creating a problem for the owner. This conflict recognized in the Wildlife Appendix and has been taken care of.

4.2.5.8 Economic Impact of Fish and Wildlife Management

At Rend Lake a highly productive and generally adequate area has been set aside for wildlife management purposes. With some modifications in management, large populations and diversity of game species can be maintained indefinitely. The area set aside for wildlife management should not be subject to attrition by subordinate consumptive uses. Pressure for allowing a chipping away at large tracts managed for wildlife invariably develops when consumptive uses are proposed for which can be claimed spectacular immediate dollar returns.

Such has happened time and again with other multi-purpose projects, especially those in which "area redevelopment" has been a primary justifying project purpose. The dollar return from wildlife management is extremely valuable and over the long run easily competitive with the return from many alternate uses.

The Nature of Fish and Wildlife Economic Benefit

Previous sections describe the impact of the Rend Lake project on fish and game in the Franklin and Jefferson Counties. For all species considered, there will be an increased population that can be harvested by hunters and fishermen. Of importance to the economy of the project area are the expenditures by these hunters and fishermen.

The hunters and fishermen will buy clothes, licenses, gear, bait, and ammunition in order to perform their activities. Additionally, desirable but not mandatory equipment such as boats, motors, camping equipment and decoys are purchased by a substantial portion of participants. Fixed recreation costs are transportation, food and

lodging, and entertainment especially for those hunters and fishermen from outside of the immediate area.

Where the money is spent on recreation demands, to a great degree, on the home location of the user. If he lives locally, he will spend less per outing but may spend all his money in the area. If he is from outside the region, he will spend more per outing but a considerable share of it will be at his point of origin. For example, it has been estimated that 75 percent of upland game hunter trips are by Franklin and Jefferson County residents. This high percentage will result in the total percentage of upland game hunter expenditures being high at local commercial/retail outlets.

The local beneficiaries from the fish and wildlife management practices are many: the hotel-motel operators, bait and tackle shops, boat and gun dealers, campground operators, to name a few. The benefit will also extend in general to the entire area in terms of increased land development and tax base.

Local Versus Regional Benefits

When defining benefits from the addition of an improved hunting and fishing resource, one is confronted with a difficult problem. The new facility will create new recreational opportunities, but it will also draw from the users of existing similar facilities. The "net" benefit to the local Franklin and Jefferson County economy will be substantially different from net benefits to the region. For example, a Benton resident who formerly fished at Crab Orchard Reservoir may now devote all fishing activity to Rend Lake. Similarly, a St. Louis resident may now decide to camp at Rend Lake rather than at Lake of the Ozarks.

Regional benefits will result specifically from new hunting and fishing activities by new users or additional activities by present users. These are those persons who otherwise would not have engaged in the hunting and/or fishing at least to the degree to which they now can and will.

Locally, the economic benefits from hunting and fishing are the increase in sales and services. There is no consideration of whether the activities would have been performed at other areas in the region.

So How Much?

It is beyond the scope of this study to develop dollar estimates for benefits accruing from hunting, fishing and other non-consumptive wildlife uses. (An adequate, uncontroversial method of fish and wildlife benefit analysis is not now available.)

Although we cannot offer a presentable dollar figure, consider what the annual economic impact might be in light of the following summary of facts:

- 1,300,000 Hunter trips per year (Section 3.2.5) were generated in Franklin and Jefferson Counties of which 75 percent were by county residents. The State of Illinois is aiming for 10,000 - 15,000 hunter days for geese and 40,000 - 50,000 hunter days for ducks at Rend Lake.

- A total of 16,000 fishing licenses and 9,000 hunting licenses were sold in Franklin and Jefferson Counties alone in 1972.

- Because most of the hunters and fishermen came from within 25 miles of the project, the expenditures by these people would be mainly in these two counties (Franklin and Jefferson).

- Rend Lake could possibly support a commercial fishery taking 25 lbs./acre annually. (18,900 acre normal pool at an average current price for commercial species at 12¢/lb.)[12]

- Increasing pressure on world plant and meat protein production capacity makes fish protein more attractive. Recent breakthroughs in process development have made production of palatable bread from fish flour feasible.

- The energy crunch will have an impact on useage of locally available areas for hunting and fishing. This is supported by the fact that in the August Busch Wildlife area in Missouri, public use in 1973 increased 3½ times over 1972.[13]

Based on the 1970 National Survey of Hunting and Fishing data, the value of the economic expenditures generated by the fishermen using Rend Lake during 1974 is a minimum of $425,000 and could possibly approach $500,000 annually. Based on the number of anglers who fished only the lake (not the tailwater area) from April 1 to September 30 only (and considerable fishing was done prior to and after the census period) our projected estimate for the census period was $411,907.

The above are just a few items of economic interest. If intense pressure develops for taking management lands out of production, an honest, in-depth, accurate comparison of economic and intangible returns from alternatives should be done by experienced recreation economists.

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[12]Conversation with Rend Lake Fisheries Manager, Bill Fritz.

[13]Personal communication with Richard Vaught, Chief, Wildlife Management Areas in Missouri, 1974.

4.2.6 AREA REDEVELOPMENT

4.2.6.1 Area Redevelopment - Definition and Scope

A basic purpose of Rend Lake is to create stimulus for reversal of economic conditions in Southern Illinois, and more specifically Franklin and Jefferson Counties. The economic stimulus will come primarily from the lake's capacity to provide a reliable water supply and from its development as a regional tourist and recreation attraction. The impact of these assets should be felt throughout the region and should create a favorable climate for the desired growth.

Some evidence of the growth can be seen at this time, but it is probably quite small in comparison to the lake's potential long-range effects upon industry, tourism and employment. It is difficult, however, to separate and identify growth directly related to Rend Lake from other redevelopment essentials such as highways, favorable community attitudes, capital, etc.

Generally, the environmental impact of area redevelopment manifests itself in side effects or secondary impacts of economic growth. These impacts are really secondary only as related to the project itself. Often to the people and communities in the area, they have far more effect than the primary purposes of the lake. The causes of these impacts and their consequences are closely interrelated, and a change in one area will inevitably generate widening pools of influence in the local area.

The study of redevelopment impact concerns itself with the assumption that growth is inevitable and will continue with Rend Lake playing a major role and does not attempt to closely distinguish between "direct" and "secondary" impacts.

Scope of Study

The basic concern of this area redevelopment discussion is two-fold:

1. To define the impact of continued lake operation upon the counties that contain it, and
2. To examine the impact that economic growth and change will have upon the lake and its setting and its users.

The impact of the lake upon area redevelopment does not confine itself neatly to the Franklin and Jefferson County area. A seven-county regional area has been defined and reviewed in Section 2 (See Figure 1-1) to give the reader a perspective of the extent and cause of the present social, economic and cultural conditions within the region. The discussion of area redevelopment impact in following sections assumes that the reader is familiar with the background material given in Section 2; however, the emphasis herein is placed upon Franklin and Jefferson Counties and the local area around Rend Lake.

Study Constraints

Substantial information exists analyzing historical trends both in Southern Illinois and the immediate Rend Lake region, and this has been summarized in this report. Analyses have been developed by several governmental and private planning agencies as well as in publications from Southern Illinois University. The primary measuring points are, of course, U. S. Census data published at ten-year intervals with the latest data published for 1970. At this time there is a relative scarcity of information available past this point. Most studies available for the area were done in the 1960's and many before the 1970 Census was taken. Many of projections and information are based on the 1960 Census data.

Thus, several difficulties present themselves in analyzing the impact of Rend Lake on local and regional economy:

a. Rend Lake was completed in 1971-1972 after the 1970 Census was taken and while some data is available on a yearly basis, for the most part a comprehensive survey will not be available until the 1980 Census unless regional mid-census studies are undertaken in 1975.

b. Due to its recent completion (1971-1972) much of its impact has not yet been felt, particularly in terms of land use and recreation. The initial recreational developments at Sandusky Creek have only been open for two years, and Marcum Branch will open this summer. The impact of the State Park, Conservancy District and future Corps developments are yet to be experienced.

c. During this period the Interstate system through the region was developed concurrently with the construction of the reservoir. I-57 now runs north from Cairo to Chicago through the region and immediately adjacent to the lake. I-64 coming east from St. Louis to Mount Vernon is now open to traffic.

I-24 southeast to Miami is under construction at the present time. Thus, as the economy grows, it will be increasingly difficult to isolate the impact of Rend Lake from the impact of the Interstate system in generating economic growth.

The problem of projecting future patterns based on historical trends becomes particularly sticky. The region is in a state of transition. Historical trends began to decline in the last decade and are now perhaps reversing themselves. Until the next census or a mid-census evaluation, the extent of this growth will probably not be known. While many of the population projections remained fairly accurate for 1970, it is felt that while accurate projections can be made, they will be increasingly less accurate in the immediate future. There can be sharp discrepancies between estimated and actual trends, particularly if a reversal occurs within the period between accurate measurement. This is most likely to occur in an area such as that around Rend Lake where an economically depressed area has begun to reverse itself, and some progress toward prosperity has been achieved for the first time in many years.

Major Impact Concerns - Outline

The wide range of Rend Lake management and operation activities conducted by controlling agencies along with those efforts of local governmental bodies and citizens groups within the area will directly or indirectly affect the shape and quality of the future environment around the lake. In the long run these practices or policies will also reflect back upon the lake itself and extend influence on the quality of Rend Lake recreational experience, its wildlife habitat, its water quality and other features, all of which are at least part of the impetus for area redevelopment.

The area redevelopment impacts will be broken down into two sections:

1. The economic benefit and development from the presence and operation of the lake, and

2. The environmental effects resulting from the growth and development attracted to the lake area.

4.2.6.2 Economic Growth (Jefferson and Franklin Counties)

The economic impact of Rend Lake will come from two sources:

1. The availability of water as an attraction for industrial growth , and

2. Development of Rend Lake as a recreational amenity aimed at attracting outside dollars and investment into the local area.

Once the region begins to grow, these direct benefits will in turn generate further secondary or induced growth within the local economy.

Impact: Industrial Growth Due to Adequate Water Supply

Franklin and Jefferson Counties have never had an industrial, manufacturing or commercial base. The area has gone from a basically agricultural economy in the early days to a coal mining boom area in the 1920's and finally to an area experiencing declining population, income levels and employment. This third phase of economic history, however, may have ended during the late 1960's as there is now considerable evidence of increased activity. This observation is predicated on two major physical changes that have been made in the immediate vicinity. First, in 1971 I-57 was opened between Chicago and Cairo. The east-west I-64 between St. Louis and Mount Vernon opened in 1974. Second, Rend Lake reached full pool in late 1972. Although it will be impossible to accurately assess the effect of these two major factors independently, together they will be the basis for economic growth in the two-county area.

Industrial Growth

Water supply, energy supply, adequate transportation facilities, adequate labor force, location and weather conditions are basic parameters for industrial growth. The study area has possessed these essentials for many years, with the exception of water supply and the possible exception of adequate highway transportation facilities. Until recently, industry has not been able to capitalize on the assets that do exist because of the lack of water supply. However, the construction of Rend Lake, the subsequent policy to supply water to the communities in the area, and the construction of recreational facilities will have substantial, positive impact on the economic base and industrial growth of the area. There is already considerable evidence of industrial activity.

Growth to Date

Although the intercity water system has been in operation only since August, 1971, there is evidence of industrial activity within

the service area. The most positive indication of what is happening to the economic community can be shown by actual cases of firms moving into the area as a result of the addition of water and transportation. These firms or others which had made a definite commitment to locate in the area were contacted in order to determine their nature and reasons for locating in the area. (See Table 4-3)

General Tire and Rubber Company - This is by far the largest industrial firm attracted to the area. They are presently completing a huge tire manufacturing plant which will ultimately employ 1,400 people. It is located in the Fountain Place Industrial Park southeast of Mount Vernon.

Norge Company (Fedders Corporation) - The company manufactures components for its washers and dryers at a plant in Herrin. Recently, they have expanded their operations to include administrative and home office facilities for the region.

McLean Trucking Company and Roadway Express Company - Both are trucking companies which have been attracted to Mount Vernon due to the combination of economic growth potential and the presence of good freeway access.

Mark Twain Boatworks - The firm is located in the Franklin Industrial Park near West Frankfort and manufactures recreational/fishing boats.

The Matte Company - Repairs and services mining equipment and anticipates increased mining activity.

Franklin County Industrial Park

Drainage Engineering - The firm is a distributor of plastic pipe and located in the Benton Industrial Park because of transportation/shipping facilities.

Superior Homes - Located in Benton Industrial Park and manufactures modular homes.

Field and Shorb Company - Located in Mount Vernon. The company is a wholesaler of plumbing, heating and air-conditioning supplies and anticipates activity in the housing industry.

Institutional Growth

Rend Lake Junior College is located adjacent to I-57 on the east side of the lake. Construction work on the first phase of the campus was started in the spring of 1969 and was completed in 1970. It

TABLE 4-3

PARTIAL SURVEY OF INDUSTRIAL/RECREATIONAL GROWTH IN TWO-COUNTY AREA

			Reasons for Locating in Rend Lake Area							
Name of Firm	Location	Type of Business	Water Supply	Recreation	Location to Interstate System	Labor Force	Other	Approx. Employee Increase Last Two Years	Future Expansion	Projected Expansion
General Tire	Mount Vernon	Tire manufacturer	x	x	x	x	Natural resources	100	Yes	1,400
Norge (Fedders Corp)	Herrin	Washers/dryers	x		x	x		200		
McLean Trucking	Mount Vernon	Trucking			x		Expand. market & growth potential	15	Yes	
Roadway Express	Mount Vernon	Trucking			x			6	Yes	
Mark Twain Boatworks	West Frankfort	Rec. Fishing Boats	x	x			Obtain SBA loans	200	Yes	
MAT Industries	West Frankfort	Mining Equipment					Mining activity	55	Yes	
Drainage Engineering	Benton	Wholesale PVC pipe			x		Shipping facilities	45		
Superior Homes	Benton	Modular homes	x		x	x		52	Yes	
Field & Shorb Co.	Mount Vernon	Plb. Htg.& Air Cond.	x		x		Anticipated housing activity	100	Yes	
Rend Lake Jr.College	Benton	Jr. college								
Lake Moses (USS Realty Develop.)	Benton	Residential developer		x						
Rend Lake Conservancy District	Benton	Recreation		x						

Note: This survey was conducted during informal discussion with company officials. The results shown are interviewer's own impressions and are not to be construed as "official" positions, plans or policies of the companies surveyed.

included administration and classrooms, science building, gym, student center and faculty buildings with investment totalling nearly two and a half million dollars. The second phase of campus development is under construction with an additional investment of nine to ten million dollars. The college is a two-year commuter college drawing nearly all its students from the immediate area. Enrollments have grown from 544 students in 1965 to approximately 1,300 this year. High school graduates from Mount Vernon, Benton, McLeansboro constitute the bulk of the enrollment. Ultimately, the campus has been planned for 5,000 full-time students. The employment at the Junior College is presently about 100 faculty, administrative and support employees.

Impact: Growth of Recreational Related Industries and Services Due to Rend Lake Development

Growth, to date, of development aimed at the recreational user market is minimal around the lake. This is primarily due to the recent completion of the lake and the fact that the public recreational facilities are even newer. The Sandusky access areas opened in 1972. Marc Branch will open this spring. The Jackie Branch and the Fitzgerrell State Park are now under construction. The Conservancy District is completing its golf course.

To date, the extent of private development has been scattered, consisting of local, small-scale facilities around the lake: two fish and bait shops outside the Sandusky access area, a few more similar facilities along Highway 37 and several privately-owned campgrounds within the area. Franklin County has three campground areas with 172 spaces already constructed within the vicinity of Rend Lake. In addition, there are three proposed campgrounds with an additional 130 sites and 80 more spaces in two campsites in Jefferson County.

Known Plans

Two major recreational areas are developing as a direct result of the lake:

1. Lake Moses U.S. Steel Development - U.S. Steel holds title to approximately 1,100 acres of land around three sides of Lake Moses just east of Benton. They plan to develop between 1,500 and 2,000 single-family homes on the site. The company has owned the land for 45 years, and it has remained largely idle until the completion of Rend Lake.

   Development is being primarily aimed at the second home or retirement market. Marketing and construction started in

the late spring of 1974. Lot sizes are from one-third of an acre to one-half of an acre each and range from $6,000 to $13,000 in price.

2. Gun Creek Resort - Rend Lake Conservancy District has outlined plans for a major recreational center located between I-57 and the east shore of Rend Lake. They project a cost of $13,349,900 for construction on the following facilities:

   a. Gun Creek resort/convention hotel - This hotel will contain between 160 and 240 rooms and will offer lounge dining, banquet and meeting rooms, and swimming pools and marina. The recreational center seating capacity will be approximately 1,400 people.

   b. 18 to 27-hole golf course with pro-shop.

   c. Marina - There are plans for three marinas. Between 350 and 800 slips will be available, and the total facilities should house roughly 1,000 boats.

Future Recreational Growth

Two types of development outlined here can be expected to increase as recreational facilities are developed around the lake: a range of motel, restaurant, resort and recreational supply establishments can be expected to develop within the area, and additional recreational or second home development can also be expected to continue.

Once the Conservancy District and Lake Moses developments are underway, their magnitude and assumed quality will begin to have their own impact upon the future development of the area. If well done, they will establish a reputation for the lake area and, in turn, attract more development and economic growth.

Impact: Secondary Economic Growth

The preceding section has been a summary of the firms and development attracted to the Rend Lake region much of which can be traced in one form or another to the result of the lake. Most of this direct benefit, it is apparent, will come through industrial manufacturing growth and growth in the tourism service industry. However, the effect of this growth will be felt throughout the economy and will generate much secondary growth not directly traceable to water or recreation alone. Some of the areas of the economy that will be affected are:

Construction

In 1962 the Outdoor Recreation Resources Review Commission published a report entitled "Economic Studies of Outdoor Recreation." In the studies several projects were thoroughly examined to determine the effect on the local economy of the construction of the reservoir and subsequent recreation activities. Several of the projects under study were located in counties which had dropped out of the main stream of economic progress and were considered problem areas. The following were the observations that were made during that study:

a. The construction industry, during the period of time that the dam was being constructed showed a spurt of activity.

b. After the dam was completed there was a brief lull in the local construction industry.

c. When recreation and industrial activities began after construction of the lake, construction employment as a percentage of the total economy again began to pick up and show signs of increased activity. The construction at Rend Lake basically took place in Franklin County and as can be seen from Table 4-4, the construction industry reached its peak in 1968 and then tapered slightly to the 1970 figures.

TABLE 4-4

CONSTRUCTION EMPLOYMENT AS A PERCENTAGE OF TOTAL EMPLOYMENT BY YEAR

	1950	1959	1965	1968	1970
Franklin County	1.3	1.8	3.5	6.0	5.0
Jefferson County	2.2	2.5	3.5	4.6	6.3

Source: County Profiles, State of Illinois, Department of Business and Economic Development

It would reasonably follow then that both Franklin and Jefferson Counties will likely experience increased activity in the area of construction. A higher percentage of total industry will be involved in construction than has been in the past, primarily due to the needs of the community in updating housing and industrial/commercial facilities.

Industrial growth has occurred at a faster pace in Jefferson County since the lake was established, and the construction industry has already seen evidence of increasing relative size. Note that Table 2-29 in Section 2 shows an increase of 3.8 to 6.7 percent in construction employment in 1970 for Jefferson County. The figures in Table 2-29 do not agree with the figures presented here in Table 4-4.

The primary reason for that is that two sources of information were used. If each table is used separately, however, a trend can be established.

The housing industry could also become particularly active as many of the homes in the area now are older and in poor condition. Much of the supply required as the population increases would have to come from new home construction.

Agriculture

As development occurs, land now used for agricultural production in Franklin and Jefferson Counties will be converted to urbanization for urban or suburban use. A rough estimate could indicate that 15,000 acres could be removed from agricultural production by the year 1990 to 2000.

This may or may not become a significant factor in agricultural employment, however, Agricultural employment in both counties and the State of Illinois has substantially declined since 1930, and this trend should continue regardless of the impact of the lake in urbanization. With the decline in employment, the number of farms should also continue to diminish; however, the average acreage per farm should increase along with productivity per employee. This increase in productivity is perhaps the most important ingredient in eventually balancing agriculture with the rest of the economy in the region.

Over a period of years, increased employment in other fields may have some impact upon the degree of part-time farming. Farmers within the growth areas of Mount Vernon and the lake will, of course, be directly affected. They will be faced with the choice of selling the land for development as its value increases. Those who wish to continue farming may become increasingly isolated and find the change not to their liking. For full-time farmers outside the zone of development, the lake exerts little economic influence other than in some cases supplying a reliable water supply. No irrigation for crops is intended.

Mining

The lake will provide a reliable source of process water, but this will not significantly affect production. Mining will likely increase, but for other reasons. These are discussed in Section 2.1.2.6.

Transportation

The transportation industry may well become a major industry within the area and may draw other firms to the source of good transportation and access. It may become a basic factor in shaping the

economic growth of the area, particularly in Mount Vernon and Jefferson County. The location at the intersection of I-57 and I-64 and a direct access to I-24 south of Marion will make Mount Vernon an attractive location for transportation companies. The presence of these companies will, in turn, be a tremendous attraction for industries that would be attracted by a concentration of trucking firms and convenient freeway access to a populous market area. (See Figure 2-16)

Financial, Real Estate and Insurance

These industries should experience some growth as a direct result of the overall economic development of the area and an increased amount of construction, housing and commercial development markets continue.

Change in Land Values

One very definite impact of the presence of Rend Lake is the effect it has had and will continue to have on land values. During the period of acquisition, land was purchased by the Corps of Engineers for approximately $240/acre. That price was considered fair by most of the recipients at the time of sale; however, a later survey reviewed that those persons displaced by the lake were finding it difficult to repurchase farm land for a similar price.[14] In any case, very soon after the land was purchased by the Corps of Engineers and particularly in the last two years, land values increased sharply. Although no lakeshore land is available for private development, the land bordering public lands has gone up in value between two and five times. Some land is selling for $1,000 to $1,500 per acre. In one case, one-acre lots were selling for 10,000 to $12,000 in the vicinity of the lake.

Impact: Future Growth

It appears that the area, Mount Vernon in particular, will continue its industrial and manufacturing growth. Further, the rate of growth can be expected to be quite rapid and perhaps accelerate even more once the impact of recreational development takes hold. This

[14]Cornwell, Ronald E., Survey of Families Displaced by Rend Lake, University of Illinois Cooperative Extension Service, 1972.

is not purely a projection; growth began to become prevalent in 1960's. "Development of Mount Vernon as a regional trade center in the past ten years (1962-1972) exceeded 1982 forecast by 33 million dollars or 62% of retail sales".[15] The present forecast is that manufacturing employment will exceed 1982 forecast with employment of 4,000 by 1975. Service industries in Mount Vernon over the past ten years have doubled their employment and have exceeded the 1982 forecast by 5,000 people.

In short, the community has already begun to grow at a fairly rapid rate, and it appears that this rate can only continue to increase. Some growth is also evident in other communities, but it is occurring at a substantially lower rate. As Mount Vernon grows, development can be expected to spread south toward the lake.

Impact: Population Growth

Table 4-4A shows the many population projections that have been made for Franklin and Jefferson Counties. There appears to be considerable discrepancy between the various agencies doing the projecting; however, the State of Illinois Bureau of the Budget projections are now considered official. (This is the first projection in Table 4-4A.) These forecasts are not intended to represent the most desirable changes in population for the state, but according to the State of Illinois, they are the most probable changes based on current information.[15]

Certainly these projections will be changed as additional information is made known, and, in fact, one change has already been made in Jefferson County due to the additional employment generated by General Tire Company. Just as historically there has been a decline in population along with a decline in economic health, it is expected that in the future (as the economic activity increases in intensity), the population of the two-county region will increase.

The total forecasted population for the two counties is consistent with economic estimates of the jobs that will be produced in the next ten years. Certainly Jefferson County and Mount Vernon could be singled out as the most likely county to industrialize. On the other hand, Franklin County may also be singled out as the county most likely to reap recreational benefits. It is doubtful that the population will continue to decline for the next 25 years as projected by the state. The success of the Lake Moses development alone could invalidate this projection.

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[15]Mount Vernon, City of, Application, Proposal Service Transportation System, 1973.

TABLE 4-4A

POPULATION PROJECTIONS

	1950	1960	1970	1980	1990	2000	2010	2020
State of Illinois Bureau of the Budget Prepared 1973								
Franklin		39,145	38,282	36,768	36,742	37,027	39,494	
Jefferson		*32,263	*31,459	*38,864	*39,435	*41,396	*46,123	
State of Illinois Dept. of Business & Econ. Develop.-1972								
Franklin	48,685	39,281	38,329	37,000				
Jefferson	35,892	32,315	31,848	30,000				
State of Illinois Dept. of Business & Econ. Develop.-1971								
Franklin	48,685	39,281	38,329	38,000				
Jefferson	35,892	32,315	31,446	32,500				
Big Muddy River Basin Coord.Comm. Comp. Basin Study 1968								
Franklin	48,685	39,281	(projected) 36,500	37,500	39,000	42,000	45,500	
Jefferson	35,892	32,315	(projected) 32,000	35,500	41,500	46,000	50,000	
U.S. Dept. of Commerce, Econ. Dev. Admin. - 1968								
Franklin	48,685	39,281	(projected) 28,322					
Jefferson	35,892	32,315	(projected) 28,729					
State of Illinois Dept. of Business & Econ. Develop.-1967								
Franklin	48,685	39,281	Low-41,700 High-44,700					
Jefferson	35,892	32,315	Low-37,000 High-42,600					
U.S. Army Corps of Engineers 1967								
Franklin	48,685	39,281	(projected) 36,500	37,500	39,000	42,000	45,500	
Jefferson	35,892	32,315	(projected) 32,000	35,500	41,500	46,000	50,000	
Greater Egypt Regional Planning & Develop. Comm. 1964								
Franklin			Low 32,900 Med 38,000 High 41,300	Low 28,400 Med 37,500 High 41,800	Low 32,100 Med 39,400 High 43,200	Low 37,500 Med 43,600 High 61,500		
Jefferson			Low 30,336 Med 33,396 High 37,263	Low 29,032 Med 34,397 High 39,350	Low 30,570 Med 35,154 High 40,048	Low 32,588 Med 36,595 High 40,828		

In summary, the regional economic benefit generated by the lake and the freeway network is just beginning to be felt. It seems apparent that the area will continue to grow economically. More people will live in the region. Mount Vernon will be the growth center in the immediate Rend Lake vicinity. If the overall national economic picture remains healthy, it is fair to say that both the rate and magnitude of the economic and population growth will exceed present projections.

4.2.6.3 Local Impact

Previous discussion has focused upon the regional economic impact of the lake as a generator of growth and employment within the two counties. It appears the lake is beginning to fulfill its stated purpose: To assist in a redevelopment and economic recovery of the area. The long-range economic impact on a region should undoubtedly be beneficial.

However, it is important to distinguish between regional growth and local impact. The benefits are not free, particularly to the communities and residents around the lake. The cost paid can take many forms: economic, social, environmental and aesthetic. It is futile to expect that this growth can be received without facing the problems it creates. The country as a whole is beginning to realize that growth and progress can have appallingly severe side effects if not approached with perception and planning.

The lake will inevitably attract development. Increased numbers of people will come to live and visit; the landscape will change as well as many of the original community values and relationships.

Management and Operations

It may seem unusual to examine these concerns as a part of an operations and maintenance review. However, the lake will have a far-reaching impact on the development at the local level. How the local governmental bodies and operating agencies plan for and react to the pressures and changes will, in turn, effect the lake and its immediate environment. Among the management policies and practices which will shape or influence this growth are the following:

- Corps of Engineers practice of retaining control of all lakeshore property.
- Corps of Engineers determination of recreational useage patterns around the lake.
- Corps of Engineers and the State of Illinois location of access roads to intensive recreational development areas.

- Type and quantity of facilities provided by the Corps and the State of Illinois and the market at which they are aimed.
- The performance of the Rend Lake Conservancy District in its extensive development plans.
- County and community land use regulations and controls. Perhaps more importantly their attitudes and responses towards growth and change.
- Policy and criteria behind water supply and its use as a land use control.
- Development of community services, particularly sewers, sewage treatment and their use as a land use control.
- Long-range plans of mining industry, their plans for their extensive land holdings adjacent to the lake and state control for reclamation of these lands.
- Major local developments.
- Promotional drive for growth within the area from a wide range of agencies and special interest groups.

Impact: Change in Future Local Land Use Patterns

In order to put economic growth, population increase, and lack of land control in proper perspective and to evaluate degree of result, it is necessary to attempt a projection of possible land use patterns which could develop in the future. This section presents a sketch of probable land use patterns for 1990-2000. This analysis looks at the development which has already occurred, considers features of Rend Lake which may dictate adjacent development patterns, and discusses possible patterns for various land uses.

Determinants

The lake is physically divided into two portions by Highway 183, both physically and functionally. The south portion, or Lower Lake, will be developed for intensive recreational use and will attract the great majority of recreational users and, consequently, the bulk of the development. The Upper Lake has less open water and much of the land is managed by the State of Illinois for waterfowl and wildlife management purposes. However, two major recreational areas will be developed in the area: Fitzgerrell State Park by the State of Illinois and the Jackie Branch recreational area. This pattern of recreational development plus the access to it will largely shape development within the area.

The lake is a regional recreational facility and most of the people will reach it via freeway. It is estimated that most of these visitors will come to the lake from the north through Mount Vernon. There are only three freeway exits which serve the lake in this area: one at Benton, one at Highway 183, which will probably receive the majority of the traffic, and one at Ina.

The probable future lane use patterns for 1990-2000 shown on Figure 4-5, demonstrate what shape these patterns may take. On the map the areas labeled "Park Development" are those access and park areas where extensive camping, launching, etc. facilities will be developed. The "Recreational Areas" simply include all the rest of the land within project boundaries where extensive developed facilities are not anticipated. These are not to be construed as specific projections for any particular parcels of land but rather as illustrations of general patterns that can develop as a result of the lake and its design and local conditions.

Land Use Change to Date

Land will be increasingly changed in rural to urban or exurban use. Evidence of the change is just beginning to appear. Land speculation is beginning to occur and land values have risen markedly. Land nearer a lake ranges from $900 to $1,000 an acre compared with average agricultural land costs of $350 to $400 an acre in Franklin County. Property is beginning to appear for sale and is being purchased for investment. Property values appear to have risen in both Benton and Sesser in excess of other towns farther from the lake. The Lake Moses Development, about 2 miles N.E. of Benton, is currently selling lots. Another housing subdivision is developing across the road just to the west of the Administration Building.

Within a year after its opening, two trailer parks and fish and bait shops developed immediately outside the entrance to the North Sandusky recreation area. Several similar facilities have begun to develop north of Benton on Highway 37. Again, these are related to points of access to the recreational areas. To date, most of the activity seems to have centered on an area south and east of the dam, perhaps because this area was initially developed for recreation. By 1976 seven private campgrounds had been established in the area to the south and east of the lake.

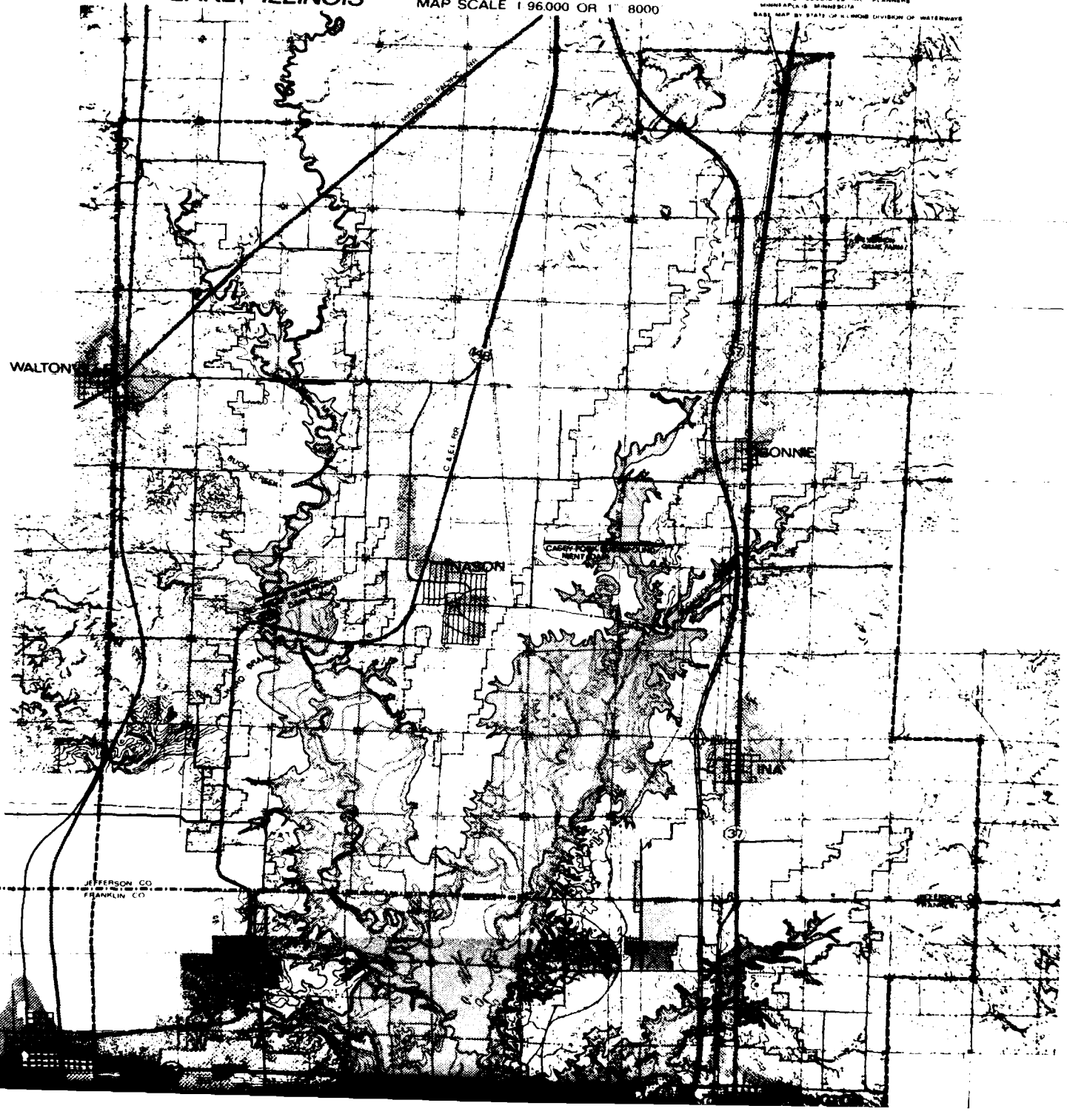
Commercial Development

The bulk of the commercial development generated by the lake will follow a pattern defined by the freeway exits and the access points to the major recreational areas. The Conservancy District Gun Creek Resort complex will be the single largest commercial development in the area. The initial plans for this complex, located in a portion of the northwest quadrant of the Highway 183 and I-57 intersection, call for a resort motel, marinas, restaurants, other motels, convention center and golf course. To date only the golf course has been completed. Their holdings south of the golf course

ENVIRONMENTAL IMPACT STATEMENT
ON OPERATIONS AND MAINTENANCE:

REND LAKE, ILLINOIS

MAP SCALE 1 96,000 OR 1" 8000



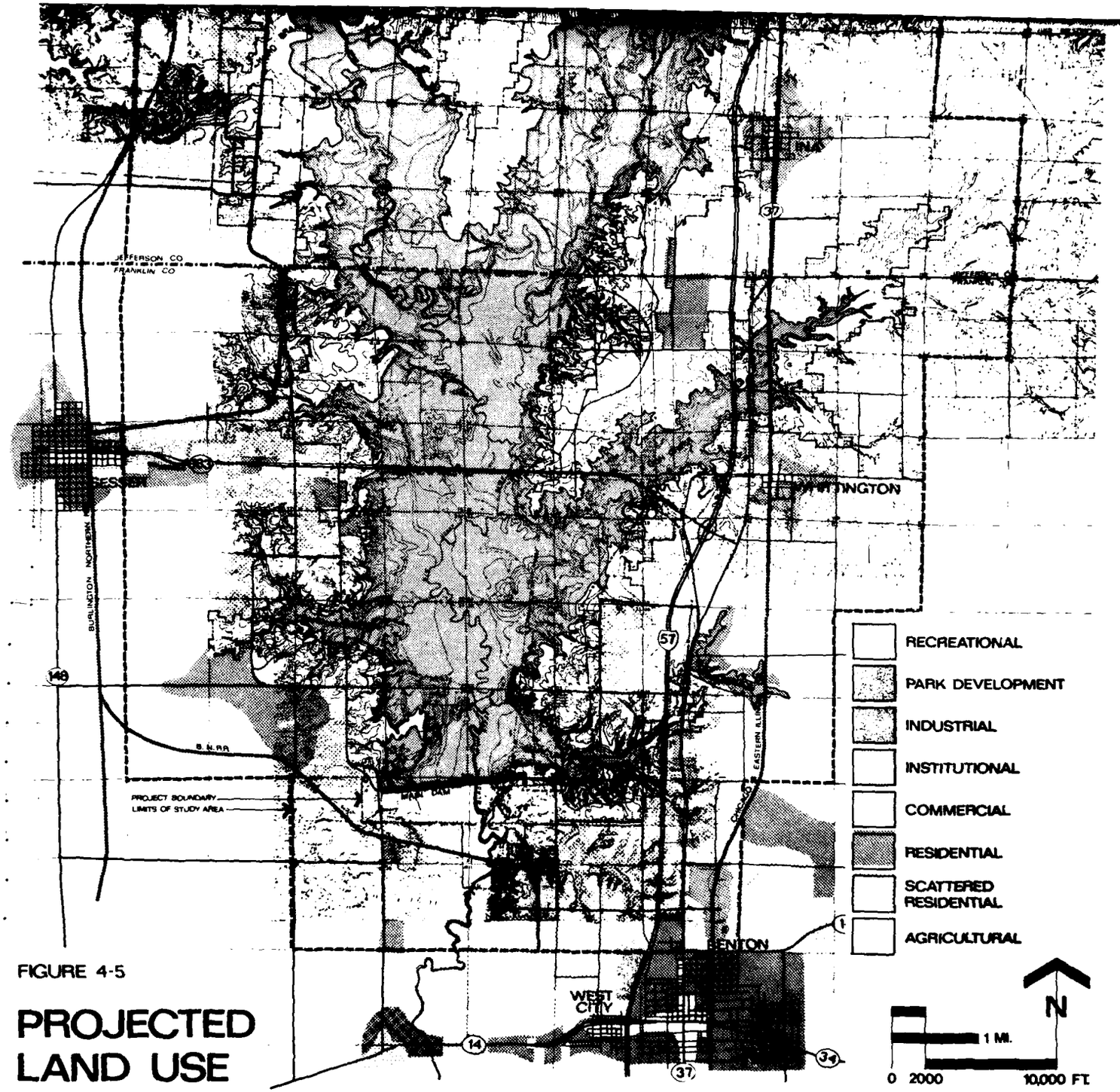


FIGURE 4-5

PROJECTED LAND USE

will be developed at a later date. The District also owns land on the east side of the lake north of Gun Creek Bay. They have no specific plans for these areas at this time, but a combination of more motel/ restaurant commercial, some cabins, and residential development is probable.

It can be expected that commercial development of a similar nature will develop at the Highway 183 and I-57 intersection; primarily highway oriented tourist facilities, additional motels, restaurants, gas stations and other related facilities. The Highway 37 corridor between Benton and Highway 183 could eventually become a corridor of commercial development serving both local and tourist needs. Initially, development can be expected to occur extending south from Highway 183 and north from Benton and around the two access points to the Marcum Branch and Conservancy District recreational developments. It can be expected that the number of people will readily attract commercial development. The first indications of this can already be seen with car dealerships, fish and bait shops coming into a strip of previously residential development.

An interchange has been constructed at the Rend Lake Junior College location, at Ina. Some commercial development can be expected in this area. Scattered commercial development could occur in the small towns further north on Highway 37.

Highway 13 west of the Benton I-57 interchange will also carry large numbers of people to the dam access and Sandusky areas. It too can be expected to develop as a commercial strip with primary highway or tourist oriented areas mixed with local, smaller-scale commercial development generated by a general increase in population and economic activity.

A smaller-scale type of commercial development can be expected at various points around the lake. Primarily, these will occur at the access points to the recreational areas. Highway 183 just west of the lake is a distribution point for recreational users south to the Sandusky area and north to the Jackie Branch area. This area can be expected to develop commercially and possibly extend west along 183 to Sesser. Mount Vernon will become a growth center, and be expected to extend south toward the lake.

Residential

As new jobs are created and people move into the area, residential development will occur around the lake. In addition to the development generated by an increase in population and economic well-being other sources of residential growth are evident in the area. The climate is good, and the area is relatively close to metropolitan areas. Vacation or second home development can be expected in the

area. Once a reputation is established, it can be expected that this type of growth will continue. Lake Moses Development east of Benton is evidence of this market.

The economic growth of Mount Vernon will also influence local residential development. The city is a major growth center within the region and it can be expected that people will work in Mount Vernon and live around the lake, particularly in the northern portion of the Upper Lake. The pattern of commuting is already well established in the area, and many of the wooded areas around the lake would make attractive home sites. The communities of Bonnie, Ina, Nason and Waltonville can be expected to become residential communities.

However, there are several deterrents to the type of lakeshore residential development that could normally be expected around a large body of water. The first is the traditional Corps policy of maintaining the actual lakeshore land and restricting access to its use. On the east side of the lake I-57 acts as a barrier, limiting the aesthetic appeal the lake may have for home sites. The land between the freeway and the lake is owned by the Conservancy District and the Junior College. Unless the Conservancy District develops its holdings for residential use, there is very little land available for home sites.

The situation is different on the west side of the lake but again there are deterrents to residential development. The presence of four mines lining the west side of the lake makes great portions of the area less than desirable as a place to live. Further, there is, at least at this time, no water supply available for residential users on the west side of the lake outside of the municipality. Due to this severe groundwater shortage, this could greatly limit residential development.

The area northwest of Benton below the dam has potential for residential development. It is heavily wooded and as such would make attractive home sites. Additionally, it is probably not valued highly for agricultural use and as such the purchase price could be relatively low. It is close enough to Benton and the sewage treatment plant to have good access to community services and facilities.

Industrial

The life expectancy of the mines around the lake is a somewhat unknown factor. A very general rule is that a five-mile radius is the economic limit around the single mine shaft, but the presence of the lake and development occurring on the east side may necessitate greater expansion by the mines on their existing holdings on the west side of the lake. Mines such as Old Ben No. 21 have been operating in the area for over 30 years. Others such as Inland and Freeman Orient No. 6 are relatively new and have just begun operation.

The picture is further clouded by the fact that there is another strata of coal below the one they are now mining. At this time the coal has a high sulfur content and is uneconomical to excavate. However, this may change with technology and demand. In any event, it appears that the coal companies will most likely maintain their land holdings and that mines can be expected to be part of the lake landscape for quite a few years in the future. Additional mine-working can be expected somewhere east of the lake, although it is impossible to pinpoint any locations at this time.

Industrial parks have been proposed at Sesser and have been developed at Benton. Little actual industrial development has occurred at either of these sites and it appears that their development will have very little direct impact upon other land use around the lake.

Open Space

Areas managed by the State of Illinois as wildlife management areas will be maintained as open space. The state has attempted to acquire additional land in the Nason Peninsula and may someday be successful in doing so. The state also owns 900 acres of land on a game farm northeast of Bonnie. Downstream from the dam the flood plain will remain as open space and will be developed as a part of the downstream canoeing and recreational corridor proposed within the Big Muddy Basin study.

Agricultural Land

It can be expected that the amount of agricultural land will continue to diminish as residential-commercial property develops around the lake.

Impact: Projected Local Population Growth

Overall projections of population growth for the two counties have been discussed in Section 4.2.6.2. Considerably less data is available for projections of growth within the local Rend Lake study area. The two sources available are both population projections derived for the purpose of estimating water usage within the overall region. Both have been tabulated on a community or service area basis. It should be noted that these projections are for water service areas and not just for communities and that the water service population is not necessarily the same as the total population. However, these projections do serve to show the projected magnitude of the expected population increase and distribution in the immediate Rend Lake area. (See Table 4-5)

If these projections are accurate, the local area will be facing a substantial increase in population within the next 20 years, and is in contradiction of the official Franklin County estimates which show a net loss for this time frame. Thus, one must differentiate

between regional and local changes, impacts and benefits when describing the impact of Rend Lake as an intended stimulus to area redevelopment on the local level.

4.2.6.4 Lack of Land Use Controls

Growth will inevitably occur, and it appears, rapidly. How it occurs and how well it is controlled will determine the future of the lake area. There are two basic requirements for controlling

TABLE 4-5

PROJECTED LOCAL POPULATION[1]

	1970 Census Data	1980 Census Data	1990 Census Data	% increase 1970 -1990
Benton[1] (includes West City, Steel City, and Lake Moses Development)	8,650	11,215	14,073	62.6
Ewing-Ina Water Commission[1] (includes Woodington and Lake Benton)	NA	1,983	2,544	-
Bonnie[1]	356	402	512	43.8
Rend Lake Water District[1]	NA	720	780	-
Waltonville[2]	384	1,000	1,250	225.5
Sesser[1]	2,957	3,150	3,820	29.1
Total	12,347	18,470	22,979	

1"Rend Lake Inter City Water System - Phase II Development" by Rend Lake Conservancy District, January, 1973.

2"Regional Water and Sewer Study" by Greater Egypt Regional Planning and Development Commission, 1969.

growth: first, an understanding of how the community wants this growth to occur and how to respond to its problems; and second, a means of insuring this growth does occur in the best interests of the community and that standards of land use quality are maintained.

Comprehensive Plans are completed for the two counties and most lake area communities, but there are now no means of implementing them. Most of the growth will occur outside existing municipal limits of control under county jurisdiction. Neither county has adopted zoning ordinances and, in effect, has no control over the growth that will occur, where it will occur, when it will occur or what quality development can be expected. No criteria exist by which the suitability of any change in land use can be judged.

Simply stated: neither county can now prevent any undesirable development from occurring around the lake nor encourage desirable development.

Once scattered, uncontrolled development gets a good hold, it begins to build on itself and to compound problems. Initially, the problem may be so small as not to cause alarm or even notice. Developers or a series of individuals can move into a platted area and develop minimal streets, septic fields, and water lines and build houses or commercial establishments. As the area grows, the need for better services becomes evident. At that point, the city or county is faced with an unattractive choice: whether or not to annex the area or extend services to it.

Neither choice is desirable. The city is faced with annexing what may be a problem and spending considerable money to extend services in an uneconomical manner to an area that may not have sufficient tax base to justify the investment. The other alternative is to ignore the problem in which the spread area begins to detract from the appearance of the community. In severe cases, living conditions deteriorate and septic effluent from failed drainage systems could possibly become locally dangerous.

The other options are possibly to attempt partial land use control. The first lies in the fact that the incorporated communities around the lake can zone land a mile and one-half beyond their corporate limits. As the municipal limits extend, the mile and one-half peripheral area also expands. It is conceivable, for example that over a longer period of time communities along the east side of the lake could develop interlocking zones of individual zoning and land use control. The solution is not a good one. First, no overall view of development and consideration of the overall good is possible on an individual community-by-community basis. Competition rather than cooperation could likely result. Second, it is not possible that the zoning could occur fast enough to keep up with growth. Communities would be faced with expanding to acquire and accept the costs of areas that may have already developed fully.

Local governmental bodies, including the Conservancy District, can enter into a variety of agreements with land owner/developers by which scenic or environmental easements can be obtained.

Impact: Lack of Policy for Extension of Water Supply

A basic tool which can be used by communities to control growth and development is the provision or refusal of community services, particularly sewer and water supply, to developers. In the case of the Rend Lake area, the lack of available groundwater makes this a particularly potent tool for controlled land use. Without the supply

of water, the rapid spread of scattered development in rural areas is greatly curtailed. This land development control tool, so effective elsewhere, is rendered ineffective in the Rend Lake area because water supply can be provided on three levels of government:

a. The Conservancy District sells water on a wholesale basis to communities within their region and to certain individual industries and some retail users.

b. The communities can, in turn, retail or resell water to other communities, individuals, developers, or water districts as they choose.

c. Rural water districts can sell water in a designated area outside boundaries of organized communities.

In short, there is no overall management criteria balancing sale of water with the general well-being of the county or community. Using the west side of the lake as an example, the situation can be illustrated as follows: A developer or industry can petition for water supply to the Conservancy District from their line running up the west side of the lake. The petitioner must be willing to either build his own distribution system or guarantee its construction cost. If this is done, the district has no criteria by which to agree to sell or deny water, however reluctant they may feel about doing so. (A precedent for retail sales has already been established, and if the district sells to one developer, they probably must sell to others.)

Assuming for now that the petitioner is refused, the same petitioner can then petition the nearest towns for water supply. In order to increase their revenue, the community may agree, although they cannot furnish corresponding sewer or other community facilities. The single line if built by the petitioner or community to an individual user, may open up a whole new area for additional construction and development. Precedence is set, and no policy is established--therefore, if "he got water, why not us?" becomes a difficult question to answer.

Still another option exists: a rural water district could be established by petition and could install a distribution system through which any variety of users could subscribe. The consequence of this action would probably be even worse. The systems, having no standards to meet, might end up being minimal single-line systems sprawling over a large area and developed with little regard for overall water resource planning or orderly growth for either the petitioner's system or the adjacent area. Such rural districts can have considerable local political muscle, and once established, it is difficult for the Conservancy District to deny or limit service to them.

Impact: Water System Service Outrunning Sewage Systems

See Section 4.2.3.

Impact: Soil Erosion Due to Lack of Sediment Control Practices During Development and Construction

See Section 4.3.4 and Section 4.3.3.2.

Potential Impacts Due to Lack of Land Use Controls

Underdevelopment of Valuable Land

Unless land use plans and controls are established, much economically valuable land could quickly become underdeveloped. This may not be of great concern at the present time but as growth and development occur, it will become evident when planning for long-range growth patterns. Land which may either become extremely valuable for major resort, motel or recreation-oriented facilities may be taken in initial years of development for substandard or poor-quality development.

Local fish and bait shops, service stations, food franchises and even resident trailer parks or quality residential development may develop initially on land which could later be used to create a far greater tax base or tourist and recreational attraction for the area. An example of the problem may be seen at Carlyle Lake where it is estimated that a shortage of zoning, roads and proper facilities could greatly reduce potential income to the immediate region.

The problem is two-fold: first, valuable land is poorly used and taken off the market, and second, the presence of a number of these substandard or poor developments will inevitably drive away quality development from locating nearby. Thus, a short-term gain achieved by immediate development may cost the community for years to come.

Loss of Environmental Quality, Open Space and Habitat

Presently the setting of Rend Lake is largely rural and untouched, and much of its beauty lies in this quality. People can move about and enjoy the lake without being crowded and can be completely removed from the urban environment. As development occurs, landscape will change. With careful planning and regulation much of this impact could be avoided or minimized. Without this control, the loss could be devastating. It is now possible to see a wide range of game animals and waterfowl on the site in relatively uncrowded, natural conditions. While the protected refuge and wildlife management land will remain, it is possible that critical areas of secondary habitat could be irretrievably lost or diminished. Further, development could occur in particularly critical environmental areas or crowd them so closely as to reduce their value.

Of particular concern would be development around the wildlife management areas and within the downstream flood plain corridor. In particular, the corridor mainly downstream from the dam would become quite attractive for residential development, given its somewhat irregular topography and heavy tree cover.

Loss of Visual Quality and Image

The lake does not have a great amount of heavily wooded shoreline nor any other major topographic features to screen surrounding development. Development around the lake will become visible from the lake itself, from within the recreation areas and to visitors driving around it. If major elements of tree cover are destroyed as a result of development, the loss will be acutely felt.

The development around the lake will provide much of the visitors' first impression of the area and create a large part of its image. Shoddy development or long strips of buildings and asphalt will dilute the tourist appeal of the lake. This does not necessarily mean that the lake setting must remain a total wilderness, but that if land development is planned with sensitivity and controlled, much of the character can be retained or in many cases improved.

Poor development of an extensive commercial strip along the highways leading from Benton to the lake will create a poor approach image. The greatest potential for influencing the image of the lake will occur at both ends of Highway 183 immediately adjacent to the site. On the west side of the lake this area is also the major access point to the Sandusky access areas and the Jackie Branch recreation area.

Large numbers of people will pass through the area and development will be attracted. It is conceivable that without controls a series of small fish and bait shops, service stations and hamburger stands could develop within this immediate area. They would be highly visible from the lake and would set much of the initial image of the area.

