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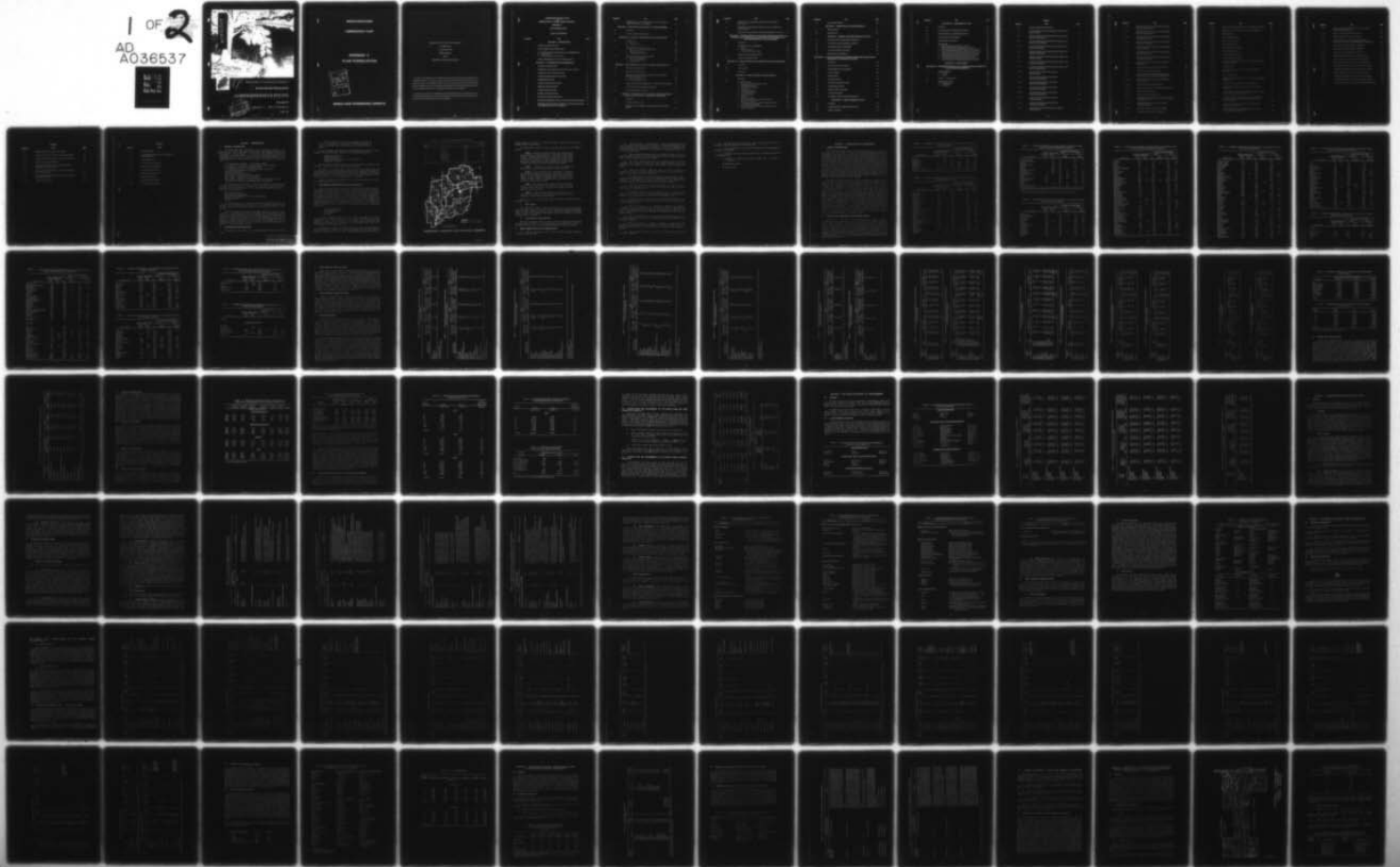
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WABASH RIVER BASIN COMPREHENSIVE STUDY. VOLUME IV. APPENDIX-C. --ETC(U)
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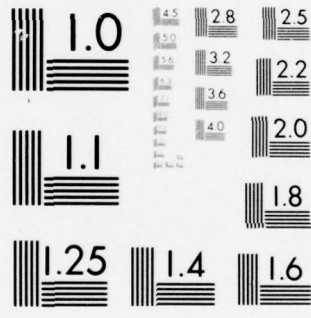
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WABASH RIVER BASIN

COMPREHENSIVE STUDY

APPENDIX - C PLAN FORMULATION

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WABASH RIVER COORDINATING COMMITTEE

Prepared by the U. S. Army Corps of Engineers
Louisville District
in cooperation with
Member Agencies
of the
Wabash River Coordinating Committee

This study by the Wabash River Coordinating Committee was prepared at field level and presents data for a comprehensive plan for the conservation, management, development and proper preservation of the water and related land resources of the Wabash River Basin. This report is subject to review by the interested Federal agencies at departmental level, by the Governors of the affected States, by the Ohio River Basin Commission, and by the Water Resources Council prior to its transmittal to the Congress for its consideration.

The main report contains the recommendations of the Coordinating Committee. Recommendations that may be included in the appendices are in effect merely suggestions by the author agencies and work groups; these are not to be construed as Coordinating Committee recommendations.

**COMPREHENSIVE BASIN STUDY
ON
WABASH RIVER, ILLINOIS, INDIANA AND OHIO**

APPENDIX C

PLAN FORMULATION

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SECTION I – INTRODUCTION

1. GENERAL INTRODUCTION

The Wabash River Basin Comprehensive Study Coordinating Committee has been working on the study for some eight years. This report is the culmination of those efforts. This appendix – Plan Formulation – like all of the other appendices represents the coordinated and combined efforts of the several States involved along with the Federal agencies. The above is true for this appendix since the Subcommittee (appointed by the Coordinating Committee) which prepared this appendix, was composed of representatives from:

- U. S. Department of Agriculture – Soil Conservation Service
- U. S. Department of the Army – Louisville District, Corps of Engineers
- U. S. Department of Health, Education and Welfare
- U. S. Department of Interior – Federal Water Quality Administration
(now the Environmental Protection Agency)
- Federal Power Commission
- Wabash Valley Interstate Commission
- State of Indiana – Department of Natural Resources
- State of Ohio – Department of Natural Resources
- State of Illinois – Department of Business and Economic Development and the
Department of Public Works and Buildings Division of Waterways

The Subcommittee, formed early in 1969, was charged by the Coordinating Committee with putting together a *comprehensive and sensible plan for the basin*. To aid in this mission five (5) task forces were to furnish information regarding their assigned areas of interest. These task forces were:

- Flood Damage Reduction
- Water Supply and Water Quality
- Recreation, Fish and Wildlife, and Environmental Resources
- Regional Development
- Land Use

The data generated by the several task forces have provided the basis for this appendix. All information and data used herein is to be found and documented in one of the other appendices. The Plan Formulation Appendix thus serves as the "tie" for all other appendices.

The Plan Formulation Subcommittee held eighteen meetings, of one, two or three days each – to sift, analyze, and correlate information. Most of the meetings were held outside of the immediate environment of any of the participants and quite often lasted well into the night only to be resumed early the next morning. The purpose of such a meeting schedule was to assure that all points of view and all available relevant information was adequately considered. Decisions and conclusions were not agreeable to all but all representatives generally concurred with the conclusion that the formulated plan or approach was the best obtainable at that time.

2. PLAN FORMULATION OBJECTIVES

We might define our objective as the United States Senate has in S. D. 97 which states:

"That the objective of water resource planning is to provide the best use or combination of uses of water and related land resources to meet the foreseeable short and long-term needs of the Basin and the Nation."

Or we might define our objectives as the Water Resources Council has in their proposed "Policies and Procedures" which defined the equal priority objectives as:

National Income Efficiency
Regional Development
Preservation and Enhancement of the Environment
Well Being of the Public

We have pursued the objectives listed above but prefer to state our objectives a little differently – with greater emphasis on human and personal values.

Our objective is to develop plans to assure that Mr. and Mrs. United States and family and Mr. and Mrs. Wabash Basin and family have the opportunity to satisfy their basic physical, spiritual and social needs while reducing to the minimum the adverse effects on basic resources and other living peoples and to provide the opportunity for future generations to enjoy more of the good things which we enjoy today.