The I-57/Highway 183 intersection is probably the most critical in terms of image as it will be the entry point for the greatest number of people to the lake itself. Land use is under better control at this point. The Conservancy District owns the land and can control the quality of development. At this point, plans call for a high-quality resort/motel/restaurant complex on one side and a convention center on the other. While under control of the Conservancy District, there is a danger that the initial impression of the area will be that of a large parking lot, largely without tree cover or screening materials.

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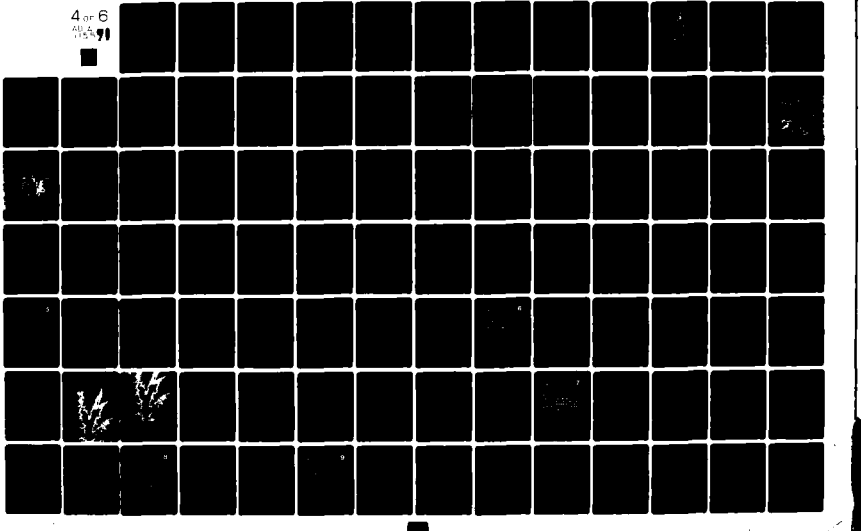

Impairment of Recreational Value

Quality recreational experience is as dependent upon the environment in which it takes place as it is on the activity itself. Different recreational users have different tolerances for crowding in a natural setting, hunters and fishermen probably being the most sensitive to change. The immediate danger here from development is probably not too severe since the bulk of hunting/fishing activity will occur in the upper lake area where development should be less intense and slower in coming. Around the lower lake, intrusion upon most of the camping areas will be somewhat removed and screened. However, people who leave Chicago and St. Louis are looking for an escape from an urban setting. They will not be inclined to come to a lake surrounded by strip commercial development and traffic just like the urban areas from which they came.

Cancellation of Redevelopment Resource

Most of this discussion has been centered upon the qualitative elements of recreational experience and environmental setting; however, destruction of any of these qualities will inevitably come back to the economy. There are innumerable examples of recreation areas that were "discovered" and showed initially a tremendous economic boom. Ultimately, the resource that gave them their reason for existence was exploited by developers to the point that the essential character of the resource itself was destroyed.

Once the natural attractions of the environment were diminished, the economy also dropped. Tourists avoided the ar[illegible] or chose to go to other areas offering better environment, better [illegible]commodations and a better setting for spending their leisure money. [illegible]xamples are common, Atlantic City and Wisconsin Dells, to name a few, [illegible]e once prosperous recreational areas of regional significance have now become areas of decay, low income and problems for the overall region.

Thus, it is conceivable to one day find that the highly successful area redevelopment resources of Rend Lake have been severely diminished or cancelled due to uncontrolled growth and development.

Impairment of the Living Environment

The uncontrolled spread of growth and poor or mixed quality of development will affect more than the lake and its recreational users. People living in the working area will have to live with the consequences every day. The results can take many forms. Residents who have carefully selected home sites or subdivisions may find commercial and tourist facilities moving into the neighborhood and attracting large amounts of traffic. Land and home values in desirable areas may deteriorate due to the development of trailer parks or other minimal

facilities next door. County roads selected for privacy may begin to carry large amounts of traffic as development occurs in the neighborhood. In the long run, this may also affect the community or lake area economics, possibly discouraging people from moving into the area and making the area more dependent upon seasonal tourism and recreational trade.

4.2.6.5 Cost of Growth to Local Government

Economic growth and increased population bring with them additional responsibilities for local government. Additional services are required. New firms and residences must have new streets, sewer, water, lighting, electricity and gas services. All of these must be constructed and maintained. New schools may be required or old ones updated and expanded. Fire and police protection must be expanded and new equipment, facilities and staff will be required. As growth continues, problems will grow in size and complexity, and new administrative staff will be hired or consultants retained. Perhaps a new level or type of expertise may become required as rural problems become urban problems.

All of these, of course, cost money, and local financial obligations will increase. The money will come from a variety of sources, the primary ones being property tax and general obligation funds or bonds for public works projects or school construction to be paid over a given period of time. How successful the county or city is in balancing the increase in tax base against its corresponding development costs will depend largely upon what kind of development occurs and the pattern of its growth. If growth is uncontrolled or so rapid as to surpass the ability of the county or community to deal with it, it is possible that the long-range costs may more than offset the advantages. This is particularly true in areas such as the one around Rend Lake that have primarily been rural and must suddenly deal with a range of urban decisions with far-reaching implications.

The level of community services and its financial position at the time rapid growth occurs is a major determinant in deciding the relative benefit of this growth. Community services and facilities from housing to streets to sewage treatment facilities are old and in poor condition. This is to be expected in an area that has experienced population loss, low incomes and low land and tax base values for nearly 40 years. Money has not been readily available, and the demand for better facilities has probably not been very active. Citizens have grown accustomed to the level of services they now have. Thus, the cost of growth, should it be extensive or particularly rapid within the immediate area, could become quite expensive. Each community must take a detailed look into the possible consequences of growth.

It is generally recognized that the more compact and orderly the growth, the more economical the extension of the community services becomes. Shorter sewer and water lines serve more people, less streets are required, police and fire services and response are better, etc.

While the precise definition of scope and magnitude is not predictable at this point, it is probable that the costs of economic growth to local governments will be significant and can only be counteracted by effective planning and development controls together with some help from federal, state or regional sources.

Cost-Revenue Inequities

From a governmental economic standpoint, two basic results are generated from growth: 1) Land and property values increase and the community property tax base is increased with it. 2) The cost of providing services and maintenance of facilities is also increased. Theoretically, the two will balance to the benefit of the overall area. Unfortunately, however, this is not always the case as some areas may become relatively wealthy as recepients of large tax base increase while others are required to provide a disproportionate share of the community services. In general, commercial and industrial development generates the largest amount of tax base while residential areas require the greatest amount of schools, parks, and community services.

Most of the smaller communities around the lake will probably remain residential in nature and relatively small in size. A substantial number of persons may choose to work in Mount Vernon and commute from other communities around the lake. These communities will have to provide services to these residents.

The second factor that may create this condition is the multiplicity of single purpose taxing units within the two counties. In fact, this proliferation of individual, single-purpose taxing units almost invites a disproportionate and unequitable distribution of cost to the residents. Thus, what may happen is that some areas or communities will require additional schools, parks, public streets and public work improvements and yet will not have the benefit of the commercial and industrial tax base generated by the lake and its water supply.

It is possible that some governmental agencies such as the Conservancy District may receive large revenues from recreational development but contribute no property tax to the communities which must

supply schools, cope with increased traffic problems generated by recreational development, create new streets and increase other public services to accommodate residents attracted to support the development.

The potential for considerable cost-revenue inequities in the region is obvious and extensive. Some form of regional responsibility for services, or equalization of revenues should be a current consideration.

4.2.6.6 Social Impact

The economic growth and the resulting environmental side effects previously discussed are inevitably as much social impacts as they are economic or environmental. By this time the reader should have a good view of many of the changes that will affect the social structure and the people living in the region.

It should be pointed out that the lake has been in the public eye for over 20 years. It has not been suddenly thrust upon the local community against their wishes. Further, it has not been an even mildly controversial issue within the region. In a region of high unemployment and a declining economy it has long been awaited as a major element in reversing these conditons. An array of local and regional groups have been engaged in promoting the economic redevelopment of the area based to a large degree upon the presence of the lake. The economic benefits have been anticipated for a long time, and it appears that they are beginning to be real.

Regional Influence

Several basic changes in the regional economy should occur, and the population characteristics in the area should reflect this. More jobs will be created and the rate of unemployment will be lessened. More importantly, the industrial base should become more diversified and less dependent upon the coal mining industry as a determinant of the regional economic well-being. With this diversity a wider range, hopefully a better choice, of jobs will be available.

A new range of jobs will in turn demand a better and more diverse range of skills within the work force as more professional managerial, white-collar and skilled craftsmen in construction and other trades will be required. The area has moved to create these skills. Good college level educational facilities and programs at Southern Illinois University and the local junior colleges will provide the opportunity for local people to take advantage of these opportunities. Overall, the educational levels will tend to rise more nearly approximating those found in the state and the nation.

With these increased opportunities the standard of living in the area should rise marked by an increase in personal or per capita income and hopefully a fewer number of lower income families.

With the improvement of job opportunities and opportunities of increased earning power, the outmigration of the younger people of the area should slow. While many will still leave, as they do in many rural areas, they will at least have a decent choice of staying and earning the type of living they desire. Further, a substantial amount of inmigration could begin to occur with the combination of economic growth and small town environment being attractive to many people now living in metropolitan or totally rural areas.

Local Impact

The regional economic benefits of the lake have been long anticipated as perhaps a partial solution to the economic conditions that have been prevalent in the area. It is important to distinguish between regional benefits and local impacts, between general trends and individual consequences. The lake will inevitably attract development; increased numbers of people will come to live and visit; the landscape will change as will many of the traditional community values and relationships. At this point in time it is not completely clear what direction the change will take. The lake is so new that many if not most of the problems or benefits have only begun to appear. They must therefore be dealt with on a potential or probability basis. Some basic observations can be made:

- Not everyone will be helped. Those helped are not necessarily those who need help. A distribution of economic benefits and cost will not be uniform. This applies to both individuals and communities.

- Things will not be the same, but better. They will change irreversibly. The change will not be to everyone's liking or benefit. Further, the change will be substantial, capable of changing economic, physical and perhaps social structure of the local lake environment.

- Regional economic benefits do not necessarily constitute corresponding benefits for individual or local communities. In some instances short-term problems may overwhelm and destroy the potential for long-range benefits.

- The rate of change itself will probably be the single greatest impact upon the area. Economic growth will be generated by more than just the lake. A combination of factors generating economic growth appears to be happening currently within the area. A combination of major freeway systems will intersect between Mount Vernon and Marion. This will be an even greater cause of growth and change in the area than the lake. The energy crisis has put a renewed emphasis upon local coal production, and in Jefferson County coal reserves are just beginning to be tapped.

All these factors individually will draw people to and around the lake. Together the rate of change and growth should be even more rapid. The history of the area makes the rate of change and its effects more deeply felt. The region has lagged behind the rest of the country for nearly 40 years. Traditional values have remained and become more firmly entrenched. A need for change has not been evident and many of these values have not been challenged or diluted as they have within the rest of the country. Set against this background the impact of change will no doubt be amplified and more severe.

The Growth/No Growth Conflict

There are two opposing points of view regarding growth in the lake area: 1) those promoting growth, and 2) those opposed to it. Many people, particularly those that have lived in the area for a long time in small towns or farms, are reluctant to accept or are outright opposed to change. They, no doubt, resent the influx of people crowding into their areas. Many of these people have lived with or seen hard times and may well not want to share the good or better times with latecomers into the area. Necessary land use controls are often regarded as an infringement of personal freedom. They probably value the rural qualities of the land and the traditional community values much more than commercial growth.

On the other side are those people who are actively promoting growth, new industries, new jobs and more people. Many of these people have worked long and hard to see the realization of the end of the economic hardships in the area, and it appears their work is beginning to pay off. Now that water supply and recreation are available, the drive for growth is gathering momentum. One is surprised at the depth, range and ability of promotional agencies within the area. It is evident in nearly every governmental agency: the Conservancy District, Southern Illinois, Inc., Office of Business and Economic Development, local Chamber of Commerce, industrial park commissions, and now real estate and financial people.

The growth and no-growth factions both occupy positions of influence and power within the two communities and region. Those who oppose the growth and wish to maintain the traditional values for the most part control positions of responsibility within the county and township governments. Those promoting growth are generally those involved in positions of financial authority or involved in government and civic affairs within the individual communities. Probably those promoting growth have better tools at their disposal to carry out their objectives, and they can attract, promote and financially back new roads, new business and new subdivisions.

Areas where conflict may be strongest might be smaller towns or rural areas where many people, particularly farmers and older

people will receive little economic benefit from the presence of the lake and, in fact, may be economically hurt by the growth it creates. Another potential source of conflict could be in the school systems. Newcomers or younger people may vocally demand different standards or methods of providing education than exists now.

The increase of people in the area along with younger people staying in the area will cause some change in itself. These people may well have different standards and expectations in terms of public services and facilities, housing and education. These people will desire a greater voice in how these decisions are made and what standards are adopted. Adoption of these standards may well increase costs to people who do not feel they are worth the expense. Traditional sources of power and influence within some communities or areas may be threatened and the "outsiders" and their requirements may be resented. This may be particularly true of those who are receiving no economic benefit from the increase in population.

Possible Real Suffering for Older Persons

The region and the two counties have an extremely high proportion of older people in its population. These people will probably be the most seriously affected by the change and due to their large numbers, the overall magnitude of the impact will be greater. First, they will not be helped. These people generally have the lowest level of job skills and education levels and will be among the last to be hired. Thus, an increase of employment opportunities may mean nothing to them.

Further, they will probably be hurt by the change. As the standard of living increases, the cost of living will increase with it. Many of these people are on fixed incomes and while these incomes have been quite low, the area's low cost of living has made them adequate in many cases. Taxes have been low, housing costs have been extremely low because their communities have not had to extend public works facilities or services. This will change. Taxes will increase, housing costs will rise and marginal income levels may become inadequate; people may be forced to skimp on food, clothing and other essentials to keep their homes. Other costs will accrue. Traffic will increase, making it harder for them to get around. Local stores will become supermarkets, and existing neighborhood relationships may be changed.

This possible problem set for older citizens is not overstated. It has happened so many other places as to be a rule. Thus, the impact of change may be magnified because of its rapidity and its action on the previously unchallenged existing social environment.

Local Economic Benefit

There is no reason to assume that the bulk of the wealth generated by the lake will be retained or experienced on a local level by

local people. Outside banks or other lending institutions, developers or other investors may well acquire and develop the prime pieces of property in the area. The economic benefits generated by the lake may be hard to understand for a man who opened a small-scale facility catering to tourist or recreation use and a few years later sees his business going across the road to a large sophisticated commercial enterprise.

Loss of Local Accessibility

The recreational amenity the lake provides will not be enjoyed only on a local level. The lake setting at this time is rural and largely untouched, and this naturalness provides much of its beauty. The ability of local residents to enjoy this beauty on a casual everyday basis will be diminished as development occurs. By design, the lake is a regional, commercial facility aimed at attracting outside money and dollars into the local community. This does not mean, of course, that the local people cannot use the facilities. But those who place a primary value upon its present unspoiled condition, may find their enjoyment severely curtailed. Crowding may well be experienced and resented most by local hunters and fishermen who may begin to lose the solitude, privacy and natural environment that they expect to be a part of these recreational pursuits.

Summary

All of the above observations are intended to show that while the area may be experiencing economic growth on a regional basis, and the normal indicators such as per capita income and unemployment may be improving, there may be large numbers of people in the local area who do not share this prosperity and may, in fact, be disadvantaged due to its presence. Perhaps there is really no way that tension or loss of sense of community with the influx of new people can be prevented, but with some planning and foresight many of the potential problems within the area probably can be avoided.

4.2.7 NEW AND CONTINUING CONSTRUCTION

4.2.7.1 Rend Lake Conservancy District Development

The following discussion pertains to the original plans formulated by the Conservancy District. Many of the elements of the initial plan and the consequent timetable have been altered and the whole plan is in the process of being revised. Since it is not known at the time of this writing (early 1976) what specific features will be included in the revised plan, the following assessment of impacts relates to the features of the original plan.

Project Description

The Conservancy District owns a total of 2,500 acres between the freeway and the lake (see Figure 1-2) and leases another 830 acres of public lands to the east of the Corps easement. The Gun Creek area at the intersection of Highway 183 and I-57 is the area now planned for development. In the original plan the facilities to be developed included:

- Resort convention hotel of 140 to 160 rooms including convention, dining facilities, marinas, swimming pool and other associated recreational activities.
- A 27-hole championship golf course and pro-shop.
- Three marinas.
- Commercial motel and restaurant development including 260 overnight rooms and a complete range of eating, lounge and banquet facilities.
- A 59,000 square foot exhibition hall/convention center.
- 25 to 120 Rental cottages with accompanying recreational facilities.

These are to be developed on a total of 470 acres. Figure 4-6 shows the proposed site plan as originally proposed.

Magnitude of the Project

This development is probably the most critical single piece of land development that will occur at the lake. Visually, it will be the most prominent piece of manmade construction from the lakeshore, from Highway 183 and from I-57. It will be located at the most heavily used interesection at the lake. It will set the standard for much of the rest of the lake development, and its standard of design could establish the reputation of Rend Lake. Originally, an investment of $11,460,000 in facilities and land costs was projected, with a total annual income of $1,180,000 when all facilities are completed. Many jobs could be expected to be gathered and more than two million visitors annually are attracted to the Rend Lake area.

Planning

Several planning studies dating back to the early 1960's have been completed regarding this development. The latest and most definitive, leading to the actual proposal of facilities and early

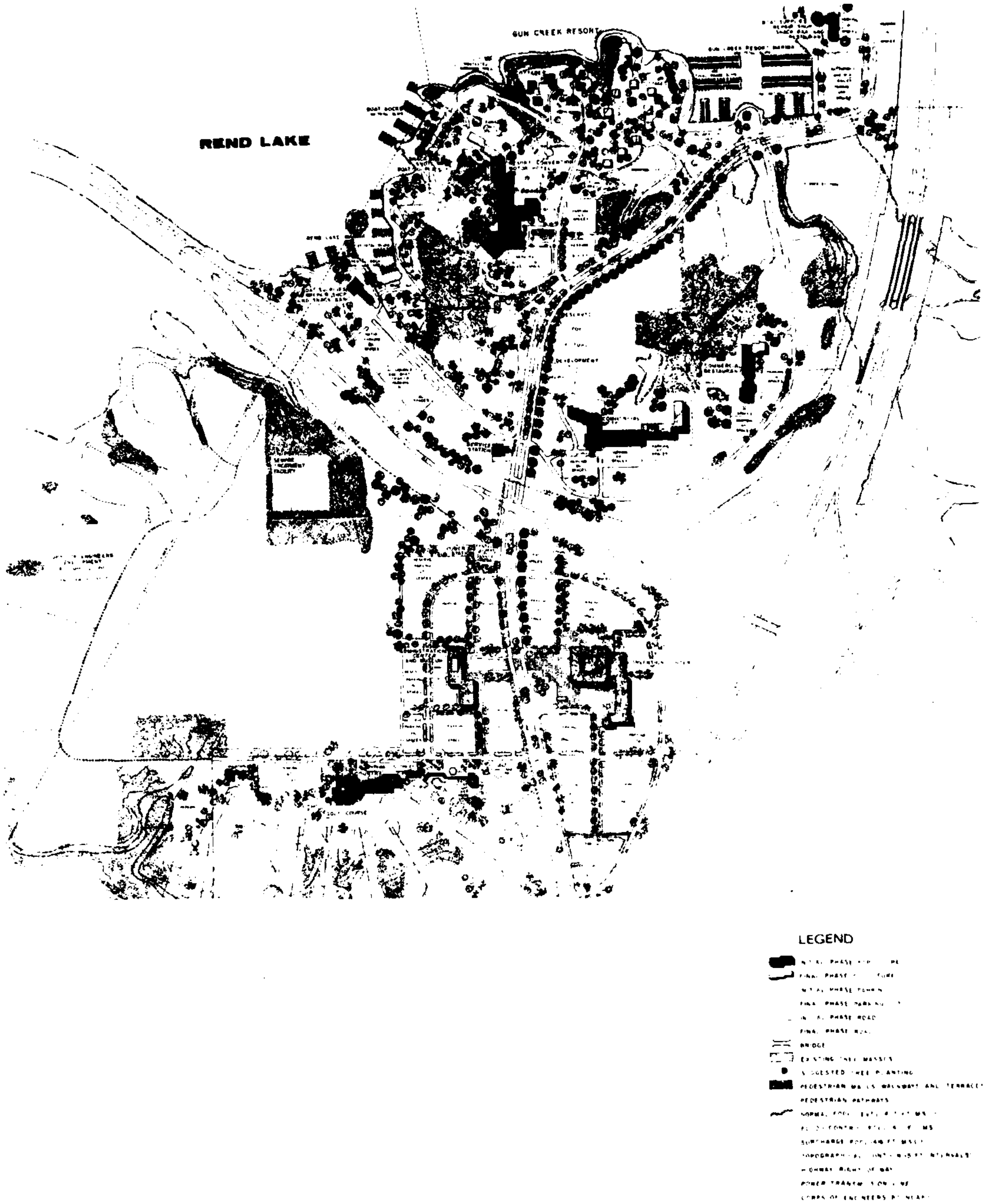

FIGURE 4-6
SITE PLAN-GUN CREEK RESORT
REND LAKE CONSERVANCY DISTRICT

JULY 1971

THE PREPARATION OF THIS MAP WAS FINANCED BY THE ECONOMIC DEVELOPMENT ADMINISTRATION CONTRACT NO [illegible] PROJECT NO [illegible]

GENERAL PLANNING AND RESOURCE CONSULTANTS
[illegible] DE MUN AVENUE ST LOUIS, MISSOURI 63105

site plan is "Recreational Development Program Rend Lake Area" by General Planning and Resource Consultants, St. Louis. This report has also looked at land use around the lake and established a competitive position in the recreational market for the proposed facilities. The intention of the overall planning is to provide a high-quality, coordinated resort complex capable of attracting people throughout the Midwest.

Impact

Land in the proposed Gun Creek resort site is perhaps one of the single most attractive parcels found around the lake; a mixture of wood lots and small meadows on a peninsula sticking out into the lake. The shoreline is heavily wooded. Thus, the land itself is well suited for almost any recreational use including wildlife management, and camping, as well as the proposed resort complex. The presence of I-57 and Highway 183, however, effectively cut the site off from adjoining parcels of land and somewhat restricts its potential for upland wildlife management. It would not be able to draw upon or fit into a wider habitat resource base for this kind of function. Undoubtedly, camping would be an attractive use of the land along the lake but would be less desirable near the freeway or Highway 183. The primary value of this land is created by the presence of the two highways and the traffic they generate. It is probably the single, most valuable piece of commercial property available around the lake.

The land south of Highway 183 has a different character. It is for the most part flat, used for agriculture with scattered areas of trees. The sewage treatment plant which will serve the proposed development will discharge effluent into Rend Lake at a point screened by a grove of trees immediately south of Highway 183. This is not as good an upland habitat as that found in other areas around the lake and would probably not directly complement any wildlife management areas as recreational plans are now drawn.

While the pro's and con's of possible use of the land has been presented, land will be lost as habitat or natural setting around the lake for those who value this quality. At this point in time the same projection is probably true for the rest of the Conservancy District land. It is all projected for development and no preservation area, as such, has been set aside. For the most part, however, the remainder of the land has no unique environmental amenities or major areas of excellent habitat existing on the site.

The Visual Impact

The Conservancy District Gun Creek Highway 183 development will be the single greatest element of urban change within the lake setting, both in terms of view from the lake and from the freeway and highway approaching the lake. Nearly all the shoreline in the Gun Creek area is wooded . Approximately 60 percent of this timber will be lost and replaced by marina or swimming facilities.

No data is available at this time on the Gun Creek skyline. Much depends upon the height of the buildings proposed and the value the district places upon the tree cover in the area. Large masses of trees exist on the site and it would be possible to retain some of the original character of the site, if it is not lost during construction, so visitors can see the lake from their room or restaurant.

The Conservancy District developments will set much of the image for the entire lake. Looking at the site plan as proposed the effects would be mixed. The golf course will be an enormous asset in terms of image. To a lesser degree, the ponding areas/marina complexes, if particularly those just off the freeway, could create a strong positive impact for the entire lake. On the negative side, the proposed convention center is highly visible and is in effect an island surrounded by approximately 2,500-car parking lot with little visual screening or plant materials to soften the blow.

Land Use/Development

High standards of development were set by the Conservancy District. No architectural character has been established at this early date. The golf course is an excellent facility and should be an asset to the local area as well as the Gun Creek Resort.

Erosion

Soil erosion problems are likely to occur during construction resulting in localized areas of turbid and unattractive water quality. This will become even more critical when the first facilities, the resort and marina, are in operation and people are using the site for recreation. Sediment levels in the lake are already high; and if no sediment control measures are taken, shoreline waters and particularly water in the marinas may become unattractive as the turbidity is increased and further aggravated by extensive boating. Periods of low-lake water level would further increase the magnitude of the problem.

Unfortunately, the construction season and recreation season generally coincide. Assuming that 20 to 40 acres could be under construction in a given year, approximately 2000 to 4000 tons of sediment could be emptied into take each year at a conservative rate of 100 ton/acre (table 4.7).

This would be a small percentage of the total estimated sediment load entering the lake in a given year. Thus, the problem is more localized, affecting the Conservancy District itself. Development of some mud flat areas could occur during low water periods, although these would more likely occur on the northwest side of Gun Creek Bay where shoreline is much flatter. Exposure during low water levels here is more extensive.

Nutrient Loadings Increased

The sewage treatment plant to serve the Gun Creek Resort area is being proposed to have a design discharge of 250,000 gallons per day. The proposed plant will have phosphorus removal, and assuming a phosphorus concentration of one milligram per liter and a total nitrogen concentration of four milligrams per liter, the plant will yield approximately 750 pounds of phosphorus and 3,000 pounds of nitrogen annually at design discharge. These phosphorus and nitrogen loadings represent about one percent of the present phosphorus load and approximately one-half percent of the total nitrogen loading to Rend Lake.

Since the nutrient loading from this source is such a small portion of the total nutrient load to the lake, it is doubtful if this discharge will have a significant impact on the total algae growth in the lake when all sources are considered. The nutrients from this source, however, could have a significant impact on algae growth in the immediate area of the sewage plant discharge. The impacts would be in the form of increased algae growth and increased growth in bottom vegetation. Since this would be near a shallow, high-density use area, this could have a significant impact on the aesthetic quality of the resort.

The other significant source of nutrients from the project is surface runoff from developed land. Throughout this study, a value of .5 pound of phosphorus per acre per year and six pounds of nitrogen per acre per year from developed land has been used. (See Section 2.1.4). If these unit loadings are applied to the 750 acres of the Gun Creek Resort, the total phosphorus contribution is 380 pounds, and the total nitrogen contribution is 4,500 pounds. The phosphorus contribution from the developed land area is roughly less than one-half of the loadings from the sewage treatment plant. The nitrogen

loading from the land is approximately 50 percent greater than respective loadings from the sewage plant. Nutrient loadings from both land and sewage plant sources can be expected to encourage an increase in the algae and weed growth in the area directly adjacent to the Gun Creek Resort.

Other Potential Problems

The other two potential water quality problems which could result from the Gun Creek Resort are: oil washed from the parking lots during runoff will reach the lake and form an oil film close to shore and effluent from the sewage plant could affect the water quality at the water treatment plant intake located eight miles southwest of the development. Whether the sewage effluent will influence the quality of the water at the water intake, should receive further study.

Irreversible Losses

The inventory of archeological sites indicates that developments on the Gun Creek and other Rend Lake Conservancy District lands may conflict with known or suspected archeological sites. With the extent of grading, paving and construction in the Gun Creek area, it appears that most of the existing sites will be completely destroyed and at least a minimal salvage exploration effort should be undertaken.

4.2.7.2 Impacts of Other Planned Construction

Other construction underway within project boundaries is enumerated in Section 1.5. Impact of these tasks will be similar in nature to those discussed above for the Gun Creek development.

Soil erosion during construction is a major problem encountered with any construction activities in the area. Sections 4.3.3 and 4.3.4 discuss the magnitude of erosion problems from developing land.

No on-going impact other than the problems associated with the commitment of relatively natural areas to public use is foreseen.

4.2.7.3 Economic Impact

The major positive immediate impact of new and continuing construction is the continuing growth of the local construction industry. An approximate federal and state construction expenditure of $30,000,000 over the next five years is foreseen. (This does not include Rend Lake Conservancy District construction which will be supported by various federal grants.) This impact contributes to the net value of the lake project as a stimulus to area redevelopment. (See Section 4.2.6 above)

4.3 RESOURCE MANAGEMENT

The previous section, 4.2, describes the impacts of the various activities, plans, policies, etc. undertaken by the various authorities controlling the destiny of Rend Lake aiming towards achieving the various purposes for which the project was created. The emphasis to this point has been upon the area-wide influences of flood control, downstream water quality control, water supply, fish and wildlife populations, recreational facilities and activities, and area redevelopment. Effects of construction activities planned or currently underway were also discussed.

Discussion of these impacts with its emphasis on area-wide social, economic, aesthetic and environmental effects, pointed out that invariably the changes taking place, due to Rend Lake's influence upstream, downstream and in adjacent communities, eventually rebound and in turn exert influence on the lake itself. For example, we have seen that the efficiency of Rend Lake Conservancy District water supply system in serving communities previously water-poor may cause considerable problem with septic tanks now overloaded which discharge sewage overload. The great positive benefit of water supply then, in turn, produces a large potential water pollution problem for Rend Lake.

This section, 4.3, will explore those impacts which are unassignable to specific Rend Lake project purposes and will attempt to "add up" those impacts on the Rend Lake resource itself from changes within the Rend Lake watershed caused directly or indirectly by the project purposes. Areas of specific concern (in addition to those discussed in Section 4.2) are:

Mineral Resources
Land and Vegetation
Soil Erosion
Lake Water Quality
Air Quality
Noise
Aesthetic Resources
Public Health and Safety (as related to Rend Lake users and resources)

4.3.1 MINERAL RESOURCES

The Corps of Engineers and others exert some control over vast mineral resources lying under the Rend Lake project boundaries. Oil has been subordinated to the project yet it is still accessible and the Corps can negotiate leases and licenses to continue extraction, renew exploration and develop new wells theoretically at any place within federal lands and waters. Also, coal rights have been purchased only under the main dam and sub-impoundment dams. Surface access to mines on federal lands is limited here, yet development of new shafts is open and negotiable. Thus the mineral resource situation is open-ended, coal mining is active, oil production winding down but future activity is not precluded.

4.3.1.1 Environmental Concerns

Coal

There are presently five active mines adjacent to the Rend Lake project. These mines are removing materials from beneath the lake as shown in Figure 2-6. Subsidence is expected for the mined areas, due to the method of mining.

Local geologists indicated that, with the room and pillar removal mining methods, the mining of the Herrin (No. 6) coal results in subsidence of 40 to 60 percent of seam thickness in the project area. This means that 2.8 to 4.2 feet of settlement can occur when the seven foot thickness of coal is removed. Average values

shown in Brauner[17] support the above subsidence estimate. For the purposes of this report, the average subsidence is estimated as four feet.

The nature of coal mining operations requires that additional shafts be drilled at times into working areas of the mines. These are either for ventilation purposes or to provide additional access points for the underground workers. The access points are justified on the basis of safety (emergency entrance-exit) and economics (travel distance to work area). There is presently one ventilation shaft near the limits of the Sandusky recreational area. More will be required for efficient removal of the coal.

Oil

Oil field operations result in the installation of facilities which may have an effect on the environment. These are brine and oil storage tanks, pipelines, access roads, and the pumping facilities. The appearance and noise effect of the wells at times may be noticeable.

Area Economy

The coal mining activities provide a strong base for the economy of the entire Southern Illinois area. The importance of a viable coal industry is recognized. Because of the surface damage caused by underground mining due to subsidence, wise land use will require careful planning of future mining areas. Developments such as the Rend Lake project, where few permanent structures are needed, is a very compatible surface land use.

4.3.1.2 Coal Resource Management

Surface Subsidence

When land was purchased for the Rend Lake project, the Corps elected not to acquire the sub-surface rights beneath the project except beneath the dams. The expected subsidence, therefore, is a given for the project and results in both positive and negative impact on other aspects of the project.

Because of the mining methods used in the Herrin (No. 6) coal operations beneath public lands, subsidence will occur beneath

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[17]Brauner, Gerhard, Subsidence due to Underground Mining (In two parts) 1. Theory and Practices in Predicting Surface Deformation, Information Circular 8571, U.S. Department of the Interior, Bureau of Mines, Denver Mining and Research Center, Denver, Colorado, 1973.

much of the project in the future. This subsidence will have a very beneficial effect on the water supply and recreational aspects of reservoir management. The lake depth could increase up to four feet and result in more usable water areas. The increase in lake volume will tend to compensate for losses resulting from expected siltation.

On the other hand, when mining occurs at specific areas of the project, there could be an adverse effect. Presently developed recreation areas at Sandusky, Marcum Branch, etc. may have installed facilities which will not tolerate a grade change of 4± feet. Examples are breakwaters, boat ramps, access roads, structures, water lines, etc. The green tree reservoirs which are intermittently flooded may be permanently inundated as the water will stand at a higher level.

Subsidence related problems can be seen on the project lands in the form of broken water lines. In the adjacent local areas subsidence related problems are also found. The runway at the Benton airport has settled, causing ponding of water in low areas and county roads show evidence of subsidence in several places.

In the future, areas of mine activity will subside after working. Figure 2-6 shows the presently mined out areas and also the inferred east limits of the "lower" sulfur Herrin (No. 6) coal. The remaining Herrin coal should be the first to be removed. Later mining may remove Herrin coal to the east and also remove Harrisburg (No. 5) coal which underlys the entire site. If the Harrisburg coal is mined, additional subsidence of perhaps two feet may occur where the Herrin subsidence has already happened. This will have no adverse effects on the water areas of the project except as described for the greentree reservoir.

Availability of Mining Area with Little Surface Conflict

Using present mining methods, greater quantities of coal can be extracted when subsidence is allowed to occur. When the Corps purchased 40,633 acres for this project, any surface development except in certain controlled areas was essentially prevented. The law is unclear as to who is liable when surface facilities are damaged by mining related causes such as subsidence. However, somebody pays whether it be the mining company or the surface interest who either must buy mineral rights or repair damages. The project has caused ideal conditions for mining because of the paucity of surface development.

Present Impact: The mined-out coal areas are shown in Figure 2-6. Records at the Illinois State Geological Survey show that the greatest portion of Herrin (No. 6) coal mined in Franklin and Jefferson Counties in 1972 and 1973 came from beneath the Rend Lake project. This coal is

reasonably low in sulfur content and is marketable even with stringent sulfur content controls. The desirability of mining in this area is apparent.

In the future, intensive mining of the Herrin (No. 6) coal should continue beneath the project at least until all lower sulfur coal is removed. Undoubtedly this is only one factor in the coal company's decision to mine in this area. However, in light of possible further legislation which would fix responsibility for surface damage on the mining companies, this limiting surface structural development may be one of considerable benefit to the mining companies.

Mine Access Requirements

Coal companies mining in areas such as near the project have need for additional access to mine working areas. Ventilation shafts are needed when methane gas levels become high in the mines. Access or emergency exit shafts are needed for safety reasons and for the efficiency of mining operations (access time required to reach the working area).

Presently there is one ventilation shaft operating adjacent to the Sandusky Creek access area on private property.

In the future, it is inevitable that many requests for access shafts will be received by the Corps. There are presently at least five mines active beneath Public Land. Freeman Mining Company, Old Ben Coal Company No's. 21, 24 and 26, and Inland Steel Company. If each mine asked for only one additional access shaft, the Corps will be required to consider five such facilities. These facilities are rather large and include parking facilities, washing facilities for miners, first-aid station, and hoisting equipment.

Ventilation shafts are not very visible at the surface. Only protective fencing and possibly small housing for the opening need be provided. Depending on the type of installation, there may be some noise associated with the fan operation. Access to these vents must also be provided for maintenance.

A case-by-case basis for review request appears satisfactory with some foresight. Project property land use will be reviewed to designate areas where these facilities would be considered as objectionable.

Economic Growth Impact on the Coal Mining Industry

One of the purposes of the Rend Lake project was to provide a dependable water supply for the study area. Because considerable water in excess of current domestic demand is now avaiable from the lake, industrial development by outside interests is being promoted. Other sections of this report indicate how the presence of Rend Lake and its water supply have and will stimulate the economy of the Franklin and Jefferson County area.

Future development in many cases means a change in the surface land use from idle, woodland, cropland, etc., to such uses as industrial, commercial, and residential. In many areas of the country, extensive development of hobby farms or rural acreages have resulted from increased employment opportunity. Increases in tourist or recreation oriented development along I-57 and adjacent to Rend Lake can also be expected.

All such surface development has an impact on coal mining. Either surface developers must purchase mineral rights or face the possible damaging effects of subsidence. The mining companies may have to mine in such a manner as to minimize the potential for subsidence and as a result decrease the efficiency of coal mining operations. If subsidence occurs, there is some expense either to the mining company or to the surface owner.

Likely, the impact of this growth on the mining industry will not be felt for some time. Presently the companies are working in the lake area with little surfact conflict and are not close to the freeway, I-57. Examples of problems arising from the development-mining conflict can be seen to the south of Rend Lake where problems have affected the Johnson City School and the central business district of Ziegler.

The future impact of the development-mining conflict will be contingent on the success of economic development of the area. The Corps as such has no control over this impact since land use jurisdiction extends only to the project limits. This potential conflict is an indirect outgrowth of area redevelopment encouraged by water availability.

4.3.1.3 Oil Resource Management

Oil Utilization on Project

Prior to purchase of the project property, there were approximately 84 production, injection, and freshwater oil wells in the project. All wells were plugged that were within the area which would be flooded by water to elevation 416. In addition, the wells within the initial development area of Marcum Branch recreation area were purchased and plugged. In January of 1974, the Corps indicated that leases for the

remaining wells would be extended for a period of three to five years. The net result of lease extension is that a valuable resource will be utilized and not abandoned due to the pressure of recreational development.

Oil well installations when properly maintained are not conspicuous and will not distract greatly from the recreational activities in the South Marcum Branch area. Illinois State Geological Survey records show 17 production wells operating on public property. The real positive impact is that this resource is utilized in a manner such that the remaining oil is not wasted.

Plans are that as the remaining wells play out or at the end of the next five-year lease interval, they will be abandoned and sealed according to accepted procedures. There is no long-term negative effect of leaving producing wells in place as they will stay only as long as they are productive.

Abandonment of Oil Resource Beneath the Lake

At least [illegible] production, injection and freshwater wells were [illegible] when the Rend Lake project was built. It resulted in the leaving of some oil resource in the ground under the lake, in portions of the North Benton oil field.

[illegible]
[illegible]
all other [illegible].

Several [illegible] producing wells were [illegible] [illegible] North Benton oil field. No drilling will be allowed in the [illegible]. Therefore, reserves in the ground beneath the reservoir and the adjacent flowage areas will not be utilized. It is possible that offset or slanted wells could reach the pay zones and use at least some of these reserves.

Should the Corps ever decide to make available the [illegible] oil resources beneath areas now excluded for production, the oil will still be there and can be extracted.

Management of Remaining Wells

[illegible] dated [illegible] [illegible] oil wells on the project. Depending on the [illegible] of these restrictions, the impact on water quality in the [illegible] and on the recreation area will be either positive or negative.

The restrictions propose that all oil pipelines be buried in the oil well area. While there is an aesthetic benefit to burying the lines,

the negative effects of this practice should be considered. Lines not exposed may be more easily damaged by utility work during other construction activities. Coal mining could feasibly occur in the pipeline areas within the next five years and result in subsidence. The coal companies are required to leave a coal pillar 200 to 300 feet in radius around the wells. However, if the lines leave these areas, subsidence could result in breaks, especially underground.

The Corps does not have prepared a detailed map of the location of all wells, tank areas, pipelines, etc. which could serve as a guide for any utilities or mining interests working in the area. The absence of this management guide is a negative impact. As long as the wells are maintained in the project area, the need for the oil facilities location map is evident.

Visual

Wells remaining on the project are those which are not in active recreation areas and not affected by lake fluctuations. Because of this, the oil facilities have little impact on use of the other site facilities. Only a few wells are noticeable from the recreation areas.

4.3.2 LAND AND VEGETATION

4.3.2.1 Management of Agricultural Lands on Public Property

Much of the Rend Lake project lands are presently being farmed in crops such as corn, soybeans, sorghum, etc. under various lease arrangements. In 1965, the U.S. Department of Agriculture, Soil Conservation Service performed a soils survey which indicated soil suitability for all unflooded areas of the project.[18] The Corps presently has 500+ acres of public property in crops. The recommendations of SCS has been adopted in managing lands. However, other public agencies owning or managing lands near Rend Lake have not.

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[18] Miles, C.C. and W. D. Parks, Soils of the Rend Lake Area, Illinois, U.S. Department of Agriculture, Soil Conservation Service, Carbondale, Illinois, 1965.

TABLE 4-5A

CROP SUITABILITY

Property Holder	Estimated Acres Crops	Limitations to Crop Use Percent of Total Slight	Moderate	Severe
State of Illinois Fitzgerrell State Park	3000	33	64	3
Rend Lake Conservancy District	800	54	40	6

While the percentage of area subject to severe limitations is low, these lands likely contribute more sediment from erosion than do the large areas having slight limitations. The other public agencies should be following procedures similar to those used by the Corps. Proper management of public lands adjacent to the lake will reduce erosion of soils by five to ten percent (see sedimentation section).

If the proper land management practices are used, there will be two results. Erosion will not damage the presently available upland areas and also the sedimentation of the lake can be reduced.

A discussion of cash cropping is presented in Section 6.2.1.1.

4.3.3 SOIL EROSION

This section looks at some of the major erosion causes around the lake and in the watershed. The emphasis here is on erosion itself and how it occurs. Section 4.3.3 discusses some of the more serious effects of erosion.

4.3.3.1 Erosion of Rend Lake Shoreline

Reservoirs in Southern Illinois are prone to damage from wave erosion. Factors causing these problems are the relatively flat terrain which does not impede high winds and the predominantly fine soils. In large reservoirs such as Rend Lake, high wind velocities can cause substantial waves. The following table shows the relationship between fetch (open water distance wave can move) and wave height for several wind speeds.

[19]Gore, J.F., Personal Communication, 1974

TABLE 4-6

WAVE HEIGHT IN FEET FOR VARYING WIND SPEEDS

Fetch - Miles	50 mph	75 mph	100 mph
2	3.0	3.4	3.7
3	3.3	3.7	4.1
4	3.5	4.0	4.4
5	3.7	4.3	4.8

Source: Bureau of Reclamation, 1965.

As the waves impact the reservoir shore area, the beaches are eroded. Lack of sands and gravels in the soil result in no natural protection developing at the beaches. Wave erosion results in retreat of beach or shore lands, transport of sediment to the reservoir, damage to facilities on shore, and in general unsightly shoreline conditions.

Figure 4-7 includes typical fetch distances applicable along the shores of Rend Lake. If the assumption is made that there is no dominant prevailing wind direction, then the most severe erosion should occur in those areas exposed to the longest fetch. Figure 2-9 shows a wind rose for the Carbondale Airport. The prevailing winds are southerly or from the northwest at higher velocities. Also the prevalence of any one wind direction is not great.

Protection of shore areas is planned for critical areas only. These include the dam face, the Highway 183 causeway, and selected recreational use areas such as boat ramps, etc. Along much of the shoreline, the beach erosion will be allowed to occur. Plantings will be used to provide some protection especially for the short periods when there are high water conditions.

Specific examples of damage around Rend Lakehave taken place. Riprap along the Highway 183 causeway was damaged at several locations due to high winds, and at one marina a breakwater was lost. A point of land near the main dam has completely disappeared. Because the reservoir has been filled for so short a time, the erosion effects on long reaches of shoreline are not as yet evident.

Analysis of Figure 2-9 indicates the areas of future concern in terms of shoreline erosion.[20] At Crab Orchard Reservoir about 25 miles

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[20] Stahl, John B., J. B. Fehrenbacher, L. J. Bartelli, G. O. Walker, E. L. Sauer, and S. W. Melsted, Water and Land Resources of the Crab Orchard Lake Basin, Bulletin 42, Illinois State Water Survey, 1954.

to the south, the long-term effects of wave erosion can be seen. A study of this erosion showed that more extensive erosion occurred along the north side of the lake due to the prevailing southerly and southeasterly winds. By using only the parameters of prevailing southeasterly wind and fetch distance, the most severe erosion should occur in the following areas:

1. On the west shore between Sandusky Creek and Highway 183.

2. All areas subject to over 4 miles of fetch in any direction.

3. Points of land which are subject to substantial fetch distance in more than one direction. An example is that part of Fitzgerrell State Park south of Highway 183.

The Crab Orchard study also showed that beach or shoreline erosion was responsible for 8.6 percent of the sediment deposited in the lake. On the north side of that lake, the shoreline had receded as much as 30 feet over a period of 11 years. At Carlyle Lake northwest of Rend Lake, severe wave erosion has occurred. Banks are predicted to recede as much as 100 to 200 feet and riprap has been placed over considerable lengths of shoreline.[21]

All the above effects of wave action can be intensified by boat wake turbulence. A lakewide zoning plan calls for 600 foot wide "no wake" area; however, waves generated during heavy use days even within the safe areas will be sufficient to erode Rend Lake embankments.

Fluctuating water levels will also intensify wave effects by exposing various embankment levels. Very high or very low levels can also expose areas of riprapped shore and subject unprotected soils to wave action. Such activity also undermines riprap, and washes out filter blankets.

4.3.3.2 Watershed Land Management Activities

Agricultural Lands

As discussed in Appendix D of the Big Muddy Comprehensive Basin Plan,[22] annual sediment yields from rural lands in the Rend Lake water-

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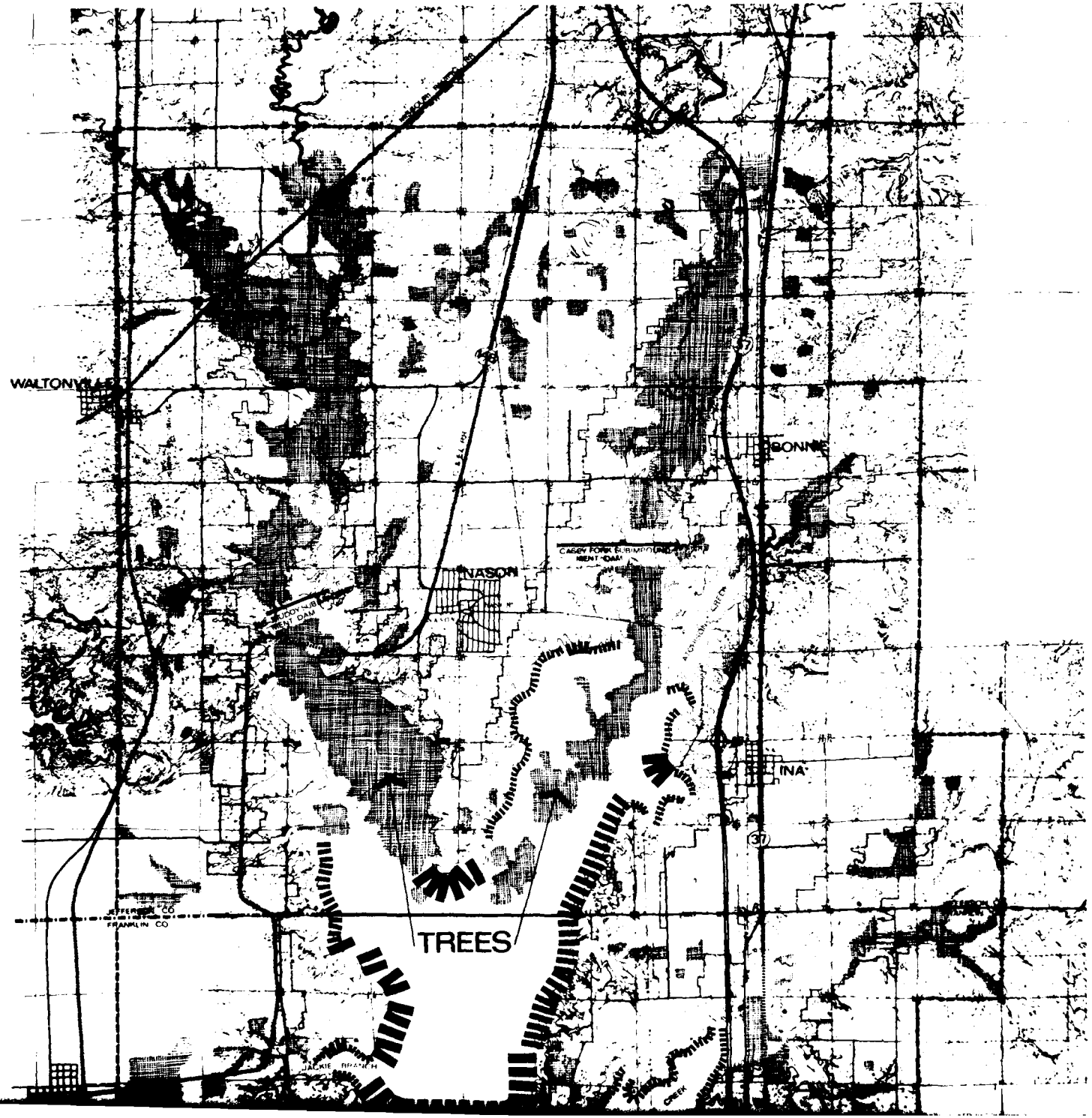
21U. S. Army Corps of Engineers, General Design Memorandum, Rend Lake Reservoir, Big Muddy River, Illinois, Design Memorandum No. 2, 1964 (revised).

22U. S. Army Corps of Engineers, Big Muddy River Comprehensive Basin Study, Appendix D, Fluvial Sediment, 1968.


WALTONVILLE
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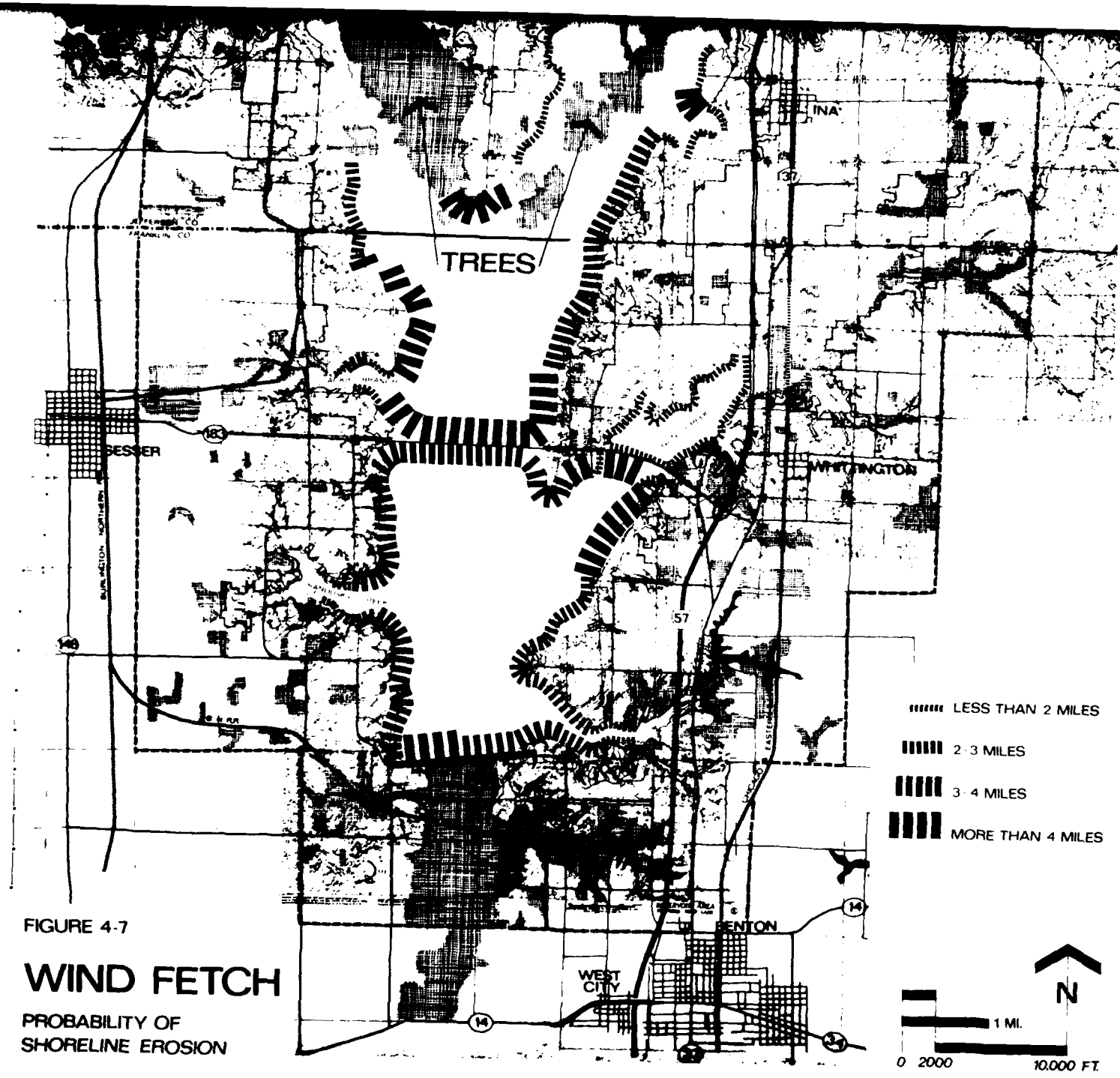

FIGURE 4-7

WIND FETCH

PROBABILITY OF
SHORELINE EROSION

shed average about 700 tons/square mile/year. In comparision to other areas of the United States this is a high sediment yield and results from the fine-grained nature of the soils and from the high surface runoff that occurs during certain times of the year. A tolerable sediment yield of 500 tons per square mile has been suggested in quantifying the broader sediment problems in the Upper Mississippi River Basin.[23] The sediment will reduce the basic water quality of the lake and tributary streams. The U.S. Department of Agriculture Soil Conservation Service has estimated that a total of 146,000 acres of land area in Franklin and Jefferson Counties need erosion treatment measures. At the present time the emphasis is on crop production and very little erosion protection is being provided from rural land.