Thus we are focusing on the physical needs present and future generations as well as the environmental needs. We can do no more.

3. PLAN FORMULATION PRINCIPLES AND METHODOLOGY

Early in the plan formulation process we considered developing different plans for Value, Region, Environment and Social Well-being. However, after considerable discussion we decided to develop one plan based on Value (National Income Efficiency) and subject that plan to successive modifications in the interest of: (1) increasing its regional output; (2) minimizing its adverse impact on the environment; (3) providing opportunity for environmental preservation; and (4) promote social well-being. The reason the latter course of action was taken is that we simply did not know how to integrate four mutually-exclusive plans into one comprehensive plan. About this time in recognition of the multiple needs of the Basin, the Subcommittee decided to develop a four element plan which would satisfy to a great extent the objectives listed heretofore. The four elements of the plan are:

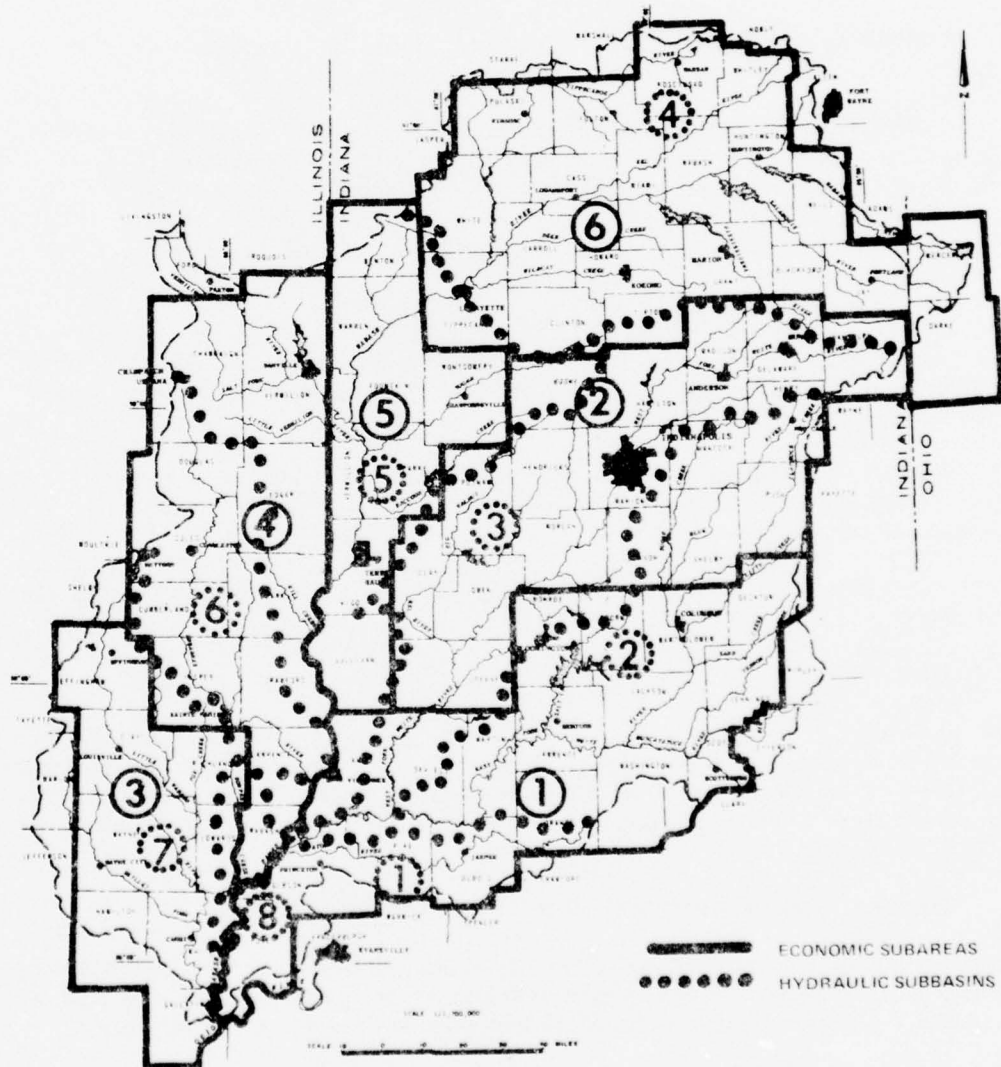
Flood Plain Management
Environmental Corridors
Land Treatment
Structural

In order to separate the Wabash Basin into components which could be better analyzed, two basic divisional criteria were used, namely, 1) drainage areas of major tributaries or parts of the main stream and 2) somewhat similar economic areas with boundaries that followed county lines. There were eight hydrologic subareas used and a brief description of each is given in table C-1.

Since economic statistics were available mostly on the basis of political boundaries another separation was required for projecting demographic, economic, social land use changes and spiritual needs for the future. Accordingly the Basin was divided into six

TABLE C-1. HYDROLOGIC SUBBASIN PERTINENT DATA

Number	Name	Area (sq mi)	Percent of basin
1	Patoka	862	2.6
2	East Fork	5,746	17.3
3	West Fork	5,603	16.9
4	Upper Wabash	7,267	22.0
5	Middle Wabash	6,555	19.8
6	Embarras	2,438	7.4
7	Little Wabash	3,209	9.7
8	Lower Wabash	1,420	4.3



HYDROLOGIC SUBBASINS AND ECONOMIC SUBAREAS

economic subareas and figure C-1 shows the hydrologic subbasins and the economic subareas and their interrelationship.

The Subcommittee decided to proceed with plan formulation in the following manner:

WHAT – determine needs and/or desires. The functional needs were determined as related specifically to environment, flood damage reduction, municipal and industrial water supply, water quality control, irrigation, water for cooling of electrical generating plants, water for rural use, water for preservation of stream environment, recreation needs, fishing needs, hunting needs, and need for preservation and enhancement of features having natural, historical and archeological significance.

WHAT – determine the alternative means for meeting the indicated needs and cost out the most relevant of these alternatives.

WHICH – select that alternative or combinations of alternatives that will most efficiently satisfy the needs irrespective of environmental, regional or social well-being considerations. These latter considerations were to be fully considered and included later. In selecting the most efficient alternative means of satisfying needs, strict adherence was accorded to sound economic principles.

WHO – after selection of tentative plans, determine which agency or groups of agencies could best be responsible for carrying out the plans or plan elements. This was the first time that an agency label was applied to any part of the plan.

WHEN – program the development so that problems could be solved and needs would be met in a timely manner and priorities set for development consistent with reasonable budgets.

There have been two basic principles which have guided us throughout the plan formulation process.

a. Retain Options

This principle has provided a basis for assuring that early action did not preclude later action which might be needed more than the justifiable early action. This principle aided us at times of indecision when the question would be asked "Which of the available sources of action will minimally preclude future action, since the future is hazy and somewhat difficult to determine."

b. Here and Now vs. There and Then

Many of the problems which we analyzed needed to be solved here and now and not there and then. However in determining solutions to the problems here and now we exercised caution that we are not creating additional problems for the there and then.

4. BASIC ASSUMPTIONS IN PLAN FORMULATION

a. That we would develop an Early Action Plan directed toward meeting the needs of the 1980 time frame.

b. That another plan — Long Range Plan — would be developed which would meet the needs of the 2020 time frame. The elements of the Early Action Plan are a part of the Long Range Plan. Although the implementation of some of the Long Range Plan elements is not firm, the Long Range Plan was formulated as an eventual plan and not an add-on to the Early Action Plan.

c. That institutional arrangement would not be responsive enough to effect flood plain management by 1980 but by 2020 could and should be able to have a significant impact on future development within the flood plain.

d. That where channel improvements were considered, specific and priority consideration were accorded to measures that would minimize alteration of the stream environment. Such considerations would protect stream fisheries and stream bank wildlife habitat.

e. That where streamflow (rather than storage) is used for municipal and industrial water supply, the streams capability would be based on the low flow that is likely to occur for any one (1) day in each 30 years.

f. That where storage is considered for municipal and industrial water supply the storage should be provided to meet the projected demands for 49 out of 50 years. This is equivalent to a 98% confidence factor. There is no such thing as a 100% confidence factor since there always may be a future drought more severe than those recorded.

g. That where stream flow (rather than storage) is used for water quality control, the stream capability would be based on the low flow that is likely to occur for seven (7) days once in each 10 years.

h. That where storage is provided for augmentation of low stream flows in the interest of water quality control the storage should be provided to meet the projected demands for 9 out of 10 years. This is equivalent to a 90% confidence factor.

i. That where storage is provided to meet downstream fishery needs, the storage should be provided to meet the projected needs for 19 out of 20 years. This is equivalent to a 95% confidence factor.

j. That no storage is to be provided for navigation since navigation considerations are a matter of another study and beyond the purview of plan formulation for the current Wabash Comprehensive Study. After plan formulation is complete and the plan is selected the impact that potential navigation on the Wabash might have on the plan could be assessed.

k. That the established intra- and inter-state water quality standards be used and all considerations be consistent with these standards and all plans be directed toward meeting these standards.

l. That the necessity of reducing air pollution is recognized but that development of programs for such accomplishment is beyond the scope of this study. However, programs resulting from this study should be directed toward minimizing air pollution.

m. That the proper disposal of solid refuse is of great concern but is beyond the scope of this study.

n. That the price level base for costs, annual charges, discount factors and projections is that which prevailed on 31 December 1968.

o. That an annual interest rate of 4 and 7/8 percent be used in determining the efficiency of all alternatives.

p. That where all needs cannot be met that priority for meeting needs would be in the following order.

1. Municipal and industrial water supply (includes farm use exclusive of irrigation.)
2. Water quality control
3. All other needs.

SECTION II – DETERMINATION OF GROSS NEEDS

5. GENERAL INTRODUCTION

The present and projected public need for the products of the water and related land resources are quite varied – ranging from structural developments through better management of our resources to the definite need (if not demand) that some of our stream environments be left unaltered from their present conditions. In developing the needs the basic parameters for future needs are population changes and anticipated activities of the projected population. Thus we should first take stock of the demographic projections for each of the economic subareas and then determine what existing and projected population level and endeavor would demand of water and related land resources. These data indicated that there would be a continuing urbanization of the basin; more land being converted from farm use to urban uses; and more land being converted from a land environment into a water environment. Thus the quantity of people and their necessary activities have formed the basis for all projections. The number of people (quantity of life) is one of the two most important facets of the basic considerations. The other most important aspect is the necessity to assure the spiritual, economic and social well-being (quality of living) of whatever population level prevails within the Wabash Basin. Thus we are trying to place the Quantity of Life in balance with the Quality of Living.

Although we recognize the absolute necessity of minimizing or stopping population growth at some level we have not attempted to place a limit on what population level the basin can sustain. The Plan Formulation Subcommittee felt inadequate to do so, since the population level sustainable by the Basin's resources reflects to a great extent the accumulative value standards of the populace and as such these value standards are based on the environment in which we have developed and the value standards have changed and will continue to change as our environment changes. Who could have foreseen the changes in our value standards that accompanied the great urbanization migration that began in the 1940's and has continued until the present? Who could have foretold that our country's population would grow from about 132 million in 1940 to 205 million in 1970 with really so little traumatic social effect? This traumatic effect would have no doubt been considerably greater if this population increase had not been accompanied or accommodated by corresponding changes in value standards. However we conclude that there is a real and absolute limit to the number of people that can live in the basin in a quality manner – it is simply that we do not know how to establish that number in the Wabash without being furnished a comparable number for the Nation and the Ohio River basin. We are convinced on the other hand that the projected population for the year 2020 can be sustained in the basin in a quality manner since the projected population density of 200 per square mile is exceeded many times over in other countries and states today with an apparent minimum of severe adverse effects.

6. MUNICIPAL AND INDUSTRIAL WATER SUPPLY NEEDS

The needs for water supply are expected to grow at a faster rate than the population since the per capita use for water is growing and this growth is expected to continue with somewhat of a muted growth in the latter years of the planning period. There are many communities mentioned in Appendix F which will need to expand their existing water supply capability to meet future demands. Many of these communities can expand or enlarge their existing sources and systems without requiring additional external (to their existing source) sources of supply. Accordingly these communities were not considered in great detail in Plan Formulation studies since Plan Formulation was related primarily to areas having external requirements. A summary listing of the communities for which Plan Formulation was effected, their existing supply and their development needs are shown in tables C-2 and C-9.

TABLE C-2. SUMMARY OF MUNICIPAL AND INDUSTRIAL WATER SUPPLY NEEDS
PATOKA SUBBASIN

Area of need	Existing supply (mgd)		Average daily needs (mgd)			
	Ground water	Surface water	1980		2020	
			Gross	Net additional	Gross	Net additional
Jasper		3.0	3.2	0.2	8.2	5.2
Huntingburg		1.1	1.2		2.9	1.8
Ferdinand		0.16	0.17	0.01	0.46	0.30
Pike County	0.07		0.13	0.06	0.31	0.24
Oakland City		0.64	0.50	0.00	1.41	0.77
Princeton	2.0		2.2	0.2	6.0	4.0
Remainder of Gibson Co.	0.19		0.18	0.00	0.48	0.29

TABLE C-3. SUMMARY OF MUNICIPAL AND INDUSTRIAL WATER SUPPLY NEEDS
EAST FORK WHITE SUBBASIN

Area of need	Existing supply (mgd)		Average daily needs (mgd)			
	Ground water	Surface water	1980		2020	
			Gross	Net additional	Gross	Net additional
New Castle	6.8		6.2		16.9	10.1
Knightstown	1.2		0.4		1.0	--
Other-Henry Co. \checkmark	1.1		0.3		0.9	--
Carthage	0.5	9.0	5.1	--	8.7	--
Rushville	2.7		0.9		2.5	
Other-Rush Co. \checkmark	0.5		0.2		0.2	--
Morristown	0.5		0.4		1.3	0.8
Shelbyville	4.7		3.8		10.2	5.5
Greenfield	2.9		2.6		9.1	6.2
Edinburg	3.5		2.1		5.8	2.3
Whiteland-New Whiteland	0.9		1.0	0.1	2.4	1.5
Franklin	3.1		2.4		7.4	4.3
Other-Johnson Co. \checkmark	0.5	0.5	0.8		1.2	0.2
Columbus	6.3		12.4	6.1	37.0	30.7
Hope	0.5		0.4		1.2	0.7
Other-Bartholomew Co. \checkmark	0.2		0.2		0.2	--
Greensburg	0.9	1.1	1.6	--	4.6	2.6
Other-Decatur Co. \checkmark	0.3		0.3		0.7	0.4
Brownstown	0.4	5.9	1.6	--	4.9	--
Medora	0.8		0.3		0.8	
Seymour		15.7	3.9		13.1	
Crothersville	0.6		0.3		1.0	0.4
Scottsburg		0.6	1.0	0.4	1.9	1.3
Austin		2/	2.6	2.6	5.3	5.3

TABLE C- 3 . SUMMARY OF MUNICIPAL AND INDUSTRIAL WATER SUPPLY NEEDS
EAST FORK WHITE SUBBASIN (CONTINUED)

Area of need	Existing supply (mgd)		Average daily needs (mgd)			
	Ground water	Surface water	1980		2020	
			Gross	Net additional	Gross	Net additional
Vernon-N. Vernon		2.6	1.4		4.6	2.0
Other-Jennings Co. ^{1/}		0.6	0.5		0.5	
Nashville		1.0	0.4		1.6	0.6
Other-Brown Co. ^{1/}		0.5	0.6	0.1	2.1	1.6
Bedford		19.0	5.2		15.8	
Mitchell		2.9	0.9		2.4	
Other-Lawrence Co. ^{1/}		0.80	1.7	0.9	2.0	1.2
Bloomington		24.0	14.5		38.7	14.7
Other-Monroe Co. ^{1/}		1.3	1.8	0.5	3.6	2.3
Loogootee	0.8		0.8	0.0	3.7	2.9
Shoals	0.3		0.3	0.0	1.3	1.0
Other - Martin Co. ^{1/}	0.2		0.4	0.2	1.0	0.8
Washington Co.	0.1		0.1		0.3	0.2
Orleans	0.5		0.3		0.8	0.3
Paoli		0.3	0.7	0.4	2.2	1.9
W. Baden-French Lick		2/	0.7	0.7	1.6	1.6

^{1/} Other small municipal, industrial or institutional demands in the East Fork White River subbasin drainage of the indicated county.