Developing Land

Studies have shown that without proper erosion protection, land under development is subject to considerably more erosion than similar land used for agricultural or urban purposes. Land under development is bare of vegetation making it very susceptible to erosion. Techniques such as sedimentation basins and rapid restoration of vegetative cover are available to reduce the erosion from developing land. These techniques are not being used in the Rend Lake watershed, however, and the result is a considerable quantity of sediment runoff from land undergoing development.

Currently, there are no enforceable regulations governing sediment control practices during construction. Land is left open during the construction period often throughout the entire winter. As the rate of development increases, the problem will, of course, become more severe.

Localized problems may become more critical to the overall lake water quality. When construction occurs near the lake and along tributary streams, erosion and runoff may create extremely turbid water conditions for only a short period of time. Unfortunately, the construction season peak corresponds directly with the primary recreation season.

Urbanized Land

Recent studies have shown that urban land can be a significant source of sediment. Since large-scale erosion is usually not tolerated from urban areas, the source of sediment is usually not land

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[23]Federal Water Pollution Control Administration, Big Muddy River Comprehensive Basin Study, Appendix E, Water Use and Stream Quality, 1968.

erosion but street litter and sand used for winter driving protection. The high runoff rates associated with urban areas can, however, result in erosion if open channels are incorrectly used to transmit surface runoff.

4.3.4 LAKE WATER QUALITY MAINTENANCE

The Rend Lake and surrounding lands are being operated and maintained for a number of purposes. The operation and maintenance activities necessary to attain such purposes as area redevelopment, water supply, recreation, and wildlife propagation could have a direct impact on the water quality of the lake and, in turn, could eventually come full circle and impact the purposes of the lake by affecting fish and wildlife, recreational use, water supply costs, and the desirability of the lake as a recreational attraction. Specifically, the following is an outline of factors having the potential of creating significant side effects which may impact the water quality of the lake. This discussion refers to area within the Rend Lake watershed and that of its tributaries.

a. Growth and development within areas served by municipal sewage facilities, thereby increasing the sewage and nutrient loadings to the lake.

b. Growth and development outside areas served by municipal sewage facilities will result in an increase in the use of individual sewage treatment facilities with a resulting increase in nutrient loading to the lake due to the poor waste assimulative characteristics of the soil.

c. Land development without proper sediment control will increase the sediment loading to Rend Lake.

d. The recreational use of Rend Lake will increase the likelihood of gasoline and oil spills on lake surface.

e. The extraction of oil resources on project lands will increase the likelihood of oil spills and the resulting degradation of the water supply of the lake.

The existing and potential future water quality problems within Rend Lake and its tributary watershed due to such influences will be considered in categories including:

Reservoir Sedimentation
Low Dissolved Oxygen Levels in Tributary Streams
Reservoir Nutrient Levels
Oil on the Lake Surface

4.3.4.1 Lake Sedimentation

Perhaps the most visible water quality problem existing in Rend Lake at the present time is the high sediment content of the reservoir and tributary streams. The sediment has the potential of affecting the ecology of the lake by smothering bottom organisms, reducing the ability of sight-feeding fish to find food, and reducing photosynthesis and the resulting food organisms by curtailing light penetration. High sediment loadings can also affect the aesthetic quality of the lake, increase treatment costs and ultimately affect the very life of the lake. In order to place the sediment loadings from the various sediment sources into perspective, the existing sources and loadings have been identified. The estimated existing annual sediment loadings from each source are summarized in Table 4-7.

Municipal Sewage Treatment

The suspended solids in municipal sewage effluent represent an obvious source of sediment to the lake. The suspended matter released by the sewage treatment plants will be carried to the reservoir; most of the suspended matter will settle to the lake bottom.

The existing average discharges from the wastewater treatment plants in the watershed were obtained from the regional office of the Illinois Environmental Protection Agency. Discharge data was not available for the Rend Lake Junior College, so the average sewage

TABLE 4-7

EXISTING SOURCES OF SED MENT
REND LAKE WATERSHE

	Quantity	Loading Rate	Annual Sediment Yield
Municipal Sewage Treatment			
Mt. Vernon	1.7 MGD	5 mg/l	26,000 lbs/yr.
Mt. Vernon (South Plant)	.05 MGD	5 mg/l	800
Sesser	.4 MGD	5 mg/l	6,100
Rend Lake Jr. College	28,000 gpd	5 mg/l	400
Corps of Engineers	100 gpd	5 mg/l	5
Rural Land	437 mi^2	7.0 tons/mi^2/yr.	628,000,000 lbs/yr.
Wildlife			
Geese	815,000 geese-days*	.04 lbs/day	32,600 lbs/yr.
Ducks	1,080,000 duck-days*	.02 lbs/day	21,600 lbs/yr.
Developing Land	500 Ac.	1.0 tons/ac./yr.	160,000,000 lbs/yr.
Developed Land	7,500 Ac.	1.2 tons/ac/yr.	18,000,000 lbs/yr.

* Actually roosting or resting on the reservoir.

Source: Barr Engineering Company, Minneapolis, Minnesota

flow from the College was estimated using 1,400 students and faculty and a 20-gallon per capita per day average consumption rate. With the exception of the Sesser Sewage Treatment Plant, the sewage effluent was assumed to meet the Illinois Effluent Suspended Solids Standard of 5 mg/l. The Sesser plant was also assumed to discharge a 5 mg/l suspended solids effluent after the additional treatment provided by the Old Ben No. 21 water supply impoundment.

Rural Land Runoff

Sediment yield from the existing rural areas in the Rend Lake basin was estimated using information from Appendix D of the Big Muddy River Comprehensive Basin Study.[24] Using the data contained in this Appendix, the sediment yield from the Rend Lake basin can be expected to average approximately 720 tons/square mile/year. As stated in Appendix D, this yield is primarily attributable to rural land. For estimating purposes, a sediment yield of 720 tons/square mile/year was used. The amount of rural land was approximated by subtracting the lake area and the existing urbanized area from the total watershed area tributary to Rend Lake.

Wildlife

Geese and ducks contribute suspended solids as they roost or rest on the surface of the reservoir. In order to estimate the number of "goose-days" and "duck-days" spent on the lake, it was assumed that:

a. An average of 2,750 ducks (primarily wood ducks) resided at the lake during the months of March through October. During the months of November and December, it was estimated that the duck population peaked at approximately 50,000 birds. These assumptions result in a total number of 2,160,000 "duck-days" during 1973.

b. During the months of January and February, it is estimated that the goose population reached 20,000. These estimates result in approximately 1,630,000 "geese-days" during 1973.

c. On the average, the ducks and geese roosted or rested on the lake approximately one-half of the time they were present. This results in a total of 815,000 geese-days and 1,080,000 duck-days actually spent on the lake.

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[24]U.S. Army Corps of Engineers, Appendix D, op. cit.

Suspended solid loadings for geese and ducks were estimated using agricultural waste data contained in Lin.[25]

Developing Land

In the absence of erosion protection measures, developing land will usually yield more sediment per acre than rural land with similar soils, slopes, and precipitation. Developing land is bare of vegetation, whereas rural land, even rural land used for agricultural purposes, has vegetation during at least a part of the year. No data is available for the sediment yield from developing land in the Rend Lake watershed.

In order to approximate the annual sediment loading from developing land, data from Guy[26] was used. Based on this data, an average sedimentation rate of 100,000 tons/square mile/year or approximately 160 tons/acre/year was chosen as representative of the soils and runoff of the Rend Lake area. The amount of developing land was based on a windshield survey of the watershed which indicated approximately 20 new home sites plus approximately 200 acres of industrial/commercial land and 300 acres of utilities and roadways under development.

Developed Land

Research has shown that urbanized land can also yield significant quantities of sediment. The quantities of sediment from developed land varies depending on the condition of the streets, lawns and general neighborhood. No data is available on the quantity of sediment from developed land in the Rend Lake watershed. A recent study of urbanized areas in Oklahoma by Cleveland[27] indicated an average annual sediment yield of 2,800 lbs./acre of urban area. This sediment rate, along with the total acres of developed land in the watershed were used to estimate the annual sediment yield to Rend Lake from developed land. It is interesting to note that the estimated sediment yield from developed land is approximately equal to the estimated sediment yield from rural land.

25Lin, Shunder, Nonpoint Rural Sources of Water Pollution, Illinois State Water Survey, 1972.

26Guy, Harold P., Sediment Problems in Urban Areas, Geological Survey Circular 601-E, U.S. Geological Survey, Washington, D.C., 1970, p. E2.

27Cleveland, Gerry G., Evaluation of Dispersed Pollutional Loads from Urban Areas, Bureau of Water Resources Research, Oklahoma University, Norman, Oklahoma, April, 1970.

The sediment loadings in Table 4-7 illustrate the overwhelming importance of land surface runoff in the sediment yield to Rend Lake. Runoff from rural, developing, and developed lands contribute over 99.9 percent of the total sediment load to the lake. Municipal sewage treatment and wildlife constitute very minor sources of sediment to the lake.

In order to evaluate the impact of future development on lake sedimentation, the projected sediment loadings to the reservoir in the years 1990 and 2020 have been approximated. Due to the overwhelming importance of land runoff, only the three land components (rural, developing, developed lands) were used in the projections. The year 1990 and year 2020 projected sediment loadings as well as the estimated existing annual sediment loading are summarized in Table 4-8. The areas in the rural, developing and developed land categories are based on projected land use estimates for the design years.

TABLE 4-8

COMPARISON OF EXISTING AND PROJECTED SEDIMENT LOADINGS

Source & Loading Rate	Existing Area	Existing Loading	1990 Area	1990 Loading	2020 Area	2020 Loading
Rural Land at 720 tons/mi²/yr.	437 mi²	314,000 tons	427 mi²	308,000 tons	416 mi²	300,000 tons
Developing Land at 160 tons/ac./yr.	500 ac.	80,000 tons	400 ac.	64,000 tons	300 ac.	48,000 tons
Developed Land at 1.2 tons/ac./yr.	7,500 ac.	9,000 tons	14,000 ac.	17,000 tons	21,000 ac.	25,000 tons
Estimated Total Sediment Loading to the Reservoir		403,000 tons		389,000 tons		373,000 tons

Source: Barr Engineering Company, Minneapolis, Minnesota

Based on the assumptions discussed above, the total sediment loads illustrated in Table 4-8 indicate that the total sediment to the lake should stay relatively constant. The loadings in Table 4-8 do, however, illustrate the importance of controlling sediment from developing land. In the soil conditions which occur in the Rend Lake area, sediment runoff from developing land can be many orders of magnitude greater than sediment runoff from rural lands.

As illustrated in Table 4-8, sediment from a 500-acre developing area makes up approximately 20 percent of the total sediment yield from a 290,000-acre watershed. If the developing area increased by a factor of 10 to 5,000 acres, the total sediment yield from the entire

290,000-acre watershed would increase approximately by a factor of three. This illustrates the importance of controlling sediment from developing land. As shown in Table 4-8, the unit sediment loadings from rural and urban land in the Rend Lake basin are approximately equal indicating that the amount of urban land in the watershed will not appreciably affect the overall sediment loading to the lake as long as proper sediment control practices are followed during construction of urban areas.

4.3.4.2 Low Dissolved Oxygen Levels in Tributary Streams

Dissolved oxygen levels at monitoring stations on streams tributary to Rend Lake have dropped below the State of Illinois dissolved oxygen standard at one time or another during each year of monitoring The reasons for this are the relatively small drainage area and resulting low flows in the tributary streams during the summer months, the low assimilation capacities of the tributary streams due to the low flows and flat gradients, and the inadequate treatment of point and non-point waste sources, the most important being municipal sewage. The low dissolved oxygen levels limit the suitability of the streams for fish and other aquatic life and result in a decrease in the recreational use of the streams.

In the past, low dissolved oxygen levels have occurred in Casey Fork Creek downstream of the Mount Vernon Sewage Treatment Plant. Oxygen levels in the stream have been measured below 4 mg/l (August 30, 1972). According to the regional office of the Illinois Environmental Protection Agency, both Mount Vernon Sewage Treatment Plants have been upgraded and are now in compliance with state standards.[28] Whether the effluent from the two plants will be sufficiently treated to maintain oxygen levels above Illinois standards, will not be known until a basin-wide water quality planning study is completed in 1974 or 1975.

Another area of depressed dissolved oxygen levels has been Rayse Creek near the water quality monitoring station on Highway 148 east of Waltonville. During 1972, only 5 of 15 samples exceeded a dissolved oxygen concentration of 5 mg/l.[29] The area exhibited dissolved oxygen concentrations less than 1 mg/l and it was concluded that fish could not live in the stream at this location. The area bordering Rayse Creek is farmland with some cattle in this area. The stream has a low flow and a large amount of organic matter in the form of leaves and other debris.

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[28]Teske, M., op. cit.

[29]U. S. Corps of Engineers, St. Louis District, Rend Lake Water Quality Report, October 1971-1972, 1972.

As the area development purposes are implemented, the discharge of sewage effluent from Mount Vernon into Casey Fork Creek can be expected to increase. As other communities in the basin construct municipal sewage treatment plants, the discharge of sewage into other small creeks tributary to Rend Lake can also be expected. As discussed previously, the small streams in the Rend Lake Reservoir simply do not have sufficient assimilative capacity to meet state dissolved oxygen standards if only secondary sewage treatment is provided. The Illinois standards recognize that advanced waste treatment will be necessary in most cases. The standards are sufficiently stringent to guarantee suitable aquatic life and recreational use of the stream will occur. The future problem will be to provide a sufficient degree of sewage treatment to meet the dissolved oxygen standards in the streams.

4.3.4.3 Lake Nutrient Levels

The amount of algae and aquatic vegetation produced in Rend Lake is dependent on the concentration of nutrients in the lake. High nutrient levels can lead to algae blooms with a resulting decrease in the desirability of the lake as a recreational resource. Decaying algae can reduce dissolved oxygen levels in the reservoir, thereby placing a stress on game fish in the lake. Algae can also increase reservoir turbidity, thereby reducing the ability of sightfeeding fish to find food. Large scale algae blooms can also result in a scum on the lake and odors which will decrease the desirability of the lake as a recreational resource.

A number of nutrient sources have been identified in the watershed tributary to Rend Lake. These include:

a. Municipal sewage treatment plants.
b. Individual family sewage disposal systems.
c. Agricultural cropland runoff.
d. Agricultural animals and feedlots.
e. Wildlife (geese and ducks).
f. Developed land.

In order to develop a perspective of the importance of the various nutrient sources, the estimated nutrient loadings from each of the major sources listed above have been quantified. The estimates are shown in Table 4-9. Existing water quality data was used wherever possible, but certain assumptions on water quality and nutrient loadings had to be made in the absence of adequate data.

TABLE 4-9

EXISTING NUTRIENT LOADINGS TO REND LAKE

	Quantity	Loading Rate Nitrogen	Loading Rate Phosphorus	Loading (lbs/yr) Nitrogen	Loading (lbs/yr) Phosphorus
Sewage Treatment Plants					
Mount Vernon	1.7 MGD	8.5 mg/l	3 mg/l*	44,000	16,000
Mount Vernon (South)	.05 MGD	3.0 mg/l	2 mg/l*	500	300
Sesser	.4 MGD	17.0 mg/l	7 mg/l*	20,600	8,500
Corps of Engineers	300 gpd	13.2 mg/l	4 mg/l*	12	4
Rend Lake Jr. College	28,000 gpd	6.5 mg/l	4 mg/l*	500	300
Total Sewage Effluent				65,500	25,100
Individual Sewage Disposal Systems	15,800 people	4.3 lbs/yr.	.6 lb/yr	68,000	9,500
Agricultural Cropland Runoff	164,000 acres	2 lb/ac/yr	.1 lb/ac/yr	338,000	16,400
Runoff from Developed Land	7,500 acres	6 lb/ac/yr	.5 lb/ac/yr	45,000	3,700
Ducks & Geese					
Geese	815,000 geese days	.003 lb/day	.001 lb/day	2,400	800
Ducks	1,080,000 duck days	.001 lb/day	.0005 lb/day	1,100	500
Agricultural Livestock					
Beef	27,000	.5 lb/day	.1 lb/day	13,500	2,700
Swine	45,000	.03 lb/day	.01 lb/day	1,400	400

* No phosphorus monitoring data available, phosphorus concentration estimates were based on unit treatment processes.

Source: Barr Engineering Company, Minneapolis, Minnesota.

As discussed previously, there are five sewage treatment plants contributing sewage effluent to Rend Lake. The estimated nutrient contributions from each plant are shown in Table 4-9. Average annual flow rates and nutrient data for 1973 were used in the estimates.

Nutrient estimates from individual sewage disposal systems are based on the number of persons in the Rend Lake watershed served by individual sewage disposal systems, the total annual quantity of nitrogen and phosphorus discharged to the individual disposal systems and an assumed removal efficiency for each nutrient. The soils in the Rend Lake watershed are notoriously poor for drainfield type of sewage disposal. The assumed removal efficiency for nitrogen was 20 percent and the assumed removal efficiency for phosphorus was 40 percent for the individual sewage disposal systems.

The nutrient loadings supplied to Rend Lake by agriculture cropland runoff is the most difficult loading to estimate. Data on the amount of fertilizers applied to agricultural land is available on a county-by-county basis, but very little data is available on the amount of fertilizer which runs off the land. The loading rates shown in Table 4-9 are based on work reported by Lin.[30] Nitrogen loss was estimated to be approximately 15 percent of the total nitrogen applied. Phosphorus loss was estimated to be approximately .5 percent of the total quantity of phosphorus applied.

Surface runoff from urban land has recently been identified as a significant source of phosphorus and nitrogen. Principal sources of nutrients in urban runoff are lawn and garden fertilizers and decaying leaves, grass and other organic matter. Work carried out in Cincinatti, Ohio by Weibel[31] indicated that unit loadings of phosphorus and nitrogen in surface runoff from a 27-acre residential and light commercial urban watershed averaged one lb./ac./yr. and 12 lb./ac./yr., respectively. The intensity of the urbanized area in Rend Lake basin is less than the intensity of urbanization in the Cincinnati study area so lower unit loadings than those derived in the Cincinnati area were used for the nutrient loadings from the urban areas in Rend Lake basin. In the absence of data on the nutrient loadings from the urban areas in Rend Lake basin, it was assumed that urban runoff contained .5 lb./ac./yr. phosphorus and 6 lb./ac./yr. nitrogen which is one-half the loadings found in the Cincinnati study. These loadings were then applied to the urbanized areas of the basin to obtain an estimate of the annual nutrient load from urban areas.

Geese and ducks contribute nutrient to the reservoir as they roost or rest on the surface of the lake. An estimate of the number of "goose-days" and "duck-days" spent on the lake developed in Section 4.3.4.1 is 815,000 goose-days and 1,080,000 duck-days. Nutrient loadings for geese and ducks were estimated using agricultural waste data contained in Lin.[32]

The nutrient loading contributed by agricultural livestock was quantified by estimating the number of farm animals in the watershed and applying an estimated annual nutrient loading per animal for the different types of animals existing in the basin. It was assumed that all of the nutrients in the livestock waste eventually reached the lake.

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[30]Lin, Shunder, op. cit.

[31]Weibel, S. R., and others, Characterization, Treatment, and Disposal of Urban Stormwater, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, 1966.

[32]Lin, Shunder, op. cit.

Table 4-9 illustrates that sewage effluents supply over 60 percent of the total phosphorus loading to Rend Lake with municipal effluents supplying approximately 45 percent and effluents from individual family sewage treatment systems supplying approximately 15 percent of the total. The other significant source of phosphorus is agricultural cropland runoff which supplies an estimated 30 percent of the total. Table 4-9 further illustrates that agricultural cropland runoff is the major source of nitrogen to Rend Lake supplying approximately 70 percent of the total. Sewage effluent is also a significant source with municipal sewage discharges and individual sewage disposal systems each supplying approximately 15 percent of the total estimated nitrogen loading.

In order to evaluate the impact of development on the nutrient balance to Rend Lake, the projected phosphorus and nitrogen loadings in the years 1990 to 2020 have been approximated. Due to the relative importance to municipal and individual sewage disposal system effluents, agricultural land runoff, and urban runoff on the overall nutrient balance only these four sources were considered in the projections. The year 1990 and 2020 projected nutrient loadings to the lake are summarized in Table 4-10. The estimated nutrient loadings from municipal sewage treatment facilities are based on the urban populations projected for the two years. The area of agricultural and urban land are based on projected land use estimates for the two study years.

TABLE 4-10

COMPARISON OF EXISTING AND PROJECTED NUTRIENT LOADINGS

Source and Loading Rate	Existing			1990			2020		
	Quan.	Nitrogen Loading	Phos Loading	Quan.	Nitrogen Loading	Phos. Loading	Quan.	Nitrogen Loading	Phos. Loading
Municipal Sewage Effluent 1.3 lb. Phosphorus/capita/yr 3/5 lb. Nitrogen/capita/yr	18,500 people	65,600 lb/yr	25,100 lb/yr	25,000 people	88,000 lb/yr	32,000 lb/yr	42,500 people	148,000 lb/yr	55,000 lb/yr
Individual Sewage Disposal .6 lb. Phosphorus/capita/yr 4.3 lb. Nitrogen/capita/yr	15,800 people	68,000 lb/yr	9,500 lb/yr	19,000 people	82,000 lb/yr	11,000 lb/yr	22,000 people	95,000 lb/yr	13,000 lb/yr
Agricultural Croplands .1 lb. Phosphorus/ac/yr 2 lb. Nitrogen/ac/yr	164,000 acres	328,000 lb/yr	16,400 lb/yr	160,000 acres	320,000 lb/yr	16,000 lb/yr	145,000 acres	290,000 lb/yr	14,500 lb/yr
Developed Areas .5 lb. Phosphorus/ac/yr 6 Nitrogen/ac/yr	7,500 acres	45,000 lb/yr	3,700 lb/yr	14,000 acres	84,000 lb/yr	7,000 lb/yr	22,000 acres	132,000 lb/yr	11,000 lb/yr
Estimated Total Nutrient Loading		506,500 lb/yr	54,700 lb/yr		574,000 lb/yr	66,000 lb/yr		665,000 lb/yr	93,000 lb/yr

Source: Barr Engineering Company, Minneapolis, Minnesota

The comparison between existing and projected nutrient loadings to Rend Lake illustrated in Table 3-10 indicates that the nutrient loadings to Rend Lake can be expectec to increase in the future. As shown in the table, the nitrogen loading can be expected to increase by 13 percent and the phosphorus loading can be expected to increase 21 percent by 1990. By 2020 the expected nitrogen and phosphorus loadings has been estimated to increase 31 percent and 70 percent, respectively. This will result in an increase in algae growth in the lake. Whether this will cause a loss in recreational use of the lake lake is not predictable without additional study.

4.3.4.4 Oil on the Lake Surface

Petroleum products which either spill on or are carried to the reservoir surface have the potential for impacting recreational use by affecting swimming. Oil on the lake surface can also affect aquatic life as well as wildlife. A major oil spill could also affect the cost of treatment or even the quality of the public water supply taken from Rend Lake.

The oil field operations in the watershed tributary to the reservoir have the potential of contributing oil wastes to the lake. In 1971 the oil fields in the area adjacent to Marcum Branch Creek suffered a large oil spill and runoff from this area periodically carries oil into the reservoir.[33] It would most likely take several years for the oil on the ground surface to dissipate.[34] This was the only documented case of oil waste reaching the reservoir found in the literature. The literature concluded that, in general, oil pollution was not a significant problem in the watershed.

The oil leases in the South Marcum access area have been extended for a five-year period. Criteria has been established to help insure the safe operation and construction of the oil facilities. The extension of the oil leases impact reservoir water quality by increasing the likelihood of oil spills on the land surface. These oil spills could then be carried into the lake by surface runoff. Operating criteria require that active oil pipelines be buried. This will make the detection of oil leaks more difficult in the absence of a coordinated maintenance program to detect leaks and spills.

The increased number of recreational boating users of Rend Lake will increase the likelihood of oil and gasoline spills at boat marinas, thereby increasing the likelihood of oil on the lake surface.

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[33] U. S. Corps of Engineers, St. Louis District, Rend Lake Water Quality Report.

[34] U. S. Corps of Engineers, Appendix E, P. 7-6.

4.3.4.5 Implications for Water Quality Control

The above discussion points up the conclusions: that sediment is a major problem and that uncontrolled construction on developing land will be the major sediment source; domestic sewage treatment plants will be the major source of phosphorous; and agricultural runoff will yield the greatest amount of nitrogen.

Control programs for water quality maintenance then can be formulated to control these major sources of pollutants:

a. Land use controls should include construction sediment control requirements.

b. Illinois EPA standards call for upgrading sewage treatment facilities which will keep phosphorous to manageable levels.

c. A program to encourage wise use of agricultural fertilizers, proper field distribution of manure and control of feedlot runoff will reduce nitrogen input.

d. Toxic spill accident control methods can be planned to minimize danger to water supply.

In summary, water quality maintenance problems do and will continue to exist. Results may mean high siltation and turbidity related problems and increased potential for algae and weed growths: an effective control program can be developed.

4.3.5 AIR QUALITY AT REND LAKE

4.3.5.1 Present Air Quality

The air quality at Rend Lake reflects the nature of its rural setting. Levels of particulates and gaseous pollutants appear to be low when compared to federal standards.[35] The major identifiable sources of air pollution in Rend Lake at the present time consist of the following:

Coal Mines

The coal mines located along the western side of Rend Lake have met the Illinois Environmental Protection Agency standards for emission

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[35]U. S. Environmental Protection Agency, National Primary and Sedondary Ambient Air Quality Standards, Federal Register, 30 April 1971, U. S. Government Printing Office.

of particulate air pollutants.[36] However, there are visible emissions associated with the least two of these mines.

Highway Vehicle Emissions

Because of the low traffic volumes, the total emissions from automobiles and trucks in the Rend Lake area are very low, resulting in low concentrations of carbon monoxide, hydrocarbons and nitrogen oxides in the ambient air over Rend Lake. The Illinois Department of Transportation estimated that the levels of carbon monoxide at the Conservancy District's property near southeastern shore of Rend Lake will be less than one part per million through the year 1995.[37]

Rend Lake Recreation Areas

Rend Lake can be classified as an indirect source of mobile air pollutants. However, because of low relative traffic volumes, this source is very small at the present time.

Oil Wells

There are several oil wells in and around Rend Lake. These oil wells have a distinguishable odor associated with them. This odor (like the smell of rotten eggs) can be attributed to hydrogen sulfide gas and mercaptans.

Meat Packing Plant

A meat packing plant has been in existence before the establishment of Rend Lake. Up to the present time there have been no public complaints about the odors from this packing plant.

Hog and Cattle Farms

Odor from these sources can be quite bad at times. Up to the present time there have been no public complaints about the operations and odors produced by the hog and cattle farms in the project area.

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[36] Illinois Environmental Protection Agency, Illinois Stationary Sources Standards, Part II: Emission Standards and Limitations for Stationary Sources, Illinois Pollution Control Board Rules and Regulations, Rule 203.

[37] Illinois Department of Transportation, District 9, Carbondale, Illinois, Air Quality Analysis; FA 126 (Rend Lake).

4.3.5.2 Impact on Air Quality

The environmental impact from the sources of air pollution in the Rend Lake area can be summarized as follows:

Coal Mines

Although the coal mines meet the Illinois EPA Standards for mass emission rates of particulate pollutants, there still is a noticeable coal dust plume visible from some of these operations. The effect of this visible plume on the aesthetic value of the area is very important. It may be a source of future complaints as the area develops and people use Rend Lake. These coal mine plumes at times can drift over the wildlife refuge area. This may cause some effect on airborne water fowl that may be present in the area at the time.

Odor Sources

Oil wells, hog and cattle farms and meat packing plants as sources of air pollution are grouped together because their effect, odor, is similar. Development near these sources could be restricted if there is strong reaction to the odor sources.

During peak use periods, the volume of automobiles using nearby traffic volumes, the associated pollutants emitted by highway vehicles will increase. However, they should not increase to the point of major concern at the present time.

4.3.5.3 Air Quality Impact Management

At the present time it appears that the coal mines in the area present the most serious air quality problem. Coal mines do meet the Illinois EPA particulate emissions regulations and because they have installed very expensive equipment to remove the bulk of particulate emissions, reducing emissions further will be very difficult and expensive. The oil wells in the area, with their localized hydrogen sulfide odor, will be difficult to control and very costly. Odor from the agricultural sources may become a problem as the area develops. Some control over these sources may be possible. Peak automobile emissions can be partially handled by good traffic control.

4.3.6 NOISE

4.3.6.1 Existing Noise Sources

The existing noise sources around Rend Lake can be clustered into four categories:

User-Generated Noise

This category covers all noise generated by people who use the lake facilities, excluding the noise of vehicles in transit to or from the lake. This category would include noise generated from the operation of recreational vehicles such as motor boats. It also includes the noise generated by equipment generators, television and radios. Finally, this category would include indirect use of lake roads especially roads within the campgrounds.

Point Source Noise

This category includes noise generated from point sources in or near the lake. At the present time there are three different point source noises. The first and major point source is from coal mining. There are four coal mines located on the western side of Rend Lake. These are Old Ben No. 21 and 26 mines, the Inland Steel mine, and the Freeman mine. Of these four, Old Ben No. 26 is located closest to existing campgrounds. Another point source of noise is the Conservancy District's water treatment plant located on the southeastern shoreline of Rend Lake. The existing and operating oil wells in the area are still another noise point source.

Railroad Traffic Noise

There are five separate railroad tracks in the area of Rend Lake. These are owned and operated by two different railroad companies, Burlington Northern Railroad and Chicago and Eastern Illinois Railroad. The combined total of trains using these tracks during a typical day ranges from 38 to 40. There is no particular schedule for these trains on four of the five tracks. One track, the Chicago and Eastern Illinois Railroad northwest track runs 12 trains only during the early morning or late night.

Highway Traffic Noise

There are three major highways in and near Rend Lake. Interstate 57 and Illinois Route 37 run from north to south along the eastern side of the lake and Illinois Route 183 runs east and west across Rend Lake. Traffic volumes on these highways are low at the present time. The annual average daily traffic (ADT) on Interstate 57 is about 10,000 vehicles. Of these, approximately 18 percent are large trucks. During

the summer months average daily traffic jumps to 12,500 vehicles.[38] Currently, Illinois 183 has an ADT of 3,350 and Illinois 37 has an ADT of 1,700 north of Illinois 183 and 4,500 south.

Ambient noise levels were measured and estimated by the Illinois Department of Transportation near Interstate 57 south of Route 183.[39] They found that noise levels at a distance of 500 feet peak above 67 dBA 10 percent of the time during afternoon peak traffic. (dBA means the decibel sound pressure using the "A" measuring scale. Normal conversation has a sound level of 60 dBA. Sound level reduced to one-half loudness is equivalent to a 10 dBA reduction). Using an average dropoff of sound with distance, the sound pressure level intruding at 2,000 feet 10 percent of the time would be 58 dBA. At night average ambient noise from this highway would be lower, however, intruding noise would be present, but not as frequent.

4.3.6.2 Environmental Impact of Noise Sources

The environmental impact of noise is highly dependent upon receptors and variations from one receptor to another. The level of noise that a receptor can tolerate is directly related to his desired activity. There are two major groups of noise receptors in the Rend Lake area: people and wildlife. People come to Rend Lake for recreation, wildlife come to Rend Lake because of habitat and food. The impact of noise upon these receptors are many. Some examples would be the following:

a. Disruption of wildlife behavior because of intruding noise generated by lake users (including noise is peak noise such as noise created by passing loud vehicles or firearm discharge). This could become one of the most serious noise problems.

b. Disruption of fishing activities caused by loud recreational vehicles such as motor boats.

c. Disruption of the sound of nature in nature trail areas by the noise from recreational vehicles.

d Disruption of campers either during the day or at night by noise generated by other campers such as the noise from portable electric generators, televisions and radios.

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[38] Illinois Department of Transportation, Traffic Characteristics on Illinois Highways/1972, 1973.

[39] Illinois Department of Transportation, Final Environmental/Section 4 (F) Statement, Administrative Action for Federal Aid Route 126, May, 1973.

e. Disruption of campers seeking quiet, tranquil surroundings by noise from the operation of a nearby coal mine. This is probably one of the most serious existing problems.

f. Disruption of campers seeking quiet, tranquil surroundings by noise generated from a water treatment plant.

g. Disruption of campers seeking quiet, tranquil surroundings by the noise generated from the operation of oil wells.

h. Disruption of campers by the sound of a nearby passing train, although some like this sound.

i. Disruption of hunting activity by noise from recreational vehicles.

Disruption of the quiet (quiet noise levels are considered to be at least at the 50 dBA level or about one-half as loud as normal conversation) tranquil sounds of nature by the combined sounds of all noise sources (increased total noise environment). This impact is a very serious problem. Although noise from all types of sources will increase, the noise increase from higher traffic volumes is the most important factor in the increase of total noise.

4.3.6.3 Noise Impact Management

Direct and indirect control over noise sources has already taken place in the operation and management of Rend Lake. The U. S. Army Corps of Engineers, by enforcing the rules and regulations set forth in Title 36 of federal laws covering parks, forests and memorials,[40] have controlled the use of recreational vehicles, motor vehicles with campgrounds and campground activities. In addition, recent Illinois Environmental Protection Agency action has created standards for point source noise,[41] and this agency will have regulations covering highway vehicles in the near future.

The Illinois State Department of Conservation has issued rules covering the use of motor boats near wildlife refuges.[42] In addition,

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[40] U.S. Corps of Engineers, Rules and Regulations Governing Public Use of Water Resource Development Projects Administered by the Chief of Engineers, Federal Law, Title 36.

[41] Illinois Pollution Control Board, Rules and Regulations, Chapter 8: Noise Regulations

[42] Illinois Department of Conservation, Rules and Regulations Pertaining to Public Use, Hunter Management, and other Management Procedures on Rend Lake Lands Supervised by the Department of Conservation and the U. S. Corps of Engineers, Administrative Order-1973, Article LII.

land use areas could be assigned particular noise levels. Rend Lake already has several land use areas; therefore, it should be easy to have specific noise levels assigned to each type of area. Using this type of criteria effective environmental management can be enhanced.

4.3.7 AESTHETIC RESOURCE ALTERATION

Section 2.1.5 discussed aesthetic resources of the Rend Lake area. The following paragraphs point out those areas of aesthetic concern that may be undesirably altered as Rend Lake and its environs develop.

4.3.7.1 Changes Due to Fluctuating Water Levels

Since the earliest stages of the project, concern has been voiced that periodic fluctuations in lake levels, particularly between the joint use and flood control pools, will kill shoreline vegetation between those pool levels and create a broad mudflat around the entire lake, from a few feet to over a hundred feet back from the shoreline depending upon the gradient of the shore. Although no severe mudflat areas have developed to date, the potential exists.

4.3.7.2 Changes Due to Impoundment

The drowned timber in the upper lake will take years to rot and topple over. It should provide fish and wildfowl habitat safe from molestation.

Wave action will continue to cause shorline erosion. Rend Lake is so shallow that the typical inland lake chop develops quite quickly and can become rather vicious when driven by a strong breeze. Its effects on the fragile soil of the shoreline will be noticeable to severe and will contibute to siltation as well as visual unattractiveness.

4.3.7.3 Skyline and Views

Should development of the recreational potential of the lake follow the anticipated process, the sight of hundreds of camper vehicles in the public access areas, many too close to the water to the water to be adequately screened by tree plantings, will intrude on the handsome parklike aspect of the lower lake. (See Section 4.2.4, Section 4.2.6 and Section 4.2.7.

Larger buildings will, of course, intrude on the flat, level skyline as the coal mine headworks already illustrate and diminish the feeling of being in a natural area. The greatest potential for this will come from the Conservancy District Gun Creek development.

4.3.7.4 The Surrounding Area

Evidence of growth of commercialism to exploit the lake is obvious and seems to be of a spotty or strip nature--shops and private campsites in particular. This is due to a lack of land use controls. The problem now is not severe, but the pattern of clustering of these developments around access points to the recreational areas is becoming evident.

4.3.7.5 Conclusion

The lake will have visual problems due to pool fluctuation and wave action as well as heavy camper and boater use which can be mitigated by user controls and careful maintenance. But with the shift of the surrounding area from a rural, natural character to more urban commercial, may, without planning, substantially diminish the visual setting of the lake, the quality of recreational experience offered and perhaps ultimately the long-range tourism economy.

4.3.8 PUBLIC HEALTH AND SAFETY

This section briefly explores the influence of Rend Lake activities on the more visible and critical threats to public health and safety.

4.3.8.1 Disease Control

Original investigations prior to Rend Lake design expressed concern for potential vector control problems created by the lake and for waterborne disease incidence (Section 2.2.2.3 inventories known mosquito species in the Rend Lake area.).

Of primary concern is the large marshy, shallow backwater area created during spring high water. Rise and fall of water levels also leaves isolated ponded water areas in portions of the upper lake. Both cases present ideal breeding conditions. Also of concern is the brackish sulphuretted salt water pools associated with oil well drilling which have been responsible for breeding large numbers of mosquitos.

Experience to date shows that mosquito infestation has been light, as compared to heavy swarms previously found in the Big Muddy flood

plain. Several factors may be responsible for this such as: elimination of oil well operation, greater exposure of backwater pools to wind action which disturbs breeding, growth of surface feeding minnows in the lake, incidence of falling water levels during critical breeding times plus the current control program. (See later sections) No population surveys have been done recently and the above is qualitative.

There have been no reported animal or human diseases such as malaria and encephalitis carried by mosquitos and no apparent or reported incidents of waterborne disease outbreaks attributed to Rend Lake waters(See appendix G-5).

Animal Health: Endemic Diseases

Rend Lake game management programs are producing ideal habitat for many diverse species. It is likely that populations will respond and thrive as intended. Although the above presents a favorable public health picture, it is conceivable that if several species such as ducks, geese, deer, etc. establish themselves in large numbers that eventually some disease problems could be observed.

4.3.8.2 Domestic Waste Management

Plans have been formulated for providing either chemical toilets, boat pump-out units or sewers and forcemains to support recreational activities at all Rend Lake sites. Solid waste pick up is under contract to private contractors who dispose of solid waste in approved landfills. Section 2.1.4.3 discusses other waste sources within the watershed and the degree of treatment being provided.

Potential problems exist in the watershed with overloaded septic systems and lack of sewage treatment facilities; these problems are discussed in Sections 4.2.3 and 4.3.4.

No other immediate water quality problems or public health threats are foreseen at this time.

4.3.8.3 Hazardous Materials

A brief investigation was made during this study of hazardous materials used by the Corps of Engineers in their field operations for possible environmental and public harm. Also, the long stretch of heavily traveled Interstate 57 which passes over or lies very close to Rend Lake waters raises the question of possible threat to the public water supplies from accidental spills.

Pesticides

Appendix 3-6 lists the pesticides used at Rend Lake as indicated in reporting forms used by the Rend Lake Corps of Engineers' field office.

At the present time the Corps of Engineers disposes of their pesticide containers with the rest of the area rubbish which is hauled to a permitted sanitary landfill. This is all done in compliance with existing State of Illinois solid waste regulations. The pesticide applications are carried out according to acceptable practices by trained applicators. Proper cautions are recognized.

The Environmental Protection Agency is in the process of adopting rules and regulations for pesticide and pesticide container disposal and storage. The regulations specify that all pesticide containers, before disposal in a sanitary landfill, must be rinsed and the rinse water treated as excess pesticide.

Hazardous Spills

This section discusses the present hazardous spill response plans for the various agencies with management responsibilities for the Rend Lake, evaluates the impacts of the present response plans. Section 5 identifies ways to provide better protection for the reservoir.

Spill Response Plans

At the present time, the Illinois Environmental Protection Agency has developed a rather simple hazardous spill response plan. The plan is outlined in a brochure entitled "Emergency Procedures for Spills of Oil or Other Hazardous Materials," dated March 1973. The brochure is directed to all "general managers, traffic superintendents, dispatchers of railroads, oil companies, marine pulling companies, shippers doing business in the State of Illinois, the Illinois State Police and other involved state and local agencies." The brochure gives a 24-hour telephone number (217-525-3637) to be called on emergency spills. The response plan requests that the following information be given if possible.

1. Nature of the material.
2. Exact location including nearest body of water.
3. Quantity of material spilled.
4. Time of spill.
5. Anticipated movement and effects of the spill.
6. Personnel at the scene.
7. Action by personnel at the scene.

When notified, the Illinois EPA will do three things:

1. Contact the United States Environmental Protection Agency.
2. Contact other state agencies and civil defense groups as appropriate.
3. Contact the appropriate basin officer (for Rend Lake he would be located at Marion).

The basin officer engineer will immediately proceed to the spill area after notification and determination that a water pollution hazard exists.

In some cases, representatives of regulatory agencies may act as on-the-scene commanders for the cleanup operation. However, full responsibility rests with the owner of the facility causing the discharge.

Potential Impacts

The potential impacts of a hazardous material spill on a roadway or railway close to the reservoir is obvious. It is noted that I-57, Highway 183 and a railroad connecting Sesser and Nason all cross over the reservoir at least at one location. A spill of a hazardous material, such as oil or gasoline, could go directly into the reservoir and not have the potential to be trapped on land. Depending on the winds, water currents and the nature of hazardous material, the spill could directly affect the recreational use of the lake in terms of swimming and fish and other aquatic life. It could affect the use of the lake as a public water supply for at least a short period of time until the material was removed from the reservoir or additional treatment facilities were installed. Section 6 suggests alternatives to the present spill management plans.

4.3.8.4 Recreational Safety

It is difficult to predict the number of accidents that may occur as a result of activities around Rend Lake, yet it is rather likely that the number and type will increase. Local law enforcement authorities are taking steps to anticipate the increases by making federal and state grant applications for men and equipment; however, several observations should be noted.

1. Four agencies (Illinois Department of Conservation, U. S. Army Corps of Engineers, and Franklin and Jefferson Counties) have law enforcement authority on Rend Lake. Caution should be taken not to create conflicts of authority or coverage overlap. A cooperative effort in the areas of ambulance service, equipment acquisition and safety procedures would eliminate duplication and possible costly confusion during emergencies.

2. A potential hazard exists in allowing hunting on camping areas; however, the Illinois Department of Conservation indicates that this has not been a problem on other projects.

3. Any time the harvest of game increases, the possibility of hunting accidents increases. The fact is that in 1973, 30,000 birds were taken by 20,000 hunters on state managed land and only two accidents were reported. This, then, does not seem to present a significant safety problem but that does not mean that an active gun safety program is not needed.

4. Access to future recreational facilities and existing campsites on the west side of I-57 could create a traffic safety problem.

5. It is recognized that high winds could catch boaters unaware at Rend Lake and that the normally calm surface could become choppy very quickly. The Rend Lake Water Safety Council was set up to institute a public information program regarding this danger.

6. The potential hazard exists for submerged tree stumps causing damage to boats. This is particularly evident on the north end of the reservoir where the lake is shallow and bordered by trees.

7. The amount of boating is hard to monitor in order to preclude density conflicts between sailing, speedboating and water skiing. Although surface zoning and "no-wake" areas have been established, the zoning plan should be monitored for possible readjustment.

8. Floating debris is for the most part, found north of the causeway. However, the amount that is in the boating area of the lake is collected and burned by campers.

4.3.9 RESOURCE MANAGEMENT OVERVIEW

Comment is necessary on an overview gained in "a step back" from all the specifics of the above sections. Up to now these discussions have taken Rend Lake's management purposes and its resources apart and have analyzed cause and effect impacts upon the study area and upon Rend Lake itself.

On first glance, it is evident that Rend Lake management tasks have been shared by the three managing agencies, generally by project purpose:

a. Conservancy District has the task of implementing Rend Lake's water supply purpose and has taken the lead in promoting the project's area redevelopment purpose. A portion of Rend Lake's land and its water access has been placed accordingly under Rend Lake Conservancy District authority by lease, grant or ownership.

b. State of Illinois has been granted the major share of the project's fish and wildlife management purposes and some recreational development with control of land areas and water access granted accordingly.

c. Corps of Engineers has emphasis on recreational development and management, land management, and is solely responsible for reservoir operation toward water impoundment, flood control and low flow control. Although full project ownership is retained as is Corps review authority over all activities of other agencies, the Corps as a day-to-day practical management matter, has its primary tasks centered on these above project purposes.

In looking at Rend Lake itself and its environs, it should be immediately clear that the project is a vast, potentially highly productive, complex, completely integrated set of natural cycles and systems. Where water matters stop and biological matters begin is indefinable. This is not to mention the complexities of the overlying cultural and economic systems of the study area.

4.3.10 IMPACTS ON CULTURAL RESOURCES

4.3.10.1 Archeological Resources

Continued development of recreational facilities on project lands can be expected to adversely affect undiscovered archeological sites that may be present at Rend Lake. At present the extent and and significance of archeological resources above flood pool levels is largely unknown. As outlined in Section 2.3.1.1, therefore additional archeological surveys are being planned to provide this type of information.

As development continues if archeological resources are encountered in excavations or other earth-moving activities work will be redirected and proper archeological expertise obtained to evaluate these resources. If resources are deemed to be significant, Advisory Council compliance procedures (36CFR800) will be implemented to mitigate adverse impacts.

4.3.10.2 Historic Resources

As indicated in Section 2.3.1.2 no historic structures are present on project lands. Operation and maintenance activities at Rend Lake are not expected to have any direct impact on historic structures in the vicinity of the project. It is quite possible the economic development in the area stimulated by the lake may

produce secondary impacts on these structures. The character of this possible impact could be either positive or negative. As tourism and development in the area increases, historic structures may be improved and preserved; conversely development pressures in specific locations may create conditions favoring destruction of old structures to make way for new growth. Either impact is likely given current conditions, and both are outside of Corps of Engineers control.

REND LAKE

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SECTION 5:

ADVERSE ENVIRONMENTAL EFFECTS AS A RESULT OF OPERATION & MAINTENANCE ACTIVITIES

Section 5

ADVERSE ENVIRONMENTAL EFFECTS AS A RESULT OF OPERATION AND MAINTENANCE ACTIVITIES

5.1 DEFINITION

Adverse effects are for this discussion considered to be those impacts of maintenance and operation which are both unavoidable and undesirable, yet must be accepted if no further adjustment to the maintenance and management of the project is made.

Unavoidable, undesirable effects of the project that must be accepted are few. Some judgment is involved here as many of the items discussed in Section 4 involve changes such as landscape alteration and enlisting community values and traditions which are adverse to some and desirable to others. This section is, therefore, strictly limited to pointing out those impacts which are generally adverse and unavoidable and are not "value" judgments. The reader of Section 4 can and undoubtedly will determine his own set of impacts which in going against his value-set are "adverse".

Most of the adverse effects of Rend Lake management are indirect and, therefore, difficult to attribute to a specific aspect of the project. Nevertheless they deserve mention. Primary concerns include reservoir management effects, mineral resource management policy, and side-effects of encouraging area redevelopment.

5.2 ADVERSE EFFECTS OF LAKE OPERATION

5.2.1 FLUCTUATION OF WATER LEVELS

Fluctuation of water levels is unavoidable if Rend Lake is to provide flood protection; however, Rend Lake will experience only minor variances in lake levels in most years when contrasted with other flood control reservoirs where extremely high levels are experienced during floods which extend well into the summer growing season. This normally results in adverse effects on the plants of the wetlands community and the exposure of extensive mud flats.

At Rend Lake conditions have been generally satisfactory for fish spawning, the wetlands' herbaceous plant and forest succession has improved, and the response by fish and wildlife has been good. No significant adverse effects on plant, fish or animals have been detected as a result of fluctuations in water levels.

Section 4.3.7 AESTHETIC RESOURCE ALTERATION discusses water levels from a strict aesthetic view. These aesthetic effects may be tagged as adverse although they are not entirely unavoidable.

5.2.2 LAKE SEDIMENTATION

Over a period of many years, reservoirs on rivers with high sediment loads, such as the Big Muddy River, will eventually become filled with sediment. In the short-term, a valuable water supply, recreation, wildlife, area redevelopment, and downstream water quality control resource is established. In the long-term, the resource will become unusable for these purposes without maintenance dredging or some other sediment removal program.

The most apparent long-term sedimentation problem in Rend Lake concerns the two sub-impoundment areas. The sub-impoundment areas will trap approximately 80 percent of the total sediment entering by way of Casey Fork Creek, Big Muddy River and Rayse Creek. It has been estimated that the two sub-impoundments will accumulate sediment to elevation 411 in approximately 100 years. At that time they will not be usable for wildlife management pruposes as they are at the present time. In order to return them to a more usable condition for wildlife management the sub-impoundment areas will have to be dredged or the water level raised. Thus, management of the lake for wildlife purposes will eventually result in the two sub-impoundment areas filling with sediment, decreasing the wildlife management potential for the reservoir.

The accumulation of sediment in the main lake presents a longer range problem. Sediment is estimated to be accumulating in the main reservoir at a rate of approximately 3,500 acre-feet in 50 years or 70 acre-feet per year. The inactive storage pool will fill with sediment in approximately 100 years. This estimate yields a sedimentation rate of approximately 250 acre-feet per year. At a sedimentation rate of 250 acre-feet per year, it will take an additional 640 years to fill the joint-use pool to elevation 405. Much earlier, however, the silt accumulation in shallow portions of the reservoir will become visible and will diminish the aesthetic quality of the lake.

5.2.3 DOWNSTREAM SCOUR

Like any other stream, the Big Muddy River is continuously trying to attain an equilibrium sediment carrying regime. As sediment is removed from the Big Muddy River by Rend Lake, scour can be expected to occur downstream. There is no completely effective alternative to preventing this scour from occurring. Channel protection can be used to control scour at critical areas in the river downstream of the lake. Scour will occur in unprotected areas, however, and will result in bank damage. Damage will also occur to downstream highway and railroad crossings of the river not provided with channel protection.

5.3 ADVERSE EFFECTS OF MINING AND MINERAL RESOURCE MANAGEMENT POLICIES

5.3.1 Unpredictable Coal Mine Subsidence

In Section 4.3.1.2 the effect of mining beneath the project is discussed. (Figure 2-6 depicts those areas affected by subsidence.) Active mines west and south of the project are removing Herrin (No. 6) Coal in large amounts from beneath the west project lands and also beneath the lake. This mining is expected to continue until most of the area beneath the project has been affected. The coal in the site area is relatively low in sulfur content and because of today's environmental concerns, is in demand.

Mineral rights were not acquired beneath the project except for areas beneath the dams. Therefore, all effects on the project from surface subsidence are unavoidable. Among these effects are several which are or may be adverse.

In recreation areas, permanent facilities have been constructed to service campers, swimmers, picnickers, etc. Several of the sites have facilities built low enough so that problems may result during periods of high water. In several of the recreation areas roads have low elevations between 414 and 418. Of necessity, boat ramps and beaches are near water level. The breakwater at Jackie Branch harbor has a top elevation of 414. Subsidence will definitely change conditions at these facilities and could result in damages.