^{2/} Surface water supply in use, firm yield questionable but small and taken as zero for purposes of this study.

TABLE C- 4 . SUMMARY OF MUNICIPAL AND INDUSTRIAL WATER SUPPLY NEEDS
WEST FORK WHITE SUBBASIN

Area of need	Existing supply (mgd)		Average daily needs (mgd)			
	Ground water	Surface water	1980		2020	
			Gross	Net additional	Gross	Net additional
Winchester	1.4		2.0	0.6	6.7	5.3
Other-Randolph Co.	0.6		0.3		0.7	0.1
Mt. Summit	1.0		1.2	0.2	1.8	0.8
Middletown	0.3		0.3		0.8	0.5
Muncie	5.0	13.8	21.6	2.8	58.0	39.2
Fortville	1.0		0.5		1.3	0.3
Other-Hancock Co.	0.4		0.2		0.3	
Chesterfield	0.5		0.4		0.9	0.4
Anderson	16.3	18.1	24.0		55.7	21.3
Edgewood	1.0		0.4		0.8	
Alexandria	1.6		1.9	0.3	4.9	3.3
Summitville	0.8		0.4		0.9	0.1
Orestes	0.4		0.4		1.0	0.6

TABLE C-4 . SUMMARY OF MUNICIPAL AND INDUSTRIAL WATER SUPPLY NEEDS
WEST FORK WHITE SUBBASIN (CONTINUED)

Area of need	Existing supply (mgd)		Average daily needs (mgd)			
	Ground water	Surface water	1980		2020	
			Gross	Net additional	Gross	Net additional
Frankton	0.2		0.2		0.5	0.3
Elwood	3.2		3.5	0.3	8.0	4.8
Lapel	0.4		0.3		0.7	0.3
Pendleton	1.6		0.4		0.9	
Pendleton Reformatory		1.0	0.8		0.8	
Tipton	1.8		1.2		2.6	0.8
Other-Tipton Co.	0.1	0.1	0.2	0.6	0.7	0.7
Noblesville	3.6		2.5		4.2	0.6
Cicero	0.3		0.2		0.5	0.2
Westfield	0.2		0.2		0.5	0.3
Other-Hamilton Co.	0.8		0.4		0.9	0.1
Indianapolis	40.0	120	174.0	14.0	360.0	200.0
Other-Johnson Co.	0.4		0.2		0.3	
Other-Boone Co.	0.3		0.1		0.4	0.1
Brownsburg	1.1		0.7		3.1	2.0
Pittsboro	0.4		0.2		0.6	0.2
Plainfield	1.7		1.0		4.0	2.3
Danville	2.0		0.6		2.2	0.2
Other-Hendricks Co.	1.7		0.2		0.4	
Mooreville	1.0		0.6		1.5	0.5
Martinsville	1.3		1.0		4.0	2.7
Other-Morgan Co.	0.8		0.2		0.8	
Other-Monroe Co.		41.2	0.4		1.0	
Industries-Monroe Co.		0.4	0.6	0.2	1.2	0.8
Greencastle	6.2		4.7		15.0	8.8
Putnamville State Farm		0.2	0.7	0.5	1.2	1.0
Other-Putnam Co.	0.2		0.2		0.4	0.2
Brazil	3.0		1.9		6.1	3.1
Other-Clay Co.	0.4		0.2		0.5	0.1
Spencer	1.0		0.2		0.6	
Other-Owen Co.	0.2		0.03		0.1	
Jasonville (Hymeria)	0.6		0.3		1.0	0.4
Bloomfield	0.8		0.3		0.6	
Linton (Dugger)	1.5		0.9		2.3	0.8
Other-Greene Co.	1.2		0.5		0.9	
Crane Naval Depot		1.0	1.0		1.0	
Odon	0.3		0.4	0.1	0.8	0.5
Washington	4.0		2.4		5.8	1.8
Other-Daviess Co.	0.4		0.2		0.6	0.2
Bicknell	1.2		0.6		1.6	0.4
Other-Knox Co.	1.9		0.3		0.8	
Petersburg		1.3	0.3		1.1	
Other-Gibson Co.	0.1		0.1		0.1	

TABLE C- 5. SUMMARY OF MUNICIPAL AND INDUSTRIAL WATER SUPPLY NEEDS
UPPER WABASH SUBBASIN

Area of need	Existing supply (mgd)		Existing daily needs (mgd)			
			1980		2020	
	Ground water	Surface water	Gross	Net additional	Gross	Net additional
Ft. Recovery, Ohio	0.75		0.23		0.59	
St. Henry, Ohio	0.70		0.42		1.10	0.4
Coldwater, Ohio	1.20		0.80		1.20	
Celina, Ohio		5.9	1.80		4.90	
Adams Co.	0.77		0.34		0.56	
Warren	1.0		0.29		0.50	
Roanoke	0.37		0.26		0.50	0.13
Huntington	2.50	12.9	4.7		19.1	3.7
Andrews	0.50		0.32		0.55	0.05
Other-Huntington Co.	1.44		0.44		0.65	
Bluffton	2.4	2.6	2.5		6.2	1.2
Other-Wells Co.	0.55		0.17		0.41	
Portland	2.7		3.2	.05	7.5	4.8
Redkey	0.51		0.33		0.80	
Dunkirk	0.90		0.90		2.30	1.4
Other-Jay Co.	0.38		0.04		0.10	
Union City	2.6		1.4		6.0	3.4
Saratoga	0.37		0.7	0.33	1.7	1.3
Other-Randolph Co.	0.33		0.11		0.28	
Albany	0.50		0.36		0.73	0.23
Eaton	0.36		0.30		0.58	0.22
Montpelier		1.3	0.40		1.2	
Hartford City	3.0		4.5	1.5	12.4	9.4
Upland	0.79		0.25		0.77	
Fowlerton	0.20		0.22	0.02	0.57	0.37
Gas City	0.90		1.5	0.6	3.7	2.8
Fairmount	1.9		0.6		1.4	
Jonesboro	0.7		0.5		1.2	0.5
Marion	22.5		13.5		36.6	13.5
Swayzee	0.9		0.45		1.5	0.6
Point Isabel	0.2		0.31	0.11	1.3	1.1
Other-Grant Co.	.58		0.49		0.86	0.26
Lagro	0.5		0.70	0.2	1.5	1.0
Wabash	7.1		5.7		15.1	8.0
North Manchester	2.1		1.4		2.6	0.5
Other-Wabash Co.	2.43		0.48		0.91	
Pierceton	0.80		0.24		0.65	
Warsaw	3.2	2.0	4.6		11.8	6.6
Mentone	0.7		0.25		0.71	0.01
Other-Kosciusko Co.	2.18		0.51		1.07	
Churubusco	0.6		0.20		1.1	0.5
Columbia City	1.6		1.20		4.0	2.4
South Whitley	1.2		0.60		2.0	0.8
Culver	0.67		0.39		0.50	
Other-Marshall Co.	0.43		0.18		0.38	

TABLE C-5 . SUMMARY OF MUNICIPAL AND INDUSTRIAL WATER SUPPLY NEEDS
UPPER WABASH SUBBASIN (CONTINUED)

Area of need	Existing supply (mgd)		Average daily needs (mgd)			
	Ground water	Surface water	1980		2020	
			Gross	Net additional	Gross	Net additional
Peru	4.5	38.7	3.3		8.8	4.3
Converse	1.0		0.70		1.0	
Grissom AFB	1.2		1.0		1.0	
Other-Miami Co.	0.32		0.09		0.23	
Akron	0.34		0.20		0.80	0.46
Rochester	3.10		1.30		3.80	0.7
Other-Fulton Co.	0.21		0.13		0.36	0.15
Winamac	1.0		0.67		3.3	2.3
Other-Pulaski Co.	0.88		0.28		0.58	
Logansport		38.7	5.3		10.9	
Galveston	0.66		0.34		0.8	0.14
Other-Cass Co.	1.18		0.51		0.76	
Greentown	0.14		0.32	0.18	0.54	0.40
Kokomo	4.5	8.0	33.1	20.6	84.8	72.3
Other-Howard Co.	None					
Tipton Co.	0.40		0.16		0.42	0.02
Frankfort	8.5		3.9		9.4	0.9
Other-Clinton Co.	0.42		0.31		0.58	0.16
Flora	1.2		0.42		1.4	0.2
Delphi	2.3		0.66		2.4	0.1
Other-Carroll Co.	0.71		0.10		0.34	
Monticello	2.0		1.4		3.1	1.1
Monon	0.50		0.27		0.68	0.18
Other-White Co.	0.88	0.20	0.48		1.18	0.1
Lafayette Area	43.5		32.8		85.1	41.6
Other-Tippecanoe Co.	1.03		0.42		0.69	

TABLE C-6 . SUMMARY OF MUNICIPAL AND INDUSTRIAL WATER SUPPLY NEEDS
MIDDLE WABASH SUBBASIN

Area of need	Existing supply (mgd)		Average daily needs (mgd)			
	Ground water	Surface water	1980		2020	
			Gross	Net additional	Gross	Net additional
INDIANA						
Other-Clinton Co.	0.75		0.23		0.43	
Lebanon	3.0		0.90		3.4	0.4
Other-Boone Co.	0.34		0.17		0.54	0.20
Fowler	1.6		0.62		2.2	0.60

TABLE C- 6. SUMMARY OF MUNICIPAL AND INDUSTRIAL WATER SUPPLY NEEDS
MIDDLE WABASH SUBBASIN (CONTINUED)

Area of need	Existing supply (mgd)		Average daily needs (mgd)			
	Ground water	Surface water	1980		2020	
			Gross	Net additional	Gross	Net additional
Other-Benton Co.	1.47		0.46		1.17	
Rural Warren Co. Industry	3.8		7.4	3.6	34.8	31.0
Williamsport	0.86		0.27		0.62	
Other-Warren Co.	0.08		0.16	0.08	0.38	0.30
Veedersburg	0.72		0.38		0.69	
Covington	0.86		0.43		0.76	
Attica	2.4		2.5	0.1	5.2	2.8
Other-Fountain Co.	0.21		0.16		0.27	0.06
Crawfordsville	3.00		5.5	2.5	18.3	15.3
Other-Montgomery Co.	2.52		0.68		1.35	
Other-Putnam Co.	0.38		0.26		0.40	0.02
Montezuma	1.2		0.17		0.51	
Rockville	1.4		0.57		1.8	0.04
Other-Parke Co.	0.59		0.40		1.19	0.60
Clinton	1.5		0.65		1.2	
Rural Vermillion Co. Industry	11.5		4.1		31.6	20.1
Other-Vermillion Co.	1.95		0.41		0.70	
Terre Haute	30.8		43.0	12.2	126.5	95.7
Sullivan	1.4		1.0		2.1	0.7
Other-Sullivan Co.	0.17		0.10		0.26	0.09
Vincennes	9.1		8.3		22.4	13.3
Other-Knox Co.	0.30		0.18		0.42	0.12
ILLINOIS						
Paxton	1.6		0.80		1.4	0.10
Other-Ford Co.	0.37		0.09		0.19	
Hoopeston	2.9		3.5	0.60	7.1	4.2
Rossville	1.0		0.80		1.4	0.40
Danville	3.0	5.0	16.4	8.4	43.8	35.8
Georgetown		1.0	1.1	0.1	2.5	1.5
Other-Vermilion Co.	1.56	0.36	0.59		1.03	
Rantoul	2.0		1.7		3.2	1.2
Chanute Field	2.0		1.7		1.7	
Champaign	23.0		16.0		32.5	9.5
Other-Champaign Co.	1.3		0.77		1.52	0.22
Paris	0.1	0.8	2.4	1.5	7.3	6.4
Other-Edgar Co.	0.54		0.24		0.42	
Marshall	2.7		2.0		7.2	4.5
Other-Clark Co.			None			
Robinson	3.3		5.4	2.1	12.7	9.4
Other-Crawford Co.	0.73		0.26		0.40	
Other-Lawrence Co.	0.06		0.16	0.10	0.25	0.19
Other-Wabash Co.	0.05		0.07	0.02	0.15	0.10

TABLE C- 7. SUMMARY OF MUNICIPAL AND INDUSTRIAL WATER SUPPLY NEEDS
EMBARRAS SUBBASIN

Area of need	Existing supply (mgd)		Average daily needs (mgd)			
			1980		2020	
	Ground water	Surface water	Gross	Net additional	Gross	Net additional
Champaign Co.	0.83		0.45		0.95	0.12
Edgar Co.	0.47		0.19		0.39	
Tuscola	0.46		0.46		1.25	0.79
Arcola	0.23		0.42	0.19	1.50	1.27
Villa Grove	0.33		0.25		0.60	0.27
Other-Douglas Co.	0.31		0.12		0.32	0.01
Charleston		0.65	2.2	1.55	4.4	3.75
Other-Coles Co.	0.15	0.25	0.19		0.38	
Casey	0.44		0.35		1.00	0.56
Other-Clark Co.	0.32		0.18		0.43	0.11
Cumberland Co.	0.72		0.30		0.63	
Crawford Co.	0.24		0.04		0.06	
Newton	0.54	0.73	0.53		1.55	0.28
Other-Jasper Co.	0.09		0.05		0.14	0.05
Lawrenceville	1.70	7.60	8.18		8.70	0.40

TABLE C- 8. SUMMARY OF MUNICIPAL AND INDUSTRIAL WATER SUPPLY NEEDS
LITTLE WABASH SUBBASIN

Area of need	Existing supply (mgd)		Average daily needs (mgd)			
			1980		2020	
	Ground water	Surface water	Gross	Net additional	Gross	Net additional
Mattoon		4.35	2.9		8.1	3.8
Cumberland		0.33	0.09		0.30	
Shelby Co.	0.11		0.04		0.08	
Effingham		6.3	2.0		5.1	
Altamont		0.10	0.30	0.20	0.70	0.60
Edgewood (Mason)	0.06		0.07	0.01	0.18	0.12
Deterich	0.05		0.06	0.01	0.16	0.11
Other-Effingham Co.	0.20		0.14		0.33	
Flora		0.70	1.0	0.30	3.7	3.0
Louisville		0.03	0.13	0.10	0.42	0.39
Clay City		0.09	0.15	0.06	0.51	0.42
Marion Co.	0.07		0.02		0.04	
Olney		3.6	1.94		6.02	2.4
Other-Richland Co.	0.32		0.10		0.20	
Albion	0.43		0.33		1.3	
Fairfield		2.23	1.34		5.11	2.9
Cisne	0.07		0.08	0.1	0.16	0.9

TABLE C- 8. SUMMARY OF MUNICIPAL AND INDUSTRIAL WATER SUPPLY NEEDS
LITTLE WABASH SUBBASIN (CONTINUED)

Area of need	Existing supply (mgd)		Average daily needs (mgd)			
			1980		2020	
	Ground water	Surface water	Gross	Net additional	Gross	Net additional
Other-Wayne Co.	0.06	1.39	0.16		0.42	
Carmi		8.70	1.24		2.77	
Enfield	0.12		0.08		0.16	0.04
Other-White Co.	0.26		0.16		0.34	
Gallatin Co.	0.14		0.07		0.20	

TABLE C- 9. SUMMARY OF MUNICIPAL AND INDUSTRIAL WATER SUPPLY NEEDS
LOWER WABASH SUBBASIN

Area of need	Existing supply (mgd)		Average daily needs (mgd)			
			1980		2020	
	Ground water	Surface water	Gross	Net additional	Gross	Net additional
INDIANA						
NO DEFICIENT AREAS						
ILLINOIS						
Mt. Carmel		10.0	2.46		7.62	
Other-Wabash Co.	0.10		0.12	0.02	0.24	0.14
Other-Richland Co.	0.03		0.02		0.04	0.01
West Salem		0.10	0.10		0.28	0.18
Grayville	0.72		0.53		1.48	0.76

7. WATER QUALITY CONTROL NEEDS

Water quality needs are defined as those improvements necessary to meet the inter- and intra-state stream standards which were established by the States of Indiana, Illinois and Ohio, and approved by the Secretary of Interior (now the responsibility of the Administrator of the Environmental Protection Agency.) The effluent wastewaters from many communities would be harmonious with the standards if their existing treatment plants were improved or if secondary treatment plants with effluent disinfection facilities were constructed. These communities have not been considered in Plan Formulation studies since Plan Formulation was directed toward those additional measures required to meet stream standards after adequate treatment at the source. Adequate treatment at the source was concluded to mean secondary treatment plus disinfection of the effluent. Those communities for which additional measures are required in order that their effluents will not violate stream standards are listed in tables C-10 to C-16.