When shoreline areas are rip-rapped or otherwise protected, lowering of the ground surface by four feet could expose unprotected shore areas above the previously protective rip-rap limits.

Subsidence will have one particularly adverse impact on the wildlife areas. The green-tree reservoirs depend on the infrequent inundation of flood waters to provide wildlife habitat at certain times of the year. Dry periods are necessary to keep the trees alive. General subsidence in the green tree reservoirs will change the water level conditions and may result in killing much of the forest resource.

For facilities already in place, the effect of coal mine subsidence is unavoidable. Where construction has not yet begun, measures can be taken to mitigate the damages. Modification of management of the green tree reservoirs should be considered if general subsidence does occur in these areas and threatens the living trees.

5.3.2 ABANDONMENT OF OIL RESOURCES

Initial construction of Rend Lake and also the subsequent operation and maintenance have resulted in abandonment of several producing oil wells. Figure 2-6 shows the location of abandoned and producing wells in the project area. The main areas of well abandonment are at Marcum Branch (Benton North field), along the west side of Fitzgerrell State Park (Whittington West Field), and south of Nason (Ina Field). These three fields had the following production in 1970:

Benton North	205.7 M.bbls.
Ina	7.0 "
Whittington West	10.4

When the lake was filled, mineral rights were subordinated. Production ceased in the Ina and Whittington West fields and was greatly reduced in the Benton North Field. In the Benton North Field, about 18 producing wells remain as compared to a total of 46 in 1970. It is apparent that one unavoidable result of the Rend Lake development has been abandonment of oil reserves.

Many of the wells in the area fall into the "stripper" class producing less than 10 barrels per day. At the time of purchase, oil price controls resulted in these wells being marginal or unprofitable. Recently, controls have been eased on the stripper wells and oil prices have dramatically increased. It is possible that many of the subordinated (and in many cases submerged) wells would now be profitable had they remained in operation.

Abandonment of the remaining oil reserves beneath the lake is an adverse economic consideration which in practical terms is unavoidable. A change in management so that oil pay zones near the shoreline areas could be redrilled and withdrawn would not change this adverse impact. Many of the abandoned wells are a considerable distance from the lake's shore and are not accessible.

5.4 ADVERSE EFFECTS OF STIMULATING AREA REDEVELOPMENT

5.4.1 RAPID UNCONTROLLED GROWTH

Rend Lake area is beginning to be caught up in the problems of rapid growth, and the efforts of many are directed toward increasing the rate of growth.

Development controls, on the other hand, have not kept pace with the dramatic change from a declining, rural-mining area, to an emerging industrial center. While planning studies and reports have taken into account this change in direction, the planning tools - zone administration, subdivision regulation and utility extensions - have not been strengthened or improved to the point where they are effective.

The typical pattern of random development with very low standards for public improvements, wherever land is cheap and easily developed, will begin without notice or concern. After sometime the unnoticed becomes a nuisance, then a concern, and finally a crisis, or more likely, a series of crises. As conditions deteriorate, the cost of providing adequate public services continues to increase. The ability of the scattered, marginal development areas to support the high cost of services is questionable, and for the most part, the rest of the area must absorb these costs.

Both the quality of the living and recreational environment can be seriously diminished. Areas of aesthetic or natural value could be lost; large areas of the landscape will be permanently altered.

There is a lack of large masses of timber or topographic relief to screen development from view within the lake and necessary access. Due to this, the aesthetic impact of this growth will be more severe.

The potentially more serious problem areas around Rend Lake include the Highway 37 and 14 corridors extending out of Benton/West City, the area immediately south of the dam northwest of Benton, and the area around and along the Highway 183 corridor between Sesser and the lake.

Because of many pressures, the Highway 37 corridor will probably be the most critical, since it is likely to be the location for most of the many commercial developments in the area.

While not precisely within the purview of operation and maintenance policies and practices for the lake, the impact of rapid, uncontrolled growth is all too real and all too significant to be overlooked.

5.4.2 SOCIAL CHANGE

Refer to Section 4.2.6.6 - Social Impact. Most results of rapid change which create stress in lives of area citizens could be considered adverse in itself. Specifically, the major adverse effect will be changes felt by senior citizens. These are described in 4.2.6.6 . Without the concern and active planning of local government, these adverse problems are unavoidable.

5.4.3 CONFLICT WITH FISH AND WILDLIFE

Of concern is the extent to which demands are being made for lands immediately adjacent to the lake for industry and housing. Setting aside the fact that these uses compete directly with

production of food and cover for wildlife, the soils in the area proposed for development are extremely unstable. Heavy erosion will follow and this additional sediment will find its way directly into the lake. Turbidity will increase which may reduce the fishery, in itself a major economic force in the community.

Sport fishes such as bass, crappies and bluegills are sight feeders. Increased turbidity limits these desirable species and favors rough fish such as carp and bullheads.

Section 4.2.5.8 discusses the encroachment issue in more detail.

5.4.4 CONFLICT OF MINING VERSUS SURFACE DEVELOPMENT

Other sections of this report describe the impetus to economic growth provided by a readily available water supply. Predictions are made for population expansion, recreational support facilities, and industrial growth. While this growth may be of benefit to the local economy, it may have a long-term effect on the coal mining industry.

Modern mining techniques in the Herrin (No. 6) Coal will result in surface subsidence. To prevent such subsidence would require a change in these methods and result in considerably less coal recovery. The present methods optimize coal recovery from underground operations.

Historically, the coal companies in southern Illinois have not been held liable for surface damages due to subsidence. This may change in the near future. In other states (Missouri and Pennsylvania), the companies have liability and a federal law is being discussed to fix this responsibility. However, regardless of who is liable for subsidence, someone will pay: the homeowner or coal company after subsidence occurs, the homeowner by purchasing mineral rights, or the coal company by changing mining techniques and decreasing the available mineral resource.

Development of surface areas due to economic growth will have the effect of scattering more damageable structures over the study area. Hobby farms, rural industrial growth, additional roads, expansion of communities, and development of commercial and industrial sites away from the urbanized areas are the expected results of economic growth. The most favorable growth condition for the coal companies would be the absence of growth. If land would remain idle, or in pasture and crops, there would be little conflict with the surface rights.

Proper land use zoning especially in areas where intensive mining is anticipated could alleviate this problem. This zoning should be based on the need for minable land and also the economics of repairing any damage from subsidence.

5.5 ADVERSE IMPACTS ON CULTURAL SOURCES

Continued development of recreational facilities on project lands has the potential for disturbing or destroying unknown archeological resources.

REND LAKE

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SECTION 6:

ALTERNATIVES TO EXISTING OPERATION & MAINTENANCE ACTIVITIES

Section 6

ALTERNATIVES TO EXISTING OPERATION AND MAINTENANCE ACTIVITIES

6.1 SCOPE OF ALTERNATIVES

Operation and maintenance activities, while conforming to the goals and objectives contained in the master plan, are continuously in flux in order to meet the exigencies of changing conditions. In addition, master plans themselves are subject to change. At the time of this writing (early 1976) the Master Plan for Rend Lake is in the process of being revised and updated. Furthermore, the Park Manager of Rend Lake has, not only the authority, but also the obligation to vary operation and maintenance activities to meet unforseen circumstances. As stated in the official job description for the Park Manager, "with only general and remote supervision, incumbent must exercise individual initiative and judgment and has wide latitude for independent action and decision in directing the operation, maintenance, development, and management of assigned dam and reservoir and appurtenant facilities, in accordance with an established reservoir development and management program." The possible alternatives are therefore practically infinite. Consequently, this section, rather than dealing with specific things such as hours of closing, placing of garbage cans, etc., that sometimes have to be modified on a day to day basis, will describe instead certain actions or policies that would represent major departures from the current philosophy of operation.

In addition, alternatives considered were limited to those applicable to the areas under which the Corps of Engineers has direct control or at least review authority. None of the alternates deal with those community problems which, while they are secondary effects, appear to have the greatest need for solution if those impacts discussed in previous sections are to be avoided.

6.2 RESOURCE MAINTENANCE/MANAGEMENT ALTERNATIVES

This section describes alternative approaches to the management of natural resources at Rend Lake. The discussion is organized under the headings of Land and Vegetation, Wildlife and Oil.

6.2.1 LAND AND VEGETATION

The following paragraphs describe specific alternatives to managing lands for agricultural purposes and for maintaining land productivity. This does not represent a complete list of possibilities.

6.2.1.1 Cash Cropping

Excluding lands licensed to the state for wildlife management purposes, approximately 2,300 acres of farmland is available. About 500 acres is now being farmed under lease to local people on a cash rental basis. This is being done as an interim measure as a wildlife management tool.

6.2.1.2 Grazing

The approximately 4,500 acres of "go-back" fields and grasslands found on the project could be rented for pasture. As in the case of farmland, improvements would be needed such as fencing and water supply which would involve a significant cash outlay by the Corps. Also, some fields would require reseeding to grass. Again, the relatively small economic return from grazing fees would be far outweighed by the benefits accrueing to the public through the use of these lands for recreation.

6.2.1.3 Timber Management

Many acres of secondary succession (cutover) bottomland and upland timber is present on Corps lands (excluding lands licensed to the state). Good demand for wood products indicates that this timber could be managed for commercial production rather than for wildlife.

Timber stand improvement would involve removing sawlogs and culling out the older poorly shaped trees. Uniformity by compartments would be an objective to promote rapid growth of merchantable trees.

While no direct comparison of management costs versus yield can be made, it is likely that the relatively small acreage involved would not justify the cost of intensive management for commercial production.

On the other hand, if such a program were developed, it would adversely affect forest game populations. Den trees which are crucial to squirrels, wood ducks, woodpeckers and some songbirds would be removed through culling and cutting large diameter trees for saw logs. Uniformity of diameter and growth in a timber compartment may be directly at odds with the diversity in size and number of openings which are required by deer and other species of forest game.

Here, again, it is believed that the small economic return from timber sales would be greatly surpassed by benefits to the public through the use of timber lands for recreation.

6.2.2 WILDLIFE MANAGEMENT

The basic philosophy guiding the management of wildlife resources in Rend Lake is to maintain a balance between consumptive and non-comsumptive users. An alternative approach is to operate completely on the basis of a "no-hunt" concept since there appears to be a national "rising swell" of protectionist sentiment. If the "no-hunt" alternative were taken, then the facilities for non-consumptive uses could be expanded. Facilities such as waterfowl display pools, self-guided nature trails, camping facilities, etc. could be expanded to a much greater level than now exists. This approach would increase the options for the non-consumptive user but it obviously would not meet the needs of the hunters. If both users are to be served then there must be facilities for both. In addition, a protectionist approach does not necessarily guarantee a healthy game population. Healthy game populations are dependent upon a proper balance between populations which, if maintained, produce harvestable surpluses like any other renewable resource. If game managers do a proper job of managing the hunt as well as of preserving habitat, then balances are maintained - populations remain healthy and thriving, plentiful opportunity is maintained for public observation of game and good hunting continues. Therefore the "no-hunt" alternative is not considered to be a desirable alternative to the mix of consumptive and non-consumptive users that now exists.

6.2.3 EXTENDING OIL LEASES

The leases for the oil wells in the Marcum Branch recreation area expired in 1975 and were not renewed. These leases are not administered by the Corps, but rather the Department of Interior.

These leases could have been extended, the logic being that the oil reserves should have been used if the operations did not interfer with the goals of the Rend Lake project. It would not have been possible to disregard the effect of operating oil wells in the Marcum Branch area. The potential existed for oil spills, pipeline breaks, etc.; access would have been provided to the sites, and an obvious visual impact would have resulted from the facilities. The termination of all oil leases meant the abandonment of those oil reserves which were being used. These oil fields had a finite life, however, and it was expected that most of the oil would have been removed within only a few years. At that time the wells would have been abandoned.

Another management alternate would be to allow additional wells and exploration on the site. It was reported that one of the more productive wells in the North Benton field which was located adjacent to the water was abandoned. There possibly could be interest in reactivating portions of this field. Wells that were located in intermittently flooded areas could be built on fill to protect the lake from water pollution. This alternate would depend on the economics of drilling and the remaining reserves.

6.3 RESERVOIR MANAGEMENT AND OPERATION

6.3.1 ADJUSTMENTS TO EXISTING OPERATIONS

This section presents operational alternatives which are essentially adjustments to existing methods proposed to minimize some of the undesirable effects and to deal with the major "safety" problem encountered at Rend Lake. These adjustments do not alter the scope of any of the original project purposes.

6.3.1.1 Water Level Fluctuation

Lake discharge through the outlet works is now limited to 30 cfs at all lake elevations below elevation 405. At lake elevations above elevation 405, additional water is released from the lake through an ungated 30-foot notch in the main spillway. The capacity of this notch is zero cfs with the lake level at elevation 405 and 1,000 cfs with the reservoir at elevation 410. The use of this notch results in frequent reservoir fluctuations between elevation 405 and 410. Reservoir levels to elevation 410 can be expected on the average once every three years.

These fluctuations result in periodic inundation of the shoreline and the establishment of a flood plain type ecology surrounding the lake between elevation 405 and 410. Fluctuations also increase the extent of bank erosion by providing waves access to higher bank elevations.

As an alternative, the outlet works could be used to discharge approximately 1,000 cfs (downstream channel capacity) independent of lake level between elevation 405 and 410. This could be done by regulating the twin gates in the outlet works and using the notch in the spillway. The effects of regulation of the twin gates in the outlet works follow.

Water level fluctuation ranges in the lake would be reduced. The major floods would, of course, still cause the lake to reach levels above elevations 410 but the frequency of the fluctuations between elevations 405 and 410 would be reduced. This would allow better use of the recreational facilities, and would also reduce problems associated with lake bank instabilities.

Downstream flood control effectiveness would be improved by insuring a greater volume of storage available for flood control purposes between elevations 405 and 410.

There would be no appreciable impact on water supply or low flow increases because the appropriations for these two purposes are taken from the joint use storage pool between elevations 391.3 and 405. The operations of the lake at levels below elevation 405 will not be affected.

Another possible impact of the resulting reduction in water level fluctuation is an increase in mosquito populations. Investigation did not reveal the extent to which current water level variation has reduced mosquito breeding. It is known that a favorable falling water level is now likely to occur at the critical time. The reduction in level fluctuation will decrease this likelihood and, therefore, may provide more favorable breeding conditions.

6.3.2 STRUCTURAL ALTERATION

An alternative requiring structural modification of the spillway is discussed which is a reconsideration of an original Illinois Division of Waterways design proposal - that of maintaining normal pool at 410 instead of 405. The final design decision calling for setting 405 as top of joint pool, has been under discussion locally since construction of the project began.

6.3.2.1 Plugging the Spillway Notch

At the present time there is a 31-foot wide ungated notch (crest elevation 405) in the main spillway of Rend Lake Dam. The main spillway itself is at elevation 410. The purpose of the notch is to provide a flood control pool between elevations 405 and 410. With the water level at 405, a 3-year frequency flood will raise the water surface to 410.0. Recreational development - beaches, access areas, etc. - are located such that they are usable with the flood control pool full at 410.

6.3.2.2 Effects

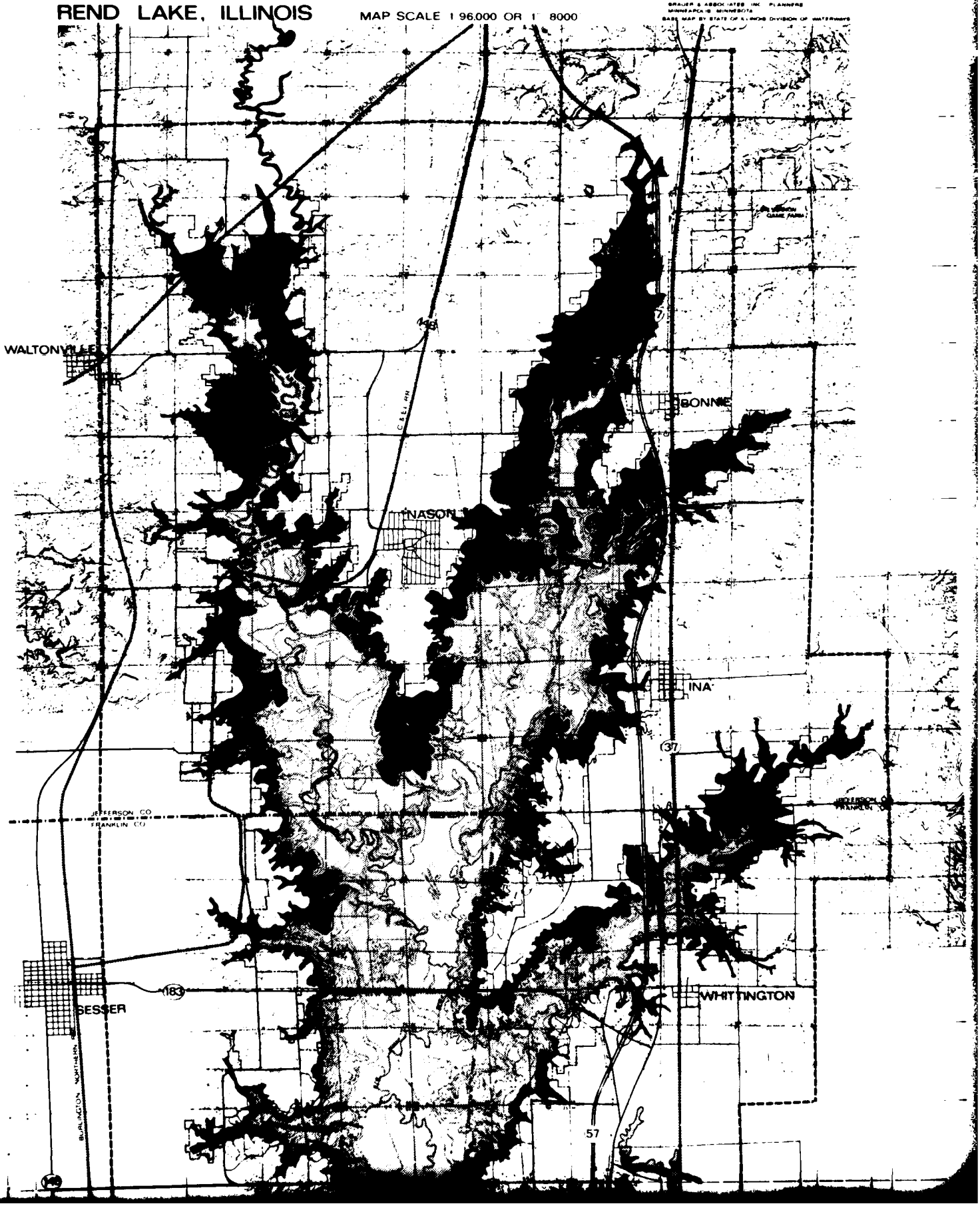
Lake water level fluctuations would be greatly reduced: computations show that the 3-year frequency fluctuation would be decreased from 5 feet with the notch open to about 2 1/2 feet with the notch plugged and pool at 410. Fluctuation reductions would be of benefit in decreasing "mudflat" areas and reducing bank erosion due to wave action.

With the flood control notch removed, many of the recreational facilities surrounding the reservoir now constructed at or just above elevation 410 would be periodically inundated. If the criteria of keeping recreational activities around the shoreline completely usable with fluctuations up to the 3-year frequency is upheld, then access, beaches and marina areas would require redesign and reconstruction to the 413 elevation or higher. This, of course, would involve a cost to somebody. For example, the "in water" and "on land" marina and sailboat harbor at Fitzgerrel State Park and boat ramps elsewhere built with Land and Water Conservation Fund Act money (Project No. 17-00179, Bureau of Outdoor Recreation and Illinois Department of Conservation) would have to be refurbished or rebuilt by the state if they were adversely affected. Figure 6-1 shows the area of the shoreline inundated by the 3-year flood with the notch closed. Table 6-1 below sums up the major project management areas affected.

ENVIRONMENTAL IMPACT STATEMENT
ON OPERATIONS AND MAINTENANCE

REND LAKE, ILLINOIS

MAP SCALE 1 96,000 OR 1" 8000



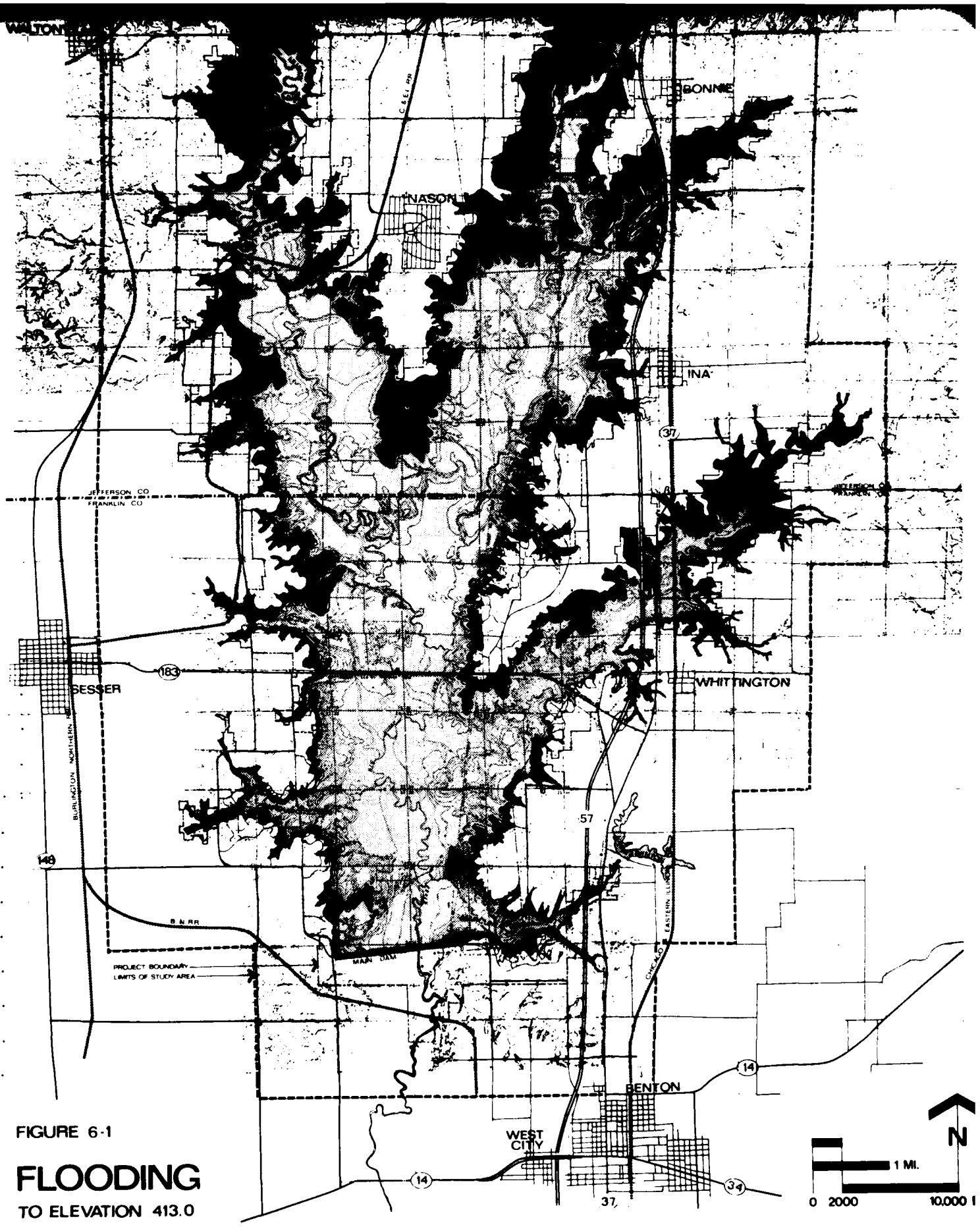


FIGURE 6-1

FLOODING

TO ELEVATION 413.0

TABLE 6-1

THREE-YEAR FLOOD EFFECTS - MAJOR MANAGEMENT AREAS WITH NOTCH PLUGGED

Area	Effect
1. Gun Creek Access Area	Roads o.k.; end of boat launch ramp covered; end of picnic area parking lot covered; an average 75' shoreline underwater
2. North Marcum Access Area	An average of 140' shoreline in beach area above 405; most of a boat launching ramps, and entire swimming beach underwater; water quite close to many camper pads.
3. Dam West Access Area	Approximately 160' of shoreline above 405.
4. South Marcum Access Area	Half of boat ramp; 80' shoreline
5. Sandusky Creek Access Area	Part of 2 boat ramps, 100-300' of shore; nearly all of northeast peninsula in south area becomes a small island.
6. Fitzgerrell State Park	Shoreline moved varies 100' to 3,000'.
7. Nason Peninsula	Lose 4,400' off tip of peninsula.
8. West Shore of lake	Lose 400' to 2,500' of shoreline.
9. Green tree reservoirs and sub-impoundments	Loss of flexibility for water level control. Redesign and construction required.
10. Natural Area - Rayse Creek	Large portion of bottomland timber flooded.

Note: Measurements refer to movement of water's edge normal to shoreline.

All the effects summarized in Table 6-1 will be compounded by surface subsidence when mining is completed under the lake. Estimated surface drop is from 3' to 5', Areas where this additional effect will be seen over the largest area will be the northern branches. Green tree reservoirs will be essentially cancelled.

Of great positive significance would be the deepening of the lake. Although additional shallow marsh areas would be created to the north, the depth across the existing 20,000-acre surface would increase 5' due to plugging the spillway notch and an additional 3' to 5' from subsidence. Deepening of the lake would greatly offset loss of volume by siltation and would prolong its life.

The primary reason for eliminating the spillway notch might be to increase available water supply. If demands greatly exceed estimates (see Section 4.2.3) as would be the case if area redevelopment far exceeded expectations, then political pressure for implementing this alternative would undoubtedly develop. The greater storage capacity might also allow maintaining a higher base flow downstream to offset increased oxygen-demanding pollution loads expected from urbanization of the area. (See Section 4.2.2)

Summary

No recommendation is made as to whether or not this is an acceptable alternative. Plugging the notch is a rather "clean" option in that the effects are relatively easily identified and it would seem that a reliable study of assets and liabilities of the option could be made. Unfortunately such a study could more easily assign value to benefits such as water supply than it could to losses such as game management lands and could, therefore, be misleading.

6.4 RESOURCE MANAGEMENT STRUCTURES

Two alternatives are mentioned here which will provide greater flexibility in resource management; both have been suggested by the State of Illinois Department of Conservation.

6.4.1 SUB-IMPOUNDMENT PUMPING STATIONS

A low-lift pumping station located at each sub-impoundment dam would offer game managers complete control over green tree reservoir water levels. Dam designs allow flooding of about 3,000 acres each from October to March to provide habitat for waterfowl. When gates are closed in the fall, normal inflow fills the lakes. If a "dry" year occurs, inflow is inadequate to fill the lakes.

Department of Conservation management plans suggest installing these pumps if a dry year occurs. With this greater flexibility the sub-impoundments could provide insured proper water levels for fish spawning thus adding to the value of the green tree reservoir system. This tool may well insure an adequate northern pike population since a good spawn is necessary at least once every three to five years. Stable or slightly rising water levels are required for good spawning conditions.

6.4.2 NURSERY PONDS

Department of Conservation, Division of Fisheries plans call for investigating alternatives for location of nursery ponds for fish brooding. Section 4 of this report discusses these ponds in greater detail and points out the use of such ponds in conjunction with an interpretive center. The issue is mentioned again here to suggest that the construction of these ponds would be a worthwhile addition to the fisheries manager's tools.

6.5 TERMINATION OR CURTAILMENT OF THE PROJECT

Federal guidelines for preparation of environmental impact statements require that the "no-go" is really not applicable here since the lake already is there. Consequently, three approaches are considered which would accomplish the nearest thing to. a "no-go" option. These are: (1) restoration of the area to its original conditions; (2) abandoning the project, leaving as is everything that has already been constructed with no management at all, and (3) leaving structures in place but reducing the scope of management functions.

6.5.1 RESTORING THE PROJECT AREA TO ITS ORIGINAL CONDITION

This extreme would require the removal of the 2-mile main dam, both sub-impoundment dams and all recreation area structures and the restoration of the 40,000-acre land area to its original condition.

The impacts of this option are obvious and are summed up as follows:

a. All original purposes are repudiated and all benefits obliterated. Water supply would, of course, be non-existent.

b. Restoration would require removal of tons of silt accumulated in the last two years and about 100 years to replace the original flood plain ecology with a roughly equivalent succession.

6.5.2 ABANDONMENT OF THE PROJECT

By just "walking away" from the project and leaving the dam as is, the lake would remain and the same sort of effects would occur as are listed below in Section 6.5.3. The additional factor, which almost of necessity negates this action is that without maintenance activities to insure the integrity of the main dam; it might fail creating an obviously serious threat to the public health and safety downstream.

6.5.3 MINIMUM MANAGEMENT

This alternative includes leaving all structures in place and reducing management to control only those essential functions necessary to the integrity of the main dam and the public health and safety.

6.5.3.1 Repudiation of Authorized Purposes

It is immediately evident that this course of action would severely restrict several purposes and benefits ascribed to the project in its initial authorization. It is assumed for the discussion of this "minimum management" alternative that project land ownership would not be terminated; the net situation being 40,000 acres of public lands and waters unmanaged. Minimum maintenance of the dam would include operation of the main structure and public health and safety protection would require severly limiting access to lands and the lake.

Flood Control and Low-Flow Augmentation

This option would insure that the flood control and downstream water quality control purposes would continue to be implemented. The impact of these would continue about as discussed in previous sections of this report.

Water Supply

Assuming that the Conservancy District would continue operation of the treatment and distribution system the water supply purpose would continue since the proper operation and maintenance of the dam insures that the joint pool level is maintained (given that nature supplies the inflow).

Recreation

Since only minimum management of the main dam is proposed, no construction, maintenance and operation of recreational facilities would be performed. Also, in order to maintain public health and safety the minimum effort required to meet this objective is to restrict public access to lands and waters. This, of course, would essentially eliminate all recreational benefits ascribed to the project.

If the public were not restricted at a minimum, severe damage to isolated popular camping areas would occur. Uncontrolled boating would, aside from encouraging accidents, increase bank erosion problems.

Rend Lake is so entrenched in the region's recreation planning that crowding and all it brings would no doubt eventually be a great problem. Enough uncontrolled crowding could cause severe damage to land and vegetation. On first glance it is likely that Rend Lake would continue to provide some recreational attraction, but would in the long run return far less to the area than that which it is capable.

Fish and Wildlife

No effort is proposed toward managing wildlife populations, other than the enforcement of state wide regulations by the Illinois Department of Conservation. If public access were totally restricted then project lands would serve as an unmanaged refuge area. Some populations could thrive; however, without control and continual maintenance of balanced habitat for the multitude of species resident at Rend Lake it is probable that problems would develop.

Such a large unmanaged refuge could also create problems with adjacent non-public lands. It may be that disease would damage populations.

If the area were not restricted to the public, hunting, if unmanaged, would eventually eliminate game species such as ducks, geese and deer. Eventually with a few seasons of over-hunting species would become scarce and hunters would try elsewhere.

Area Redevelopment

Given that the above assessment is close to reality, the net effect for the project's continuing area redevelopment purpose is:

a. Water supply would continue to give the area its much needed missing element for industrial/commercial development.

b. Recreation-oriented industrial/commercial growth would be either severely curtailed if public access to Rend Lake were restricted or would likely glut the immediate Rend Lake area initially if no restricted access were enforced. No growth means unrealized economic potential and the later possibility of "glutted" development with the existing lack of land use controls insures that Rend Lake would become an "Atlantic City" or "Wisconsin Dells".

c. In addition, several area jobs would be lost from the reduced field office staff and the annual expenditure locally by the project would be reduced.

6.5.3.2 Net Result

The above analysis is sketchy as to possible effects, yet the point is that with minimum management and with the void not filled or only partially so, the net result is at the least the loss of a large part of Rend Lake's potential tangible and intangible benefits to the region.

6.6 SINGLE AGENCY MANAGEMENT

Three different agencies have been involved in the development of the Rend Lake project area; the Rend Lake Conservancy District, the Illinois Department of Conservation, and the Corps of Engineers. A fourth group, the Casey Fork Park District, has also recently entered the scene. Theoretically, an environment as complex as Rend Lake should be managed by one highly responsive authority - well staffed, properly funded and dedicated to the task of attending to all the details of implementing a far-sighted, balanced management plan. Shall we find such an enlightened body anywhere in the future?

This arrangement has been proposed for Rend Lake, and, although still a possibility, it appears to be precluded by several legitimate political, administrative and financial considerations which likely will not change in the near future. Appendix 5-1 excerpts an item from a past Rend Lake coordination meeting which summarizes early discussion on the one managing agency proposal.

It appears then, that the current arrangement of splitting responsibility between the Corps of Engineers, State of Illinois and Rend Lake Conservancy District will continue and this is perhaps best. Although single-agency management may be attractive and theoretically efficient, it cannot provide the much needed elements of check-and-balance and perspectives from three different levels of government that will be present if the cooperative management effort is made to work. These elements may be essential for Rend Lake's long-term success in view of Rend Lake's large role in both local and regional economic recreation and natural resource planning.

REND LAKE 7

SECTION 7:

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

Section 7

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

In this section we are charged with identifying actions which when undertaken now will restrict or eliminate uses of the Rend Lake resource in the future. The perspective here is from this generation to those succeeding and in question are those options, activities or benefits of Rend Lake which are made unavailable to later generations.

7.1 COMMITMENT OF REND LAKE TO REGIONAL COMMERCIAL BENEFIT

Although newly completed, Rend Lake has been in the public eye for nearly 20 years. As the certainty of Rend Lake's existence increased over the years, regional planning for economic and commercial growth placed greater and greater emphasis on Rend Lake as a regional economic asset.

Sections 1 and 2 outline various comprehensive plans in which Rend Lake plays a role. Summarizing current planning for Rend Lake, we find that:

a. Rend Lake is regarded as a regional recreational area aimed at attracting money and people from metropolitan areas into the local markets; and

b. Rend Lake is seen as the most highly developed recreation intensive lake within the southern Illinois region and is in no way regarded as a wilderness area.

Rend Lake has been authorized to serve a major fish and wildlife management purpose which is seeing successful beginnings. Yet, this purpose has also been incorporated into economic plans as being a great drawing card for hunters and fishermen. (This is evidenced already in the disproportionate wildlife management effort devoted to consumptive uses and currently popular game species.)

Local land use planning also reflects strong emphasis on commercial development around the project boundaries. Review of existing management plans and interviews with local officials give no reason to suspect that this commitment has or will change.

This strong commitment of Rend Lake as a growth generator may foreclose several options for future (and present) generations. Also, the success of Rend Lake already evident along with lack of local

preparation for controlling growth presents the possibility that hopes for Rend Lake-generated prosperity may not be realized to its full long-term potential. Explanations follow.

7.2 FUTURE OPTIONS LOST OR THREATENED

The first concern is that the prevailing view of Rend Lake and the hopes associated with it for economic growth represent, in a sense, license for broad consumptive use of Rend Lake's natural resources. Also, the push for greater numbers of "out-of-town" users could greatly restrict the availability of Rend Lake to local users both present and future.

7.2.1 CONSUMPTIVE USE OF REND LAKE AND ENVIRONS

The push for more people and greater density of development to maximize economic return could ultimately result in across-the-board degradation of Rend Lake's environment.

Environmental degradation is a slow, insidious process - an integrated net result of a multitude of unspectacular, minor, seemingly inconsequential actions and compromises which while possibly good in themselves, produce side effects of an undesirable nature. These "little things" go on usually without notice. They cannot be managed by crisis-oriented government, because few of these damaging activities can of themselves become great enough issues to arouse necessary public concern for correction.

This report, so far, (particularly Section 4) has shown that a number of seemingly minor factors now exist and others to be expected as growth occurs will continue quietly to slightly pollute storm water, slightly erode soils, slightly encroach upon wildlife areas, slightly trample vegetation, and slightly degrade visual qualities. For some time the net result will be only slightly evident, and with the strong focus on economic growth, officials will only be slightly concerned.

Integrated across one generation, however, these minimal consumptions of Rend Lake's resources could mean foreclosure of a quality recreational experience for those not yet born. Where a father may remember the great peace of an early morning on Rend Lake in its early years, his son might experience mainly the noise of heavy traffic, crowds of people, trampled lands and glittery commercial areas. And if "Junior" happens to like peace and natural beauty, his best bet may be to try Shawnee National Forest and pack in along the river somewhere.

7.2.2 LESS AVAILABLE TO LOCAL USERS

Many recreational development plans for Rend Lake have been oriented toward the out-regional and distant metropolitan user

in that access and traffic circulation seems to key strongly to Interstate access and major circulation roads. Commercial development already proposed shows strong commitments of land to overnight and longer accommodation businesses. Also evident are plans for commitment of nearby lands for second home development and expensive entertainment-oriented facilities. The net result is an early trend toward committing large blocks of available developable land to attract regional users.

This trend, if it continues, will mean greater restriction of access to Rend Lake to local people who may not want to stay overnight, buy meals, go to a theater or other attraction or compete with crowds. The areas around the lake left uncommitted to commercial crowd-draw (including auto-oriented camping areas) will become fewer, and the local user may have to travel farther to enjoy the lake. The trip will be less spontaneous, and the recreational experience less casual and relaxing.

7.3 FORECLOSURE OF LONG-TERM ECONOMIC RETURN

Rend Lake has great economic potential benefit for both Franklin and Jefferson Counties and Southern Illinois. While development planning locally and regionally has looked far into the future to set growth goals, effort has not yet been directed toward insuring that no valuable options are foreclosed by growing too fast or by allowing initial development which is short of ultimate potential. The quality of initial short-term development (how well it is controlled, where it is located, how it spreads, how it looks) will be a major significance in sustaining future full economic value of Rend Lake.

If no land use controls and standards for development are adopted, or if they are adopted too late, or if they are administered on a shortsighted or political basis, much of the economic potential of the area could be foreclosed. Regardless of the particular type of planning and zoning controls enacted, in the end analysis the result and character of development will be largely a matter of attitude. If the lake area is regarded as a valuable and limited resource, the growth and development can be accommodated with a minimum of damage and can possibly improve the Rend Lake resource.

Economic growth and environmental quality are not mutually exclusive issues. If the lake remains an attractive place, and the quality of residential and tourist development is high, the economic value to the region and local residents could be expected to grow in proportion to this quality. If on the other hand, the initial development begins to sprawl along highways and recreation areas, much of the environmental character of the area will be diminished. It can be expected that the recreational quality will diminish with it particularly on a long-range basis.

The most valuable parcels of land, in terms of potential tax base to the communities, or the best locations to attract tourism and recreational consumers may be taken by marginal development. Two things happen: 1) the land is not available for quality development and 2) the presence of undesirable and unsightly sprawl will inevitably prevent such development from taking place.

There are innumerable examples in Minnesota and Wisconsin of lake areas which were developed to the point that the very landscape of the lake and shoreline which first attracted people has been lost. The lakes have become polluted. The people seeking investment opportunities or recreation have gone elsewhere bypassing these areas in favor of new and larger facilities.

7.4 REPLACEMENT OF A CULTURE

It has been noted throughout this report that business and governmental interests in the Rend Lake area are highly motivated, capable and well-organized in their efforts to generate economic growth. Because the area has lagged behind the rest of the state for so many years, there appears to be a total commitment being made to the prosperous new day coming; growth has been assumed to be totally desirable and obtainable at any cost.

One can't quarrel with the fact that a 'higher standard of living' is a wise and necessary objective but total commitment of assets and resources to obtaining greater economic growth could well, in the long term, reorder the entire lifestyle of the area. Without some balance being sought between economic growth and other "quality of life" goals, some may find the new life to be a total foreclosure of the valued old ways. We know from observation of other areas similar to southern Illinois, which have boomed and blossomed economically, that the old ways have been gradually changed as growth occurred. In all cases a new industrial culture has ultimately pressed down upon and submerged the old rural ways. This process is extremely difficult to percieve as John Morley in "The Life of Richard Cobden" stated: "Great economic and social forces flow with a tidal sweep over communities that are only half conscious of that which is befalling them".

7.4.1 COMMUNITY IDENTITY

Not so long ago there was a strong tie between an individual and his community. Evidence of this was the local tavern, post office and general store, or community building where news was passed, community problems solved and most social activities took place. Community identity is an increasing problem in more industrialized society, where an individual may work in one community, live in another, send his children to school in yet another, etc. In this particular study the 'dispersed city' emphasis may even be evidence of this concern.

7.4.2 SELF-SUFFICIENCY

Another loss which is characteristic of industrialized society is that of self-sufficiency. The subsistence farms in southern Illinois provided a resident and his family with food, shelter, clothing and most of the other necessities of life. The blacksmith supplied all metal goods and handmade furniture and pottery were made in a local area. Unlike modern-day society, the residents did not depend on automobiles from Detroit, fruit from California, oil from Texas and potatoes from Idaho. Almost all items necessary for daily use were provided by someone in the area. If a self-sufficient attitude still clings to some of the older residents of southern Illinois, economic progress will change that attitude and there will be an increased acceleration toward outside material dependency and economics of scale.

7.4.3 CRAFTSMANSHIP

An observation being made by many people across the United States is the loss of craftsmanship. People are saying, "let's do it 'better' rather than 'more'." Southern Illinois once produced some very fine handcrafted furniture which is now worth a considerable amount of money. Also, wooden barrels for packaging hot sorghum were made in the area and of exceedingly high quality. There seems to be no question that many of the crafts and much of the quality of workmanship has been lost as a result of mass production efforts.

7.4.4 POPULATION AGE SHIFT

A trend has already begun toward a younger population in the area. A change in attitudes and behavior patterns of the young will certainly affect the social/political and economic features of the area. The result will be a greater impact on the physical as well as the social environment of the region. The historical values related to this particular area of southern Illinois are intrinsically tied to the older residents who remain in the area. It is apparent, then, that an influx of younger people will bring a change in these values.

7.4.5 SUMMARY

The preceding paragraphs have specifically addressed themselves to areas of cultural change that resulted, if not directly from economic growth, certainly in conjuction with it. Short term pursuits of economic gain may preclude full enjoyment of long-term social amenities if consumption is not properly thought out, planned for and controlled. Evidence of misjudgements in other areas of our past is pointed out in a recent magazine article, "on the horizon are the beginnings of a new American way of life - more limited in material

ways but perhaps more beneficial in tempo of living, human relationships and basic values".[1] These questions have not come up overnight and, in fact, there is considerably more evidence over the last ten years of the peoples' desire for a better quality of life. Many are yearning for a simpler past - to the point where some Americans regard the fuel crisis as a blessing in disguise. In addition to less consumption there is evidence of group living, fewer children, religious and aesthetic comebacks. There is some evidence that people are leaving the city where lucrative jobs are available, in order to seek out social amenities that have been lost. There is also evidence that there is a loss in confidence in the political structure and in the institutions in the United States. The entire concern is trending toward one for quality rather than quantity and social/cultural amenities rather than material.

Certainly the question is not whether to choose economic progress or social amenity but rather what are the social costs of economic growth and what are the residents of this particular area willing to sacrifice in order to obtain economic parity with the rest of the United States.

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[1]Flieger, Howard, Editor, Special Section, How America is Changing, U.S. News & World Report, Vol. LXXVI, No. 8, February 25, 1974.

REND LAKE

8

SECTION 8:

ANY IRREVERSIBLE & IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTIONS SHOULD THEY BE IMPLEMENTED

Section 8

ANY IRREVERSIBLE & IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTIONS SHOULD THEY BE IMPLEMENTED

This consideration required identifying and describing those unavoidable impacts enumerated in previous sections which irreversibly curtail the range of uses of the environment. According to Federal Environmental Quality Council guidelines[1] the term "resources" means not only labor and materials devoted to an action but "also means the natural and cultural resources committed to loss or destruction" by the proposed continuing activity. "Irreversible" is a hard and fast term and is considered for this discussion to mean literally "irreversible" by any means.

8.1 LABOR AND MATERIALS

Obviously, Rend Lake requires a continuing commitment of money, manpower and materials to support maintenance and operational activities. Level of support will increase as Rend Lake resource management requirement increases. Figures on current support requirements for the Conservancy District, the State of Illinois and the Corps of Engineers operations are shown in Appendix 1-3. These are partial figures only, but do show current relative operating levels.

It is questionable whether or not expenditure of money and manpower has the net effect of being irreversible and irretrievable; this being public investment in support of Rend Lake, the return in annual benefits from which, it has been determined, exceeds annual costs.

8.2 NATURAL RESOURCES

All consumptive use of Rend Lake resources in a sense are irreversible and irretrievable. Game harvested in order to maintain populations at self-sustaining levels would be gone or consumed yet the proper level of consumption is the factor which insures that numbers lost will be replaced.

No biological systems within the Rend Lake project resource area appear to be on the verge of total irreversible loss for all time. Water is, for all practical purposes, nondestructible and cannot be irreversibly lost but, as has been shown, it can be poorly distributed or temporarily impaired by man (Section 4.2.3).

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[1]Water Resources Council, Water & Related Land Resources, Establishment of Principles and Standards for Planning, Federal Register, Volume 38, Number 174, Park III, 10 September 1973, U.S. Government Printing Office

8.3 CULTURAL RESOURCES COMMITTED TO LOSS

8.3.1 ARCHEOLOGICAL RESOURCES

The Rend Lake project area received brief attention in its beginnings by archeologists who identified and catalogued an extensive inventory of archeological sites within the study area. Section 2.3.1 discusses Rend Lake's pre-historical background. A few of these sites located below expected water levels were excavated by hurried salvage techniques before Rend Lake's construction.

Salvage work was supported by National Park Service funds. (Some Corps funds were given to the ParkService.) Policy at the time (early 1960's) limited exploratory efforts to key sites below proposed normal pool elevation. Although these sites are not totally lost because they are under water the increased excavation costs would make salvage work both difficult and economically unfeasible.

8.3.2 LOSS BY CONTINUING MANAGEMENT AND CONSTRUCTION

Continuing and planned construction threatens known sites in the Gun Creek area. Data given in salvage reports available gives sufficient location on sites to show that the Gun Creek development will destroy at least two suspected sites. No other conflicts from new construction with catalogued sites are evident.

Heavy recreational user densities also may destroy suspected sites. Foot traffic on poor soils can increase erosion and eventual loss of artifacts. This potential exists in and around nearly all the public access areas. Increasing public interest in archeology can also take its toll on destruction of information by untrained amateur diggers. Site locations have been published and are, therefore, known to persons seeking to dig.

Wave action from both natural wind generated waves and heavy power boat wakes can jeopardize sites located near the water line by eroding unprotected embankments. It has been shown that the bank erosion will be a problem but perhaps not as severe as has been seen at Carlyle Reservoir where several archeological sites have been lost or threatened.

REND LAKE

9

SECTION 9:

COORDINATION

Section 9

COORDINATION AND COMMENT AND RESPONSE

9.1 COORDINATION OF THE DRAFT ENVIRONMENTAL STATEMENT

The Draft Environmental Statement addressing the operation and maintenance of Rend Lake was coordinated with appropriate federal and state agencies, local communities, organizations, and interested individuals in December 1974 for review purposes in compliance with the National Environmental Policy Act of 1969. That draft environmental statement was filed with the Council on Environmental Quality and subsequently a notice of this action was published in the Federal Register on 30 December 1974. The comments which were received as a result of this review are addressed in this part. Copies of the letters of coordination are contained in Appendix E-1.

The Draft Environmental Statement was sent to agencies, organizations and individuals. Those agencies and organizations who responded follow:

a. Environmental Protection Agency
b. U. S. Department of Interior
c. U.S. Forest Service
d. U.S. Soil Conservation Service
e. Department of Health, Education and Welfare
f. Department of Housing and Urban Development
g. U.S. Department of Transportation - Federal Highway Administration
h. U.S. Department of Transportation - U.S. Coast Guard
i. Advisory Council on Historical Preservation
j. Illinois Archeological Survey
k. Illinois State Geological Survey
l. Illinois Department of Conservation
m. Illinois Department of Conservation - Fisheries
n. Greater Jefferson County Chamber of Commerce
o. Migratory Waterfowl Hunters, Inc.
p. National Campers and Hikers Association, Inc.
q. Old Ben Coal Company
r. Outboard Boating Club of America

The following agencies and organizations also received a copy of the statement:

U.S. Department of Commerce
Illinois Natural History Survey
Illinois Historical Survey
Illinois Environmental Protection Agency
Illinois Department of Public Health
Illinois Department of Transportation
Illinois Department of Business and Economic Development
Illinois Department of Labor
Greater Egypt Regional Planning & Development Commission
Rend Lake Conservancy District
Southern Illinois, Inc.
Mt. Vernon Chamber of Commerce
Benton Chamber of Commerce
Christopher Chamber of Commerce
West Frankfort Chamber of Commerce
Orient Coal Company
Outdoor Illinois
Illinois Wildlife Federation
Illinois Association of Soil and Water Conservation District
Izaak Walton League of America, Inc. - Illinois Division
Illinois Audubon Society
Sierra Club - Great Lakes Chapter
The Nature Conservancy - Illinois Chapter
American Fisheries Society - Illinois Chapter
Ducks Unlimited
The Wildlife Society - Illinois Chapter
The Coalition on American Rivers
Coalition for the Environment
Environmental Response

Public Libraries Receiving Copies:

Benton Public Library
Christopher Public Library
Mt. Vernon Public Library
West Frankfort Public Library
Southern Illinois University - Carbondale

Draft Statement to CEQ 30 December 1974

a. United States Environmental Protection Agency

Comment 1: Project Description. The operational schedule and the expected life of the Casey Fork and Rayse Fork sub-impoundments should be indicated. The impact of the present reservoir release rates on the downstream corridor areas should be described.

Response: Operation of the sub-impoundment dams (Big Muddy and Casey Fork) is by the State of Illinois. About 3,000 ac. ft. of storage is provided by these two dams between elevations 407 to 412. Plan of Operation calls for the gated gravity outlet in both structures to be closed about October 1, to allow fall runoff to be impounded for waterfowl use during the fall hunting season. Around March 1 the gated outlets are opened and the impoundment dam assumes the level of the main dam pool. Overflow sections at elevation 412 provide adequate flow length for each sub-impoundment dam to protect its integrity during the fall and winter period in the event of flood-control pool elevation in excess of 412.

Little is known about downstream conditions, however, three contacts with downstream farmers indicate that high sustained releases result in the flooding or backing up of slough areas. The areas of contact have been concerned with slough areas that prevented access to fields.

Comment 2: Water Quality. The EIS indicates that water quality standards have been violated downstream and upstream of the impoundment. It is also stated that these violations are the result of inadequate treatment of municipal discharges, storm sewer overflows and agricultural and industrial non-point sources. In view of the admittedly poor water quality in the upper portion of the impoundment and the possible inadequacy of reservoir releases for water quality control, the EIS should address itself to possible changes in the release schedules. Some assessment of the non-point source contribution and the adequacy of the existing low flow from the dam of 30 cfs (to meet the dissolved oxygen requirements of 6 mg/l of dissolved oxygen during at least 16 hours of any 24 hour period nor less than 5 mg/l at any time) is basic to a discussion of the alternative management schemes. The possibility of providing additional flow downstream of the dam until adequate levels of point source treatment and non-point controls are provided should be investigated even though the present operations and maintenance procedure for low flow augmentation does not appear to conflict with the findings of the Big Muddy Comprehensive Study. A 303(e) basin plan for the Big Muddy River Basin has not been submitted by the State; its scheduled completion date is unknown at this time. Therefore, the compliance efforts of the upstream major dischargers discussed on pages 59-60 in the EIS are tentative improvements and should be indicated as such.

Response: The water quality downstream of the dam has improved with the operation of Rend Lake. This is evidenced in the EIS as follows:

> Page 57 "The Water quality records show that the quality of the water immediately downstream of the reservoir has been significantly improved by the reservoir" . . ." This represents a monumental improvement over the water quality on the tributaries upstream of the reservoir."

The upstream water quality at times does not meet standards, however, the water quality in the pool is better than the tributary streams entering the lake.

Low flow Augmentation - Reservoir Storage allocations in the joint-use pool (elevations 391.3 to 405) of 51,000 ac. ft. flow augmentation and 109,000 a-ft. for water supply is provided. A minimum average annual release of 30 cfs is provided for water quality. Changes in reservoir low flow releases would necessitate reassessment and re-allocation of the available storage. The interests of the State of Illinois and the Water Conservancy District could not be provided for.

Comment 3: We note that high turbidity values have been recorded in the lake, especially north of Highway 183. An explanation should be included in the EIS on the period or periods during the year in which turbidity is consistently high; the respective causes for the high turbidity; the effects of such levels on the lake's fishery, water quality and recreation activities; and the feasibility of mitigation measures.

Response: The high turbidity values noted north of Highway 183 evidently refer to Stations 3 and 4 sampled by the Corps of Engineers. Both of those stations are located at the upmost portion of the reservoir. The water quality generally resembles that of the river. Since much of this turbidity settles as the velocities decrease farther into the pool no significant problem occurs.

In fact the turbidity on the upper portion of the lake may be beneficial in one respect. Since the nutrient concentrations are higher in the upper portion of the reservoir, the lack of light penetration, caused by turbidity, may help to control any potential algae problems. As the turbidity decreases from settling so does the nutrient concentration, much of which was attached to the suspended solids.

The turbidity values are generally higher in the months of January through April and again in September. Surface runoff from the surrounding cropland areas cause the major portion of the turbidity. Cultivation of this cropland accompanied by rainfall cause erosion resulting in higher turbidity values in the receiving stream.

Comment 4: The location and frequency of backwash discharge of the water treatment plant should be indicated. The effects of having to treat waters with high levels of turbidity, fecal coliform, phosphorus, iron, manganese and copper should be discussed. The extent of occurrence of algae blooms and their resultant odor and taste problems should also be mentioned.

Response: Back wash discharge is into sludge lagoons followed by a temporary drying bed with discharge to the lake. The system has a NPDES permit and monitoring indicates BODs averaging less than 1 mg/l. Future plans will be necessary for sludge handling facilities because lagoon space will become limited. Mr. Lipe indicated the possible use of centrifuges. Economics prove unfavorable for any kind of chemical reclamation.

Raw water with high turbidity is noticed at times of the year when seasonal turnovers occur and large rainfalls. During summer months the lake is extremely clear and turbidity is no problem. Fecal coliform, iron, and copper have not been problems during the five years of operation of the plant. Phosphorus and manganese concentrations increase as the pool elevation decreases in the lake.

The second summer in the five years of operation, an algae bloom created taste and odor problems which reached the plant. The problem was not detected and the distribution system was plagued with taste and odor problems. Since this time there has been no problem of taste or odor caused by algae blooms.

Comment 5: As discussed in the EIS, the availability and reliability of the Rend Lake impoundment and the Conservancy District water treatment and distribution system without a corresponding sewage treatment system has resulted in spurious development around the lake. Septic tanks systems are being constructed in soils poorly suited for septic treatment, experiencing close to 90 percent rate of failure (pages 44, 175). Increased per capita usage of water and proliferation of septic fields is further aggravating the failure rate of septic systems. Because of the soil's low permeability and the high water table, sanitary wastes cannot easily seep into the ground and in many cases are discharged on the surface. Leaching or runoff of such wastes to Rend Lake can severly degrade water quality and cause severe local public health problems depending upon the density of septic fields in the watershed. Therefore, Corps monitoring programs should be expanded to include certain areas around the lake that are specifically being affected by septic tank runoff to determine the degree of water quality degradation. Once specific areas such as tributary watersheds and drainage ditches have been determined as being degraded by sanitary wastes with monitoring and tracing methods, appropriate State and local agencies should be contacted to effectuate a water quality management program to minimize such impacts.

Response: We concur fully that the Corps monitoring program should be expanded to include certain areas around the lake that are specifically being affected by septic tank runoff to determine the degree of water quality degradation. Our program is currently broad in scope due to manpower limitations. It is planned in the future, however, to monitor these areas.

Comment 6: The articles of cooperation with the Corps of Engineers for utilizing the water supply storage portion of the reservoir should be such as to control the indiscriminate use of the Conservancy District in the distribution and sale of water to communities, developers, and individuals around the lake that are or will be contributing to the degradation of Rend Lake's water quality. Lack of control affects the project's water supply and recreational purposes for which the lake was designed and also the desired water quality goals for this basin. According to page 226 of the EIS, the Conservancy District has no current management criteria for balancing the sale of water with the general well-being of the county or local communities. We believe criteria should be developed for determining the suitability of a potential water supply user or petitioner; controlling water supply use once it is sold to a lower unit of government; evaluating the environmental consequences of water supply use by a petitioner; and vetoing the sale of water to a petitioner when it is assessed that the resultant environmental degradation would outweigh the achievable benefits. We suggest that the Conservancy District and the Illinois EPA be contacted to discuss the feasibility of these or similar criteria.

Response: Comment noted. The above statement is outside the jurisdiction of the operation and maintenance procedures of Rend Lake.

Comment 7: With regard to the three alternative plans of action for rectifying the problem of fish kills in the stilling basin because of stagnant waters, the economic and environmental advantages and disadvantages of each plan should be noted and compared in the Final EIS. This evaluation will assist in determining the most cost-effective and environmentally-sound plan.

Response: The engineering and cost data were studied for the three proposals however, they need not appear in the Final statement. The test has been modified to indicate the type of system which was installed.

Comment 8: Solid Waste Disposal. From information obtained during our field inspection, we note that solid wastes from project properties are being deposited at a Franklin County landfill. Information from the Illinois EPA is that while private landfills exist, there are no county-run landfills in existence. Furthermore, none of the private landfills have a current operating permit issued by the State of Illinois. Federal

guidelines for the disposal of solid waste are intended to apply to all solid waste generated by Federal agencies, regardless of whether processed or disposed of on or off Federal property. Solid waste disposal should be permitted only at State approved landfill sites holding a current operating permit. Since this is apparently not the case, we request that the current waste management program be modified to adhere to this requirement. Compliance with EPA's Thermal Processing and Land Disposal of Solid Waste Guidelines (August 14, 1974, Federal Register) is required by Section 209 of the Solid Waste Disposal Act (PL 92-512) and Executive Order 11752 - Prevention, Control and Abatement of Environmental Pollution at Federal Facilites.

Response: The Franklin County Landfill has an operating permit from the Illinois EPA (Permit No. 1975-10). A current permit was issued on June 12, 1975.

Comment 9: We note that the Corps generally purchased only surface rights within the project boundaries except beneath the dams where mineral rights were also acquired in order to prevent subsidence of these critical structures. Yet Figure 2-6 of the EIS shows Herrin Coal (No. 6) beneath the west side of the Main Dam and all of the Big Muddy Sub-impoundment Dam as already having been mined out. We realize that these areas were probably mined out prior to the construction of the reservoir. However, the EIS should discuss whether these areas have already been subjected to subsidence, the extent subsidence has occurred or has the potential to occur, the environmental and economic effects that the estimated subsidence is having or will have on the dam structures, access areas, local roads, the sub-impoundment areas and the lake ecosystem (refuge and open water). The provisions to assure that the remaining coal lying underneath sensitive surface structures (such as the dams) will not be mined should be detailed in the EIS. Consideration should be given to a periodic monitoring program to survey subsidence levels and mining efforts.

Response: The areas beneath the west side of the main dam and the Big Muddy Sub-impoundment Dam were mined out prior to construction of the project. These areas have already been subjected to subsidence, the extent of which was estimated at 5 feet or less. Additional subsidence in these areas is possible but not as likely as in areas which have been mined more recently. New subsidence has been observed in the Sandusky Creek and Jackie Branch area during 1974 and 1975. This subsidence is in the form of deep (over 15 feet), nearly vertical ground cracks varying in width from a few inches to about 3 feet. The most significant of these cracks can be traced for a distance of about 1500 feet. A re-evaluation of the possible effects of subsidence and potential subsidence on various features of the project including the dam structures has been initiated. This will be part of a comprehensive engineering geology study which will include a complete evaluation of

the project relative to subsidence, structural geology, and seismicity. Mining restrictions to protect sensitive surface structures prohibit mining beneath the dam and within a 45^{0} vertical angle (estimated draw angle for subsidence) from the U/S & D/S limit of embankment. Periodic monitoring of mining efforts is an established procedure. Measurements and monitoring of subsidence will also be initiated over mined out areas.

Comment 10: From information obtained from our field inspection and in the EIS, ventilation shafts and access shafts will be constructed on Corps of Engineers property for safety and efficiency purposes. While the property required for construction of ventilation shafts is minimal, the facility could be incompatible to surrounding land use such as camping, recreation activities and nature study areas if adequate forethought is not given to evaluating potential effects and minimizing negative environmental impacts. The potential adverse effects of these facilities upon ambient noise levels, air quality, land use conversion and aesthetics and the steps that will be taken to mitigate or eliminate these adverse effects should be detailed. Location alternatives, design alternatives and landscaping should be carefully considered in compatibly integrating these facilities into the area. The EIS indicates that five access shafts will be required on Corps of Engineers property and that such facilities are rather large and include parking facilities, washing facilities and appurtenant structures. The actual amount of land required for such facilities should be noted. In order to reduce the land surface required for this activity, to minimize construction impacts and erosion in proximity to Rend Lake from these facilites, and to decrease the potential conflicts with recreational activities of the lake, we suggest that consideration be given to providing only limited parking for necessary service vehicles, and shuttle buses. Larger parking areas could be constructed on more compatible lands or private property, if necessary; and miners could be shuttled back and forth to the parking area.

Response: Coal is one of the many resources of Rend Lake lands and a major resource of the area. The actual number and type of facilities needed by coal companies for their future operations can not be determined at this time. As the laws and economics of the coal industry change, their needs will change. In the role of project managers responsible for public lands, the Corps of Engineers carefully studies each request, placing restriction on new facilities which are deemed necessary to protect other project resources such as wildlife and recreation. The use of shuttle buses may be desirable in some areas, but their utilization throughout the entire project appears to have little purpose at this time. This concept will continue to be considered as an alternative.

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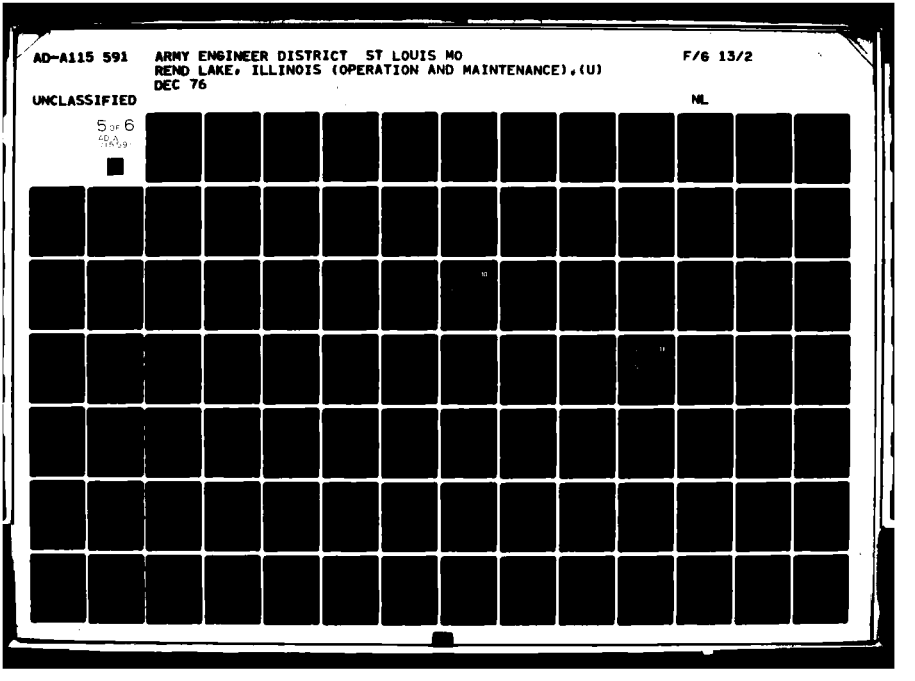

b. United States Department of Interior

Comment 1: Paragraph 2.1.2.6, Economic Geology. Oil. The discussion of petroleum reserves and production on pages 36 and 37 gives this information by counties, not by fields. On page 284, oil production for 1970 is given for the three fields that have been affected by the lake. The statement asserts in several places that oil production is declining. This could be misleading and is not supported by data from just one year's production. We suggest that an estimate of petroleum reserves should be given for all three fields.

Response: Data published by county is a common means of displaying reserves and production. The abandonment of the three oil fields is clearly stated in Section 5 - "Adverse Environmental Effects as a Result of Operation and Maintenance Activities" and is a recognized loss of energy resources.

Comment 2: Because of the current energy crisis and the need for a supply of domestic oil, we question the advisability of limiting exploration and terminating leases as part of management practices. Such actions warrant more explanation in the final statement.

Response: Production of all previously existing oil and gas wells at Rend Lake has been terminated and the wells plugged in compliance with applicable laws, where continued production would be incompatible with project requirements. Leases are being issued by the Bureau of Land Management, Department of the Interior, to authorize continued production of the remaining wells on the perimeter of the Lake. Under the provisions of Title 30, United States Code, such leases will continue in effect as long as oil or gas is produced in paying quantities.

NOTE: In substantial areas of the project, oil and gas interests were not purchased by the United States, but were subordinated to project requirements. If the recovery of such oil and gas is determined to be economic under future conditions, the drilling of additional wells by private capital will be subject to the legal estate acquired by the United States, as well as Federal and State pollution laws.

Comment 3: 2.3.1.2 Historical Site Survey. The statement does not clearly confirm that the State Historic Preservation Officer (Mr. Anthony Dean, Director, Department of Conservation, 602 State Office Building, Springfield, Illinois 62706) has been consulted to determine what effect the proposed activities might have on cultural resources, especially those which might be in process of nomination to the National Register of Historic Places. It is erroneously asserted on page 82 that the National Register is published in the Federal Register each February and supplements are published on the first Tuesday of each month. If the proposed activities should be found to have an effect on listed or eligible National Register sites, the statement should reflect further compliance with Section 106 of the National Historic Preservation Act of 1966.

Response: The State Historic Preservation Officer (SHPO) has received a copy of the draft environmental statement and has commented on it. A copy of the final statement incorporating these comments and reporting Corps of Engineers cultural management procedures in operation and maintenance operations at Rend Lake will be sent to the SHPO.

The sentence concerning the National Register has been changed in the final to show that the most recent (February 1976) compilation of the Register has been checked.

Comment 4: The discussion of archeological resources leaves the impression that further studies of the resources which have not been inundated would serve no purpose. Considering the statements in Section 2 (page 81) and in Section 8 (page 242) that adverse effects on archeological sites are expected to occur as development proceeds at Gun Creek and around the lake, it would appear necessary that the Corps of Engineers undertake further surveys of all Federally controlled lands in the project area in order to identify significant resources and prepare a program for mitigation and salvage.

Response: If such an impression is given in sections of the draft statement dealing with cultural resources it certainly was not intended. Sections on cultural resource management have been revised in the final statement, and the need for and value of additional archeological surveys made explicit.

Comment 5: Until such actions are taken, the description of historic and archeological resources in the statement and the anlaysis of expected adverse effects will be incomplete. The program for mitigation and salvage should identify procedures to be followed when previously unknown resources are encountered in the future.

Response: Comment noted. The text has been changed to include a discussion of procedures to be employed should cultural resources be encountered during on-going operation and maintenance activities.

Comment 6: 4.2.5.5 Non-Game Species. We concur with the observation that management of non-game wildlife should be included in all plans for the Rend Lake area. The non-game component of our native wildlife is important in residential, commercial, and recreational areas we well as on land designated as wildlife habitat.

Response: Comment noted.

Comment 7: 6.3.2 Structural Alteration. The possibility and consequences of modifying the spillway to raise the normal pool from 405 feet above mean sea level to 410 feet is discussed. The Bureau of Outdoor Recreation is assisting the Illinois Department of Conservation,

through the Land and Water Conservation Fund Act (Project No. 17-00179), to construct in water and on land marina and sailboat harbor facilities at Wayne Fitzgerrell State Park and boat ramps elsewhere at Rend Lake. We believe the statement should recognize that if the project or project operation is altered in a manner inimical to the Land and Water Conservation Fund assisted recreational facilities or their usefulness, that the State of Illinois will be responsible, pursuant to the provisions of Section 6(f), for the refurbishing or replacement of such facilities.

Response: Section 6.3.2 has been modified to answer the above comment.

Comment 8: 6.5.2.1 Fish and Wildlife. The statement that hunting, if unmanaged, would eliminate game species from the area is unfounded, based on the information given. Extremely high hunting pressure could have this result, but there is no evidence that hunting pressure on the unmanaged wildlife area would be that great.

Response: Statement concerning elimination of certain game species has been deleted since under the assumption of minimum management, access would be limited and therefore no hunting would be permitted at all. Even if hunting were permitted, hunters would still be subject to the regulations of the Illinois Department of Conservation.

c. United States Department of Agriculture - Forest Service

Comment 1: Your description of the natural resources, including woodland, and the effect of operation and maintenance of Rend Lake project is excellent. We feel the final statement should attempt an estimate of the recreational and developmental impacts on wildlife cover and vegetation in general.

Response: Comment noted. In section 1.6.3.1 is a discussion of certain specific activities relating to land management practices of the staff at Rend Lake, these activities include the planting of trees, shrubs, grasses, etc., which in the judgment of the Park Manager will improve wildlife cover.

d. United States Department of Agriculture - Soil Conservation Service

Comment 1: Page 2, item 5, line 3 of the summary lists "U. S. Soil Conservation District" - This should read "U. S. Soil Conservation Service."

Response: Comment noted. This change has been made in the final statement.

Comment 2: Page 5, 2.1.4.3 Waste Sources Tributary to Watershed, last sentence - suggest the word "cropland" be deleted because agricultural runoff is not limited to cropland.

Response: Comment noted. Text has been changed accordingly.

Comment 3: Page 60, Non-point Waste Sources, first paragraph, line 2 - suggest it read "include runoff from agricultural land and animal feedlots..."

Response: Comment noted.

Comment 4: Page 196, second paragraph, third sentence - suggest it read "The need to grow standover crops such as grasses and legumes for..."

Response: Comment noted. The text has been modified accordingly.

Comment 5: Page 240, Erosion - This section could be expanded to include erosion from the total watershed area. Attached is an SCS Technical Note entitled "Erosion in Illinois - Amount by Counties" which includes our latest information on erosion. This may be useful in estimating the watershed erosion.

Response: Comment noted. It is the purpose of this statement to address activities directly related to O&M activities.

Comment 6: Page 289, 6.2.1.4 Upstream Sediment Control - The statement recognizes the importance of and need for more sediment control measures. Every effort should be made to accelerate the installation of needed soil and water conservation practices on all lands in the watershed. The local soil and water conservation districts in Franklin and Jefferson Counties have leadership responsibilities for this activity. Additional funds for providing technical and financial assistance through the soil and water conservation districts should be considered to help get this job completed.

Response: Comment noted.

Comment 7: Page 313, "U. S. Soil Conservation District" should read "U. S. Soil Conservation Service."

Response: Comment noted. The text has been changed accordingly.

Comment 8: A soil map of the area would be helpful in reviewing the statement. This may be obtained from the Soil Conservation Service field offices. Soil information should be used by land users in making proper land use decisions.

Response: In 1965, the S.C.S. prepared a map of soils of the Rend Lake Area (p. 43). This study was utilized in preparing the Master Plan.

Comment 9: Shoreline erosion is recognized, however, more definite plans for control would strengthen the statement.

Response: At this time there are no definite plans for shoreline erosion control beyong that discussed in Section 4.3.3.1.

Comment 10: Care and timing will be very important in releasing water through the spillway to avoid flooding on agricultural land below Rend Lake Dam.

Response: The reader should refer to Section 1.3.1.1 - Downstream Flood Control and 4.2.1.2 - Economic Impact Downstream for an explanation of the impacts of flooding downstream.

Comment 11: Considerable development is anticipated, therefore, it is important that productive agricultural land be preserved for agricultural production. We are concerned with the continued and accumulative effects of loosing such land to other uses of an irreversible nature.

Response: Comment noted. Section 3.1.3 points out that neither Franklin nor Jefferson County has adopted a zoning ordinance.

Comment 12: We look forward to continued coordination and cooperation with our District Conservationists. If you have questions relating to the soils, vegetative seedings, woody plantings, fertilization, erosion control or any soil and water conservation practices, don't hesitate to get in touch with Mr. William A. Morris or Mr. Tommy D. Heinrich at our field offices.

Response: Comment noted and thank you.

e. Department of Health, Education and Welfare

Comment 1: We have reviewed the Draft Environmental Impact Statement for the above project. To our knowledge, and based upon the information provided, this project will not impact to any significant degree on the health, education or welfare of the population.

Response: Comment noted.

f. Department of Housing and Urban Development

Comment 1: We wish to advise you that HUD owns $8,925,000 in revenue bonds issued by the Rend Lake Conservancy District in 1968 for the Intercity Water System. The Conservancy District is in default on these bonds. The Conservancy District may not issue additional bonds against the Intercity Water System without HUD's consent; we do not intend to consent to any such issuance.

Response: Comment noted.

Comment 2: Rend Lake is a good example of a project designed to bring great benefits to a region which also has the potential to do great harm to the region in the absence of local planning and land use regulation. The present lack of local responsibility for planning and control of growth is already showing detrimental effects; septic tank overloading from new water lines is polluting the lake, unregulated development is leading to crises in services, lack of policy will overcrowd the lake with boaters, etc. The lack of overall management criteria for the sale of water by the Conservancy District is a major contributing problem. The imposition of federal controls in a situation such as Rend Lake's is open to question. However, we have a legitimate interest in protecting the federal investment and promoting orderly development. It would appear reasonable to require that local planning, regulatory, and implementation mechanisms be in place prior to the commitment of federal resources in a project of this magnitude.

Response: Acts of Congress, and interpretations thereof by the Supreme Court, clearly indicate that the Federal Government may accept some degree of responsibility for all aspects of water conservation, development and use. However, it is also clear that the degree of responsibility that may be accepted is not the same for all purposes; that it varies from a maximum degree for sound planning, to a lesser degree for construction, and to a still lesser degree for financing, operation and maintenance. More specifically, under existing legislation, the Federal Government may:

a. Act as the prime mover in, and accept a high degree of responsibility for carrying out, projects for navigation, irrigation, flood control (including major drainage and hurricane flood protection), and shore protection;

b. In connection with projects to serve the above purposes, assume a lesser degree of responsibility for the generation of power, the provision of water supply, the control and improvement of water quality, the conservation and enhancement of the fish and wildlife resource, and the provision of opportunities for outdoor recreation.

g. U. S. Department of Transportation - Federal Highway Administration

Comment 1: It is suggested, that following general coordination, a memorandum of understanding be arranged through the Illinois Department of Transportation to assure that required highway transportation to and through the recreational areas can be provided as needed. Discussion of the arrangements for necessary highway transportation service to the recreation areas should be expanded.

Response: Coordination with the Illinois Department of Transportation took place prior to the construction of Rend Lake. Such matters as highway relocations, travel corridors, and other highway needs were discussed and agreed to at that time. As the project matures the Corps will work with the Illinois Department of Transportation to solve mutual problems.

h. U.S. Department of Transportation - U.S. Coast Guard

Comment 1: The Department of Transportation has reviewed the material submitted. We have no comments to offer nor do we have any objection to this project.

Response: Comment noted.

i. Advisory Council on Historic Preservation

Comment 1: Compliance with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470(f)). Although the National Register of Historic Places was consulted the Council must have evidence that the most recent listing of the National Register has been consulted (see Federal Register, February 4, 1975).

Response: The most recent listing of the National Register has been checked (Federal Register, 10 February 1976). This check revealed no properties now on or considered to be eligible for placement on the Register which may be adversely affected by the operation and maintenance of Rend Lake.

Comment 2: Compliance with Executive Order 11593 of May 13, 1971. In the case of land under the control or jurisdiction of the Federal Government, a statement should be made as to whether or not the proposed undertaking will result in the transfer, sale, demolition, or substantial alteration of potential National Register properties. If such is the case, the nature of the effect should be clearly indicated.

In the case of lands not under the control or jurisdiction of the Federal Government, a statement should be made as to whether or not the proposed undertaking will contirubte to the preservation and enchancement of non-federally owned districts, sites, buildings, structures, and objects of historical, archeological, architectural, or cultural significance.

Response: Based on information now known about the cultural resources at Rend Lake, operation and maintenance of the lake will not adversely affect any potential National Register properties. Since as is noted in the text, archeological surveys on all project lands have not been completed this situation could change. If such an event occurred, Advisory Council compliance procedures would be implemented.

The operation and maintenance of Rend Lake is not anticipated to have any effect on significant cultural resources outside the project area.

Comment 3: Under Section 800.4(a) of the Advisory Council's "Procedures for the Protection of Historic and Cultural Properties" (36 CFR 800) the Corps of Engineers, in conjunction with the State Historic Preservation Officer, is responsible for determining which of the historical sites mentioned in sections 2.3.1.2 may be eligible for nomination to the National Register and for assessing the impact of development and management plans upon the sites. The same procedures apply to the archeological sites mentioned in sections 2.3.1.1 and 8.3. Historic, architectural, archeological and cultural properties on all lands except those owned by the Conservancy District should be considered.

Response: All historic sites listed in the draft statement are located outside of project boundaries and are not subject to Corps of Engineers control. Operation and maintenance of Rend Lake is not expected to have any direct impact on these structures. It is quite possible that the economic development stemming from the lake that is occurring in the area may produce secondary impacts on these structures. The character of this impact could be either positive or negative, however. As tourism increases in the area these historic structures may be improved and preserved; conversely development pressures in specific locations may create conditions favoring demolition of old structures to make way for new growth. Either impact is likely given current conditions, and both are outside of Corps of Engineers control.

As noted in Comment 2 above, data on archeological resources on project lands is lacking at the present time. These areas will be surveyed as funds become available and compliance procedures will be followed for archeological resources that are determined to be significant and which are found to be adversely affected by operation and maintenance practices.

Comment 4: To ensure a comprehensive review of historical, cultural, archeological, and architectural resources, the Advisory Council suggests that the environmental statement contain a copy of the State Historic Preservation Officer's comments concerning the effects of the undertaking upon these resources.

Response: The State Historic Preservation Officer (SHPO) has received a copy of the draft Environmental Statement and has commented on it. A copy of the final statement with responses to these comments and changes in the text which reflect these concerns and indicates cultural resource management procedures will be sent to the SHPO.

j. Illinois Archeological Survey

Comment 1: A review of the Draft EIS indicates that it is not adequate with regard to preservation of the archeological resource base and mitigation of the effects of Corps operation and maintenance on this cultural resource in Rend Lake. Pages 79-81 in the EIS describes the archeological resources in the lake area, while paragraph 8.3.2 on page 312 indicates several situations that will take place in which sites could and will be destroyed. These effects include construction in the Gun Creek area, recreational usage by the public, and wave action or bankline erosion. The Draft EIS, however, does not subsequently describe how this threat of destruction to existing archeological sites can be mitigated. I would think this should be discussed in the Final EIS, and the adverse effects outlined in Section 5.

Response: This aspect of cultural resource management has been incorporated into the final statement; see Section 4.3.1.0.

Comment 2: I would recommend that a program of archeological evaluation and reconnaissance be immediately instituted for Rend Lake similar to the archeological planning which is now taking place for the Shelbyville Reservoir. For Rend Lake, I would think that the entire bankline should be resurveyed, or at least in those areas where there is serious erosion, and where known archeological sites, based on the surveys described in pages 79-81, exist. I would also think that all areas should be resurveyed, where there can not be total preservation and which will eventually house or be the sites for the kinds of land activities described in Table 2-42 on page 155. Such areas in which there will either be construction or usage on the existing surface could inadvertently destroy archeological sites. Known archeological sites must be protected, and land activities such as listed in Table 2-42 must first be checked for cultural resources prior to development.

Response: As outlined in Section 4.3.1.0, additional archeological surveys are being planned which will seek to determine areas where greatest damage or potential damage to archeological resources may occur.

k. Illinois State Geological Survey

Comment 1: Page 27, line 10 - Suggest reference to Silurian reefs (I.S.G.S. Illinois Petroleum Series 102, "Silurian Pinnacle Reefs and Related Oil Production in Southern Illinois," H. M. Bristol, 1974).

Response: Comment noted and corrections and additions added to Final Statement.

Comment 2: Page 27, line 4 - Suggest "During the Paleozoic most terrigenous sediments were derived from areas northeast of the Illinois Basin."

Response: Comment noted and corrections and additions added to Final Statement.

Comment 3: Page 27, line 2 - "Chesterian System" should be "Chesterian Series."

Response: Comment noted and corrections and additions added to Final Statement.

Comment 4: Page 28, lines 8 and 10 - Suggest deletion of two occurrences of "continued" and joining of two sentences.

Response: Comment noted and corrections and additions added to Final Statement.

Comment 5: Page 28, last sentence under stratigraphy and lithology - Would be better stated if author substituted "lower" for "underlying" strata.

Response: Comment noted and corrections and additions added to Final Statement.

Comment 6: Figure 2-3 - Bond Formation (not Bend).

Response: Comment noted and corrections and additions added to Final Statement.

Comment 7: Page 29 - This formation consists predominately of shale (not limestone).

Response: Comment noted and corrections and additions added to Final Statement.

Comment 8: Page 30, last line - Change "Members" to "pay zones."

Response: Comment noted and corrections and additions added to Final Statement.

Comment 9: Page 30, line 10 - "fossiliferious" should be "fossiliferous."

Response: Comment noted and corrections and additions added to Final Statement.

Comment 10: Page 30, line 36 (also on p. 31) - "Valmiererian" should be "Valmeyeran."

Response: Comment noted and corrections and additions added to Final Statement.

Comment 11: Page 31, line 11 - Kinderhookian Series is about 125 feet thick at King; Chouteau is about 10 feet thick and is underlain by New Albany Shale.

Response: Comment noted and corrections and additions added to Final Statement.

Comment 12: Page 31, line 27 - "Trenton Member." Make it Trenton Limestone.

Response: Comment noted and corrections and additions added to Final Statement.

Comment 13: Page 32, line 16 - DuQuoin Monocline dips steeply to the east not west.

Response: Comment noted and corrections and additions added to Final Statement.

Comment 14: Page 32, line 18 - Only the eastern portion (actually the Shawneetown Fault) of the Rough Creek in Illinois is a high angle reverse fault; west of the Shawneetown Fault, faulting is mostly normal.

Response: Comment noted and corrections and additions added to Final Statement.

Comment 15: Page 32. Structural Geology - All structures should be in caps.

Response: Comment noted and corrections and additions added to Final Statement.

Comment 16: Considering the energy situation, why terminate all oil production after 5 years? If the wells are "not conspicuous and will not distract greatly from the recreational activities." why not let the oil companies continue to produce this valuable resource?

Response: Please refer to U.S. Department of Interior's letter and their Comment No. 2.

Comment 17: Relative to coal mining in the area, two suggestions in the draft were made (by the consulting company) as follows:

1. That an inventory of possible sites on the project land be made for future air shafts and man and materials shafts.

2. That the surface rights be zoned relative to the impact of coal mining subsidence.

However, no assurance was given that these suggestions are or will be implemented.

It was mentioned in the report that no future detailed mining plans have been received from the mining companies operating in this area. It would seem likely to us that these companies would have their mining plans laid out for at least the next 5 years.

Response: Please refer to the letter from U. S. Environmental Protection Agency and Comment No. 10.

Comment 18: It was also mentioned that only mineral rights beneath the dams were condemned and purchased by the Corps. While the report contains considerable discussion on a probable 4-foot (seems slightly high) subsidence over mined-out areas, no mention was made of the fact that the western portion of the main dam and the entire Big Muddy sub-impoundment dam were built over mined-out areas. However, this is clearly shown on Figures 2-6. It was not indicated whether mining would or could be prohibited beneath Route 183 causeway or the planned convention center. How much additional area was to be acquired to include the draw of subsiding mined-out areas?

Response: Please refer to the letter from U.S. Environmental Protection Agency and Comment No. 9.

Comment 19: Detailed mapping of the nature and distribution of Pleistocene deposits within the project area seems desirable from the viewpoint of the operation and maintenance of Rend Lake. This data could be helpful in predicting construction conditions and the effect of expected coal mine subsidence. Perhaps small gravel deposits would be located that could be used to retard wave erosion where it is now considered uncontrollable (p. 252-294). The data presented in the five bridge borings in Appendix 2-1 are useful, but their locations on Figures 2-6 are not numbered and are hard to find.

Response: Detailed mapping of Pleistocene materials is beyong the scope of preparation of this statement. Information provided by the Soil Conservation Service as to the soils (top 60 inches) is utilized in the operation and maintenance of the project.

Comment 20: The problem of siltation is also discussed (p. 257, 282, 294), but unless the reservoir is going to be allowed to gradually deteriorate after 50 years or so, there should be at least an alternate plan to establish a dredging program in a few years where a given portion of the lake bottom is restored or deepened each year.

Response: Concur. A long range dredging program is needed, but as yet the only plans for dredging are confined to existing harbors and boat channels.

1. Illinois Department of Conservation

Comment 1: Page 136, last paragraph: Crab Orchard National Wildlife Refuge - this paragraph states "winter refuge for over 100,000 Canada geese.: Populations never have reached this figure. The highest has been 91,000 in 1975. The average peak would be 75,000.

Response: Concur. Text has been changed to read accordingly.

Comment 2: The statement "It has provided the nucleus from which other goose flocks in the area will be generated." This is pure conjecture. In fact, preliminary data suggest otherwise. Such statements can lead to erroneous conclusions later.

Response: Concur. Sentence has been deleted in text.

Comment 3: Page 155, 3rd line, Table 2-42 on Supply and Demand -Hunting: You list the 1970 demands as 8,694 for all hunting. Waterfowl hunting alone showed 6,013 man-days in 1973 and in 1974 the waterfowl man-days use was 8,485. This, of course, is not the total demand but the actual use and does not include the put-and-take areas or open hunting.

Response: The discrepancy is noted. However, the demand figures were taken from the Illinois Department of Conservation Outdoor Recreation Plan and they will remain in the Final Statement. A note of caution in the utilization of Table 2-42 is provided in the text.

Comment 4: Page 187, 4th paragraph: The figures in this paragraph are from Periodic Report No. 7 of the Migratory Bird Section. They are not referenced or listed in the bibliography.

Response: Comment noted. The data is from Report No. 8 and this notation has been added to the bibliography.

Comment 5: Page 187, Species Expected: Our Division of Wildlife Resources has a species composition from the bag which should have been used.

Response: Comment noted. The information is in file that is not retrievable in published form.

Comment 6: Page 189, Goose Flock Management Objectives: Of the 1100 acres farmed on the refuge, only 165 are now tenant farmed. The remainder is farmed with Department personnel and all of this portion remains in the field.

Response: Comment noted and the final statement has been modified to reflect the change in management.

Comment 7: Page 190, 2nd line: Should read (one year of grain with a catch crop) - instead of cash crop.

Response: Comment noted. The Final Statement has been changed accordingly.

Comment 8: Page 190, 4th paragraph: This paragraph has no relationship to Rend Lake and should be deleted.

Response: The information concerning Horicon Refuge, while not directly related to Rend Lake, was included to simply indicate the possible impacts on other areas that might result from an increase in goose numbers at Rend Lake.

Comment 9: Page 190, Management Critique: It may be added that a mid-winter survey in December, 1974, showed over 30,000 geese with a much larger number using the area during January and February of 1975.

Response: The Final Statement has been changed to reflect the results of the mid-winter survey conducted in December, 1974.

Comment 10: Page 190, last line: Our projected harvest of Canada geese in Franklin and Jefferson counties for 1973 was 232 geese - not 428.

Response: Comment noted. The Final Statement has been changed accordingly.

Comment 11: Figure 4-2 Projected Waterfowl Use - Rend Lake Canada Geese Realistically these numbers should be cut in half!

Response: Comment noted. With current management techniques employed by the Illinois Department of Conservation at Rend Lake, utilization of the project by Canadian Geese could well exceed the 100,000 figure. In January and February 1975, over 50,000 geese used this area.

Comment 12: Figure 4-3 Numbers of Canada Geese - Southern Illinois - The figures in the table are in error. We suggest you use the following figures:

1945	OK	1965	202,000
1950	Probably 75-100,000	1972	243,000
1955	221,000	1973	210,000
1960	159,000		

Response: Concur. Figure 4-3 has been changed to reflect the above suggested figures.

Comment 13: Page 191, 3rd paragraph: This advocates a separate quota for the Rend Lake area. I suggest that when or if that is needed, these counties simply be added to the existing quota zone. This paragraph should be deleted.

Response: Paragraph in text has been modified.

Comment 14: Page 192, 1st paragraph: Are the figures in this paragraph from Periodic Report No. 9 of the Migratory Bird Section? If so, they should be documented.

Response: The paragraph in question has been deleted from the Final Statement.

Comment 15: Page 220: Map facing page 220 is coded for "Recreational" and "Park Development." It is not clear how you differentiate between the two.

Response: A statement has been added to the text to clarify the distinction.

Comment 16: Page 253: Perhaps more emphasis should be placed on erosion potential, particularly from wave action. Protection of exposed points on the longer fetch distances is recommended.

Response: Further protection of exposed areas is under study and in the future more riprapping and gabon placement will take place in response to project funding.

Comment 17: Page 320 Hine - Should be DEMBAR not DENBAR

Response: This change has been added to the Final Statement.

Comment 18: Page 321 Huchbaum - Should be HOCHBAUM and the title of the book is Travel and Traditions.

Response: The Final Statement has been corrected as indicated.

Comment 19: Page 325 Reeves - Not a complete reference. Should be as is, plus ED, Hine and Schoenfeld. Canada Goose Management. Dembar Ed. Res. Ser.

Response: Comment noted.

Comment 20: A general comment concerns the waterfowl goals and objectives attributed to the State; i.e., page 5 last paragraph. It would be worthwhile to discuss the State goals with our Division of Wildlife Resources to make sure that terms attributed to the State in the Environmental Impact Statement are truly the State's goals and objectives.

Response: Comment noted. At this time, 31 December 1975, there is no published waterfowl goals and objectives available from the State of Illinois.

m. Illinois Department of Conservation - Fisheries

Comment 1: Page 6 - 1.3.1.1 Benefits - Shouldn't negative benefits also include loss of tax revenues, crop and timber production, and overall land productivity?

Response: Loss of tax revenue is not a real economic cost although it may be important for financial stability of the area involved. The crop, timber and overall land productivity could be classed as a negative benefit, however, the Corps has traditionally shown these losses on the cost side as you will see in Para 1.3.2.2 Annual Cost.

Comment 2: Page 10 - 1.4.2.4 Public Access Areas - Gun Creek has not opened in 1974, and may not in 1975, according to my latest information. It is obvious throughout the whole report that dates of completion and availability of recreational areas, and the resulting recreational useage and impact figures are based on dates that are erroneous. They should be updated to 1975 level of information of progress.

Response: Dates and figures in the report have been updated as best as possible to represent the situation as of 31 December 1975.

Comment 3: Page 11- 1.5.1.f. - Was this project completed in 1975?

Response: The Jackson Branch Harbor improvements were completed in 1974.

Comment 4: Page 70 - 2.2.1.1. Aquatic communities - Creeping water primrose has become a problem in some bays.

Response: Creeping water primrose was not the problem in 1975 that is had been in 1974.

Comment 5: Page 73 - 2.2.2.2. Fishery Resources - Additional information regarding the Big Muddy basin fishery resources is available in "Inventory of the Fishes of Four River Basins in Illinois, Special Fishery Report 8, January 1965, Illinois Department of Conservation, Division of Fisheries.

Response: Comment noted and thank you for the reference.

Comment 6: Page 74 - 5th paragraph. Fishing has vastly improved.

Response: Comment noted.

Comment 7: Page 75 - This species list is more accurate than the one found in the appendix.

Response: Comment noted.

Comment 8: Figure 2-18 Sailboat Harbor location not labeled correctly.

Response: Comment noted. Figure 2-18 represents an obsolete plan by the Conservancy District, but is included until present plans are updated.

Comment 9: Page 138 - Kincaid Reservoir - Location description and water acreage is incorrect.

Response: Comment noted. Text has been changed accordingly.

Comment 10: Page 138 - Carlyle Reservoir - Approximately 50 miles east of St. Louis, not 60 miles.

Response: Comment noted. Text has been changed accordingly.

Comment 11: Page 147 - 1st paragraph - Eleven launching ramps will be available and very serviceable in 1975.

Response: As of this date numerous launching ramps are available to fishermen and boaters. Reference to launching ramps in Section 2.4.3.2 have been deleted.

Comment 12: Page 155-156 - Regarding Surveys, an angler creel census survey was completed on Rend Lake in 1974, for which figures are available.

Response: Section 4.2.5.6 has been updated to reflect the information.

Comment 13: Page 172 - paragraph 4 - The Benton sewage plant effluent not only reduces water quality but frequently poses an odor problem. Hopefully this situation will be remedied as the treatment plant is upgraded.

Response: Comment noted.

Comment 14: Page 199 - paragraph 3 - This situation will be remedied in 1975 with the opening of more and better developed launching ramps.

Response: Comment noted. The statement has been updated to reflect the change in situation.

Comment 15: Page 204 - paragraph 5 - Catfishes are usually not removed from sport fishing waters by commercial fishermen. It would be more accurate to insert "commercial species" for catfish at "12¢ per pound" rather than "50¢ per pound".

Response: Comment noted, the Final Statement has been changed accordingly.

n. Greater Jefferson County Chamber of Commerce

Comment 1: While I lack the qualifications required in analyzing the Draft Environmental Statement you were good enough to send me, from an amateur viewpoint I think you and your associates did a good job in its presentation.

Response: Comment noted.

o. Migratory Waterfowl Hunters, Inc.

Comment 1: Page 20, 1.7.4 - The present waterfowl hunting practices are in conflict with the design requirements "for that type of individual who is interested in getting away from the metropolitan area but does not desire to leave the modern conveniences of the city." (see comment p. 151, 2.4.3.2).

Response: The statement in Section 1.7.4 reflects the planning opinions of the early 1960's while Section 2.4.3.2, Hunting, reflects the current management practices.

Comment 2: P. 53, 2.1.4.2 In light of the present concern for lead shot poisoning of waterfowl, the source of the lead which violates the standards (Rayse Creek) should be identified and efforts to reduce it to an acceptable level intensified.

Response: Comment noted. Water quality will continue to be monitored by the Corps and the Illinois Environmental Protection Agency. Attempts will be made to isolate sources of pollution and to eliminate the cause.

Comment 3: P. 78, 2.2.4.2 The "over-hunting" should be specified as market hunting as it is extremely doubtful if sport or recreational hunting has ever contributed to the extinction of any species on North America.

Response: Comment noted and reference to market hunting has been inserted in the text.

Comment 4: P. 97, 2.3.3.1 Indicates the need for a change in the present method of waterfowl hunting in that a significant portion of the population, the aged, are excluded because they cannot exert the required physical effort.

Response: Comment noted. Most of Rend Lake can be hunted by and from boats or with a moderate amount of walking. If individuals, regardless of age, cannot exert a moderate amount of physical effort, they constitute a safety hazard to themselves as well as fellow hunters.

Comment 5: P. 146, 2.4.3.2 Second paragraph. Waterfowl hunting should be included as a water related activity for basic recreational use of Rend Lake.

Response: Concur. Text has been modified.

Comment 6: P. 151, 2.4.3.2 Waterfowl hunting practices should be changed to reflect greater concern for safety, allow more participation by the aged or infirmed and family units. "Walk In" hunting discriminates against the senior citizen and the less than fully physically fit. It effectively prevents fathers from taking their children waterfowling. In the short period that Carlyle and Rend Lakes have been hunted for waterfowl, they have been the scene of more deaths than our local area (where blinds are required) has experienced in four times that length of time.

We strongly recommend that the practices and standard for blinds required by the Illinois Department of Conservation in pools 25 and 26 on the Mississippi be implemented. Namely that:

1. That Migratory Waterfowl hunting be done only from those sites located and staked by the Illinois Department of Conservation.

2. That these sites be no less than 150 yards apart.

3. That permanent waterfowl hunting facilities be built on these sites.

4. That the Illinois Department of Conservation hold a first-year draw for interested hunters to draw for these blind sites.

5. That the Illinois Department of Conservation have an annual draw for all unclaimed blind sites.

6. That during waterfowl season, those blinds not claimed by the blind builder one hour prior to shooting time be allocated on a lottery basis.

7. That all blind sites be reallocated no less than every two years.

8. That these blind sites be built, brushed and maintained by the person whose name is drawn at the annual draw.

Response: We are, of course, very interested in guarding the welfare of lake users. It is inevitable with the millions of people that use the lakes that accidents will happen. The waterfowl hunt system, as proposed and carried out by the State, does not force anyone to undertake activities that will harm them. General water safety rules should be followed by all persons active on or around water no matter what their particular activity is.

Some areas at Rend Lake would require a strenuous walk. However, most of Rend Lake can be hunted by and from boats, or with moderate walking.

Since the Illinois Department of Conservation has the legislative responsibility and authority, and wildlife management expertise, administration of managed hunt programs within the State of Illinois are under their supervision. The Corps insures that areas are open for recreational use to the public without regard to sex, race, creed, color or national origin and that the program is fair and equitable. The present system of walk-in hunting has been successful in providing high quality hunting and providing lightly restricted hunting opportunity for many citizens of the State. The system at Rend Lake provided more hunter trips and birds bagged in 1974 than any other public area in the State.

Comment 7: This statement should include information as to whether an effective plan to deal with duck virus and similar diseases exist.

Response: Concur. A statement has been added to the text (Section 4.2.5 Fish and Wildlife) addressing the wildlife disease plan.

Comment 8: P. 155, 2.4.4.1 We question the value of using table 2-42 because of the inaccuracies of its projections, particularly with respect to hunting as demonstrated by the information contained in this draft E.I.S.

Response: The table is derived from a sampling program of the 1972 Illinois Outdoor Recreation Plan, I.D.C. The sample size of the survey may have been limited and thus reflects information different from the opinion held by your organization. With respect to waterfowl hunting, waterfowl managers know that more hunting pressure has occurred on public areas during the past few years and the upward trend is likely to continue.

Comment 9: P. 188, 4.2.5.1 We concur in the stated need for a nesting box program for both wood ducks and mallards. The addition of a pumping capability to regulate sub-impoundment is highly desirable.

Response: Concur. Paragraph has been deleted in text.

Comment 10: P. 201, 4.2.5.7 The interference of boating and fishing with wood duck nesting and brooding should be monitored and corrective action taken if a need is indicated.

Response: Comment noted. The primary nesting and brooding area for wood ducks is located in the northern area of the lake. This area consists of flooded dead timber and is visited primarily by fishermen who must travel at low speeds due to the obstructions in the water. It is anticipated that this activity will have a minimal effect upon wood duck nesting and brooding.

Comment 11: P. 218, 4.2.6.3; P. 302, 6.6 The Corps appears to be the agency best suited to play the dominant role in the management of this project because it has the agency resources, expertise and is less susceptible to local interests that might be destructive to waterfowl habitat.

Response: Comment noted.

Comment 12: P. 222, 4.2.6.3 Deterrents to lake shore residential development should be continued and reinforced by statutory provision. The Corps should adopt all legal policies designed to encourage the inaction of such statutes on the local level.

Response: The lake shore management policies of the St. Louis District prohibit the private exclusive use of public lands.

Comment 13: P. 227, 4.2.6.4 We agree that the negative influences stated as impacts due to the lack of land use controls will occur and are the basis for the prior recommendation.

Response: Comment noted.

Comment 14: P. 278, 4.3.8.4 We disagree with the conclusion that two accidents do not present a significant safety problem. Safer hunting methods for waterfowl do exist and should be implemented. (See comments P. 151, 2.4.3.2).

Response: The text was referencing all hunting at Rend Lake; upland, big game and waterfowl. See response to Comment 6 above concerning safety.

Comment 15: P. 282, 5.2.2 Sedimentation of the sub-impoundments appears to be an acceptable consequence, but the plan should be formulated to maintain, NOT restore wildlife management potential for the sub-impoundments.

Response: Concur. Sediment delivered by the streams flowing into the lake is largely from agricultural land and under construction. Hopefully, the land owners in the watershed will be more active in the future in the prevention of unwarranted erosion.

Comment 16: P. 288-289, 6.2.1.1, 2, 3, 4 We concur in these conclusions.

Response: Comment noted.

Comment 17: P. 291, 6.2.2.2 We feel the interpretive center described in this section is highly desirable and recommend that provisions be made to explain the role regulated hunting and sportsmen play in modern game management as an element of this center.

Response: The Corps will demonstrate in the interpretive centers the management procedures for both non-game and game species. The role that the sportsman plays in modern game management will also be illustrated.

Comment 18: P. 291, 6.2.2.2 "Giant Canada Geese" We believe the efforts of the Illinois Department of Conservation are presently quite effective and additional efforts beyond these are not now warranted.

Response: Comment noted.

p. National Camper & Hikers Association, Inc.

Comment 1: I. Flood Control Most projects built today by the Corps of Engineers has a main purpose - flood control. We would like to see this No. 1 in the operation at Rend Lake project.

Response: The authorized purposes for Rend Lake are flood control, downstream water quality control, water supply, recreation, fish and wildlife and area redevelopment. All authorized purposes are considered in the operations of Rend Lake. The Corps attempts to maximize the total benefits to the public from all the project purposes; in doing so, all project purposes are considered and no project purpose is considered number one.

Comment 2: II. Water Quality It would be hard, in my opinion, to maintain Water Quality with coal mines, oil wells, and that many communities do not have some kind of Sewer System, and little streams with erosion from usages. We would like to see that the Army Corps of Engineers, along with the State of Illinois Environmental Protection Agency help to solve the problems that come from mine operations and oil well operations, and also the runoff from our small communities, in order to maintain good Water Quality.

Response: Pollution from the sources mentioned in the above comment are closely monitored on public lands at Rend Lake. No pollution is taking place on public lands from these sources. The Corps has no authority to deal with pollution sources located off the public lands. It is our understanding that the Rend Lake Conservancy District is proposing a sewage district for the east side of the lake, which would take care of some of these concerns.

Comment 3: III. Water Supply It seems that Rend Lake is a big Water Supply for small communities in the area. As I read the Statement, it seems, that well water is very hard to get. We are asking that the Lake at all times meet the water quality standards so that these communities' needs for quality water is met.

Response: The water quality of Rend Lake is constantly monitored by the State of Illinois Natural History Survey under contract by the St. Louis District.

Comment 4: It is hard to make any kind of a statement on the Recreational aspect. As there is much construction to be done on this type areas in the future. But over all it seems that there could be some wind trouble with lack of vegetation and trees, in camping and recreation areas. This in time would, in a measure, correct itself, with good conservation practices.

Response: Rend Lake personnel make every effort to advise campers of impending bad weather.

Comment 5: We would like to see that there is some planning given to downstream, and the tributaries, or feeder stream that feeds the lake itself.

Odor. It would be hard to do much about odor from oil wells, hog and cattle farms, meat packing plants and other plants, as many of these people depend upon these type occupations to earn their livelihood. I cannot see how you can use this to restrict development in certain areas, as these conditions would only exist in certain seasons, or in short term. We have many of these types of trouble in many parts.

Response: Comment noted.

Comment 6: We, as the Illinois State Association of N.C.H.A., would like to see the Army Corps of Engineers Conservancy District and the State of Illinois meet the important needs of the area, and we wish to see them accomplished within the limits of achieving a practical ecological balance between man and nature.

Response: The Corps of Engineers makes every effort to see that the above is accomplished.

q. Old Ben Coal Co.

Comment 1: Page 33, 1st paragraph: The reference to Old Ben Mine No. 19 is misleading since it had been abandoned some 40 years prior to lake construction and the workings were never active under the lake. I would further suggest including Old Ben Mine No. 24 as being one with planned future operation under the lake since that property was in existence and operating prior to construction.

Response: The final statement has been changed accordingly.

Comment 2: Page 61, 1st paragraph: make-up water is also secured from the Rend Lake Intercity Water System.

Response: The final statement has been changed accordingly.

Comment 3: Page 67, paragraph 2.1.5.4; Old Ben Mine No. 21 construction commenced in 1956. It began operations in January, 1960 and continues today. Since commencement of operations, several millions of dollars for scrubbing and air pollution control and equipment have been expended. The present installation is approved and operates in compliance with required environmental standards. The reference to the casting of a heavy pall over the lake is unnecessary, unwarranted and subject to misleading interpretation.

Response: Concur, the statement was the opinion of a consultant, not necessarily a statement of fact. The statement has been deleted from the final EIS.

Comment 4: Paragraph 2.1.5.5: references as made in the prior paragraph coupled with this one should serve to remind all that five of the six mines existed prior to the lake planning, construction and completion. References to aesthetic screening needs should, therefore, have been a consideration of the project planners and not one to have been made by the mining companies. The reference to noise from "hoisting machinery" is not understandable. To our knowledge, the hoists are all electrically operated with little or no perceptible sound level. It is possible that the detectable noise is that of the preparation plants during their operating periods. Similarly, a constant low level sound is emitted by the continuously operating ventilation fans.