8. FLOOD DAMAGE REDUCTION NEEDS

Flood control reduction needs are predicated on reducing annual flood damages to urban endeavors, agricultural pursuits, transportation facilities and to the social and economic disruptions caused by floodwater overflows. It is somewhat ironic that flooding adversely affects most that segment of the population least able to sustain losses — the economically deprived including many black Americans in the urban areas and the small farmer who, in order to make a living, has no alternative but to extract the greatest income he can from the land he has. Tables C-17 through C-24 provide a summary of the present and projected future flood damages for various streams and reaches in each of the hydrologic subbasins. Table C-25 is a condensed version of these tables. Data in these tables were extracted from Appendix D.

9. RECREATION NEEDS

Recreation needs are predicated on the desires of the populace, the leisure time they have, the affluence they exhibit and their cumulative value standards. It is most difficult to separate recreation demands from desires. It is concluded however, that in order to maintain a reasonable level of social and domestic tranquility, a certain amount of recreational opportunity and use be available. This unknown amount is without question a demand. Any amount in excess of this demand is more of a desire. Thus, we may conclude that recreation needs are comprised of two components namely demand and desire. We readily confess that we do not know how to quantify each of the two components. However, we can quantify the sum of the two components. This has been done (as explained in Appendix I) by projecting the needs for six water associated activities.

We have confined our activities to those that relate to needs for water associated activities since the ability to meet these needs as far as this study is concerned are basically confined to water associated activities. We cannot and should not attempt to supply the full spectrum of recreational opportunities since a great portion of the opportunities must be met by local institutions such as City and County Park Boards, private enterprise and state park organizations. Accordingly, the recreation needs as considered herein are those beyond what can reasonably be met by other institutions and are related to those types of activities which have traditionally been provided by a combined local state-federal institutional program. It is recognized that there is an exchange of recreation need between the basin and external areas, i.e., some residents of the basin will participate or desire to participate in recreational experiences outside of the basin while many residents outside of the basin will participate in the basin. We conclude that this will about balance out since there is no hard evidence to the contrary. A summary of the recreation needs by economic subarea is depicted in table C-26.

TABLE C-10. SUMMARY OF WATER QUALITY CONTROL NEEDS
PATOKA SUBBASIN

Identification of point of need ^{1/}	1980		2020		
	Existing supply 7-day, 1 in 10 low flow, cfs	CFS needed to maintain water quality ^{2/} at point of need	Efficiency requirement of treatment plant at point of need	CFS needed to maintain water quality ^{2/} at point of need	Efficiency requirement of treatment plant at point of need
Jasper	0	25	97	78	97
Huntingburg	0	7.8	97	18	97
Princeton	0.3	20	97	52	97

^{1/} Upstream from effluent

^{2/} Based on 90% treatment efficiency.

TABLE C-11. SUMMARY OF WATER QUALITY CONTROL NEEDS
EAST FORK WHITE SUBBASIN

Identification of point of need ^{1/}	1980		2020		
	Existing supply 7-day, 1 in 10 low flow, cfs	CFS needed to maintain water quality ^{2/} at point of need	Efficiency requirement of treatment plant at point of need	CFS needed to maintain water quality ^{2/} at point of need	Efficiency requirement of treatment plant at point of need
New Castle	3.1	19	97	78	97
Greenfield	0	15	97	34	97
Shelbyville Area	34.0	36	90	108	95
Whiteland-New Whiteland	0	2.8	95	7.4	95
Franklin	Nil	13	97	40	97
Rushville	2.0	6.3	95	14	97
Columbia	100.0	77	90	225	95
Greensburg	0	4.1	97	12	97
Mitchell	0	2.3	95	6.0	95
Bloomington	0	30	97	52	97
Vernon-North Vernon	0	3.5	95	14	97
Austin-Scottsburg	0	30	97	55	97
Paoli	0	1.7	95	5.5	95
West Baden-French Lick	Nil	1.9	95	3.8	95
Loogootee	0	5.3	97	18	97

^{1/} Upstream from effluent

^{2/} Based on 90% treatment efficiency.

TABLE C-12. SUMMARY OF WATER QUALITY CONTROL NEEDS
WEST FORK WHITE SUBBASIN

Identification of point of need ^{1/}	1980			2020		
	Existing supply 7-day, 1 in 10 low flow, cfs	CFS needed to maintain water quality ^{2/}	Efficiency requirement of treatment plant at point of need	CFS needed to maintain water quality ^{2/}	Efficiency requirement of treatment plant at point of need	Efficiency requirement of treatment plant at point of need
Winchester	0.2	7.0	97	17	97	97
Muncie	1.6	200.0	98	510	98	98
Anderson	36.0	185.0	98	480	98	98
Alexandria	2.0	5.7	95	16	97	97
Elwood	0.2	11.0	97	34	97	97
Tipton	0.3	3.6	97	6.6	97	97
Pendleton	8.0	8.0	90	12	95	95
Indianapolis	44.0	2,150.0	97	3,950	97	97
Brownsburg	0	3.0	97	11	97	97
Plainfield	1.0	4.9	97	16	97	97
Danville	0	2.3	97	9	97	97
Mooreville	2.0	2.6	95	7.6	95	95
Greencastle	2.5	11.0	95	19	95	95
Brazil	0	5.3	97	11	97	97
Linton	0	5.6	97	13	97	97
Bicknell	0	3/	3/	3/	3/	3/
Washington	0	3/	3/	3/	3/	3/
Petersburg	0	3/	3/	3/	3/	3/
Bloomington (Plant No 2)	0	21.0	97	55	97	97

^{1/} Upstream from effluent

^{2/} Based on 90% treatment efficiency

^{3/} Not estimated. Indicated solution is transport of waste waters of White River following adequate secondary treatment and effluent chlorination.

TABLE C-13. SUMMARY OF WATER QUALITY CONTROL NEEDS
UPPER WABASH SUBBASIN

Identification of point of need ^{1/}	1980			2020		
	Existing supply 7-day, 1 in 10 low flow, cfs	CFS needed to maintain water quality ^{2/}	Efficiency requirement of treatment plant at point of need	CFS needed to maintain water quality ^{2/}	Efficiency requirement of treatment plant at point of need	Efficiency requirement of treatment plant at point of need
Celina	0	16	97	33	97	97
Coldwater	0	5.4	97	8.8	97	97
Bluffton	4.7	7.9	95	21	95	95
Huntington	20	12	95	47	95	95
Portland	0.9	8	95	24	97	97
Montpelier	5.1	3	90	6.4	95	95
Wabash-Lagro	40	69	95	115	95	95
Union City	0	4.5	97	21	97	97
Dunkirk	0	3.1	97	3.8	95	95
Hartford City	0.3	31	97	73	97	97
Jonesboro, Gas City, Fairmount	10	18	95	28	95	95
Marion	16	64	95	236	97	97
Peru	87	32	90	114	95	95
Grissom AFB	4	6	95	6	95	95
Columbia City	2.4	6.4	97	14	97	97
Warsaw-Winona Lake	1.3	8.3	95	33	97	97
Kokomo	0	68	97	212	97	97
Frankfort	0	14	97	37	97	97
Lafayette-West Lafayette	535	530	90	1,120	95	95