Response: Concur, section 2.1.5.5 - Aesthetic Values - has been removed from the final statement.

Comment 5: Page 129 - Air Transportation: reference to Marion Airport should be Williamson County and not Washington County.

Response: Concur, the final statement has been changed accordingly.

Comment 6: Paragraph 5.4.4 - Conflict of Mining vs. Surface Developments: the oversimplification of the cost or liability of subsidence from mining is not consistent with the detail provided in other topics of the Report, especially when relating to wildfowl, fishing and recreation. To merely state that either the homeowner or coal company will pay for any solution is a misrepresentation of the impetus any such curtailment would have on the entire populace of not only this state but the nation, in loss of and cost for energy.

Response: Disagree, Section 2.3 - Cultural Elements, provides a detailed setting for future of the area. The paragraph in question simply points out a problem which is common throughout Illinois and will be a problem within the study area.

Comment 7: General: It would seem to us that any complete impact statement should identify the adverse impact of the lake location upon the mining industry active therein. In this particular instance, there is a very unique adverse condition due to the particular location of company ownership boundaries and previous mining wherein normal shaft locations that would serve the inundated reserves in the greatest efficiency are prohibited by the very nature of the project. The resultant increases in underground haulage costs, increased ventilation costs, loss of production from increased travel time, increased power costs are, in part only, reflected in the production reduction shown in the Franklin County area since 1970 on Table 2-2, page 35.

Response: Comment noted.

Comment 8: In reiteration, it would seem that those aesthetic and environmental considerations which in the Report are implied as being disregarded and unanticipated by the mining company should rightfully have been considered and planned by the planners of the lake project.

Response: Comment noted.

r. Outboard Boating Club of America.

Comment 1: For obvious reasons, we were especially interested in the section dealing with the recreational aspects of Rend Lake. We were delighted, first of all, that the recreational benefits of this impoundment play such an important part in your plans. As you know, recreation was not even considered in standard cost - benefit ratios of impoundments not too long ago.

Response: Comment noted.

Comment 2: We were especially impressed with the statement that boating facilities - particularly launching ramps - will be "greatly expanded" at Rend Lake. For many years, a shortage of such facilities has been a major complaint of boat-owning families. The result has been dangerous overcrowding where such facilities are provided, and a serious slow-down in the growth of water-related recreational activities, such as fishing, boating, water skiing, etc. We are certain that the development of recreational facilities at Rend Lake will have a significant beneficial effect on the economy of that area.

Response: Comment noted.

Comment 3: I am enclosing some materials which I hope will be of some interest to you. One deals with the economic aspects of boating; the other deals with a subject that has been of some concern - alleged "pollution" from outboard engines. We hope to have a 60-page Summary Report available soon on the latter subject which I would be happy to send to you, if you are interested.

Response: Comment noted. Thank you for your interest in providing the Corps of Engineers with updated information.

REND LAKE

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SECTION 10:

BIBLIOGRAPHY

BIBLIOGRAPHY

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REND LAKE

11

SECTION 11:

TECHNICAL APPENDIX FOR THE ENVIRONMENTAL IMPACT STATEMENT

APPENDIX A-1

MEMORANDUM OF UNDERSTANDING BETWEEN REND LAKE CONSERVANCY DISTRICT, STATE OF ILLINOIS, AND CORPS OF ENGINEERS, JULY 16, 1962

The following attached pages are a copy of Exhibit "A" to Design Memorandum No. 2, Rend Lake Reservoir General Design Memorandum - U. S. Army Corps of Engineer District, St. Louis.

Exhibit "A" is a memo of understanding between the Rend Lake Conservancy District, the State of Illinois and the Corps of Engineers drawn in 1962 regarding how Rend Lake was to be built, the tasks to be shared in the building effort and agreed upon ongoing management responsibilities.

Exhibit "A" is intended to be: "....a complete and clear understanding of the project and the respective roles of the Rend Lake Conservancy District, the State of Illinois, and the Corps of Engineers."

16 July 1962

HOW REND LAKE RESERVOIR WILL BE BUILT

The construction of Rend Lake Reservoir will be undertaken as a joint venture by the Rend Lake Conservancy District, the State of Illinois, and the Corps of Engineers. At a recent meeting of representatives of the three agencies, it was agreed:.

(1) That the Rend Lake Conservancy District will:

a. Serve as local sponsor for the contribution of funds which are necessary for the water supply feature of the project.

b. Continue its efforts toward the development of a plan of industrialization of the area to be served by the Rend Lake Reservoir.

c. Develop a plan for a water distribution system for this area to utilize the water to be impounded in the reservoir.

d. Develop plans for additional recreational development over and above the federally constructed public use areas which will be provided as a part of the construction of the reservoir.

e. Encourage such land use practices in the area tributary to the reservoir project as will reduce land erosion and deposition of sediment in the reservoir.

(2) That the State of Illinois will:

a. Assist the Rend Lake Conservancy District in its role as sponsor. The Board of Economic Development will coordinate the activities of the State to forestall any delays in the initiation of construction.

b. Construct Interstate Highway No. 57 to grade elevation 418 m.s.l., utilizing $550,000 made available to the State by ARA for this purpose.

c. Participate in the advance planning of highway relocations which form a large portion of the cost of the project.

d. Cooperate with the Corps of Engineers to accelerate the advance planning and construction of the project by making available all information previously assembled by the State on this project.

e. Plan for participation in recreational and public use areas.

EXHIBIT A

... operate and maintain the subimpoundment areas on Rayse Creek and ... to be utilized as fish and wildlife improvements, the dams for which will be constructed by the Corps of Engineers as part of the project.

(3) That the Corps of Engineers will:

a. Proceed with advance planning for the project immediately, utilizing funds made available by ARA for this purpose.

b. Complete the advance planning with funds to be appropriated after the project is authorized by Congress.

c. Acquire all lands necessary for the project, including subordination of mineral rights.

d. Construct, operate and maintain the project in accordance with the plan of improvement authorized by Congress, utilizing sound engineering principles of the Civil Works program.

e. Construct and maintain recreation facilities at designated public access areas.

f. Supervise the management of the public lands acquired for the project.

The basic laws which govern the Corps of Engineers civil works programs stem from River and Harbor and Flood Control laws enacted by the Congress of the United States. Generally, the engineering and economic procedures used for formulating and evaluating projects are those used for similar undertakings by private enterprise. With due cognizance both of these basic laws, as well as the desires and needs of the people at large, the District Engineer considered the following objectives in developing the optimum plan of operation for the Rend Lake Reservoir; flood control, domestic and industrial water supply, low flow water quality control, conservation of fish and wildlife, recreation, and long-range redevelopment to alleviate the depressed economy of the region. These objectives had to be reconciled so as to develop the best plan which would be both engineeringly and economically feasible, produce the best benefit-to-cost ratio, and provide the greatest good for the people of the area. In general, the engineering features of the project adopted in the Corps of Engineers recent study are based on those outlined in the plan of improvement developed by the Division of Waterways, State of Illinois, in its report published in 1957. The project purposes and the estimated annual dollar benefits of the best plan considered to be both engineeringly and economically feasible are as follows:

EXHIBIT A

a.	Recreation	$536,100
b.	Fish and wildlife conservation	312,000
c.	Water supply	300,700
d.	Long-range redevelopment benefits	285,100
e.	Flood control	216,500
f.	Pollution abatement	60,600

More detail on each of these project purposes follows:

a. Recreation. The influx of visitors to the reservoir area will supplement other benefits derived therefrom, and expenditures by recreationists for services and commodities will broaden the scope of commercial activities and strengthen the economy of the region. The National Park Service estimates that visitation anticipated within 3 years after completion of the project would be approximately 1,670,000. Based solely on provisions of public use facilities planned by the Federal Government, average annual recreational benefits are estimated at $536,100.

b. Fish and Wildlife Conservation. A detailed report prepared by the U. S. Fish and Wildlife Service indicates a substantial benefit to the fishery and wildlife resources by the proposed operation of the Rend Lake Reservoir. The operational plan includes construction of two small impoundments in the upper arms of the reservoir, one on Rayse Creek and the other on Casey Fork as a waterfowl refuge. Total average annual benefits for fish and wildlife conservation are estimated at $312,000.

c. Water Supply. While it is not possible to definitely determine all of the potential water users at this time, the Public Health Service indicated that the ultimate demand from the Rend Lake Reservoir would be approximately 40,000,000 gallons per day within an area of 25 miles of the reservoir. Average annual benefits to water supply are estimated at $300,700.

d. Long-range Redevelopment. In addition to the primary benefits credited to the project, the proposed Rend Lake Reservoir will provide additional benefits based on its contribution to the reorientation of the depressed economy of the region. According to the Area Redevelopment Administration, the long-range redevelopment benefits include new jobs in the area with a substantial increased payroll and decrease in area relief costs. An assessment of long-range redevelopment benefits attributable to the Rend Lake Reservoir is conservatively estimated at $285,100 annually.

e. Flood Control. Operation of the reservoir as planned will reduce the flood of record, August 1961, approximately 6.8 feet at Benton, 3.8 feet at Plumfield, and 3.1 feet at Murphysboro. In addition to eliminating substantial flood damages in the valley below the dam, it

would make possible more intensive cropping practices with some redistribution of acreages planted. There would also be some minor reduction in flood crests on the Mississippi River. Total annual benefits creditable to the project for eliminating flood damages downstream are estimated at $216,500.

f. Pollution Abatement. The Public Health Service in studying the Rend Lake project indicated that forecasted future population growth in the basin would contribute a large domestic and industrial waste load to the stream. Under the low flow conditions characteristic of the Big Muddy River, the water quality would be seriously impaired. The contemplated minimum daily release of approximately 30 c.f.s. would greatly improve such conditions. Benefits attributable to improved low flow augmentation are estimated at $60,600 annually.

Estimates of first costs are based on the assumption that the United States will construct the dam and appurtenant works, acquire necessary lands, including the subordination of mineral and oil rights, make such alterations and relocations of highways, railroads, and utilities, and undertake remedial measures as are necessary. Total estimated cost of the Rend Lake Reservoir is $35,500,000, of which $29,469,000 is Federal cost and $6,031,000 non-Federal cost for water supply. Annual operation and maintenance costs, including major replacements, are estimated at $88,000, of which $79,000 would be Federal and $9,000 non-Federal cost.

The plan has been formulated to obtain optimum utilization of the reservoir site. The Area Redevelopment Administration has determined that the project will provide for a basic need for permanent, constructive reorientation of the depressed economy of the region through the provision of water supply and recreation potential which will lead to relief from the substantial persistent unemployment causing hardship to thousands of individuals and their families thus detracting from the national welfare.

The Board of Engineers for Rivers and Harbors and the Chief of Engineers have taken favorable action on the report. Currently the report is being reviewed by interested Federal agencies and the Governor of Illinois. After receipt of the comments of these agencies and the Governor, which are due by 30 July 1962, the Chief of Engineers will submit his final report to the Secretary of the Army. Prior to transmittal of the report to Congress, the Secretary of the Army will request a statement from the Bureau of the Budget on conformance of the project with the program of the President. Authorization of the project and appropriation of funds are then dependent upon Congress.

EXHIBIT A

On 21 June 1962, the Area Redevelopment Administration announced that it had made $450,000 available to the Corps of Engineers to undertake detailed preconstruction planning. In addition, $550,000 was being made available to the State of Illinois for certain road relocations in connection with the project. The St. Louis District, Corps of Engineers, has initiated preconstruction planning on the Rend Lake Reservoir. Early in July, field parties started damsite surveys and foundation explorations.

It is hoped that the foregoing comprehensive statement will assist in a complete and clear understanding of the project and the respective roles of the Rend Lake Conservancy District, the State of Illinois, and the Corps of Engineers.

REND LAKE CONSERVANCY DISTRICT

By /s/ John D. Douglas
JOHN D. DOUGLAS
President, Board of Trustees

STATE OF ILLINOIS

By /s/ Victor de Grazia
VICTOR de GRAZIA
Executive Director
Board of Economic Development

CORPS OF ENGINEERS, U. S. ARMY

By /s/ Alfred J. D'Arezzo
ALFRED J. D'AREZZO
Colonel, CE
District Engineer

EXHIBIT A

APPENDIX A-2

PROJECT PHYSICAL DATA SUMMARY

GENERAL

Project purposes	Flood control, water supply, water quality control, recreation, fish and wildlife conservation, and area redevelopment.
Location of dam	
Stream	Big Muddy River, Illinois
River mile above mouth	103.7
County	Franklin
Nearest town	Benton, Illinois (3 miles SE)
Location of reservoir	
River mile above mouth	103.7 to 130
Counties	Franklin and Jefferson
Drainage area	
Upstream from damsite	488 square miles
Upstream from mouth	2,360 square miles
Project fee purchase contour	
Elevation (take line)	416.0 ft. m.s.l.
Area	39,713 acres

RESERVOIR

Stream flow, natural conditions (Benton) (Period 1946 to 1964, inclusive)	
Average daily flow	470 c.f.s.
Maximum flow	38,600 c.f.s.
Minimum flow	0.1 c.f.s.
Channel capacity at Benton	1,000 c.f.s.
Inactive storage pool	
Top elevation	391.3 ft. m.s.l.
Top area	5,400 acres
Storage	25,000 acre-feet
Storage (runoff)	0.96 inches

Joint-use pool	
Elevation	391.3 - 405.0 ft. m.s.l.
Top area	18,900 acres
Storage	160,000 acre-feet
Storage (runoff)	6.15 inches
Regulated outflow	30 c.f.s.
Flood control pool	
Elevation	405.0 - 410.0 ft. m.s.l.
Top area	24,800 acres
Storage	109,000 acre-feet
Storage (runoff)	4.19 inches
Unregulated outflow (min.)	30 c.f.s.
Unregulated outflow (max.)	1,030 c.f.s.
Surcharge pool (Standard project)	
Elevation	410.0 - 416.1 ft. m.s.l.
Top area	34,200 acres
Storage	179,200 acre-feet
Storage (runoff)	6.89 inches
Unregulated outflow (min.)	1,030 c.f.s.
Unregulated outflow (max.)	30,500 c.f.s.
Surcharge pool (max. possible)	
Elevation	410.0 - 419.7 ft. m.s.l.
Top area	40,700 acres
Storage	314,000 acre-feet
Storage (runoff)	12.06 inches
Unregulated outflow (min.)	1,030 c.f.s.
Unregulated outflow (max.)	83,400 c.f.s.
Freeboard	
Elevation	419.7 - 424.0 ft. m.s.l.
Top area	50,000 acres
Storage	194,000 acre-feet
Storage (runoff)	7.45 inches
Height	4.3 feet
Standard project flood	
Peak (natural condition)	36,190 c.f.s.
Peak inflow (reservoir)	150,960 c.f.s
Peak outflow (reservoir)	30,500 c.f.s.
Design storm	14.71 inches
Runoff (includes base flow)	283,432 (1) acre-feet
Runoff (includes base flow)	10.89 inches
Design flood (Flood control)	
Peak flow at damsite	14,740 c.f.s.
Runoff (includes base flow)	188,252 acre-feet
Runoff (includes base flow)	4.54 inches
Peak outflow (reservoir)	1,030 c.f.s.

DAM

Earthfill with ungated main and auxiliary spillways	
Elevation, top of dam	424 ft. m.s.l.
Height above steambed	54 feet
Length of crest	10,600 feet

SPILLWAYS

Main spillway (ungated)	
Width at crest	435 (2) feet
Elevation of crest	410 ft. m.s.l.
Capacity (pool el. 419.7)	56,800 c.f.s.
Capacity of notch (pool el. 410)	1,000 c.f.s.
Auxiliary spillway (ungated)	
Width at crest	800 feet
Elevation of crest	415 ft. m.s.l.
Capacity at el. 419.7	26,600 c.f.s.
Outlet Works	
Number	2 each
Size	4'Wx6'H
Invert elevation	
Inlet	373.5 ft. m.s.l.
Outlet	372.0 ft. m.s.l.
Exit channel invert	372.0 ft. m.s.l.
Base width	9 feet
Tailwater elevation	
30 c.f.s.	373.6 ft. m.s.l.
320 c.f.s.	375.5 (3) ft. m.s.l.
640 c.f.s.	377.8 (3) ft. m.s.l.
1,030 c.f.s.	380.0 (3) ft. m.s.l.
30,500 c.f.s.	390.8 (4) ft. m.s.l.
83,400 c.f.s.	398.3 (4) ft. m.s.l.

SUB-IMPOUNDMENT DAMS

Big Muddy	Earthfill dam with ungated overflow section
Total length	3,740 feet
Overflow length	2,435 feet
Non-overflow section	416.0 ft. m.s.l.
Overflow section	412.0 ft. m.s.l.
Outlet conduit	6'x8' reinforced concrete box
Flowline of conduit	396.2

Casey Fork	Earthfill dam with ungated overflow section
Total length	6,650 feet
Overflow length	4,485 feet
Non-overflow section	416.0 ft. m.s.l.
Overflow section	412.0 ft. m.s.l.
Outlet conduit	4'x6' reinforced concrete box
Flowline of conduit	396.2

Notes:

(1) Reservoir inflow.
(2) Includes 31-foot wide notch with crest at elevation 405.
(3) Main spillway in service with approximately 30 c.f.s. through outlet works.
(4) Main and auxiliary spillways in service.

c.f.s. = cubic feet per second
ft. m.s.l. = feet above mean sea level
acre-feet = 43,560 cubic feet per acre foot
one inch of runoff to damsite = 26,027 acre-feet

APPENDIX A-3

PART I
PROJECT OPERATIONAL CONCEPTS

PART II
BASIC LAWS AFFECTING ADMINISTRATION AND MANAGEMENT

(EXCERPTED FROM MEMORANDUM 6B - THE MASTER PLAN AND ITS APPENDICES, REND LAKE RESERVOIR, U.S. ARMY CORPS OF ENGINEERS)

PART I:

Part I of this appendix is a description of the operational concepts developed by the St. Louis District, U.S. Army Corps of Engineers under which Rend Lake is managed. This description is not a detailed operating plan but does give a view through Corps eyes of the nature and scope of project operation.

PART II:

Part II is a summary of the primary federal laws and enabling acts under which the Corps administers the Rend Lake project. Areas which have been delegated to the State of Illinois and Rend Lake Conservancy District are operated by these agencies under a body of Illinois law not shown here.

PART I
PROJECT OPERATIONAL CONCEPTS

2. OPERATIONAL CONCEPTS.

2.1 Flood Control. In order to realize full recreational use, the normal pool elevation of 405.0 feet above sea level will be maintained, if at all practical. The portion of the reservoir between 405.0 and 410.0, having a capacity of 109,000 acre-feet, is reserved for flood storage.

The lake level may rise or lower depending upon the natural factors of climatic conditions. As the level of the lake rises, portions of land used for recreation may be inundated, thereby restricting their use. The degree and length of restriction depends upon the severity of the flood. Records indicate that notable floods occurred in 1913, 1915, 1943, 1944, 1946, 1950, 1961, 1962, and 1964. Floods of high intensity can be expected once every 3 years (above 410.0). Floods of this magnitude will have some detrimental effects upon recreation at the lake. All of the recreation areas will remain open, if practical. Some swimming, picnic and boating activities will be disrupted. Adverse side effects will include the destruction of grass turf, killing of trees, accumulation of driftwood in mowed areas, erosion of the shoreline, reduction of visitation, and loss of marina income. Floods in excess of a three-year flood will cause proportionately greater damages. The fish population could be adversely affected if spawning coincides with receding high water.

Allowance at all swimming beaches will be made for a fluctuating water level of plus or minus three feet, thus limiting the affects of flood or drought periods on the recreationist. Greater fluctuation will render the beaches unusable due to the limits of spread sand.

Most picnic and all camping facilities at Rend Lake are located above the three-year flood frequency, thereby minimizing their damage. Some areas are provided with concrete tables and pads which are little affected by flood waters.

Boat launching ramps should not be affected by the three-year flood. In the event of greater flooding, the boat launching ramps will be rendered unusable, thereby greatly diminishing boating and fishing activity on the lake. Marina activity will still be available due to the floating docks; however, some boating activity may be restricted due to inundated service facilities.

During the time of flood conditions, grass is destroyed, some species of trees are killed, and wind and wave action cause shoreline erosion and drift deposits. Shoreline erosion is the most critical of these factors since a fertile soil is required to grow grass, trees or other vegetation. The inundated areas are unsightly when the water recedes.

Management practices undertaken to reduce the effect of flooding on the recreation activities include the planting of water-tolerant trees and shrub species to preserve vegetative cover on low-lying recreation land and riprap protection of key areas which are subject to erosion at high pool stages. In drought years, low water level may be a problem. Low water levels affect recreation in that beaches are not fully usable, the bare strip around the lake is unsightly, and the desire for boating is much less. Sufficient underwater portions of launching ramps were constructed to accommodate boats during a moderate drawdown.

2.2 Water Supply. For years, Southern Illinois' problems have been directly related to a lack of water. Even though the area is located between two of the nation's great rivers and criss-crossed by rivers and creeks, ground water is scarce. The answer to the water supply problem, therefore, is surface impoundments.

One outcome of the years of studying, planning, and building of Rend Lake is the inter-city water supply system operated by the Rend Lake Conservancy District. The inter-city system is in the wholesale water business. More than 131 miles of transmission lines carry water to contracting communities where it is metered. Rural customers have formed water districts which buy from the inter-city system. Among these customers are those who had to haul about 30 million gallons of water yearly to replenish their wells in drought years.

In 1971, the inter-city system became operational. Treated water from Rend Lake began to flow to the first of 43 communities and rural customers in a five-county area.

A detailed plan of water supply withdrawal from the allocated storage of 109,000 acre-feet within the joint-use pool is in the process of development. The storage is sufficient to permit a withdrawal of 62 c.f.s. or 40,000,000 gallons per day. The Conservancy District has constructed a water treatment plant on Rend Lake adjacent

to the main dam. The system includes an intake pumping station and [illegible]. The water treatment plant provides potable water for a large surrounding area. The initial withdrawal rate was 11 MGD and future plans call for an increase to 40 MGD as needs arise. At the end of each month, the Conservancy District reports the daily meter readings of the water pumped. The data are furnished to the Hydraulics Branch, St. Louis District, for inclusion in the joint-use water analysis and for record. In the future, any increase above the maximum allowable withdrawal (40 MGD) will require negotiation between the State of Illinois and the Corps of Engineers. At present, the Conservancy District treatment plant has a capacity of 27,000,000 gallons per day.

The effect of water withdrawal for water supply purposes will have little if any effect on pool elevations. It would only be noticed in extremely dry years. The lake level would then lower at a gradual rate until additional inflows were received. No detrimental side effects are foreseen.

Among the benefits to the cities and communities the system now serves are the guarantee of an abundant water supply, no increase in bonded indebtedness from enlarging water impoundments and treatment plants, and an increase in industrial potential.

2.3 Water Quality Control. A minumum release of 30 c.f.s. will be maintained to provide assured downsteam flows for water quality control. Flows as low as 0.1 c.f.s. have been experienced many times during the period of record.

The water quality investigating program, as approved by LMVD and Office, Chief of Engineers, continually takes water samples from the reservoir and tributary areas. Of special interest is any evidence of petroleum from abandoned oil wells in the area flooded by the reservoir. All observations of suspected pollution will be promptly reported.

2.4 Fish and Wildlife Conservation. This topic will be covered in detail in Appendix D.

Prime responsibility for fish and wildlife management has been delegated to the State of Illinois, Department of Conservation. The Corps has licensed approximately 10,900 acres of land and 5,364 acres of water in the upper reaches of the lake to the State of Illinois for the primary purpose of wildlife management. The State's major effort has been the development of a waterfowl area which attracts and holds waterfowl during their migration, consequently providing outstanding hunting opportunities to the public. The State has also stocked the lake with game fish and is carrying out a fish

enhancement program to maintain desirable species at appropriate population densities. The Department of Conservation has developed a controlled public pheasant hunting area on the proposed State Park Area. Through the release of birds daily, excellent hunting is maintained throughout the prescribed season. Due to the lack of reproducing pheasant populations in Southern Illinois and the demand of the local populace to hunt pheasants, this program has been well received.

There are additional project lands that are not developed as recreation areas and are available for hunting. These lands require vegetative management practices to improve wildlife habitat and to establish a forest cover. Specific techniques will be covered in Appendix D. Corps personnel will manage these lands.

Wildlife habitat restoration will also be carried on within recreation areas. Hunting opportunities are important but so is the sight of a deer or a covey of quail to the camper and picnicker. The goal of the Corps' Wildlife Management Program is to provide maximum populations of both game and non-game species.

2.5 Recreation. The minor fluctuations of Rend Lake, especially during the intensive recreation season, June through September, are highly favorable for recreational use. The majority of the using public view Rend Lake as a recreational development. In the administration of the project, an important objective is minimizing adverse effects on recreational pursuits through proper coordination of all operational activities and concepts. Recreational management concepts include:

a. The provision of a wide-range of outdoor opportunities and recreation facilities in a relatively natural setting. Traditionally and justifiably, the Corps of Engineers' projects have provided facilities for the water-oriented user. At Rend Lake, access areas contain boat ramps, parking lots, campgrounds, picnic areas, beaches, and, in the near future, marinas. As good as these facilities are, recreation in, on, or near water does not always meet the needs of the whole family throughout their stay at a lake project. Since each member of a family has diverse recreational needs, it is our objective to provide non-water-oriented facilities or activities for diversification. Examples include providing playground equipment for the young, nature trails for enjoyment and education, hiking trails for exercise and exploring, evening campfire programs, shelters which may be reserved for group outings, group camps to serve organized groups, and sites where one can enjoy a natural surrounding in a passive environment.

b. Reduction in conflict of use through activity and zoning. The motorboater and [illegible] have different requirements and neither can enjoy their selected activity while operating in close proximity of each other. For this reason, beaches will be established and buoyed so that the swimmer will be safe from the boater and the boater will know where to expect the most swimming activity. Other management steps to be implemented to reduce conflict of use are the construction of campground control stations to provide security to the camper and restrict the non-campers and sightseers from the camping areas; establishment of a "No-Wake" zone along the lake shore and in selected embayments to reduce conflict between the boater and fisherman; and establishing wildlife areas to protect the wildlife in certain areas for public viewing in a natural setting during a recreational outing. Protective space zoning will be used when necessary. Examples of this type of zoning are: Playground sites will be located away from vehicular traffic; buffer zone around camping, picnic, and administrative areas; and limited development in fragile areas. Time zoning is utilized to separate day-use activities from the camping areas. In the future, it may be necessary to implement time zoning on the lake by activity to limit conflict among users.

c. The interpretation of natural resources and project objectives through a viable public relations program. Natural resources interpretation is becoming increasingly important as society becomes progressively urbanized. Interpretive trails are being developed so that the user will understand more about his outdoor environment. These trails may take the form of a self-guiding trail, or guided tours by Rangers to point out features of interest.

During public presentations, the role of the Corps of Engineers in management of the project, multi-purpose aspects upon which the project was authorized, and safety considerations while using the project will be worked into the program for a better understanding of the overall picture. These programs are presented to schools, civic groups, lake tours, and during campfire programs.

d. The development of policies which provide for maximum sustained public use without undue deterioration of natural and project resources. Campground control stations will be provided not only to accommodate a means of fee collection, security, and a source of information, but also to prevent over-use of the campground. Once capacity is reached, the area will be closed and campers will be referred to other campground sites. The restriction of private development along the shoreline through a mooring and docking policy prevents excessive development from degrading the environment.

A Vegetative Management Permit is issued before an adjacent landowner can mow or cut brush on project land adjoining his residence. These permits are restrictive in nature and serve to protect the naturalness of the shoreline and sustain, to some degree, wildlife habitat and erosion control. Title 36, Code of Federal Regulations, addresses these concepts and strengthens the enforcement of actions which tend to degrade the resources. Cross-country riding of motor vehicles and noise in campgrounds are examples of restrictive rules covered in Title 36.

e. The provision of additional recreational opportunities through concessions, leases, and licenses to State governments. There are some activities that can be better served through private enterprise. The Government has neither the expertise nor the money to provide lodge and marina facilities. Through concession agreements, private enterprise can benefit the economic climate of the lake area and provide services over and above those provided by the Corps of Engineers. The partnership between the Department of Conservation, Rend Lake Conservancy District, and the Corps of Engineers, through leased park areas, enables the public to have additional facilities beyond those the Corps could provide and manage. One Government agency cannot provide for all of the appropriate outdoor activities of specialized interest groups.

f. The maintenance of facilities and grounds to a standard above that normally expected in a public area. It has been proven that a clean, well-maintained area will receive better care by the public, and have less litter and less vandalism than a poorly maintained area. At Rend Lake recreation areas, maintenance is performed by contract. Operational personnel inspect the contractor's work continually to assure a clean, attractive recreation area. Twenty-four hour Ranger patrols will assist in holding down vandalism and reducing litter. Maintenance is covered thoroughly in Section 5 of this document.

g. The provision of a safe and rewarding outdoor recreation experience to the using public. Safety considerations are covered fully in Appendix E. The outdoor experience we hope to provide will send the recreationist home with a better understanding of nature after having had an opportunity to develop skill associated with out-of-door living and renew his spirits in enjoyable recreational pursuits.

2.6 Area Redevelopment. The Big Muddy Watershed of Southern Illinois is rich in natural resources. The moderate climate, coal reserves, the presence of gas, oil and clay in commercial quantities, the network of railroads and highways, and the large available work force - all are desirable elements in the development of an industrial economy.

The one vital ingredient missing in the past was an adequate water supply. Rend Lake will eliminate this past barrier in the development of a new era of prosperity for Southern Illinois. Industries which formerly overlooked the area for plant expansion due to lack of water will now locate in the Rend Lake region.

Since the 1950's, the once prosperous coal mining industry has declined in the lower Illinois region. Although production has remained about the same, increased mechanization of the industry cost the area more than 15,000 jobs. The result was massive unemployment, heavy migration, a dwindling tax base and, consequently, a severely depressed economy. Development of Rend Lake as a major Illinois tourist attraction will mean hundreds of job opportunities in the area.

Since construction began in 1967, thousands of jobs have been created in the area - both directly, through construction employment, and indirectly, by the creation of supportive services such as restaurants, gas stations, schools, and light industry. The new water treatment plant has also created many new jobs at Rend Lake. The economic rejuvenation enjoyed so far is small in comparison to the Lake's long-range effect on industry and employment. "

PART II
BASIC LAWS AFFECTING ADMINISTRATION AND MANAGEMENT

" 1-02. BASIC LAWS AFFECTING ADMINISTRATION AND DEVELOPMENT

Development and management of Federal reservoirs for various purposes are provided under several statutes. These laws cover development of recreational facilities, use of project lands for fish and wildlife purposes, protection of natural resources, and leasing of project lands for incidental uses other than recreation.

a. Recreation. Development and management of recreation facilities at Department of the Army-constructed reservoirs by the Corps of Engineers, by other governmental agencies, local groups, or individuals, under agreement with the Chief of Engineers, are authorized under the following public laws:

(1) Section 1 of the Flood Control Act, approved 22 December 1944 (Public Law 534, 78th Congress).

(2) The River and Harbor Act, approved 2 March 1945 (Public Law 14, 79th Congress).

Both specify the rights and interests of the states in watershed development and water utilization and control, and the requirements for cooperation with State agencies in planning for flood control and navigation improvements.

(3) Section 207 of the Flood Control Act of 1962, approved 23 October 1962 (Public Law 87-874, 87th Congress, 76 Stat. 1195) as amended by the Land and Water Conservation Fund Act of 1965, is quoted as follows:

> "Section 4 of the Act entitled 'An Act authorizing the construction of certain public works on rivers and harbors for flood control, and for other purposes,' approved December 22, 1944, as amended by section 4 of the Flood Control Act of July 24, 1946, and by section 209 of the Flood Control Act of 1954, is hereby further amended to read as follows:
>
> "'SEC. 4. The Chief of Engineers, under the supervision of the Secretary of the Army, is authorized to construct, maintain, and operate public park and recreational facilities at water resource development projects under the control of the Department of the Army, to permit the construction of such facilities by local interests (particularly those to be operated and maintained by such interests), and to permit the maintenance and operation of such facilities by local interests. The Secretary of the Army is also authorized to grant leases of lands, including structures or facilities thereon, at water resource development projects for such periods, and upon such terms and for such purposes as he may deem reasonable in the public interest: Provided, That leases to nonprofit organization for park or recreational purposes may be granted at reduced or nominal considerations in recognition of the public service to be rendered in utilizing the leased premises: Provided further, That preference shall be given to Federal, State, or local governmental agencies, and licenses or leases where appropriate may be granted without monetary considerations, to such agencies for the use of all or any portion of a project area for any public purpose, when the Secretary of the Army determines such action to be in the public interest, and for such periods of time and upon such conditions as he may find advisable: And provided further, That in any such lease or license to a Federal, State or local governmental agency which involves lands to be utilized for the development and conservation of fish and wildlife, forests, and other natural resources, the licensee may be authorized to cut timber and harvest crops as may

be necessary to further such beneficial uses and to collect and utilize the proceeds of any sales of timber and crops in the development, conservation, maintenance and utilization of such lands. Any balance of proceeds not so utilized shall be paid to the United States at such time or times as the Secretary of the Army may determine appropriate. The water areas of all such projects shall be open to public use generally, for boating, swimming, bathing, fishing and other recreational purposes, and ready access to and exit from such areas along the shores of such projects shall be maintained for general public use, when such use is determined by the Secretary of the Army not to be contrary to the public interest, all under such rules and regulations as the Secretary of the Army may deem necessary. No use of any area to which this section applies shall be permitted which is inconsistent with the laws for the protection of fish and game of the State in which such area is situated. All moneys received by the United States for leases or privileges shall be deposited in the Treasury of the United States as miscellaneous receipts.'"

b. Fish and wildlife. The Fish and Wildlife Coordination Act, approved 14 April 1946 (Public Law 732, 79th Congress, 48 Stat. 401), provides authority for making project lands of value for wildlife purposes available for management by interested Federal and State wildlife agencies. Further, that the Fish and Wildlife Coordination Act, approved 12 August 1959 (Public Law 624, 85th Congress, 72 Stat. 563), provides for more effective integration of a fish and wildlife conservation program with Federal water resources developments.

c. Other uses. In addition to the above-cited authorities for specific uses of project lands and waters, there are several additional provisions and uses which are considered important.

(1) Protection and improvement of natural resources. An act providing for protection of forest cover in reservoir areas, approved 6 September 1960 (Public Law 717, 86th Congress, 74 Stat. 817), specifies that the Chief of Engineers shall provide for the protection and development of forests and other vegetative cover and the establishment and maintenance of other conservation measures on reservoir areas, so as to yield maximum benefits and otherwise improve such areas. It also provides that such development and management be compatible with other uses of the project.

(2) Incidental uses. Public Law 364, 80th Congress, 61 Stat. 774, approved 5 August 1947, authorizes the leasing of project lands by the Departments of the Army and Navy for incidental uses other than recreation."

APPENDIX A-4

OPERATION RESERVOIR WATER LEVELS
FOR
FLOOD CONTROL, WATER QUALITY CONTROL AND WATER SUPPLY

The operation of the reservoir is most easily explained by dividing the main reservoir into four pools, each pool corresponding to the volume of water between two levels in the reservoir. The four pools are described below and shown on Figure 1-3:

a. Inactive Storage Pool - The inactive storage pool is the portion of the reservoir below elevation 391.3. The inactive storage pool has a storage volume of approximately 25,000 acre-feet and this volume is sufficient to allow for 100 years of sediment acculumation at the expected sedimenttation rate.

b. Joint Use Pool - The joint use pool is that portion of the reservoir between elevations 391.3 and 405.0. The use of this pool is jointly shared for water supply and downstream water quality control purposes. This pool has a storage capacity of 160,000 acre-feet and a top surface area of 18,900 acres.

c. Flood Control Pool - The flood control pool is that part of the reservoir between elevations 405.0 and 410.0. The flood control pool contains a storage capacity of 109,000 acre-feet with a top surface area of 24,800 acres. Discharge from the flood control pool occurs through the 31-foot wide notch in the main spillway.

d. Surcharge Pool - The surcharge is the portion of the reservoir between elevations 410 and 419.7 and contains a storage capacity of 322,000 acre-feet with a top surface area of 41,100 acres. Downstream releases from this pool will be uncontrolled over the main spillway and when the pool reaches above elevation 415.0, over the auxiliary spillway.

The general manipulation of the reservoir pool levels for flood control, water supply and water quality control purposes are discussed in the following paragraphs:

1. Flood Control - the general plan for the operation of the Rend Lake Reservoir provides for downstream release of 30 cfs when the reservoir is in the inactive storage pool and in the joint use storage pool. The 30 cfs downstream discharge is released by adjusting a gate in the outlet works. The adjustment to the gate is based on the reservoir elevation and on a tailwater elevation.

As the reservoir elevation rises above elevation 405.0, the flood control pool is entered and releases will be made through the outlet works and through the 31-foot wide notch in the main spillway. The overflow through the notch is unregulated and will vary from 0 with the reservoir elevation at 405.0 and below to approximately 1,000 cfs at an elevation of 410.0. When combined with the constant 30 cfs discharge through the outlet work, the total outflow from the project will be 30 cfs at elevation 405.0 and 1,000 cfs at a reservoir elevation of 410.0. The capacity of the Big Muddy River channel downstream of the Rend Lake project near Benton is approximately 1,000 cfs therefore with the reservoir at elevation 410.0, the Big Muddy River downstream of the project will be bank full.

As the reservoir level rises above elevation 410.0, the reservoir enters the surcharge pool. Above elevation 410.0 uncontrolled overflow occurs over the main spilway. Above reservoir elevation 415.0, the auxiliary spillway will go into service. Discharges over the auxiliary spillway are also uncontrolled. At maximum pool elevation of 410.0, the combined outlet and spillway facilities have a capacity of 82,000 cfs. At all reservoir elevations above elevation 410.0, the Big Muddy River immediately downstream of the project will be in flood stage.

In summary, the only manipulation of water levels for flood control operation of the project which can occur is by operation of the two gates in the outlet works. The present operating plan for the project, however, does not envision operation of these gates for any purpose other than to maintain a constant 30 cfs downstream discharge with the reservoir level below elevation 405.0.

2. Water Quality Control - With the reservoir pool elevation below elevation 405.0, one 4 x 6 flat rectangular gate in the outlet works is adjusted to release a constant 30 cfs downstream discharge for water quality control purposes. The gate is operated upon instructions from the St. Louis District Corps of Engineers. The gate position is indicated by a dial type indicator and the gate is opened and closed by a motorized gate hoisting system.

The regulation of the reservoir during low inflow periods requires a detailed accounting of downstream water quality control releases, water supply withdrawal, reservoir inflow, precipitation on the reservoir surface, and evaporation from the reservoir surface. The 160,000 acre-feet in the joint use storage pool has been proportioned with 51,000 acre-feet in federal storage for downstream water quality control releases and 109,000 acre-feet in the State of Illinois storage for the water supply purposes. Records of pool elevations, inflow, downstream releases, water supply withdrawals, precipiation and evaporation are maintained. Net inflow to the joint storage use pool will be allocated to Federal and State of Illinois storage

blocks on the basis of the proportionate share in the joint use storage allocations. However, at no time will the water in storage in the joint use water account exceed the allocated storage. Water in excess of the allocated storage will be credited to the other joint use account if available storage exists.

3. Water Supply - The State of Illinois has the right to withdraw water from the available water supply storage provided the elevation of the reservoir surface is above the top of the inactive storage pool, elevation 391.3. In the event that the State of Illinois' water supply account becomes depleted and the pool surface is above the top of the inactive storage pool, the available state's water supply will be limited to the state's proportionate share (68.1 percent) of the net inflow until credit accrues to the state's account. The State of Illinois is responsible for issuing permits, administering the water supply withdrawals and submitting pumping records to the federal government at the end of each month. The available water in the state's storage account is determined for the first day of each month and is based upon the available water in the account on the first day of the previous month plus the credits and minus the debits against the account during the month but not ever to exceed the maximum of 109,000 acre-feet. The state's water account is credited to the proportionate share (68.1 percent) of the reservoir net inflow including rainfall on the reservoir surface minus evaporation. Withdrawals for water supply purposes will constitute the debits against the state's account. The State of Illinois has designated the Rend Lake Conservancy District as the operating agency to administer the water supply withdrawals. The State of Illinois is authorized to appropriate a maximum of 40 million gallons per day from the reservoir. At the present time approximately 11 million gallons per day of the state's account is being appropriated by the Rend Lake Conservancy District under state license.

APPENDIX A-5

STATE OF ILLINOIS
DEPARTMENT OF CONSERVATION
FISH AND WILDLIFE MANAGEMENT PLANS SUMMARY

The attached sheets are Appendix I, Section B, General Design Memorandum 6B, the Master Plan for Rend Lake Development. These plans are not detailed but show the general objectives and scope of operation of the Fish and Wildlife Divisions of the Department of Conservation. A complete 5-year plan and up-to-date annual plan has been prepared and approved by the Corps which gives detailed objectives.

PROPOSED FISHERY MANAGEMENT

REND LAKE

The following recommendations concerning fishery management activities on Rend Lake are suggested:

Pre-impoundment: Steps should be taken to provent the release of pollutants normally associated with areas of oil production into the drainage of the main reservoir. These measures should be taken before impoundment, rather than having to face a condition of pollution requiring corrective measures after water levels are obtained. The large acreage of watershed for the main impoundment precludes any watershed treatment involving fish toxicants as a means of eradication of undesirable fishes. The topographical features of the main basin is not favorable for any program involving the establishment of brood ponds within the basin. Pre-impoundment fisheries management operations should be centered on assuring an adequate number of predator game fish (largemouth bass) for initial introduction into the reservoir during early impoundment.

Early impoundment: The expected explosion of plankton plus successful reproduction of small and less desirable fishes commonly associated with early impoundment will afford an unlimited food supply for both the stocked largemouth bass and other fishes that will be present in the stream at the time of impoundment (channel catfish, blue catfish, flathead catfish and crappie). The initial growth obtained during early impoundment will be available to the anglers at an early date.

To assure the presence of large numbers of largemouth bass during early impoundment the following recommendations have been resolved:

1. Notification to the U. S. Fish and Wildlife Service in advance of a large demand for fingerling or fry largemouth bass for stocking;

2. Notification to the State of Illinois, Department of Conservation in advance for a large demand of fingerling largemouth bass for stocking.

The Illinois Department of Conservation will coordinate the largemouth bass fingerling requirements with the U. S. Fish and Wildlife Service. Notification two years in advance of the time when adequate water will be present in the reservoir is required to give hatchery personnel time to plan for large production to meet the stocking requirements.

Post impoundment: It is recommended that boating activity be restricted to the main reservoir and that the bays and fingers of the lake be reserved for fishermen. On a permit basis the main reservoir should be fished commercially to harvest the commercial species of fish that will be present. Periodic creel census of the anglers should be made to determine species being caught and angling success. This information should be used to publicize the sport fishing aspects of the main reservoir. Periodic checks of the main reservoir will be made by the Division of Fisheries of the Illinois Department of Conservation to determine species composition, growth rate, and condition of the fishery. No subsequent stocking of fish will be necessary after the initial planting of largemouth bass in the reservoir.

ILLINOIS DEPARTMENT OF CONSERVATION
WJH/7/2/65

REND LAKE WILDLIFE MANAGEMENT

Wildlife management and hunting will be accomplished on Rend Lake by two sub-impoundments on Big Muddy and Casey Fork Ditch, and on the uplands surrounding these arms and the Gun Creek Arm.

These sub-impoundments, totaling 5,600 acres, of land and water will provide water control between elevations 407' and 412'. This will provide the tools for two components of waterfowl management. First, it will be possible to maintain the extensive, widely scattered stands of live pin oak timber capable of producing acorns, which are a favored duck food. The timber also acts as attractive cover to ducks. Secondly, those areas of land between elevations 407' and 412' which are now in crops can be maintained and farmed for production of waterfowl foods such as millet, corn, etc. This will add quality to the carrying capacity in years when the acorn crop fails. These two sub-impoundment arms are long and narrow and the evenly distributed quality of the above developments will be a key to waterfowl use of the area and thus be important to the quality of hunter spacing.

Up to elevation 407', the timber, in time, will be killed by the water. These areas will serve as refuges. Again, this is designed to add as much high quality waterfowl habitat as possible on these two arms.

Some of the land areas between elevations 407' and 412' in the sub-impoundment are in neither good oak timber nor crop fields, but are in brush and undesirable non-mast producing species. These areas will be improved by either spraying and/or other type of removation, and will be planted to oak or food crops for waterfowl. In some of the pin oak stands, timber stand

improvement will be desirable. The purpose is to remove competition from weed species and to induce increased mast production.

The plan calls for the sub-impoundment to be dewatered during the growing season, beginning approximately April 1, to prevent killing of desirable timber. Reflooding will begin about October 1 in preparation for migration and the hunting season. From October 1 until hunting season, the area will be closed to other uses to reduce harassment and permit waterfowl populations to build.

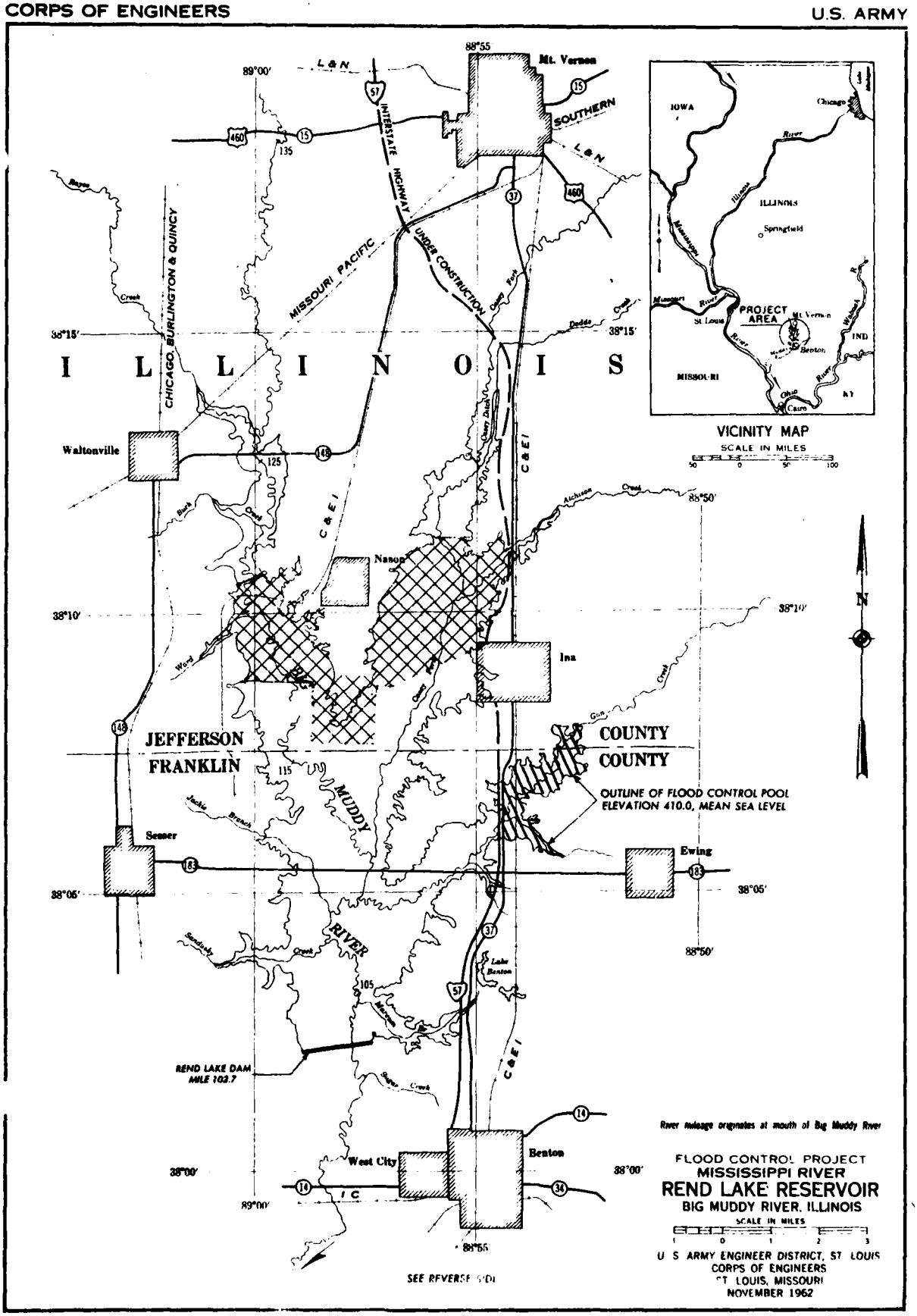
The Gun Creek Arm, some 1,900 acres in size, will include approximately 350 acres of water at normal pool (405') and 1,550 acres of land. This area will be managed for public hunting of upland game in particular. The cropland portion will be sharecropped under a developed wildlife plan that will maintain the area in high productivity. By such a plan, adequate food for ducks and geese will be planned for in certain desirable areas, as well as for upland game species in other areas. This arm is generally of a shallow nature and constitutes attractive habitat for both ducks and geese without the necessity of sub-impoundment structures. Uncut timber in the shallow bays and arms of this area will provide waterfowl sanctuary as well as public hunting. It is planned that this area will be used as an open hunting area of "walk in" type, with daily regulations as to shooting hours.

Refuge areas should include all Corps land within red crosshatched areas on enclosed map. It is recommended that this area, to be clearly delineated at a later date, include at least 2500 acres. Sanctuary must provide for no trespassing from two weeks before the current waterfowl season until closure.

The Corps land on Nason Point will be cropped on shares under a developed plan. This plan will call for crops that will supplement the food supply produced on the sub-impoundment areas. There is a possibility here to produce crops which will be favorable to holding geese in the area, if desired. Green pasture crops, such as wheat, clover, barley, etc., as well as hard grains (corn), will also be used by ducks as well as geese. By providing sanctuary on the Nason Point lands and the adjacent waters, it is possible that a goose concentration area can be started here.

CORPS OF ENGINEERS

U.S. ARMY



APPENDIX B-1

SOIL BORINGS

Five borings are listed in this appendix. Locations are shown in Figures 2-6. These borings were made by the Illinois Department of Transportation, Effingham and Carbondale Districts, and were for soils exploration at bridge construction sites.

Soil descriptions are reproduced verbatim. It should be noted that various classification methods are used. For holes 1 and 2, the AASHO classification is used and the United classification is shown for hole 3.

Holes 2, 4 and possibly 5 represent upland soil areas where glacial tills and loess predominate in the boring. Holes 1 and 3 are definitely in alluvial soils and represent the Glacial Lake Muddy sediments.

HOLE #1

Surface Elevation = 395.2 Water level (@ 24 hrs.) = 391.0

0 -5½	Soft very moist brown silty clay loam A-4(8).
5½-11½	Medium moist brown silty clay A-6(9-10).
11½-13	Loose wet brown sand.
13 -20	Medium moist brown silty clay A-6(10).
20 -22½	Stiff moist brown mottled gray clay A-6(11-12).
22½-28	Medium moist gray clay A-6(11-12).
28 -33	Stiff moist gray clay A-6(12).
33 -35½	Hard damp gray clay shale.

HOLE #2

Surface Elevation = 439.9 Water level (@ 72 hrs.) = 437.4

0 -4½	Medium and moist brown silty clay loam A-4(8).
4½-9	Stiff and moist gray mottled brown silty clay loam A-6(11).
9 -11½	Soft and wet brown mottled black clay loam A-6(6).
11½-21½	Hard and slightly moist brown mottled gray clay loam A-6(10).
21½-23½	Very stiff and slightly moist brown clay loam A-6(7).
23½-25½	Very stiff and slightly moist brown mottled gray clay loam A-6(10).
25½-29½	Stiff and moist brown mottled black silty clay A-6(11).
29½-35	Stiff and moist bluish-gray silty clay A-6(11-12).
35 -37½	Stiff and moist gray clay A-7-6(14).
37½-41½	Stiff and moist gray with blue streak silty clay A-6(10-11).
41½-43½	Very stiff and moist gray with blue streak clay loam A-6(9-10).
43½-50½	Stiff to very stiff and moist green clay loam A-6(9).
50½-52	Soft to medium and moist light blue fine grained sandstone
52 -55	Soft to medium and wet light blue fine grained sandstone

HOLE #3

Surface Elevation = 390.9 Water level (@ 24 hrs.) = 387.9

0 -9½	Very stiff moist gray mottled brown, CL-ML, clayey silt.
9½-14½	Stiff moist gray mottled brown, CL, silty clay.
14½-19½	Medium very moist brown, CL, sandy clay.
19½-29½	Medium very moist gray-brown, CL, silty clay.
29½-37	Stiff very moist gray-brown, CL, silty clay containing gravel.
37 -52	Very soft wet gray, CL, silty clay containing gravel.
52 -57	Stiff to very stiff moist to very moist gray, CL, silty clay containing gravel.
57 -61	Dense gray, SP, sand and gravel.
61 -63½	Dense wet gray, SM, silty sand.
63½-65	Soft to medium gray fine grained sandstone with very thin shale seams.

HOLE #4

Surface Elevation = 407.2 Water level @ Completion = 398.5

0 -3	Soft gray speckled brown silty clay loam.
3 -8	Medium gray mottled light brown silty clay loam to silty loam.
8 -10	Very soft gray silty loam.
10 -15	Very soft brown-gray mottled, silty loam to loam.
15 -18	Soft brown-gray mottled, clay loam to sandy clay loam.
18 -19½	Medium brown-gray water bearing sandy loam.
19½-21½	Hard gray streaked brown clay loam.
21½-26	Hard blue-gray shale.

HOLE #5

Surface Elevation = 411.6 Water level after 24 hrs. = 410.0

0 -3	Soft, wet, brown and gray mottled, silty clay loam to silty clay.
3 -6	Stiff, very moist to damp, mottled brown and gray silty clay.
6 -10½	Stiff to medium, very damp, mottled brown and gray, silty clay to clay.
10½-13½	Soft, very damp to wet, mottled brown and gray, clay.
13½-16½	Soft, wet, mottled brown-gray and black, clay loam with thin sand lenses.
16½-19	Medium, wet, mottled brown-orange and gray, clay with lenses of sandy clay and gravel particles.
19 -20½	Stiff, very damp, mottled brown-orange and gray, slightly organic clay.
20½-24½	Soft, very damp to wet, gray marbled brown, loam to clay loam with thin lenses of silty loam.
24½-31	Soft, wet, bluish-gray, clay.
31 -36½	Medium, very damp to wet, dark gray, clay with thin lenses of sand.
36½-43	Medium, very damp, dark gray, clay loam to clay with lenses of sand.
43 -44½	Medium, very damp, gray, sandy loam to sandy clay loam with fragments of sandstone.
44½-46	Medium, sandy loam to sandy clay loam.
46 -48	Hard, very moist, gray, clay till to clay loam till with thin sand lenses.
48 -50½	Very stiff, damp gray, loam to clay loam with lenses of very fine sand.
50½-54½	Medium, wet, greenish-gray sand with gravel particles and very thin lenses of clay.
54½-55½	Weathered shale.
55½-61	Hard, dry to moist, gray, shale.

APPENDIX B-2

PARTIAL LIST OF THE MORE COMMON HERBACEOUS PLANTS OF THE REND LAKE VICINITY

Alumroot	*Heuchera hirticaulis*
Amaranth, Spiny	*Ameranthus spinosis*
Ammannia	*Ammannia coccinea*
Amsonia	*Amsonia Tabernaemontaina*
Asarabacca	*Asarum reflexum*
Aspargus	*Asparagus officinalis*
Aster	*Aster spp.*
Avens	*Geum canadense*
Beard-tongue, Small	*Penstemon calycosus*
Bedstraw	*Galium spp.*
Beggar-ticks	*Bidens connata*
Bellflower, Tall	*Campanula americana*
Bergamot, Wild	*Monarda fistulosa*
Bluegrass, Canada	*Poa compressa*
Bluegrass, Kentucky	*Poa pratensis*
Brachyelytrum	*Brachyelytrum spp.*
Brome-Grass	*Bromus spp.*
Broom-sedge	*Andropogon virginicus*
Bulrush	*Scirpus atrovirens*
Bulrush	*Scirpus lineatus*
Bur-reed	*Sparganium spp.*
Bush-Clover	*Lespedeza procumbens*
Bush-Clover	*Lespedeza capitata*
Butterweed	*Senecio glabellus*
Cane, Large	*Arundinaria gigantea*
Cat-tail	*Typha angustifolia*
Cat-tail, Common	*Typha latifolia*
Chickweed, Common	*Stellaria media*
Clover, Hop-	*Trifolium agrarium*
Clover, Japanese	*Lespedeza striata*
Clover, Korean	*Lespedeza stipulacea*
Clover, Red	*Trifolium pratense*
Clover, White	*Trifolium repens*
Cocklebur	*Xanthium spp.*
Coneflower	*Rudbeckia hirta*
Conobea	*Conobea multifida*
Crab-Grass	*Digitaria sanguinalis*
Cranesbill, Wild	*Geranium maculatum*
Crowfoot	*Ranunculus abortivus*
Cupseed	*Calycocarpum Lyoni*

Daisy, White	Chrysanthemum leucanthemum
Dandelion, Common	Taraxacum officinale
Dayflower, Virginia	Commelina virginica
Deergrass, Virginian	Rhexia virginica
Ditch-Stonecrop	Penthorum sedoides
Dittany, Common	Cunila origanoides
Dock, Great Water-	Rumex Britannica
Dock, Swamp-	Rumex verticillatus
Dock, Yellow	Rumex crispus
Dogbane, Siberian	Apocynum sibiricum
Duckweed	Lemna spp.
Evening-Primrose	Oenothera biennis
Everlasting	Antennaria spp.
False Dandelion	Pyrrhopappus carolinianus
False Nettle	Boehmeria cylindrica
False Solonom's Seal	Smilacina stellata
False Spikenard	Smilacina racemosa
Fanwort	Cabomba caroliniana
Fern, Christmas	Polystichum acrostichoides
Flax, Virginian	Linum virginianum
Fog-fruit	Lippia lancolata
Foxtail, Bristly	Setaria Faberii
Foxtail, Green	Setaria viridis
Foxtail, Yellow	Setaria lutescens
Galingale	Cyperus strigosus
Garlic, Wild	Allium canadense
Geranium, Wild	Geranium carolinianum
Germander, Canadian	Teucrium canadense
Goldenrod	Solidago spp.
Grass, Blue-eyed	Sisyrinchium spp.
Grass, Terrell	Elymus virginicus
Groundnut	Apios americana
Hemp, Indian	Apocynium cannabinum
Hogwort	Croton capitatus
Honewort, Canadian	Cryptotaenia canadensis
Hornwort	Ceratophyllum demersum
Honeysuckle, Japanese	Lonicera japonica
Horse-nettle	Solanum carolinense
Horsetail, Common	Equisetum arvense
Hydrangea, Wild	Hydrangea arborescens
Indian-tobacco	Lobelia inflata
Ironweed, Missouri	Vernonia missurica
Jack-in-the Pulpit, Small	Arisaema triphyllum
Joe-Pye-weed, Sweet	Eupatorium purpureum

Knotweed	Polygonum aviculare
Knotweed, Virginian	Polygonum virginianum
Lamb's-quarters	Chenopodium album
Loosestrife	Lysimachia lanceolata
Lopseed	Phryma leptostachya
Milkweed	Asclepias perennis
Milkweed, Swamp	Asclepias incarnata
Milkweed, Syrian	Asclepias syriaca
Milkwort	Polygala sanguinea
Monkey-flower	Mimulus alatus
Moonseed, Canadian	Menispermum canadense
Moonwort	Botrychium dissectum
Morning Glory	Ipomoea hederacea
Mountain-Mint	Pycnanthemum spp.
Muhlenbergia	Muhlenbergia spp.
Mullein, Common	Verbascum thapsus
Mustard, Wild	Barbarea vulgaris
Oats, Wild	Uniola longifolia
Orchard-Grass	Dactylis glomerata
Orchis. Purple Fringeless	Habenaria peramoena
Panic-Grass	Panicum spp.
Partridge Pea	Cassia chamaecrista
Passion-flower	Passiflora lutea
Patience	Rumex Patientia
Pellitory	Parietaria pensylvanica
Pennyroyal of America	Hedeoma pulegioides
Phlox, Fall-	Phlox paniculata
Pigweed	Amaranthus hybridus
Plantain	Plantago virginica
Plantain, Bracted	Plantago aristata
Plantain, Common	Plantago major
Pokeweed	Phytolacca americana
Pokeweed	Phytolacca decandra
Pond-lily, Yellow	Nuphar advena
Pondweed	Potamogeton spp.
Potato-vine, Wild	Ipomoea pandurata
Primrose-willow	Jussiaea diffusa
Purslane, Common	Portulaca oleracea
Ragweed	Ambrosia artemisiifolia
Ragweed	Ambrosia bidentata
Ragweed, Great	Ambrosia trifida
Rattlesnake-Root	Prenanthes altissima
Redtop	Agrostis alba
Reed	Phragmites communis
Reedgrass, Wood	Cinna arundinacea

Ribgrass	Plantago lanceolata
Richweed	Pilea pumila
Rock-Cress	Arabis laevigata
Ruellia	Ruellia humilis
Rush	Juncus spp.
Rye, Canadian Wild	Elymus canadensis
Rye, Wild	Elymus villosus
Sabatia, Rose-pink	Sabatia angularis
St. Andrew's Cross	Ascyrum multicaule
St. John's-wort	Hypericum spp.
Sassafras, White	Sassafras albidum
Sedge	Carex spp.
Seedbox	Ludwigia alternifolia
Senna, Wild	Cassia marilandica
Shamrock	Oxalis Dillenii
Silkgrass	Yucca filamentosa
Skullcap	Scutellaria incana
Skullcap, Mad-dog	Scutellaria lateriflora
Smartweed	Polygonum spp.
Smartweed, Pennsylvanian	Polygonum pennsylvanicum
Smartweed, Water-	Polygonum punctatum
Snakeroot, Black	Sanicula canadensis
Sneezeweed	Helenium nudiflorum
Snow-on-the-mountain	Euphorbia marginata
Soapwort	Saponaria officinalis
Sorrel, Lady's-	Oxalis corniculata
Sorrel, Sheep-	Rumex acetosella
Sorrel, Violet Wood-	Oxalis violacea
Spanish-needles	Bidens bipinnata
Spicebush	Lindera Benzoin
Spike-Rush	Eleocharis spp.
Spleenwort, Ebony-	Asplenuim platyneuron
Spleenwort, Silvery	Athyrium thelypteroides
Spurge, Flowering	Euphorbia corollata
Squaw-weed	Senecio aureus
Stickseed, Virginian	Hackelia virginiana
Stink-Grass	Eragrostis cilianensis
Strawberry	Fragaria virginiana
Sunflower, Common	Helianthus annuus
Swamp-Buttercup	Ranunculus septentrionalis
Sweet Clover, White	Melilotus alba
Sweet Clover, Yellow	Melilotus officinalis
Teasel, Wild	Dipsacus sylvestris
Tick-Trefoil	Desmodium nudiflorum
Thoroughwort	Eupatorium spp.
Timothy, Common	Phleum pratense
Touch-me-not, Pale	Impatiens pallida
Trumpet-creeper	Campsis radicans

Velvetleaf	Abutilon Theophrasti
Vervain	Verbena simplex
Vervain, Blue	Verbena hastata
Vervain, White	Verbena urticifolia
Violet, Green	Hybanthus concolor
Virgin's-bower	Clematis virginiana
Wapato	Sagittaria latifolia
Water-dragon	Saururus cernuus
Water-hyssop	Bacopa rotundifolia
Water-meal	Wolffia-spp.
Water-parsnip	Sium suave
Water-Pimpernel	Samolus parviflorus
Water-plantain	Alisma subcordatum
Water-purslane	Ludwigia palustris
Water-Purslane	Peplis diandra
Water-shield	Brasenia spp.
Waterweed	Elodea canadensis
Witch-Grass	Panicum capillare
Yam	Dioscorea villosa
Yarrow, Common	Achillea millefolium
Yerba-de-Tago	Eclipta alba

APPENDIX B-3

PARTIAL LIST OF THE MORE COMMON WOODY PLANTS OF THE REND LAKE VICINITY

Alder	Alnus serrulata
Arrow-wood	Viburnum spp.
Ash, Green	Fraxinus
Ash, Red	Fraxinus tomentosa
Balm-of-Gilead	Populus balsamifera
Basswood	Tilia americana
Beech, Blue	Carpinus caroliniana
Birch	Betula spp.
Birch, River	Betula nigra
Blackberry, Wild	Rubus spp.
Black-haw	Viburnum prunifolium
Boxelder	Acer
Buttonbush	Cephalanthus occidentalis
Cherry, Black	Prunus serotina
Cinquefoil	Potentilla recta
Coralberry	Symphoricarpos orbiculatus
Cottonwood	Populus deltoides
Cottonwood, Swamp	Populus heterophylla
Crab-Apple, American	Pyrus coronaria
Crab-Apple, Wild	Pyrus ioensis
Currant	Ribes spp.
Dewberry, Northern	Rubus flagellaris
Dewberry, Prickly	Rubus flagellaris
Dogwood, Flowering	Cornus florida
Dogwood, Red Osier	Cornus stolonifera
Elder, Common	Sambucus canadensis
Elm, American	Ulmus americana
Elm, Slippery	Ulmus rubra
Elm, Winged	Ulmus alata
Gooseberry	Ribes spp.
Grape, Summer	Vitis aestivalis
Grape, Wild	Vitis spp.
Greenbrier	Smilax ecirrahata
Greenbrier	Smilax rotundifolia
Hackberry	Celtis occidentalis
Hawthorn	Crataegus spp.
Hickory, Bitternut	Carya cordiformis
Hickory, Pignut	Carya glabra
Hickory, Shagbark	Carya ovata
Hickory, Shellbark	Carya
Hop-Hornbeam	Ostrya virginiana

Ivy, Poison	Toxicodendron radicans
Locust, Black	Robinia pseudo-acacia
Locust, Honey	Gleditsia triacanthos
Maple, Red	Acer rubrum
Maple, Soft	Acer saccharinum
Maple, Silver	Acer saccharum
Mistletoe, American	Phoradendron flavescens
Mulberry	Morus rubra
Sugarberry	Celtis laevigata
Oak, Black	Quercus velutina
Oak, Black Jack	Quercus marilandica
Oak, Bur	Quercus macrocarpa
Oak, Pin	Quercus palustris
Oak, Post	Quercus stellata
Oak, Red	Quercus rubra
Oak, Shumard	Quercus Shumardii
Oak, Shingle	Quercus imbricaria
Oak, Spanish	Quercus falcata
Oak, Swamp-White	Quercus bicolor
Oak, White	Quercus alba
Osage Orange	Maclura pomifera
Pawpaw	Asimina triloba
Pecan	Carya illinoensis
Persimmon	Diospyros virginiana
Plum, Chickasaw	Prunus angustifolia
Plum, Wild	Prunus americana
Possum-Haw	Ilex decidua
Raspberry, Black	Rubus occidentalis
Raspberry, Wild	Rubus spp.
Redbud	Cercis canadensis
Rose, Marsh	Rosa palustris
Rose, Prairie	Rosa setigera
Rose-Mallow	Hibiscus lasiocarpos
Sumac, Dwarf	Rhus copallina
Sumac, Smooth	Rhus glabra
Sweetgum	Liquidambar styraciflua
Sycamore	Platanus occidentalis
Thorn, Cockspur-	Crataegus crus-galli
Tulip Tree	Liriodendron tulipifera
Viburnum	Viburnum spp.
Virginia Creeper	Parthenocissus quinquefolia

Walnut, Black	*Juglans nigra*
Willow	*Salix spp.*
Witch-hazel	*Hamamelis spp.*

APPENDIX B-4

CHECK LIST:
BIRDS OF THE BIG MUDDY BASIN REGION***

Common Loon	Gavia immer
*Horned Grebe	Podiceps auritus
**Pied-billed Grebe	Podilymbus caspicus
White Pelican	Pelecanus erythrorhynchos
Double-crested Cormorant	Phalacrocorax auritus
Great Blue Heron	Ardea herodias
**Green Heron	Butorides virescens
Little Blue Heron	Florida caerulea
Cattle Egret	Bubulcus ibis
Common Egret	Casmerodius albus
**Black-crowned Night Heron	Nycticorax nycticorax
**Yellow-crowned Night Heron	Nyctanassa violacea
*Least Bittern	Exobrychus exilis
**American Bittern	Botaurus lentiginosus
**Canada Goose	Branta canadensis
White-fronted Goose	Anser albifrons
Snow Goose (including Blue)	Chen caerulescens
**Mallard	Amas platyrhynchos
Black Duck	Anas rubripes
Gadwall	Anas strepera
Pintail	Anas acuta
Green-winged Teal	Anas crecca
Blue-winged Teal	Anas discors
American Wigeon	Anas americana
Shoveler	Anas clypeata
**Wood Duck	Aix sponsa
Redhead	Aythya americana
Ring-necked Duck	Aythya collaris
Canvas-back	Aythya valisineria
*Greater Scaup	Aythya marila
Lesser Scaup	Aythya affinis
Common Goldeneye	Bucephala clangula

*Uncommon
**Nests in Southern Illinois
***From data supplied by Crab Orchard National Wildlife Refuge, Carterville, Illinois.

Bufflehead	Bucephala albeola
Oldsquaw	Clangula hyemalis
White-winged Scoter	Melanitta deglandi
Ruddy Duck	Oxyura jamaicensis
Hooded Merganser	Lophodytes cucullatus
Common Merganser	Mergus merganser
Red-breasted Merganser	Mergus serrator
**Turkey Vulture	Cathartes aura
Black Vulture	Cathartes atratus
*Goshawk	Accipiter gentilis
Sharp-shinned Hawk	Accipiter striatus
**Cooper's Hawk	Accipiter cooperii
**Red-tailed Hawk	Buteo jamaicensis
**Red-shouldered Hawk	Buteo lineatus
**Broad-winged Hawk	Buteo platypterus
Rough-legged Hawk	Buteo lagopus
Golden Eagle	Aquila chrysaetos
Bald Eagle	Haliaeetus leucocephalus
**Marsh Hawk	Circus cyaneus
Osprey	Pandion haliaetus
*Pigeon Hawk	Falco columbarius
**Sparrow Hawk	Falco sparverius
**Bobwhite	Colinus virginianus
**Turkey	Meleagris gallopavo
Ruffed Grouse	Bonasa umbellus
Virginia Rail	Rallus limicola
Sora	Porzana carolina
*Common Gallinule	Gallinula chloropus
American Coot	Fulica americana
Semipalmated Plover	Charadrius semipalmatus
**Killdeer	Charadrius vociferus
American Golden Plover	Pluvialis dominica
Black-bellied Plover	Pluvialis squatarola
**American Woodcock	Philohela minor

*Uncommon
**Nests in Southern Illinois

Common Snipe	Capella gallinago
**Upland Plover	Bartramia longicauda
**Spotted Sandpiper	Actitis macularia
Solitary Sandpiper	Tringa solitaria
Greater Yellowlegs	Tringa melanoleucus
Lesser Yellowlegs	Tringa flavipes
Pectoral Sandpiper	Calidris melanotos
White-rumped Sandpiper	Calidris fuscicollis
Baird's Sandpiper	Calidris bairdii
Least Sandpiper	Calidris minutilla
Dunlin	Calidris alpina
Dowitcher, Short-billed	Limnodromus griseus
*Stilt Sandpiper	Micropalama himatopus
Semipalmated Sandpiper	Calidris pusillus
Sanderling	Calidris alba
American Avocet	Recurvirostra americana
Wilson's Phalarope	Steganopus tricolor
Northern Phalarope	Lobipes lobatus
Herring Gull	Larus argentatus
Ring-billed Gull	Larus delawarensis
Franklin's Gull	Larus pipixcan
Bonaparte's Gull	Larus philadelphia
Common Tern	Sterna hirundo
Least Tern	Sterna albifrons
*Caspian Tern	Hydroprogne caspia
Black Tern	Chlidonias niger
**Mourning Dove	Zenaida macroura
**Yellow-billed Cuckoo	Coccyzus americanus
Black-billed Cuckoo	Coccyzus erythropthalmus
**Screech Owl	Otus asio
**Great Horned Owl	Bubo virginianus
**Barred Owl	Strix varia
*Short-eared Owl	Asio flammeus
**Chuck-will's-widow	Caprimulgus carolinensis
**Whip-poor-will	Caprimulgus vociferus
**Common Nighthawk	Chordeiles minor
**Chimney Swift	Chaetura pelagica
**Ruby-throated Hummingbird	Archilochus colubris

*Uncommon - seen at intervals of 2-5 years
**Nests in Southern Illinois

**Belted Kingfisher	Megaceryle alcyon
**Common Flicker	Colaptes auratus
**Pileated Woodpecker	Dryocopus pilaetus
**Red-bellied Woodpecker	Centurus carolinus
**Red-headed Woodpecker	Melanerpes erythrocephalus
Yellow-bellied Sapsucker	Sphyrapicus varius
**Hairy Woodpecker	Dendrocopos villosus
**Downy Woodpecker	Dendrocopos pubescens
**Eastern Kingbird	Tyrannus tyrannus
**Great Crested Flycatcher	Myiarchus crinitus
**Eastern Phoebe	Sayornis phoebe
Yellow-bellied Flycatcher	Empidonax flaviventris
**Acadian Flycatcher	Empidonax virescens
Willow Flycatcher	Empidonax traillii
Least Flycatcher	Empidonax minimus
**Eastern Wood Pewee	Contopus virens
*Olive-sided Flycatcher	Nuttallornis borealis
**Horned Lark	Eremophila alpestris
**Tree Swallow	Iridoprocne bicolor
Bank Swallow	Riparia riparia
Rough-winged Swallow	Stelgidopleryx ruficollis
**Barn Swallow	Hirundo rustica
**Cliff Swallow	Petrochelidon pyrrhonota
**Purple Martin	Progne subis
**Blue Jay	Cyanocitta cristata
**Common Crow	Corvus brachyrhynchos
Black-capped Chickadee	Parus articapillus
**Carolina Chickadee	Parus carolinensis
**Tufted Titmouse	Parus bicolor
White-breasted Nuthatch	Sitta carolinensis
*Red-breasted Nuthatch	Sitta canadensis
Brown Creeper	Certhia familiaris
**House Wren	Troglodytes aedon
Winter Wren	Troglodytes troglodytes
**Bewick's Wren	Thryomanes bewickii
**Carolina Wren	Thryothorus ludovicianus
Long-billed Marsh Wren	Telmalodytes palustris
Short-billed Marsh Wren	Cistothorus platensis

*Uncommon
**Nests in Southern Illinois

**Mockingbird	Mimus polyglottos
**Catbird	Dumetella carolinensis
**Brown Thrasher	Toxostoma rufum
**Robin, American	Turdus migratorius
**Wood Thrush	Hylocichla mustelina
Hermit Thrush	Catharus guttatus
Swainson's Thrush	Catharus ustulatus
Gray-cheeked Thrush	Catharus minimus
*Veery	Catharus fuscescens
**Eastern Bluebird	Sialia sialis
**Blue-gray Gnatcatcher	Polioptila caerulea
Golden-crowned Kinglet	Regulus satrapa
Ruby-crowned Kinglet	Regulus calendula
Water Pipit	Anthus spinoletta
**Cedar Waxwing	Bombycilla cedrorum
**Loggerhead Shrike	Lanius ludovicianus
**Starling	Sturnus vulgaris
**White-eyed Vireo	Vireo griseus
* **Bell's Vireo	Vireo bellii
Yellow-throated Vireo	Vireo flavifrons
Solitary Vireo	Vireo solitarius
**Red-eyed Vireo	Vireo olivaceus
**Warbling Vireo	Vireo gilvus
Black-and-white Warbler	Mniotilta varia
**Prothonotary Warbler	Protonotaria citrea
Swainson's Warbler	Limnothlypis swainsonii
Worm-eating Warbler	Helmitheros vermivorus
Golden-winged Warbler	Vermivora chrysoptera
Blue-winged Warbler	Vermivora pinus
Tennessee Warbler	Vermivora peregrina
*Orange-crowned Warbler	Vermivora celata
Nashville Warbler	Vermivora ruficapilla
**Parula Warbler	Parula americana
**Yellow Warbler	Dendroica petechia
Magnolia Warbler	Dendroica magnolia
*Cape May Warbler	Dendroica tigrina

*Uncommon
**Nests in Southern Illinois

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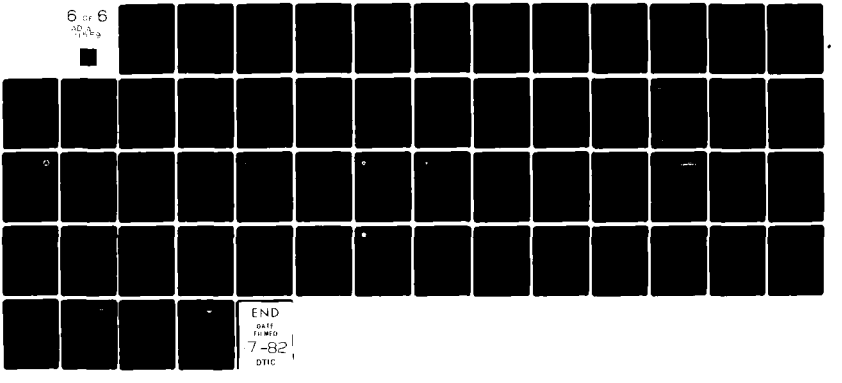

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*Black-throated Blue Warbler	Dendroica caerulescens
Yellow-rumped Warbler (Myrtle)	Dendroica coronata
Black-throated Green Warbler	Dendroica virens
**Cerulean Warbler	Dendroica cerulea
Blackburnian Warbler	Dendroica fusca
**Yellow-throated Warbler	Dendroica dominica
Chestnut-sided Warbler	Dendroica pensylvanica
Bay-breasted Warbler	Dendroica castanea
Blackpoll Warbler	Dendroica striata
**Pine Warbler	Dendroica pinus
**Prairie Warbler	Dendroica discolor
Palm Warbler	Dendroica palmarum
Ovenbird	Seiurus aurocapillus
Northern Waterthrush	Seiurus noveboracensis
**Louisiana Waterthrush	Seiurus motacilla
**Kentucky Warbler	Oporornis formosus
*Mourning Warbler	Oporornis philadelphia
**Yellowthroat	Geothlypis trichas
**Yellow-breasted Chat	Icteria virens
Hooded Warbler	Wilsonia citrina
Wilson's Warbler	Wilsonia pusilla
Canada Warbler	Wilsonia canadensis
American Redstart	Setophaga ruticilla
**House Sparrow	Passer domesticus
Bobolink	Dolichonyx oryzivor
**Eastern Meadowlark	Sturnella magna
**Red-winged Blackbird	Agelaius phoeniceus
**Orchard Oriole	Icterus spurius
**Northern Oriole (Baltimore)	Icterus galbula
Rusty Blackbird	Euphagus carolinus
**Common Grackle	Quiscalus quiscula
**Brown-headed Cowbird	Molothrus ater
Scarlet Tanager	Piranga olivacea
**Summer Tanager	Piranga rubra
**Cardinal	Richmondena cardinalis
*Evening Grosbeak	Hesperiphona vespertina
Rose-breasted Grosbeak	Pheucticus ludovicianus
**Blue Grosbeak	Guiraca caerulea
**Indigo Bunting	Passerina cyanea

*Uncommon
**Nests in Southern Illinois

**Dickcissel	Spiza americana
Purple Finch	Carpodacus purpureus
**American Goldfinch	Spinus tristis
**Rufous-sided Towhee	Pipilo erythrophthalmus
Savannah Sparrow	Passerculus sandwichensis
**Grasshopper Sparrow	Ammodramus savannarum
Henslow's Sparrow	Ammodramus henslowii
*Vesper Sparrow	Pooecetes gramineus
*Lark Sparrow	Chondestes grammacus
**Bachman's Sparrow	Aimophila aestivalis
Slate-colored Junco	Junco hyemalis
Tree Sparrow	Spizella arborea
**Chipping Sparrow	Spizella passerina
**Field Sparrow	Spizella pusilla
Harris' Sparrow	Zonatrichia querula
White-crowned Sparrow	Zonotrichia leucophrys
White-throated Sparrow	Zonotrichia albicollis
Fox Sparrow	Passerella iliaca
*Lincoln's Sparrow	Melospiza lincolnii
Swamp Sparrow	Melospiza georgiana
**Song Sparrow	Melospiza melodia

The following birds are considered accidentals in the area:

Eared Grebe	Podiceps nigricollis
Western Grebe	Aechmophorus occidentalis
Snowy Egret	Egretta thula
Whistling Swan	Olor columbianus
Brant	Branta bernicla
Barrow's Goldeneye	Bucephala islandica
Surf Scoter	Melanitta perspicillata
Mississippi Kite	Ictinia Misisippiensis
Sandhill Crane	Grus canadensis
Willet	Catoptrophorus semipalmatus
Western Sandpiper	Ereunetes mauri
Marbled Godwit	Limosa fedoa
Ground Dove	Columbina passerina
Bachman's Warbler	Vermivora bachmanii
Connecticut Warbler	Oporornis agilis
Brewer's Blackbird	Euphagus cyanocephalus
Western Tanager	Piranga ludoviciana
Pine Siskin	Spinus pinus
Red Crossbill	Loxia curvirostra
LeConte's Sparrow	Ammospiza leconteii
Clay-colored Sparrow	Spizella pallida
Lapland Longspur	Caecarius lapponicus

*Uncommon
**Nests in Southern Illinois

APPENDIX B-5

CHECK LIST:
VERTEBRATE ANIMALS OF THE BIG MUDDY BASIN REGION*

Chestnut Lamprey	Ichthyomyzon castaneus
Silver Lamprey	Ichthyomyzon unicuspis
American Brook Lamprey	Lampetra lamottei
Paddlefish	Polyodon spathula
Spotted Gar	Lepisosteus oculatus
Longnose Gar	Lepisosteus osseus
Shortnose Gar	Lepisosteus platostomus
Bowfin	Amia calva
American Eel	Anguilla rostrata
Skipjack Herring	Alosa chrysochloris
Gizzard Shad	Dorosoma cepedianum
Threadfin Shad	Dorosoma petenense
Goldeye	Hiodon alosides
Mooneye	Hiodon tergisus
Central Mudminnow	Umbra limi
Grass Pickerel	Esox americanus
Northern Pike	Esox lucius
Stoneroller	Campostoma anomalum
Goldfish	Carassius auratus
Southern Redbelly Dace	Phoxinus erythrogaster
Carp	Cyprinus carpio
Oxark Minnow	Dionda nubila
Silverjaw Minnow	Ericymba buccata
Cypress Minnow	Hybognathus hayi
Silvery Minnow	Hybognatus nuchalis
Plains Minnow	Hybognatus placitus
Speckled Chub	Hybopsis aestivalis
Flathead Chub	Hybopsis gracilis
Sicklefin Chub	Hybopsis meeki
Silver Chub	Hybopsis storeriana
Golden Shiner	Notemigonus crysoleucas

* From data supplied by the Crab Orchard National Wildlife Refuge, Carterville, Illinois.

Emerald Shiner	Notropis atherinoides
River Shiner	Notropis blennius
Bigeye Shiner	Notropis boops
Ghost Shiner	Notropis buchanani
Red Shiner	Notropis lutrensis
Silverband Shiner	Notropis shumardi
Spotfin Shiner	Notropis spilopterus
Sand Shiner	Notropis stramineus
Redfin Shiner	Notropis umbratilis
Blacktale Shiner	Notropis venustus
Mimic Shiner	Notropis volucellus
Steelcolor Shiner	Notropis whipplei
Pugnose Minnow	Notropis emiliae
Suckermouth Minnow	Phenacobius mirabilis
Bluntnose Minnow	Pimephales notatus
Fathead Minnow	Pimephales promelas
Bullhead minnow	Pimephales vigilax
Creek chub	Semotilus atromaculatus
River carpsucker	Carpiodes carpio
Quillback	Carpiodes cyprinus
Highfin carpsucker	Carpiodes velifer
White sucker	Catostomus commersoni
Blue sucker	Cycleptus elongatus
Creek chubsucker	Erimyzon oblongus
Lake chubsucker	Erimyzon sucetta
Northern hog sucker	Hypentelium nigricans
Smallmouth buffalo	Ictiobus bubalus
Bigmouth buffalo	Ictiobus cyprinellus
Black buffalo	Ictiobus niger
Spotted sucker	Minytrema melanops
Black redhorse	Moxostoma duquesnei
Golden redhorse	Moxostoma erythrurum
Shorthead (Northern) redhorse	Moxostoma macrolepidotum
Blue catfish	Ictalurus furcatus
Black bullhead	Ictalurus melas
Yellow bullhead	Ictalurus natalis
Brown bullhead	Ictalurus nebulosus
Channel catfish	Ictalurus punctatus
Mountain madtom	Noturus eleutherus
Slender madtom	Noturus exilis
Stonecat	Noturus flavus
Tadpole madtom	Noturus gyrinus
Brindled madtom	Noturus miurus
Freckled madtom	Noturus nocturnus
Flathead catfish	Pylodictis olivaris

Spring Cavefish	Chologaster agassizi
Burbot	Lota lota
Pirate Perch	Aphredoderus sayanus
Blackstripe topminnow	Fundulus notatus
Starhead topminnow	Fundulus notti
Blackspotted topminnow	Fundulus olivaceus
Mosquitofish	Gambusia affinis
Brook silverside	Labidesthes sicculus
White bass	Morone chrysops
Yellow bass	Morone mississippiensis
Rock bass	Ambloplites rupestris
Flier	Centrarchus macropterus
Warmouth	Lepomis gulosus
Banded pygmy sunfish	Elassoma zonatum
Green sunfish	Lepomis cyanellus
Orangespotted sunfish	Lepomis humilis
Bluegill	Lepomis macrochirus
Longear sunfish	Lepomis megalotis
Redear sunfish	Lepomis microlophus
Bantam sunfish	Lepomis symmetricus
Smallmouth bass	Micropterus dolomieui
Spotted bass	Micropterus punctulatus
Largemouth bass	Micropterus salmoides
White crappie	Pomoxis annularis
Black crappie	Pomoxis nigromaculatus
Mud darter	Etheostoma asprigene
Rainbow darter	Etheostoma caeruleum
Bluntnose darter	Etheostoma chlorosomum
Fantail darter	Etheostoma flabellare
Slough darter	Etheostoma gracile
Stripetail darter	Etheostoma kennicotti
Johnny darter	Etheostoma nigrum
Cypress darter	Etheostoma proeliare
Orangethroat darter	Etheostoma spectabile
Spottail darter	Etheostoma squamiceps
Logperch	Percina caprodes
Blackside darter	Percina maculata
Slenderhead darter	Percina phoxocephala
River darter	Percina shumardi
Sauger	Stizostedion canadense
Walleye	Stizostedion vitreum vitreum
Freshwater drum	Aplodinotus grunniens
Banded sculpin	Cottus carolinae
Hellbender	Cryptobranchus alleganiensis
Spotted salamander	Ambystoma maculatum

Marbled salamander	Ambystoma opacum
Mole Salamander	Ambystoma talpoideum
Small-mouth salamander	Ambystoma texanum
Tiger salamander	Ambystoma tigrinum
Newt	Notophthalmus viridescens
Dusky salamander	Desmognathus fuscus
Two-lined salamander	Eurycea bislineata
Long-tailed salamander	Eurycea longicauda
Cave salamander	Eurycea lucifuga
Zigzag salamander	Plethodon dorsalis
Slimy salamander	Plethodon glutinosus
Mudpuppy	Necturus maculosus
Lesser siren	Siren intermedia
Eastern Spadefoot	Scaphiopus holbrooki
Bigfoot	Magnificus clodhopperus
American toad	Bufo americanus
Fowler's toad	Bufo woodhousei
Cricket frog	Acris crepitans
Bird-voiced treefrog	Hyla avivoca
Green treefrog	Hyla cinerea
Spring peeper	Hyla crucifer
Gray treefrog	Hyla versicolor
Illinois chorus frog	Pseudacris streckeri
Chorus frog	Pseudacris triseriata
Crayfish frog	Rana areolata
Bullfrog	Rana catesbeiana
Green frog	Rana clamitans
Pickerel frog	Rana palustris
Leopard frog	Rana pipiens
Wood frog	Rana sylvatica
Narrow-mouthed toad	Gastrophryne carolinensis
Snapping turtle	Chelydra serpentina
Alligator snapping turtle	Macroclemys temmincki
Mud turtle	Kinosternon subrubrum
Stinkpot	Sternothaerus odoratus
Painted turtle	Chrysemys picta
Map turtle	Graptemps geographica
False map turtle	Graptemys pseudogeographica
Slider	Pseudemys concinna
Red-eared turtle	Pseudemys scripta
Box turtle	Terrapene carolina
Ornate box turtle	Terrapene ornata
Smooth softshell	Trionyx muticus
Spiny softshell	Trionyx spinifer
Fence Lizard	Sceloporus undulatus
Slender glass lizard	Ophisaurus attenuatus

Six-lined racerunner	Cnemidophorus sexlineatus
Five-lined skink	Eumeces fasciatus
Broad-headed skink	Eumeces laticeps
Ground skink	Scincella laterale
Worm snake	Carphophis amoenus
Scarlet snake	Cemophora doliata
Racer	Coluber constrictor
Ringneck snake	Diadophis punctatus
Corn snake	Elaphe guttata
Rat snake	Elaphe obsoleta
Mud snake	Farancia abacura
Eastern hognose snake	Heterodon platyrhinos
Prairie kingsnake	Lampropeltis calligaster
Common kingsnake	Lampropeltis getulus
Milk snake	Lampropeltis triangulum
Coachwhip	Masticophis
Green water snake	Natrix cyclopion
Plain-bellied water snake	Natrix erythrogaster
Banded water snake	Natrix fasciata
Diamond-backed water snake	Natrix rhombifera
Common water snake	Natrix sipedon
Rough green snake	Opheodrys aestivus
Graham's water snake	Regina grahami
Brown snake	Storeria dekayi
Red-bellied snake	Storeria occipitomaculata
Flat-headed snake	Tantilla gracilis
Ribbon snake	Thamnophis sauritus
Common garter snake	Thamnophis sirtalis
Smooth earth snake	Virginia valeriae
Copperhead	Agkistrondon contortrix
Cottonmouth	Agkistrodon piscivorus
Timber rattlesnake	Crotalis horridus
Massasauga	Sistrurus catenatus
Opossum	Didelphis marsupialis
Short-tailed shrew	Blarina brevicauda
Least shrew	Cryptotis parva
Southeastern shrew	Sorex longirostris
Eastern mole	Scalopus aquaticus
Southeastern big-eared bat	Corynorhinus rafinesquii
Big brown bat	Eptesicus fuscus
Silver-haired bat	Lasionycteris noctivagans
Red bat	Lasiurus borealis
Hoary bat	Lasiurus cinereus
Southeastern bat	Myotis austroripārius
Gray bat	Myotis grisescens

Keen's bat	Myotis keenii
Little brown bat	Myotis lucifugus
Indiana bat	Myotis sodalis
Evening bat	Nycticeius humeralis
Eastern pipistrel	Pipistrellus subflavus
Swamp rabbit	Sylvilagus aquaticus
Eastern cottontail	Sylvilagus floridanus
Southern flying squirrel	Glaucomys volans
Woodchuck	Marmota monax
Eastern gray squirrel	Sciurus carolinensis
Eastern fox squirrel	Sciurus niger
Eastern chipmunk	Tamias striatus
Beaver	Castor canadensis
Prairie vole	Microtus ochrogaster
Eastern wood rat	Neotoma floridana
Muskrat	Ondatra zibethicus
Rice rat	Oryzomys palustris
Cotton mouse	Peromyscus gossypinus
White-footed mouse	Peromyscus leucopus
Deer mouse	Peromyscus maniculatus
Golden mouse	Peromyscus nuttalli
Pine vole	Pitymys pinetorum
Southern bog lemming	Synaptomys cooperi
House mouse	Mus musculus
Norway rat	Rattus norvegicus
Meadow jumping mouse	Zapus hudsonius
Coyote	Canis latrans
Gray fox	Urocyon cinereoargenteus
Red fox	Vulpes fulva
Black bear	Ursus americanus
Raccoon	Procyon lotor
River otter	Lutra canadensis
Striped skunk	Mephitis mephitis
Long-tailed weasel	Mustela frenata
Mink	Mustela vison
Badger	Taxidea taxus
Bobcat	Lynx rufus
White-tailed deer	Odocoileus virginianus

APPENDIX C-1

Date Prepared 1 November 1973
District St. Louis

FLOOD HISTORY

Project: Rend Lake, Illinois

b. Flood History

Flood Stage Date (1)	Index Station (2)	Flood Stage (3)	Natural Stage (4)	Stage Reduction: Possible with reservoir in full operation (5)	Stage Reduction: As afforded by reservoir in time of flood (6)	Damages: Without Reservoir (7)	Damages: Preventable with reservoir in full operation (8)	Damages: Prevented at time of flood (9)	Damages: Preventable under present conditions with project in full operation (10)
A. Past 5 Fiscal Years									
April 1973	Murphysboro	16.0	32.7	Operational	Negligible 3/	103,500	N/A	0	0
January 1973 1/	"	"	22.0	"	0.4	3,700	N/A	0	0
January 1973 2/	"	"	20.5	"	0.1	45,000	N/A	1,000	1,000
December 1972	"	"	17.0	"	0.1	0	N/A	0	0
November 1972	"	"	20.0	"	0.8	44,700	N/A	6,600	7,500
April 1972	"	"	30.2	"	4.2	72,900	N/A	20,000	22,800
February 1971	"	"	30.6	6.6	Not Oper.	44,000	17,200	Not Oper.	21,800
March 1970	"	"	23.4	4.0	" "	22,400	3,200	" "	4,200
February 1970	"	"	17.3	1.5	" "	9,000	9,000	" "	11,800
July 1969	"	"	27.2	2.6	" "	166,400	38,400	" "	52,200
April 1969	"	"	24.8	2.8	" "	37,700	6,600	" "	9,000
February 1969	"	"	32.0	3.4	" "	46,600	11,000	" "	15,000
B. Major Floods Prior to Past 5 Fiscal Years (30' stage or greater)									
March 1964	"	16.0	32.8	4.5	Not Oper.	48,000	45,000	Not Oper.	92,900
May 1961 4/	"	"	38.0	4.8	" "	293,800	196,200	" "	302,200
December 1958	"	"	30.1	5.1	" "	6,400	4,600	" "	10,200
April 1957	"	"	33.9	4.9	" "	99,400	66,400	" "	144,500
January 1950	"	"	35.5	4.6	" "	35,300	30,700	" "	81,200
January 1949	"	"	36.0	4.7	" "	42,700	37,800	" "	100,000
August 1946	"	"	33.2	4.9	" "	335,400	195,900	" "	457,700
April 1945	"	"	32.8	4.8	" "	57,400	35,300	" "	92,300
January 1937	"	16.0	33.9	4.9	" "	14,900	13,000	" "	94,300
March 1935	"	"	34.1	4.7	" "	18,000	14,200	" "	115,100
March 1933	"	"	33.5	5.7	" "	13,300	10,800	" "	127,400

1/ 24 January
2/ 5 January
3/ Flood crest resulted from Mississippi River backwater
4/ Record flood

APPENDIX C-2

POSSIBILITY OF WATER SUPPLY CURTAILMENT WITH RESERVOIR LEVEL FALLING BELOW ELEVATION 391.0

The purpose of this appendix is to discuss the possibilities of the reservoir dropping below elevation 391.0. Below this elevation there is no provision for water supply appropriation from the reservoir; only a provision for a low flow release downstream. In other words, if the reservoir ever dropped to elevation 391.0, the water supply would be cut off.

The reservoir pool hydrographs from the years 1946 to 1970 and the minimum pool elevation frequency curves developed by the Corps of Engineers have been reviewed. The reservoir pool hydrographs were developed assuming the reservoir was in place since 1946. Separate hydrographs were developed by the Corps for a 10 cfs water supply withdrawal and for a 62 cfs water supply withdrawal. If the reservoir had been in place, the low water level would have occurred in 1954 and would have been to elevation 402.75 with a 10 cfs water supply withdrawal and to elevation 399.1 with a 62 cfs withdrawal.

Using the period 1946 to 1970, minimum pool elevation frequency curves for a 10 cfs withdrawal and for a 62 cfs withdrawal were platted. The frequency curve for a 10 cfs withdrawal indicates that the once in 100-year low pool elevation would be approximately elevation 402 and the once in 1000-year minimum pool elevation would be approximately elevation 401.5. The 62 cfs minimum pool elevation frequency curve indicates that the once in 100-year minimum pool elevation would be approximately 399.5 and the once in 1000-year minimum pool elevation would be approximately 398. In terms of frequency, then, the drought which occurred in 1954 would have been approximately a once in 50-year drought using a 10 cfs withdrawal and a once in 30-year drought using a 62 cfs withdrawal.

APPENDIX C-3

EXCERPTS FROM U. S. ARMY CORPS OF ENGINEERS
PROJECT RESOURCE MANAGEMENT PLAN

Excerpt from: Operational concept describing area redevelopment purposes of Rend Lake

Source: Appendix A - Design Memorandum 6B, The Master Plan "Project Resource Management Plan"

"2.6 Area Redevelopment. The Big Muddy Watershed of Southern Illinois is rich in natural resources. The moderate climate, coal reserves, the presence of gas, oil and clay in commercial quantities, the network of railroads and highways, the large available work force - all are desirable elements in the development of an industrial economy.

"The one vital ingredient missing in the past was an adequate water supply. Rend Lake will eliminate this past barrier in the development of a new era of prosperity for southern Illinois. Industries which formerly overlooked the area for plant expansion due to lack of water will now locate in the Rend Lake region.

"Since the 1930's, the once prosperous coal mining industry has declined in the lower Illinois region. Although production has remained about the same, increased mechanization of the industry cost the area more than 15,000 jobs. The result was massive unemployment, heavy migration, a dwindling tax base and, consequently, a severely depressed economy. Development of Rend Lake as a major Illinois tourist attraction will mean hundreds of job opportunities in the area.

"Since construction began in 1967, thousands of jobs have been created in the area - both directly, through construction employment, and indirectly, by the creation of supportive services such as restaurants, gas stations, schools, and light industry. The new water treatment plant has also created many new jobs at Rend Lake. The economic rejuvenation enjoyed so far is small in comparision to the lake's long-range effect on industry and employment."

APPENDIX C-4

ECONOMIC PROJECTIONS

Labor Force Participation

It is extremely difficult to predict future economic growth with any degree of accuracy, and for that reason the following calculations are intended to be an indication of industrial activity and not accurate economic projections. In Section 2 of this report it was shown that the labor force participation rate for Franklin and Jefferson Counties was 45 and 51 percent respectively for 1970. The rate for the total United States was approximately 55 percent. In order to estimate the labor force in 1980 and then compare it to projected population, the number of jobs created between 1970 and 1980 must be calculated.

Table 3-3 in Section 3 is a partial list of firms who have located in the Rend Lake area within the last two years. The total number of employees on that list engaged in a primary industry is 607. Because that figure represents only two years between 1970 and 1980, it can be multiplied by five to determine the total basic industry jobs created in ten years.

(607 Basic Industry Jobs) x 5 = 3,035 Jobs

Mr. Ian Wilson, in a recent speech, pointed out that for every[1] basic industry job created, five secondary jobs will be generated.

3,035 x 5 = 15,175 Jobs

Over the ten-year period from 1970 to 1980, then, 15,175 new jobs could be created in the two-county area. As was noted in Section 2, 24,747 jobs existed in both counties in 1970. The two figures combined result in the number of jobs in 1980.

24,747 + 15,175 = 39,992 Jobs (1980)

If the labor force in 1980 is divided by total projected population, the labor force participation rate will result. (Table 2-11 shows the official population projection figures.)

---

[1] The multiplier (5) is an arbitrary number. Walter Isard in his book "Methods of Regional Analysis" uses 3.5 as an example for the Wichita area. The reason for using 5 in this case is threefold: 1) a higher multiplier is necessary for smaller communities, 2) it is generally understood that the service to manufacturer ratio is getting larger, and 3) Mr. Ian Wilson, General Electric Company, predicts it will be at least 5 by 1985.

The method used in this projection was crude, but conservative for two reasons: 1) The list of firms locating in the area in the last two years is only a partial list. 2) The fact that General Tire Company plans to add 700 to its working force in the next three years was not considered.

In summary, then it has been noted that the recent growth rate (primarily due to Rend Lake water supply and freeway construction) projected in 1980 will result in a minimum of 52.3 percent labor force participation rate. That rate for the U.S. during the last ten years has been relatively stable at 55 percent. Although this particular measurement is not an absolute indication of economic health, it does show that there will be an increase in family and per capita income.

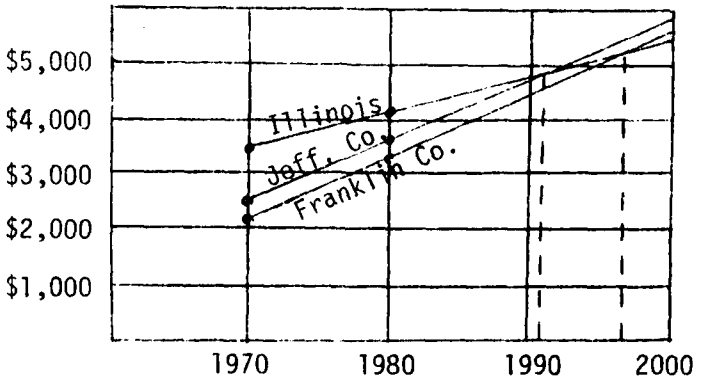
Personal Income Growth

Perhaps the best measurement of economic growth is per capita personal income. The rate of improvement in this indicator between 1960 and 1970 increased substantially as was pointed out in Section 2.

Table 2-22 shows that in Franklin County between 1965 and 1970, five percentage points were gained. If that rate of improvement holds, per capita personal income for Franklin County will equal that of the United States in 1995.

Another method of projecting income levels is comparing the actual rate of increase for the county and state between 1960 and 1970. In Illinois, per capita personal income increased by approximately 46 percent. If that trend continues, these two counties would catch up to Illinois between 1990 and 2000.

PROJECTED PER CAPITA PERSONAL INCOME



Source: 1960, 1970 Census of Population
County Economic Profiles, State of Illinois
Department of Business and Economic Development

APPENDIX C-5

ILLINOIS WATERBORNE-DISEASE OUTBREAKS REPORTED
1961 - 1973

Institution	Month	Year	Disease or Organism	Cases	Deaths	Public or Private	Source	Treatment	Cause of Outbreak Remarks	References
A State Park near Grafton	May	1972	Gastroenteritis	90	-	Private	Well	None	Epidemiologic evidence implicates water. It was felt that septic tank effluent contaminated the well. The well and septic tank had been constructed in the fall of 1971. The septic tank was placed about 10 feet deep and those digging the hole struck water. During the time the septic tank was being installed, the well water was muddy. Water samples on May 24 contained 1100 fecal coliforms per 50 ml. Dye placed in restroom and home toilets were found in distribution system within 24 hours.	CDC-MMWR, 21 (23) 198 (1972), Internal Report, CD CDC
Country Club Batavia (Kane County)	Oct.	1963	Unknown	30	-	Private	Well	Cl_2	Chlorinator broken on well. Suspected vehicle - water.	Internal Correspondence, NCDC, 3/29/65.
near Joliet (Will County)	Sept.	1962	S. flexneri	4	-	Private	Well	None	Contaminated well; source of contamination unknown.	Internal Correspondence, NCDC, 1/15/63, EPI-63-29-2.
Country Club Batavia (Kane County)	March	1962	Unknown	27	-	Private	Well	None	Contaminated well. Suspected vehicle - water.	Internal Correspondence, National Communicable Disease Center, 3/29/65.
Mattoon (Coles County)		1962	Infectious Hepatitis	95	-	Private	Well	None	Septic tank located 30 feet from well water badly contaminated.	Correspondence, Ill. State Health Dept. 1/27/71.

SOURCE: Illinois Department of Public Health

APPENDIX G-6

HERBICIDES & PESTICIDES USED AT REND LAKE BY THE U.S. ARMY CORPS OF ENGINEERS

The following is a list of pesticides used during the operating year 1973. Section 3.3.8.3 discusses disposal practices.

Malathion

Used for control of crockroaches, spiders, water bugs, silverfish, pine sawfly, eastern tent caterpillar, mosquitos, flies, and web worms. This pesticide is used for the following purposes: sanitation, health, moral, protection of pine trees, protection of various tree species, visitor comfort, health, protection of vegetation. Approximately three pints of this pesticide was hand-sprayed along baseboards in the administration building. Aerial survey was used to spray 400 acres at six different sites on the reservoir to protect pine trees. An unknown quantity was hand-sprayed to spot treat infested trees at campgrounds and picnic areas. A truck-mounted diesel fogger was used to fog three miles of roadway and three campgrounds with this pesticide mixed in fuel oil. A pump sprayer was used to spot treat recreation areas with this pesticide as a general insecticide.