^{1/} Upstream from effluent

^{2/} Based on 90% treatment efficiency

TABLE C-14. SUMMARY OF WATER QUALITY CONTROL NEEDS
MIDDLE WABASH SUBBASIN

Identification of point of need ^{1/}	Existing supply 7-day, 1 in 10 low flow, cfs	1980		2020	
		CFS needed to maintain water quality ^{2/}	Efficiency requirement of treatment plant at point of need	CFS needed to maintain water quality ^{2/}	Efficiency requirement of treatment plant at point of need
Paxton	0	3.7	97	7.4	97
Rantoul-Chanute	0	22.4	97	33.3	97
Urbana-Champaign	2.2	82	97	134	97
Hoopeston	0.7	13.9	97	22.9	97
Danville	12.8	133	97	270	97
Georgetown	0	3.5	97	7.1	97
Lebanon	0	8.2	97	11.7	97
Crawfordsville	4.4	16.5	97	36.0	97
Rockville	0	1.2	95	3.6	95
Terre Haute	900	659	90	1,361	95
Paris	0	12.8	97	39.5	97
Marshall	0	9.8	97	28.0	97
Robinson	0	13.4	97	67.5	97
Sullivan	0	2.4	95	5.2	95

^{1/} Upstream from effluent

^{2/} Based on 90% treatment efficiency

TABLE C-15. SUMMARY OF WATER QUALITY CONTROL NEEDS
EMBARRAS RIVER SUBBASIN

Identification of point of need ^{1/}	1980			2020		
	Existing supply 7-day, 1 in 10 low flow, cfs	CFS needed to maintain water quality ^{2/}	Efficiency requirement of treatment plant at point of need	CFS needed to maintain water quality ^{2/}	Efficiency requirement of treatment plant at point of need	Efficiency requirement of treatment plant at point of need
Tuscola	0	4.3	97	12	97	97
Charleston	0	24	97	45	97	97
Mattoon	0	13	97	34	97	97
Newton	0	4.6	97	13	97	97

^{1/} Upstream from effluent

^{2/} Based on 90% treatment efficiency

TABLE C-16. SUMMARY OF WATER QUALITY CONTROL NEEDS
LITTLE WABASH SUBBASIN

Identification of point of need ^{1/}	1980			2020		
	Existing supply 7-day, 1 in 10 low flow, cfs	CFS needed to maintain water quality ^{2/}	Efficiency requirement of treatment plant at point of need	CFS needed to maintain water quality ^{2/}	Efficiency requirement of treatment plant at point of need	Efficiency requirement of treatment plant at point of need
Effingham	0	7.8	97	23	97	97
Flora	0	10	97	37	97	97
Olney	0	14	97	42	97	97
Fairfield	0	13	97	61	97	97
Albion	0	2.1	97	5.1	97	97
Carmi	3.2	38	97	98	97	97
Wayne City	0	20	97	20	97	97

^{1/} Upstream from effluent

^{2/} Based on 90% treatment efficiency

TABLE C-17. SUMMARY OF PRESENT AND PROJECTED FLOOD DAMAGES
PATOKA SUBBASIN

Tributary or mainstem of subbasin	Mileage location	Existing (\$1,000)			1980 (\$1,000)			2020 (\$1,000)					
		Agr	Trans	Urban	Total	Agr	Trans	Urban	Total	Agr	Trans	Urban	Total
		95-106	84.8	3.2	8.1	96.1	111.7	4.5	12.7	128.9	146.4	11.1	29.6
Mainstem	233.8	13.7	189.0	436.5	308.5	24.8	375.1	708.4	404.3	67.5	1,324.7	1,796.5	
95-86	140.1	16.9	13.9	170.9	185.1	30.7	21.7	237.5	242.5	83.5	38.3	364.3	
Mainstem	342.3	18.0	28.5	388.8	451.8	32.6	40.6	525.0	592.1	88.7	69.4	750.2	
95-62	55.2	6.0	14.2	75.4	72.8	9.1	19.6	101.5	95.6	27.7	34.0	157.3	
Mainstem	337.5	0.5	89.4	427.4	445.5	0.6	112.6	558.7	583.9	1.3	189.2	774.4	
95-35	289.3	10.1	79.8	379.2	382.3	16.7	114.6	513.6	500.9	45.0	220.7	766.6	
Mainstem	122.3	1.7	3.8	127.8	161.5	2.6	5.0	169.1	211.6	7.3	7.6	226.5	
95-0													
TOTAL				2,102.1				2,942.7					5,022.9

TABLE C-18. SUMMARY OF PRESENT AND PROJECTED FLOOD DAMAGES
EAST FORK WHITE SUBBASIN

Tributary or mainstem of subbasin	Mileage location	Existing (\$1,000)			1980 (\$1,000)			2020 (\$1,000)					
		Agr	Trans	Urban	Total	Agr	Trans	Urban	Total	Agr	Trans	Urban	Total
		96-49-190R-15-0	762.6	89.7	558.3	1,410.6	1,002.0	136.4	675.2	1,813.6	1,319.1	350.6	2,108.4
Sugar Cr	186.5	0.5	18.7	205.7	246.3	0.8	24.7	271.8	322.8	2.0	32.7	357.5	
Driftwood R	222.2	37.5	24.7	284.4	293.3	86.3	51.3	430.9	384.3	185.8	234.8	804.9	
Flatrock R	317.1	54.3	126.6	498.0	418.5	95.6	222.6	736.7	548.5	239.9	814.9	1,603.3	
Clifty Cr	22.4	1.4	27.9	51.7	29.7	3.1	58.1	90.9	38.8	6.9	268.8	314.5	
Sand Cr	32.2	1.9	3.6	37.7	42.5	4.1	5.1	51.7	55.7	10.5	7.7	73.9	
Big Cr													
Graham Cr													
E.F. Muscatatuck R	655.5	58.2	20.2	733.9	848.1	82.2	24.3	954.6	1,111.4	215.0	31.8	1,358.2	
Vernon Fork	642.7	68.9	64.5	776.1	848.4	104.8	87.3	1,040.5	1,111.9	286.6	130.7	1,529.2	
Muscatatuck R	411.9	26.6	12.4	450.9	543.7	45.6	15.3	604.6	712.8	129.0	26.4	868.2	
Salt Cr	69.9	1.2	7.7	78.8	92.3	1.6	10.2	104.1	120.6	3.9	16.4	140.9	
Indian Cr													
Lost R	275.0	25.8	141.0	441.8	349.1	35.0	215.9	600.0	457.5	90.5	416.0	964.0	
Mainstem	2,549.9	256.8	211.7	3,018.4	3,324.6	464.6	394.7	4,183.9	4,357.1	1,285.7	1,540.2	7,183.0	
TOTAL				7,988.0				10,883.3					18,975.7

TABLE C-19. SUMMARY OF PRESENT AND PROJECTED FLOOD DAMAGES
WEST FORK WHITE SUBBASIN

Tributary or mainstem of subbasin	Mileage location	Existing (\$1,000)			1980 (\$1,000)			2020 (\$1,000)					
		Agr	Trans	Urban	Total	Agr	Trans	Urban	Total	Agr	Trans	Urban	Total
Killback Cr	96-292-0	52.6	1.8	10.2	64.6	67.8	3.5	15.9	87.2	88.3	10.0	42.5	140.8
Pipe Cr	96-278	2.0	1.0	0	3.0	2.0	2.0	0	4.0	4.0	5.0	0	9.0
Cicero Cr	96-262-0	10.4	0	5.6	16.0	13.4	0	8.2	21.6	17.4	0	25.9	43.3
Fall Cr	96-233-0	73.9	0	544.1	618.0	95.4	0	1,159.0	1,254.4	124.2	0	2,728.8	2,853.0
Pleasant Run	96-228-0	--	--	--	--	--	--	--	--	--	--	--	--
Eagle Cr	96-227-0	11.8	0	1.2	13.0	15.2	0	1.5	16.7	19.7	0	2.0	21.7
Little Buck Cr	96-223-0	--	--	--	--	--	--	--	--	--	--	--	--
Indian Cr	96-187-0	49.1	1.1	6.0	56.2	63.4	1.4	6.6	71.4	82.6	3.6	13.6	99.8
White Lick Cr	96-200-0	84.6	3.3	20.6	108.5	109.2	5.7	30.0	144.9	142.2	16.8	86.9	245.9
Bean Blossom Cr	96-173-0	171.7	11.0	20.7	203.4	221.4	15.2	26.7	263.3	276.6	37.8	40.7	355.1
Big Walnut Cr	96-135-51L-0	281.0	49.1	37.4	367.5	362.4	74.5	49.9	486.8	471.9	177.0	78.3	727.2
Mill Cr	96-135-51R-0	337.6	--	33.8	371.4	435.5	0	43.5	479.0	567.1	0	56.7	623.8
Eel River	96-135-0	1,765.5	237.7	19.0	2,022.2	2,277.7	345.0	24.7	2,647.4	3,494.0	883.8	34.6	4,412.4
Plummer Cr	96-120-0	55.9	1.1	5.3	62.3	72.2	1.7	6.9	80.8	94.0	4.3	9.5	107.8
Mainstem	96-0	4,887.0	846.7	2,174.7	7,909.3	6,232.0	1,346.6	3,361.5	10,940.1	8,190.3	3,726.9	10,932.6	22,849.8
TOTAL					11,815.4				16,497.6				32,489.6