Warfarin

Used to bait areas throughout the administration and maintenance buildings for rat and mice control.

Premitol

Used to spot treat along guard rails and walks for crab grass, foxtail and other weeds. It was applied with a hand sprayer. No quantities available.

2, 4-D Amine

Used for weed control over approximately 30 acres of wildlife management area. Approximately 60 to 120 pints of 2, 4-D Amine were broadcast sprayed.

Dalapon

The herbicide dalapon was also broadcast sprayed over approximately 30 acres of reforestation area to reduce weeds and weed competition. Approximately 450 to 900 pounds of dalapon were used.

Simazine

Simazine was also broadcast sprayed over 30 acres of reforestation area to reduce weed competition and kill fescue weeds. Approximately 150 pounds of simazine was used.

APPENDIX D-1

EXCERPT FROM REND LAKE COORDINATION
MEETING 2 MARCH 1971

The item below was taken from the minutes of a Rend Lake coordination meeting held in Benton, Illinois on March 2, 1971. Agencies represented were: Rend Lake Conservancy District, Illinois Department of Conservation and St. Louis District U.S. Army Corps of Engineers.

The following records a discussion on the possibility of one agency managing the entire Rend Lake project after completion of all construction; the item is a direct quote:

"The concept of single managership was discussed. Mr. Barkhausen, on behalf of the State, indicated that he had discussed this with the Governor who is of the opinion that the State could not abdicate this responsibility to manage, construct, and operate the areas at Rend Lake previously allocated to them. With this obligation, however, he felt that the State would not be able to participate financially with the Conservancy District in the construction, operation or management of any other areas now allocated either to the Corps of Engineers or the Conservancy District. As to this latter point, Colonel LeTellier stated that the Corps did not believe it feasible to allocate substantial additional areas below the State development to the Conservancy District without financial guarantees by the State. Since this was impossible, it appeared that we should proceed on the basis of each of the three agencies being responsible for the areas previously allocated to each. Messrs. John Douglas and Dick Jones expressed agreement on behalf of the Conservancy District with this viewpoint. Several people mentioned, however, that it was essential for the three agencies to proceed with development in a coordinated fashion and recommended that additional meetings such as this be held for that purpose. It was agreed that the next meeting would be held at Benton, Illinois, in May 1971 and hosted by the Conservancy District; the exact date to be agreed upon later."

APPENDIX E-1

LETTERS OF RESPONSE

TO

DRAFT ENVIRONMENTAL IMPACT STATEMENT

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN STREET
CHICAGO, ILLINOIS 60604

Mr. Jack R. Niemi
Chief, Engineering Division
U. S. Army Engineer District, St. Louis
210 North 12th Street
St. Louis, Missouri 63101

MAY 7 1975

Dear Mr. Niemi:

We have completed our review of the Draft Environmental Impact Statement (EIS) for Operation and Maintenance of Rend Lake in Franklin and Jefferson Counties, Illinois as requested in your letter of December 30, 1974. We have classified our comments as Category ER-2. Specifically, this means that we have environmental reservations regarding the project's water supply practices and solid waste disposal. We believe that additional information should be provided in the EIS to fully assess the project's environmental impacts. The classification and 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.

We have previously reviewed the proposed wastewater disposal facilities and practices at Rend Lake's Access Areas; our letters of February 26, 1974 and February 14, 1975 included a determination that the proposed facilities and wastewater practices at Rend Lake were satisfactory.

We offer the following comments for your use in preparing the Final EIS.

PROJECT DESCRIPTION

The operational schedule and the expected life of the Casey Fork and Rayse Fork subimpoundments should be indicated. The impact of the present reservoir release rates on the downstream corridor areas should be described.

WATER QUALITY

The EIS indicates that water quality standards have been violated downstream and upstream of the impoundment. It is also stated that these violations are the result of inadequate treatment of municipal discharges, storm sewer overflows and agricultural and industrial non-point sources. In view of the admittedly poor water quality in the upper portion of the impoundment and the possible inadequacy of reservoir releases for water quality

control, the EIS should address itself to possible changes in the release schedules. Some assessment of the non-point source contribution and the adequacy of the existing low flow from the dam of 30 cfs (to meet the dissolved oxygen requirements of 6 mg/l of dissolved oxygen during at least 16 hours of any 24 hour period nor less than 5 mg/l at any time) is basic to a discussion of the alternative management schemes. The possibility of providing additional flow downstream of the dam until adequate levels of point source treatment and non-point controls are provided should be investigated even though the present operations and maintenance procedure for low flow augmentation does not appear to conflict with the findings of the Big Muddy Comprehensive Study. A 303(e) basin plan for the Big Muddy River Basin has not been submitted by the State; its scheduled completion date is unknown at this time. Therefore, the compliance efforts of the upstream major dischargers discussed on pages 59-60 in the EIS are tentative improvements and should be indicated as such.

We note that high turbidity values have been recorded in the lake, especially north of Highway 183. An explanation should be included in the EIS on the period or periods during the year in which turbidity is consistently high; the respective causes for the high turbidity; the effects of such levels on the lake's fishery, water quality and recreation activities; and the feasibility of mitigation measures.

The location and frequency of backwash discharge of the water treatment plant should be indicated. The effects of having to treat waters with high levels of turbidity, fecal coliform, phosphorus, iron, manganese and copper should be discussed. The extent of occurrence of algae blooms and their resultant odor and taste problems should also be mentioned.

As discussed in the EIS, the availability and reliability of the Rend Lake impoundment and the Conservancy District water treatment and distribution system without a corresponding sewage treatment system has resulted in spurious development around the lake. Septic tanks systems are being constructed in soils poorly suited for septic treatment, experiencing close to 90 percent rate of failure (pages 44, 175). Increased per capita usage of water and proliferation of septic fields is further aggravating the failure rate of septic systems. Because of the soil's low permeability and the high water table, sanitary wastes cannot easily seep into the ground and in many cases are discharged on the surface. Leaching or runoff of such wastes to Rend Lake can

severely degrade water quality and cause severe local public health problems depending upon the density of septic fields in the watershed. Therefore, Corps monitoring programs should be expanded to include certain areas around the lake that are specifically being affected by septic tank runoff to determine the degree of water quality degradation. Once specific areas such as tributary watersheds and drainage ditches have been determined as being degraded by sanitary wastes with monitoring and tracing methods, appropriate State and local agencies should be contacted to effectuate a water quality management program to minimize such impacts.

The articles of cooperation with the Corps of Engineers for utilizing the water supply storage portion of the reservoir should be such as to control the indiscriminate use of the Conservancy District in the distribution and sale of water to communities, developers, and individuals around the lake that are or will be contributing to the degradation of Rend Lake's water quality. Lack of control affects the project's water supply and recreational purposes for which the lake was designed and also the desired water quality goals for this basin. According to page 226 of the EIS, the Conservancy District has no current management criteria for balancing the sale of water with the general well-being of the county or local communities. We believe criteria should be developed for determining the suitability of a potential water supply user or petitioner; controlling water supply use once it is sold to a lower unit of government; evaluating the environmental consequences of water supply use by a petitioner; and vetoing the sale of water to a petitioner when it is assessed that the resultant environmental degradation would outweigh the achievable benefits. We suggest that the Conservancy District and the Illinois EPA be contacted to discuss the feasibility of these or similiar criteria.

With regard to the three alternative plans of action for rectifying the problem of fish kills in the stilling basin because of stagnant waters, the economic and environmental advantages and disadvantages of each plan should be noted and compared in the Final EIS. This evaluation will assist in determining the most cost-effective and environmentally-sound plan.

SOLID WASTE DISPOSAL

From information obtained during our field inspection, we note that solid wastes from project properties are being deposited at a Franklin County landfill. Information from the Illinois

EPA is that while private landfills exist, there are no county-run landfills in existance. Furthermore, none of the private landfills have a current operating permit issued by the State of Illinois. Federal guidelines for the disposal of solid waste are intended to apply to all solid waste generated by Federal agencies, regardless of whether processed or disposed of on or off Federal property. Solid waste disposal should be permitted only at State approved landfill sites holding a current operating permit. Since this is apparently not the case, we request that the current waste management program be modified to adhere to this requirement. Compliance with EPA's Thermal Processing and Land Disposal of Solid Waste Guidelines (August 14, 1974, Federal Register) is required by Section 209 of the Solid Waste Disposal Act (PL 92-512) and Executive Order 11752 - Prevention, Control and Abatement of Environmental Pollution at Federal Facilities.

OTHER

We note that the Corps generally purchased only surface rights within the project boundaries except beneath the dams where mineral rights were also acquired in order to prevent subsidence of these critical structures. Yet Figure 2-6 of the EIS shows Herrin Coal (No. 6) beneath the west side of the Main Dam and all of the Big Muddy Subimpoundment Dam as already having been mined out. We realize that these areas were probably mined out prior to the construction of the reservoir. However, the EIS should discuss whether these areas have already been subjected to subsidence, the extent to which subsidence has occurred or has the potential to occur, the environmental and economical effects that the estimated subsidence is having or will have on the dam structures, access areas, local roads, the subimpoundment areas and the lake ecosystem (refuge and open water). The provisions to assure that the remaining coal lying underneath sensitive surface structures (such as the dams) will not be mined should be detailed in the EIS. Consideration should be given to a periodic monitoring program to survey subsidence levels and mining efforts.

From information obtained from our field inspection and in the EIS, ventilation shafts and access shafts will be constructed on Corps of Engineers property for safety and efficiency purposes. While the property required for construction of ventilation shafts is minimal, the facility could be incompatible to surrounding land use such as camping, recreation activities and nature study areas if adequate forethought is not given to evaluating potential effects and minimizing negative

environmental impacts. The potential adverse effects of these facilities upon ambient noise levels, air quality, land use conversion and aesthetics and the steps that will be taken to mitigate or eliminate these adverse effects should be detailed. Location alternatives, design alternatives and landscaping should be carefully considered in compatibly integrating these facilities into the area. The EIS indicates that five access shafts will be required on Corps of Engineers property and that such facilities are rather large and include parking facilities, washing facilities and appurtenant structures. The actual amount of land required for such facilities should be noted. In order to reduce the land surface required for this activity, to minimize construction impacts and erosion in proximity to Rend Lake from these facilities, and to decrease the potential conflicts with recreational activities of the lake, we suggest that consideration be given to providing only limited parking for necessary service vehicles, and shuttle buses. Larger parking areas could be constructed on more compatible lands or private property, if necessary; and miners could be shuttled back and forth to the parking area.

We thank Messrs. Owen Dutt (of your staff) and Phil Jenkins (Assistant Manager of Rend Lake) for the courtesies they extended to my staff during their field inspection of February 11, 1975. The opportunity to review this Draft EIS is appreciated. Please send us two copies of the Final EIS when it is filed with the Council on Environmental Quality.

Sincerely yours,

Donald A. Wallgren
Chief,
Federal Activities Branch

United States Department of the Interior

OFFICE OF THE SECRETARY
NORTH CENTRAL REGION
230 S. DEARBORN STREET, 32nd FLOOR
CHICAGO, ILLINOIS 60604

(ER-75/5)

February 25, 1975

Colonel James E. Hays
District Engineer
U.S. Army Engineer District
Detroit
P.O. Box 1027
Detroit, Michigan 48231

Dear Colonel Hays:

The Department of the Interior has reviewed the Draft Environmental Statement for the Rend Lake Operation and Maintenance, Franklin and Jefferson Counties, Illinois, as requested in Mr. Niemi's transmittal letter of December 30, 1974 to our Assistant Secretary, Program Development and Budget. Our comments which are of both a general and specific nature relate to areas of our jurisdiction and expertise and have been prepared in accordance with the National Environmental Policy Act of 1969.

2. ENVIRONMENTAL SETTING OF THE EXISTING RESERVOIR

2.1.2.6 Economic Geology

Oil

The discussion of petroleum reserves and production on pages 36 and 37 gives this information by counties, not by fields. On page 284, oil production for 1970 is given for the three fields that have been affected by the lake. The statement asserts in several places that oil production is declining. This could be misleading and is not supported by data from just one year's production. We suggest that an estimate of petroleum reserves should be given for all three fields.

Because of the current energy crisis and the need for a supply of domestic oil, we question the advisability of limiting exploration and terminating leases as part of management practices. Such actions warrant more explanation in the final statement.

2.3.1.2 Historical Site Survey

The statement does not clearly confirm that the State Historic Preservation Officer (Mr. Anthony Dean, Director, Department of Conservation, 602 State Office Building, Springfield, Illinois 62706) has been consulted to determine what effect the proposed activities might have on cultural resources, especially those which might be in process of nomination to the National Register of Historic Places. It is erroneously asserted on page 82 that the National Register of Historic Places was last published in 1972. The National Register is published in the Federal Register each February and supplements are published on the first Tuesday of each month. If the proposed activities should be found to have an effect on listed or eligible National Register sites, the statement should reflect further compliance with Section 106 of the National Historic Preservation Act of 1966.

The discussion of archeological resources leaves the impression that further studies of the resources which have not been inundated would serve no purpose. Considering the statements in Section 2 (page 81) and in Section 8 (page 242) that adverse effects on archeological sites are expected to occur as development proceeds at Gun Creek and around the lake, it would appear necessary that the Corps of Engineers undertake further surveys of all Federally controlled lands in the project area in order to identify significant resources and prepare a program for mitigation and salvage.

Until such actions are taken, the description of historic and archeological resources in the statement and the analysis of expected adverse effects will be incomplete. The program for mitigation and salvage should identify procedures to be followed when previously unknown resources are encountered in the future.

4. ENVIRONMENTAL IMPACT OF OPERATION AND MAINTENANCE ACTIVITIES

4.2.5.5 Non-Game Species

We concur with the observation that management of non-game wildlife should be included in all plans for the Rend Lake area. The non-game component of our native wildlife is important in residential, commercial, and recreational areas as well as on land designated as wildlife habitat.

6. ALTERNATIVES TO EXISTING OPERATION AND MAINTENANCE ACTIVITIES

6.3.2 STRUCTURAL ALTERATION

The possibility and consequences of modifying the spillway to raise the normal pool from 405 feet above mean sea level to 410

feet is discussed. The Bureau of Outdoor Recreation is assisting the Illinois Department of Conservation, through the Land and Water Conservation Fund Act (Project No. 17 - 00179), to construct in water and on land marina and sailboat harbor facilities at Wayne Fitzgerrell State Park and boat ramps elsewhere at Rend Lake. We believe the statement should recognize that if the project or project operation is altered in a manner inimical to the Land and Water Conservation Fund assisted recreation facilities or their usefulness, that the State of Illinois will be responsible, pursuant to the provisions of Section 6(f), for the refurbishing or replacement of such facilities.

6.5.2.1 Fish and Wildlife

The statement that hunting, if unmanaged, would eliminate game species from the area is unfounded, based on the information given. Extremely high hunting pressure could have this result, but there is no evidence that hunting pressure on the unmanaged wildlife area would be that great.

Sincerely yours,

Madonna F. McGrath

Madonna F. McGrath
Acting Special Assistant
to the Secretary

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
NORTHEASTERN AREA, STATE AND PRIVATE FORESTRY
6816 MARKET STREET, UPPER DARBY, PA 19082
TELEPHONE: 215/597-3772

8400
February 21, 1975

Jack R. Nieme, Chief
Department of the Army
St. Louis District
Corps of Engineers
210 North 12th Street
St. Louis, MO 63101

Re: LSMED; Draft Environmental Statement, Rend Lake, Illinois (Operation & Maintenance)

Dear Sir:

The above statement was referred to us by our Milwaukee office for review and comment since no National Forest Land is involved.

Your description of the natural resources, including woodland, and the effect of operation and maintenance of the Rend Lake project is excellent. We feel the final statement should attempt an estimate of the recreational and developmental impacts on wildlife cover and vegetation in general.

Thank you for this opportunity to comment on the project.

Sincerely,

ALFRED H. TROUTT
Assistant Director
Environmental Protection &
Improvement Unit

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
P.O. Box 678, Champaign, Illinois 61820

February 21, 1975

Mr. Jack R. Niemi
Chief, Engineering Division (LMSED)
U. S. Army Corps of Engineers
210 North 12th Street
St. Louis, Missouri 63101

Dear Mr. Niemi:

The draft environmental statement for operation and maintenance of Rend Lake in Franklin and Jefferson Counties, Illinois, that was addressed to this office on December 30, 1974, has been reviewed. The following comments are submitted for your consideration.

Page 2, item 5, line 3 of the summary lists "U. S. Soil Conservation District" - This should read "U. S. Soil Conservation Service."

Page 58, 2.1.4.3 Waste Sources Tributary to Watershed, last sentence - suggest the word "cropland" be deleted because agricultural runoff is not limited to cropland.

Page 60, Non-point Waste Sources, first paragraph, line 2 - suggest it read "include runoff from agricultural land and animal feedlots..."

Page 196, second paragraph, third sentence - suggest it read "The need to grow standover crops such as grasses and legumes for..."

Page 240, Erosion - This section could be expanded to include erosion from the total watershed area. Attached is an SCS Technical Note entitled "Erosion in Illinois - Amount by Counties" which includes our latest information on erosion. This may be useful in estimating the watershed erosion.

Page 289, 6.2.1.4 Upstream Sediment Control - The statement recognizes the importance of and need for more sediment control measures. Every effort should be made to accelerate the installation of needed soil and water conservation practices on all lands in the watershed. The local soil and water conservation districts in Franklin and Jefferson Counties have leadership responsibilities for this activity. Additional funds for providing technical and financial assistance through the soil and water conservation districts should be considered to help get this job completed.

Page 313, "U. S. Soil Conservation District" should read "U. S. Soil Conservation Service."

General Comments

A soil map of the area would be helpful in reviewing the statement. This may be obtained from the Soil Conservation Service field offices. Soil information should be used by land users in making proper land use decisions.

Shoreline erosion is recognized, however, more definite plans for control would strengthen the statement.

Care and timing will be very important in releasing water through the spillway to avoid flooding on agricultural land below Rend Lake Dam.

Considerable development is anticipated, therefore, it is important that productive agricultural land be preserved for agricultural production. We are concerned with the continued and accumulative effects of loosing such land to other uses of an irreversible nature.

We look forward to continued coordination and cooperation with our District Conservationists. If you have questions relating to the soils, vegetative seedings, woody plantings, fertilization, erosion control or any soil and water conservation practices, don't hesitate to get in touch with Mr. William A. Morris or Mr. Tommy D. Heinrich at our field offices.

We appreciate the opportunity to review and comment on this project.

Sincerely,

Daniel E Holmes

Daniel E. Holmes
State Conservationist

Attachment

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGION V
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606

OFFICE OF
THE REGIONAL DIRECTOR

February 25, 1975

Mr. Jack R. Niemi
Chief, Engineering Division
Department of the Army
Corps of Engineers
210 North 12th Street
St. Louis, Missouri 63101

RE: Draft Environmental Impact Statement
Rend Lake
Operation and Maintenance
Franklin and Jefferson Counties, Illinois

Dear Mr. Niemi:

We have reviewed the Draft Environmental Impact Statement for the above project. To our knowledge, and based upon the information provided, this project will not impact to any significant degree on the health, education or welfare of the population.

Sincerely yours,

Robert A. Ford
Regional Environmental Officer

cc: Charles Custard, OEA
Warren Muir, CEQ

ED-EA

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
CHICAGO AREA OFFICE
17 NORTH DEARBORN STREET
CHICAGO, ILLINOIS 60602

April 16, 1975

REGION V
00 South Wacker Drive
hicago, Illinois 60606

IN REPLY REFER TO:
5.2CPD:(Koziol)

Mr. Jack R. Niemi
Chief, Engineering Division
Department of the Army
St. Louis District, Corps of Engineers
210 North 12th Street
St. Louis, Missouri 63101

Dear Mr. Niemi:

Subject: Draft Environmental Statement
Operation and Maintenance
Rend Lake, Illinois

We have reviewed the draft environmental statement for the operation and maintenance of Rend Lake, Illinois and have these comments:

1. We wish to advise you that HUD OWNS $8,925,000 in revenue bonds issued by the Rend Lake Conservancy District in 1968 for the Intercity Water System. The Conservancy District is in default on these bonds. The Conservancy District may not issue additional bonds against the Intercity Water System without HUD's consent; we do not intend to consent to any such issuance.

2. Rend Lake is a good example of a project designed to bring great benefits to a region which also has the potential to do great harm to the region in the absence of local planning and land use regulation. The present lack of local responsibility for planning and control of growth is already showing detrimental effects; septic tank overloading from new water lines is polluting the lake, unregulated development is leading to crises in services, lack of policy will overcrowd the lake with boaters, etc. The lack of overall management criteria for the sale of water by the Conservancy District is a major contributing problem. The imposition of federal controls in a situation such as Rend Lake's is open to question. However, we have a legitimate interest in projecting the federal investment and promoting orderly development. It would appear reasonable to require that local planning, regulatory, and implementation mechanisms be in place prior to the commitment of federal resources in a project of this magnitude.

Thank you for the opportunity to comment.

Sincerely,

John L. Waner
Director
Chicago Area Office

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION 5
18209 DIXIE HIGHWAY
HOMEWOOD, ILLINOIS 60430

January 28, 1975

IN REPLY REFER TO
05-00.5

Mr. Jack R. Niemi
Chief, Engineering Division
St. Louis District, Corps of Engineers
210 North 12th Street
St. Louis, Missouri 63101

Dear Mr. Niemi:

As requested, we have reviewed the draft environmental statement for the operation and maintenance of Rend Lake, Illinois.

It is suggested, that following general coordination, a memorandum of understanding be arranged through the Illinois Department of Transportation to assure that required highway transportation to and through the recreational areas can be provided as needed. Discussion of the arrangements for necessary highway transportation service to the recreation areas should be expanded.

The opportunity to review and comment on the draft statement is appreciated.

Sincerely yours,

H. L. Anderson
Regional Administrator

By:

W. G. Emrich, Director
Office of Environment and Design

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
U.S. COAST GUARD (G-WS/73)
400 SEVENTH STREET SW.
WASHINGTON, D.C. 20590
PHONE: (202) 426-2262

20 FEB 1975

Mr. Jack R. Niemi
Chief, Engineering Division
St. Louis District, Corps of Engineers
Department of the Army
210 North 12th Street
St. Louis, Missouri 63101

Dear Mr. Niemi:

This is in response to your letter of 30 December 1974 concerning a draft environmental statement for the Operation and Maintenance of Rend Lake, Franklin and Jefferson Counties, Illinois.

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

The opportunity to review this draft statement is appreciated.

Sincerely,

W. E. Caldwell

W. E. CALDWELL
Captain, U.S. Coast Guard
Deputy Chief, Office of Marine
Environment and Systems
By direction of the Commandant

Advisory Council
On Historic Preservation
1522 K Street N.W. Suite 430
Washington D.C. 20005

March 25, 1975

Mr. Jack R. Niemi
Chief, Engineering Division
Department of the Army
St. Louis District
Corps of Engineers
St. Louis, Missouri 63101

Dear Mr. Niemi:

This is in response to your request of December 30, 1974 for comments on the environmental statement for Operation and Maintenance of Rend Lake, Franklin and Jefferson Counties, Illinois. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council on Historic Preservation has determined that while you have discussed the historical, architectural, and archeological aspects related to the undertaking, the Advisory Council needs additional information to adequately evaluate the effects on these cultural resources. Please furnish additional data indicating:

a. Compliance with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470(f)). Although the National Register of Historic Places was consulted the Council must have evidence that the most recent listing of the National Register has been consulted (see Federal Register, February 4, 1975).

b. Compliance with Executive Order 11593 of May 13, 1971.

1. In the case of land under the control or jurisdiction of the Federal Government, a statement should be made as to whether or not the proposed undertaking will result in the transfer, sale, demolition, or substantial alteration of potential National Register properties. If such is the case, the nature of the effect should be clearly indicated.

2. In the case of lands not under the control or jurisdiction of the Federal Government, a statement should be made as to whether or not the proposed undertaking will contribute to the preservation and enhancement of non-federally owned districts, sites, buildings, structures, and objects of historical, archeological, architectural, or cultural significance.

Under Section 800.4(a) of the Advisory Council's "Procedures for the Protection of Historic and Cultural Properties" (36 CFR 800) the Corps of Engineers, in conjunction with the State Historic Preservation Officer, is responsible for determining which of the historical sites mentioned in sections 2.3.1.2 may be eligible for nomination to the National Register and for assessing the impact of development and management plans upon the sites. The same procedures apply to the archeological sites mentioned in sections 2.3.1.1 and 8.3. Historic, architectural, archeological and cultural properties on all lands except those owned by the Conservancy District should be considered.

To ensure a comprehensive review of historical, cultural, archeological, and architectural resources, the Advisory Council suggests that the environmental statement contain a copy of the State Historic Preservation Officer's comments concerning the effects of the undertaking upon these resources.

Should you have any questions or require any additional assistance, please contact Jordan Tannenbaum ((202) 254-3380) of the Advisory Council staff.

Sincerely yours,

John D. McDermott
Director, Office of Review
and Compliance

ILLINOIS ARCHAEOLOGICAL SURVEY

109 DAVENPORT HALL UNIVERSITY OF ILLINOIS URBANA, ILLINOIS 61801

Cooperating Institutions:
University of Illinois
Southern Illinois University
Illinois State Museum

January 14, 1975

Mr. Jack R. Niemi, Chief
Engineering Division
St. Louis District
Corps of Engineers
210 North 12th Street
St. Louis, Missouri 63101

Dear Mr. Niemi:

Thank you for your letter of December 30 and enclosure of the Draft ES for the Operation and Maintenance of Rend Lake, Illinois.

A review of the Draft ES indicates that it is not adequate with regard to preservation of the archaeological resource base and mitigation of the effects of Corps operation and maintenance on this cultural resource in Rend Lake. Pages 79-81 in the ES describes the archaeological resources in the lake area, while paragraph 8.3.2 on page 312 indicates several situations that will take place in which sites could and will be destroyed. These effects include construction in the Gun Creek area, recreational usage by the public, and wave action or bankline erosion. The Draft ES, however, does not subsequently describe how this threat of destruction to existing archaeological sites can be mitigated. I would think this should be discussed in the Final ES, and the adverse effects outlined in Section 5.

I would recommend that a program of archaeological evaluation and reconnaissance be immediately instituted for Rend Lake similar to the archaeological planning which is now taking place for the Shelbyville Reservoir. For Rend Lake, I would think that the entire bankline should be resurveyed, or at least in those areas where there is serious erosion, and where known archaeological sites, based on the surveys described in pages 79-81, exist. I would also think that all areas should be resurveyed where there can not be total preservation and which will eventually house or be the sites for the kinds of land activities described in Table 2-42 on page 155. Such areas in which there will either be construction or usage on the existing surface could inadvertently destroy archaeological sites. Known archaeological sites must be protected, and land activities such as listed in Table 2-42 must <u>first</u> be checked for cultural resources <u>prior</u> to development.

I am hopeful that the above remarks will assist your office in protecting the existing archaeological resource base in the Rend Lake project area.

Cordially yours,

Charles J. Bareis
Secretary-Treasurer

CJB:bv
cc: Frank Peckenham

STATE OF ILLINOIS
DEPARTMENT OF
REGISTRATION AND
EDUCATION
RONALD E. STACKLER
DIRECTOR, SPRINGFIELD
BOARD OF NATURAL
RESOURCES AND
SERVATION

ILLINOIS STATE GEOLOGICAL SURVEY

NATURAL RESOURCES BUILDING, URBANA, ILLINOIS 61801 TELEPHONE 217 344-1481

Jack A. Simon, ACTING CHIEF

February 17, 1975

Mr. Jack R. Niemi
Chief, Engineering Division
St. Louis District, Corps of Engineers
210 North 12th Street
St. Louis, MO 63101

Dear Mr. Niemi:

In response to your request for comments from our Survey about the draft environmental statement for Rend Lake, Illinois, the following reply was compiled from reviews by several members of our staff.

Our general opinion is that the statement is comprehensive and well written. A number of minor technical errors were found, as follows:

1. Page 27, line 10 - Suggest reference to Silurian reefs (I.S.G.S. Illinois Petroleum Series 102, "Silurian Pinnacle Reefs and Related Oil Production in Southern Illinois," H. M. Bristol, 1974).

2. Page 27, line 4 - Suggest "During the Paleozoic most terrigenous sediments were derived from areas northeast of the Illinois Basin."

3. Page 27, line 2 - "Chesterian System" should be "Chesterian Series."

4. Page 28, lines 8 and 10 - Suggest deletion of two occurrences of "continued" and joining of two sentences.

5. Page 28, last sentence under stratigraphy and lithology - Would be better stated if author substituted "lower" for "underlying" strata.

6. Fig. 2-3 - Bond Formation (not Bend).

7. Page 29 - This formation consists predominately of shale (not limestone).

8. Page 30, last line - Change "Members" to "pay zones."

9. Page 30, line 10 - "fossiliferious" should be "fossiliferous."

10. Page 30, line 36 (also on p. 31) - "Valmiererian" should be "Valmeyeran."

11. Page 31, line 11 - Kinderhookian Series is about 125 feet thick at King; Chouteau is about 10 feet thick and is underlain by New Albany Shale.

12. Page 31, line 27 - "Trenton Member." Make it Trenton Limestone.

13. Page 32, line 16 - DuQuoin Monocline dips steeply to the east not west.

14. Page 32, line 18 - Only the eastern portion (actually the Shawneetown Fault) of the Rough Creek in Illinois is a high angle reverse fault; west of the Shawneetown Fault, faulting is mostly normal.

15. Page 32. Structural Geology - All structures should be in caps.

Some comments were raised during our discussions of the statement that we feel should be brought to your attention.

Considering the energy situation, why terminate all oil production after 5 years? If the wells are "not conspicuous and will not distract greatly from the recreational activities," why not let the oil companies continue to produce this valuable resource?

Relative to coal mining in the area, two suggestions in the draft were made (by the consulting company) as follows:

1. That an inventory of possible sites on the project land be made for future air shafts and man and materials shafts.

2. That the surface rights be zoned relative to the impact of coal mining subsidence.

However, no assurance was given that that these suggestions are or will be implemented.

It was mentioned in the report that no future detailed mining plans have been received from the mining companies operating in this area. It would seem likely to us that these companies would have their mining plans laid out for at least the next 5 years.

It was also mentioned that only mineral rights beneath the dams were condemned and purchased by the Corps. While the report contains considerable discussion on a probable 4-foot (seems slightly high) subsidence over mined-out areas, no mention was made of the fact that the western portion of the main dam and the entire Big Muddy subimpoundment dam were built over mined-out areas. However, this is clearly shown on Figures 2-6. It was not indicated whether mining would or could be prohibited beneath Route 183 causeway or the planned convention center. How much additional area was to be acquired to include the draw of subsiding mined-out areas?

Detailed mapping of the nature and distribution of Pleistocene deposits within the project area seems desirable from the viewpoint of the operation and maintenance of Rend Lake. This data could be helpful in predicting construction conditions and the effect of expected coal mine subsidence. Perhaps small gravel deposits would be located that could be used to retard wave erosion where it is now considered ontrollable (p. 252-294). The data presented in the five bridge borings in Appendix 2-1 are useful, but their locations on Figures 2-6 are not numbered and are hard to find.

The problem of siltation is also discussed (p. 257, 282, 294), but unless the reservoir is going to be allowed to gradually deteriorate after 50 years or so, there should be at least an alternate plan to establish a dredging program in a few years where a given portion of the lake bottom is restored or deepened each year.

We hope our comments will be helpful, and if you have any questions, please do not hesitate to write.

Yours very truly,

Paul B. DuMontelle
Coordinator
Environmental Geology

STATE OF ILLINOIS

DEPARTMENT OF CONSERVATION

605 STATE OFFICE BUILDING

400 SOUTH SPRING ST.

SPRINGFIELD 62706

CHICAGO OFFICE—1227 S. MICHIGAN AVE. 60605

April 9, 1975

Mr. Jack R. Niemi
Chief, Engineering Division
Department of the Army
Corps of Engineers, St. Louis District
210 North 12th Street
St. Louis, Missouri 63101

Dear Mr. Niemi:

We have completed our review of your draft Environmental Impact Statement for Rend Lake, Illinois (Operation and Maintenance). Our comments follow:

page 136, last paragraph: Crab Orchard National Wildlife Refuge - this paragraph states "winter refuge for over 100,000 Canada geese." Populations never have reached this figure. The highest has been 91,000 in 1975. The average peak would be 75,000.

The statement "It has provided the nucleus from which other goose flocks in the area will be generated." This is pure conjecture. In fact, preliminary data suggest otherwise. Such statements can lead to erroneous conclusions later.

page 155, 3rd line, Table 2-42 on Supply and Demand - Hunting:
You list the 1970 demands as 8,694 for all hunting. Waterfowl hunting alone showed 6,013 man-days in 1973 and in 1974 the waterfowl man-days use was 8,485. This, of course, is not the total demand but the actual use and does not include the put-and-take areas or open hunting.

page 187, 4th paragraph:

The figures in this paragraph are from Periodic Report No. 7 of the Migratory Bird Section. They are not referenced or listed in the bibliography.

page 187, Species Expected: Our Division of Wildlife Resources has a species composition from the bag which should have been used.

page 189, Goose Flock Management Objectives: Of the 1100 acres farmed on the refuge, only 165 are now tenant farmed. The remainder is farmed with Department personnel and all of this portion remains in the field.

page 190, 2nd line: Should read (one year of grain with a catch crop) instead of cash crop.

page 190, 4th paragraph: This paragraph has no relationship to Rend Lake and should be deleted.

page 190, Management Critique: It may be added that a mid-winter survey in December, 1974, showed over 30,000 geese with a much larger number using the area during January and February of 1975.

page 190, last line: Our projected harvest of Canada geese in Franklin and Jefferson counties for 1973 was 232 geese - not 428.

Figure 4-2 Projected Waterfowl Use - Rend Lake Canada Geese
Realistically these numbers should be cut in half!

Figure 4-3 Numbers of Canada Geese - Southern Illinois
The figures in the table are in error. We suggest you use the following figures:

1945	OK	1965	202,000
1950	Probably 75-100,000	1972	243,000
1955	221,000	1973	210,000
1960	159,000		

page 191, 3rd paragraph: This advocates a separate quota for the Rend Lake area. I suggest that when or if that is needed, these counties simply be added to the existing quota zone. This paragraph should be deleted.

page 192, 1st paragraph: Are the figures in this paragraph from Periodic Report No. 9 of the Migratory Bird Section? If so, they should be documented.

page 220: Map facing page 220 is coded for "Recreational" and "Park Development." It is not clear how you differentiate between the two.

page 253: Perhaps more emphasis should be placed on erosion potential, particularly from wave action. Protection of exposed points on the longer fetch distances is recommended.

page 320 Hine - Should be DEMBAR not DENBAR

page 321 Huchbaum - Should be HOCHBAUM and the title of the book is Travel and Traditions.

page 325 Reeves - Not a complete reference. Should be as is, plus ED, Hine and Schoenfeld. Canada Goose Management. Dembar Ed. Res. Ser.

A general comment concerns the waterfowl goals and objectives attributed to the State; i.e., page 5 last paragraph. It would be worthwhile to discuss the State goals with our Division of Wildlife Resources to make sure the terms attributed to the State in the Environmental Impact Statement are truly the State's goals and objectives.

We have not commented on the fishery aspects of this EIS as they have been forwarded to you earlier.

Sincerely yours,

Bruce A. Rogers
Supervisor
Division of Long-Range Planning

BAR:af

cc: Jim Lockart
Dave Kennedy
George Arthur
Bill Mestel
Arnold Gesterfield
Arnold Fritz

STATE OF ILLINOIS

DEPARTMENT OF CONSERVATION

605 STATE OFFICE BUILDING
400 SOUTH SPRING ST
SPRINGFIELD 62706

CHICAGO OFFICE—1227 S. MICHIGAN AVE. 60605

January 14, 1975

Mr. Jack R. Miami, Chief
Engineering Division
U. S. Army Corps of Engineers
210 N. 12th Street
St. Louis, Missouri 63101

Dear Mr. Miami,

The draft environmental statement regarding Mond Lake (operations and maintenance) has been reviewed.

Except for a few minor points (listed on the accompanying comment sheet) the report appears to be well prepared and quite comprehensive. No major points of contention have been omitted regarding the lake fishery or those factors deemed to have an influence on the lake fishery.

This review can also be considered as review comments from the American Fisheries Society, Illinois Chapter. Being secretary-treasurer of the same organization, I was also requested to review this same E.I.S. report.

Sincerely,

Arnold W. Fritz
Reservoir Fishery Biologist
Illinois Department of Conservation
140 Lake Vista Drive
Carlyle, Illinois 62231

AWF:be

DRAFT

ENVIRONMENTAL STATEMENT

REED LAKE

OPERATIONS AND MAINTENANCE

COMMENTS REQUESTED

page 6 - 1.3.2.1. Benefits
Shouldn't negative benefits also include loss of tax revenues, crop and timber production, and overall land productivity?

page 10.- 1.4.2.4. Public Access Areas
Gun Creek has not opened in 1974, and may not in 1975, according to my latest information. It is obvious throughout the whole report that dates of completion and availability of recreational areas, and the resulting recreational useage and impact figures are based dates that are erroneous. They should be updated to 1975 level of information of progress.

page 11 - 1.5.1.f.
Was this project completed in 1975?

page 70 - 2.2.1.1. Aquatic communities
Creeping water primrose has become a problem in some bays.

page 73 - 2.2.2.2. Fishery Resources
Additional information regarding the Big Muddy basin fishery resources is available in "Inventory of the Fishes of Four River Basins in Illinois, Special Fishery Report 8, January 1965, Illinois Department of Conservation, Division of Fisheries.

page 74 - 5th paragraph. Fishing has vastly improved.

page 75 - This species list is more accurate than the one found in in the appendix.

Figure 2-13 Sailboat Harbor location not labeled correctly.

Page 138 - Kincaid Reservoir
Location description and water acreage is incorrect.

Page 138 - Carlyle Reservoir
Approximately 50 miles east of St. Louis, not 60 miles.

Page 147 - 1st paragraph
Eleven launching ramps will be available and very serviceable in 1975.

page 155 - 156
Regarding Surveys, an angler creel census survey was completed on Rend Lake in 1974, for which figures are available.

page 172 - paragraph 4
The Benton sewage plant effuent not only reduces water quality but frequently poses an odor problem. Hopefully this situation will be remedied as the treatment plant is upgraded.

page 199 - paragraph 3
This situation will be remedied in 1975 with the opening of more and better developed launching ramps.

page 204 - paragraph 5
Catfishes are usually not removed from sport fishing waters by com ercial fishermen. It would be more accurate to insert "commercial species" for catfish at "12¢ per pound" rather than "50¢ per pound".

page 240 - Erosion
Contractors should be required to utilize sediment control measures at construction sites.

page 242 - 4.2.7.3. Reservoir level drawdown.
No mention of the fact that a reservoir level drawdown can and is a beneficial fishery management tool is mentioned in the text of this report. This tool should be incorporated into the overall reservoir operational plan for the maintenance of good sport fishing.

Page 204
Based on the 1970 National Survey of Hunting and Fishing data, the value of the economic expenditures generated by the fishermen using Rend Lake during 1974 is a minimum of $425,000 and could possibly approach $500,000 annually. Based on the number of anglers who fished only the lake (not the tailwater area) from April 1 to September 30 only (and considerable fishing was done prior to and after the census period) our projected estimate for the census period was $411,997.

appendix 2 - 5
A more up-to-date list of fish species of Rend Lake has been provided to the St. Louis District office. Many of the species listed on the Crab Orchard National Wildlife Refuge List are not currently found nor have they been identified from the Big Muddy drainage, north of the present dam site.

Submitted by:

Arnold W. Fritz
Reservoir Fishery Biologist
Illinois Department of Conservation
140 Lake Vista Drive
Carlyle, Illinois 62231
January 14, 1975

Greater Jefferson County Chamber of Commerce

"Here to Serve"

TELEPHONE 242-5725
MT. VERNON, ILLINOIS 62864

January 17, 1975

Mr. Jack R. Niemi
Chief, Engineering Division
Department of the Army
Corps of Engineers
210 North 12th St.
St. Louis, MO 63101

Dear Mr. Niemi:

While I lack the qualifications required in analyzing the Draft Environmental Statement you were good enough to send me, from an amateur viewpoint I think you and your associates did a good job in its presentation.

It will be appreciated if you will include me on your mailing when the final statement is completed.

Sincerely,

Bob Poisall, Manager

3204 Duco Street
Alton, Ill. 62002
February 21, 1975

Department of the Army
St. Louis District, Corps of Engineers
210 North 12th St.
St. Louis, Mo. 63100

Attn: Jack R. Niemi
Chief, Engineer Division

Dear Sir,

Enclosed is the Comments of the Migratory Waterfowl Hunters, Inc. of Alton on the Draft Environmental Impact Statement on the operation and maintenance of Rend Lake.

Thank you for the opportunity to submit our view on this project.

Sincerely,

William P. O'Neal

William P. O'Neal
Chairman, Corps Committee

WPO:do

ENCLOSURE

February 21, 1975

COMMENTS OF THE MIGRATORY WATERFOWL HUNTERS, INC. UPON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT ON THE OPERATION AND MAINTENANCE OF REND LAKE

p. 20, 1.7.4 The present waterfowl hunting practices are in conflict with the design requirements "for that type of individual who is interested in getting away from the metropolitan area but does not desire to leave the modern conveniences of the city." (see comment p. 151, 2.4.3.2)

p. 53, 2.1.4.2 In light of the present concern for lead shot poisoning of waterfowl, the source of the lead which violates the standards (Rayse Creek) should be identified and efforts to reduce it to an acceptable level intensified.

p. 78, 2.2.4.2 The "over-hunting" should be specified as market hunting as it is extremely doubtful if sport or recreational hunting has ever contributed to the extinction of any species on North America.

p. 97, 2.3.3.1 Indicates the need for a change in the present method of waterfowl hunting in that a significant portion of the population, the aged, are excluded because they cannot exert the required physical effort.

p. 146, 2.4.3.2 Second par. Waterfowl hunting should be included as a water related activity for basic recreational use of Rend Lake.

p. 151, 2.4.3.2 Waterfowl hunting practices should be changed to reflect a greater concern for safety, allow more participation by the aged or infirmed and family units. "Walk In" hunting discriminates against the senior citizen and the less than fully physically fit. It effectively prevents fathers from taking their children waterfowling. In the short period that Carlyle and Rend Lakes have been hunted for waterfowl, they have been the scene of more deaths than our local area (where blinds are required) has experienced in four times that length of time.

We strongly recommend that the practices and standard for blinds required by the Illinois Department of Conservation in pools 25 and 26 on the Mississippi be implemented. Namely that:

1) That Migratory Waterfowl hunting be done only from those sites located and staked by the Illinois Department of Conservation.

2) That these sites be no less than 150 yards apart.

3) That permanent waterfowl hunting facilities be built on these sites.

4) That the Illinois Department of Conservation hold a first-year draw for interested hunters to draw for these blind sites.

5) That the Illinois Department of Conservation have an annual draw for all unclaimed blind sites.

6) That during waterfowl season, those blinds not claimed by the blind builder one hour prior to shooting time be allocated on a lottery basis.

7) That all blind sites be reallocated no less than every two years.

8) That these blind sites be built, brushed and maintained by the person whose name is drawn at the annual draw.

This statement should include information as to whether an effective plan to deal with duck virus and similar diseases exist.

p. 155, 2.4.4.1 We question the value of using table 2-42 because of the inaccuracies of its projections, particularily with respect to hunting as demonstrated by the information contained in this draft E.I.S.

p. 188, 4.2.5.1 We concur in the stated need for a nesting box program for both wood ducks and mallards. The addition of a pumping capability to regulate sub-impoundment is highly desirable.

p. 201, 4.2.5.7 The interference of boating and fishing with wood duck nesting and brooding should be monitored and corrective action taken if a need is indicated.

p. 218, 4.2.6.3 The Corps appears to be the agency best suited to play
p. 302, 6.6 the dominant role in the management of this project because it has the agency resources, expertise and is less susceptable to local interests that might be destructive to waterfowl habitat.

p. 222, 4.2.6.3 Deterrents to lake shore residential development should be continued and reinforced by statutory provision. The Corps should adopt all legal policies designed to encourage the inaction of such statutes on the local level.

p. 227, 4.2.6.4 We agree that the negative influences stated as impacts due to the lack of land use controls will occur and are the basis for the prior recommendation.

p. 278, 4.3.8.4 We disagree with the conclusion that two accidents do not present a significant safety problem. Safer hunting methods for waterfowl do exist and should be implemented. (See comments p. 151, 2.4.3.2)

p. 282, 5.2.2 Sedimentation of the sub-impoundments appears to be an acceptable consequence, but the plan should be formulated to <u>maintain</u>, NOT restore wildlife management potential for the sub-impoundments.

p. 288-289, 6.2.1.1,2,3,4 We concur in these conclusions.

p. 291, 6.2.2.2 We feel the interpretive center described in this section is highly desirable and recommend that provisions be made to explain the role regulated hunting and sportsmen play in modern game management as an element of this center.

p. 291, 6.2.2.2 "Giant Canada Geese" We believe the efforts of the Illinois Department of Conservation are presently quite effective and additional efforts beyond these are not now warrented.

Department of the Army
St. Louis District Corps of Engineers
210 N. 12th St.
St. Louis, Missouri, 63101

Sometime ago the Draft-Environmental Statement Rend Lake of Illinois on operation and maintenance was mailed to Mr. Bill Harvey, Illinois state association president, and was given to me to make this report on, as I am the Conservation Chairman for this Association, of National Campers and Hikers Association, Incorporated.

As I read the Environmental statement I concluded that this is probably the only study that has been made to cover all phases of this project - operation and maintenance. I was not close to the project during its planning and construction, so this is the only statement of information that I have read.

I would like to make my comments on the different areas, as our Association is a Camping group, and we are all concerned with Conservation in its entirety, not just the Camping phase.

It has not been my privilege to view the project to date; so am making my comments solely from the information I read in this Environmental Statement.

It is possible that after I have viewed the project some of my comments could be changed, pro or con.

I Flood Control

Most projects built today by the Corps of engineers has a main purpose - flood control. We would like to see this no. 1 - on the operation at Rend Lake project.

II Water Quality

It would be hard, in my opinion, to maintain Water Quality with Coal mines, oil wells, and that many communities do not have some kind of Sewer System, and with streams with erosion from usages. We would like to see that the Army Corps of Engineers, along with the State of Illinois Environmental Protection Agency keep to solve the problems that come from mine operations and Oil well operations, and also the runoff from our small Communities, in order to maintain good water Quality

III Water Supply

It seems that Rend Lake is a big Water Supply for small communities in the Area. As I read the Statement, it seems that well Water is very hard to get. We are taking that the Lake at all times meet the water Quality Standard so that the 459 Communities, etc. of

Quality Water is met.

IV

It is hard to make any kind of a statement on the Recreational aspect, as there is much Construction to be done on this type areas in the future. But over all it seems that there could be some ~~kind~~ weed trouble without lack of vegetation and trees, in Camping and recreation areas. This in time would be a measure Correct itself, with good Conservation practices.

V

We would like to see that there is some planning given to down stream, and the tributaries, or feeder streams that feed the lake itself.

Odor-

It would be hard to do much about oder from Oil wells, hog + cattle farms, meat packing plants and other plants, as many of these people depend upon these type occupations to earn their livlihood. I Cannot see how you can use this to restrict development in certain areas, as these Conditions would only exist in certain seasons, or in short terms. We have many of these types of trouble in many parts of the United States today. (odor)

III

We, as the Illinois State Association of W.C.H.A. would like to see the Army Corps of Engineers Conservancy District and the State of Illinois meet the important needs of the area, and we wish to see them accomplished within the limits of achieving a practical ecological balance between man and nature.

Illinois State Association
of W.C.H.A.
Elbert Bonn,
Conservation Chairman
Box 64
Blue Mound, Illinois
62513

OLD BEN COAL [redacted]

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February 21, 1975

Department of the Army
St. Louis District
Corps of Engineers
210 North 12th Street
St. Louis, Missouri 63101

ATTENTION: Mr. Jack L. Niemi
Chief, Engineering Division

Review-Environmental Statement
Rend Lake

Dear Mr. Niemi:

Following are the comments provided on behalf of Old Ben Coal Company of the subject review. These are provided at the invitation of your December 20, 1974 letter which accompanied the draft of the Environmental Statement relative to operation and maintenance of Rend Lake, Illinois.

The Report is very comprehensive. However, to avoid misrepresentation and to clarify our industry position prior to the completion of the lake and the industry's continuing eminence in its local and state economic status, the following comments are respectfully submitted:

1. Page 33, 1st paragraph: the reference to Old Ben Mine No. 10 is misleading since it had been abandoned some 40 years prior to lake construction and the workings were never active under the lake. I would further suggest including Old Ben Mine No. 24 as being one with planned future operation under the lake since that property was in existence and operating prior to construction.

2. Page 61, 1st paragraph: make-up water is also secured from the Rend Lake Intercity Water System.

3. Page 67, Paragraph 2.1.5.4: Old Ben Mine No. 21 construction commenced in 1956. It began operations in January, 1960 and continues today. Since commencement of operations, several millions of dollars for scrubbing and air pollution control and equipment have been expended. The present installation is approved and operates in compliance with required environmental standards. The reference to the creation of a heavy pall over the lake is unnecessary, unwarranted and subject to misleading interpretation.

4. Paragraph 2.1.5.5: references as [illegible] in the prior paragraph coupled with this one should [illegible] all [illegible] five of the six mines existed prior to the lake planning, construction and completion. [illegible] aesthetic [illegible] needs should, therefore, have been a consideration of the project planners and not one to have been made by the mining companies. The reference to noise from [illegible] machinery is not understandable. [illegible] hoists are all electrically operated with little or no perceptible sound level. It is possible that the [illegible] noise is that of the preparation plants during their operating periods. Similarly, a constant low level sound is emitted by the continuously operating ventilation fans.

5. Page 120-Air Transportation: reference to Marion Airport should be Williamson County and not Washington County.

6. Paragraph 5.4.4 - Conflict of Mining vs. Surface Developments: the oversimplification of the cost or liability of subsidence from mining is not consistent with the detail provided in other topics of the Report, especially those relating to wildfowl, fishing and recreation. To merely state that either the homeowner or coal company will pay for any solution is a misrepresentation of the impetus any such curtailment would have on the entire populace of not only this state but the nation, in [illegible] for energy.

GENERAL: It would seem to us that any complete impact statement should identify the adverse impact of the lake location upon the mining industry active therein. In this particular instance, there is a very unique adverse condition due to the particular location of company ownership boundaries and previous mining wherein normal shaft locations that would [illegible] the [illegible] reserves in the greatest efficiency are prohibited by the very nature of the project. The resultant increases in underground haulage costs, increased ventilation costs, loss of production from increased travel time, increased power costs are, in part only, reflected in the production reduction shown in the Franklin County area since 1970 in Table 2-2, page 35.

In reiteration, it would seem that those aesthetic and environmental considerations which in the Report are implied as being disregarded and unanticipated by the mining company should rightfully have been considered and planned by the planners of the lake project.

Very truly yours,

OLD BEN COAL CORPORATION

[signature]

C. E. Beddie
Manager, Corporate Engineering

CEB/ich

OUTBOARD BOATING CLUB OF AMERICA

Serving the Boating Sport and Industry

February 6, 1975

Mr. Jack R. Niemi
Chief, Engineering Division
Department of the Army
St. Louis District, Corps of Engineers
210 North 12th Street
St. Louis, Missouri 63101

Dear Mr. Niemi:

We appreciate you giving us an opportunity to comment on your "Draft Environmental Statement - Rend Lake, Illinois."

For obvious reasons, we were especially interested in the section dealing with the recreational aspects of Rend Lake. We were delighted, first of all, that the recreational benefits of this impoundment play such an important part in your plans. As you know, recreation was not even considered in standard cost - benefit ratios of impoundments not too long ago.

We were especially impressed with the statement that boating facilities -- particularily launching ramps -- will be "greatly expanded" at Rend Lake. For many years, a shortage of such facilities has been a major complaint of boat-owning families. The result has been dangerous overcrowding where such facilities are provided, and a serious slow-down in the growth of water - related recreational activities, such as fishing, boating, water skiing, etc. We are certain that the development of recreational facilities at Rend Lake will have a significant beneficial effect on the economy of that area.

I am enclosing some materials which I hope will be of some interest to you. One deals with the economic aspects of boating; the other deals with a subject that has been of some concern -- alleged "pollution" from outboard engines. We hope to have a 60-page Summary Report available soon on the latter subject which I would be happy to send to you, if you are interested.

Sincerely,

Matt Kaufman

Administrator

Matt Kaufman/cmc
Encl:


DAT
ILM