TABLE C-20. SUMMARY OF PRESENT AND PROJECTED FLOOD DAMAGES
UPPER WABASH SUBBASIN

Tributary or mainstem of subbasin	Mileage location	Existing (\$1,000)			1980 (\$1,000)			2020 (\$1,000)					
		Agr	Trans	Urban	Total	Agr	Trans	Urban	Total	Agr	Trans	Urban	Total
Rock Cr	419-0	104.5	4.4	11.4	120.3	133.7	5.7	22.8	162.2	172.4	21.0	47.1	240.5
Little R	406-0	122.0	2.7	4.9	129.6	136.2	3.5	16.3	176.0	201.3	13.1	22.7	237.1
Salamonie R	394-0	250.5	8.9	26.2	285.6	320.7	11.6	34.9	367.2	413.3	42.6	51.3	507.2
Mississnewa R	375-0	96.9	0	145.9	242.8	134.2	0	202.8	337.0	160.0	0	744.1	904.1
Eel River	354-0	194.4	2.9	23.3	220.6	248.3	3.6	30.4	282.3	320.6	12.9	54.5	388.0
Deer Cr	329-0	162.2	4.0	42.9	209.1	207.6	5.1	63.7	276.4	256.6	18.1	207.1	481.8
Tippecanoe R	322-0	319.7	0.5	31.8	352.0	469.2	0.8	40.9	450.9	520.2	2.6	52.6	575.4
Wildcat Cr	317-0	301.3	3.1	52.9	357.3	345.8	4.1	75.5	465.4	555.2	10.7	128.4	694.3
Mainstem	312	678.5	33.1	151.0	862.6	868.9	42.4	211.7	1,123.0	1,074.4	147.3	621.9	1,843.6
TOTAL					2,779.9				3,640.4				5,872.0

TABLE C-21. SUMMARY OF PRESENT AND PROJECTED FLOOD DAMAGES
MIDDLE WABASH SUBBASIN

Tributary or mainstem of subbasin	Mileage location	Existing (\$1,000)			1980 (\$1,000)			2020 (\$1,000)					
		Agr	Trans	Urban	Total	Agr	Trans	Urban	Total	Agr	Trans	Urban	Total
Big Pine Cr	288+2	11.6	1.3	1.4	14.3	15.0	1.6	1.8	18.4	19.2	5.5	3.0	27.7
Vermilion R	257-28-0	268.3	16.2	129.0	413.5	345.9	20.5	177.4	543.8	445.4	69.3	472.4	987.1
Little Vermilion R	248-0	30.1	0	3.0	33.1	38.9	0	3.9	42.8	50.0	0	5.0	55.0
Sugar Cr	245-0	116.3	33.9	22.6	172.8	150.0	42.8	30.6	223.4	192.7	145.5	83.5	421.7
Raccoon Cr	238-0	144.8	25.8	50.6	221.2	97.0	11.0	29.2	137.2	125.0	37.5	46.9	209.4
Brouillets Cr	226-0	52.7	0.1	5.3	58.1	68.0	0.2	6.8	75.0	87.5	0.5	8.9	96.9
Mainstem	96	3,763.2	260.3	382.0	4,405.5	4,740.1	266.2	476.8	5,483.1	6,100.0	901.4	1,169.3	8,170.7
TOTAL					5,318.5				6,523.7				9,968.5

TABLE C-22. SUMMARY OF PRESENT AND PROJECTED FLOOD DAMAGES
EMBARRAS SUBBASIN

Tributary or mainstem of subbasin	Mileage location	Existing (\$1,000)			1980 (\$1,000)			2020 (\$1,000)					
		Agr	Trans	Urban	Total	Agr	Trans	Urban	Total	Agr	Trans	Urban	Total
Mainstem	122-106	229.4	8.7	67.7	305.8	291.6	11.9	94.7	398.2	365.4	34.3	275.9	675.6
Mainstem	122-64	574.2	39.1	23.2	636.5	729.6	53.5	29.6	812.7		155.0	47.1	1,115.9
Mainstem	122-44	311.2	50.2	25.3	386.7	395.4	71.8	33.3	500.5	495.0	213.0	65.1	773.1
Mainstem	122-9	934.5	88.6	89.2	1,112.3	1,186.8	126.5	115.6	1,428.9	1,485.8	371.7	182.2	2,039.7
Mainstem	122-8	76.5	3.7	76.2	156.4	97.1	5.4	170.3	272.8	121.5	15.9	301.8	439.2
Mainstem	122-0	159.3	18.8	5.4	183.5	202.3	26.9	7.0	236.2	253.3	80.2	9.9	343.4
TOTAL					2,781.2				3,649.3				5,386.9

TABLE C-23. SUMMARY OF PRESENT AND PROJECTED FLOOD DAMAGES
LITTLE WABASH SUBBASIN

Tributary or mainstem of subbasin	Mileage location	Existing (\$1,000)			1980 (\$1,000)			2020 (\$1,000)					
		Agr	Trans	Urban	Total	Agr	Trans	Urban	Total	Agr	Trans	Urban	Total
Mainstem	15-40	2,074.9	114.6	98.7	2,288.2	2,757.5	158.3	134.1	3,049.9	3,584.3	408.2	237.4	4,229.9
Skillet Fork	15-401-0	1,186.3	93.4	87.2	1,366.9	1,552.4	127.6	121.0	1,801.0	2,028.2	325.2	235.5	2,588.9
Mainstem	15-0	139.6	22.2	87.5	249.3	174.9	31.6	147.1	353.6	227.4	81.3	507.0	815.7
TOTAL					3,904.4				5,204.5				7,634.5

TABLE C-24. SUMMARY OF PRESENT AND PROJECTED FLOOD DAMAGES
LOWER WABASH SUBBASIN

Tributary or mainstem of subbasin	Mileage location	Existing (\$1,000)			1980 (\$1,000)			2020 (\$1,000)					
		Agr	Trans	Urban	Total	Agr	Trans	Urban	Total	Agr	Trans	Urban	Total
Mainstem	65	737.2	0.5	28.2	765.9	881.6	20.2	55.5	957.3	1,139.9	68.3	100.3	1,308.5
Mainstem	40	669.7	17.0	33.7	720.4	805.2	38.4	59.0	902.6	1,041.5	130.5	101.6	1,273.6
Mainstem	15	727.0	64.0	40.5	831.5	1,012.6	59.1	41.7	1,113.4	1,308.1	200.5	79.0	1,587.6
Mainstem	0	306.5	10.4	10.7	327.6	438.2	0	1.3	439.5	504.8	0	5.0	569.8
TOTAL					2,645.5				3,412.8				4,739.5

TABLE C-25. SUMMARY OF PRESENT AND PROJECTED FLOOD DAMAGES
WABASH BASIN

Subbasin	Average annual flood damages (\$1,000)		
	Existing	1980	2020
Patoka	2,102.1	2,942.7	5,022.9
East Fork White	7,988.0	10,883.3	18,975.7
West Fork White	11,815.4	16,497.6	32,489.6
Upper Wabash	2,779.9	3,640.4	5,872.0
Middle Wabash	5,318.5	6,523.7	9,968.5
Embarras	2,781.2	3,649.3	5,386.9
Little Wabash	3,904.4	5,204.5	7,634.5
Lower Wabash	2,645.5	3,412.8	4,739.5
TOTAL	39,335.0	52,754.3	90,089.6

TABLE C-26. SUMMARY OF TOTAL PROJECTED RECREATION NEEDS^{1/}
(100,000 recreation days)

Economic subarea	Present (1968)	1980	2020
I	28.87	21.82	90.64
II	158.44	189.02	536.20
III	11.21	4.92	13.31
IV	50.94	40.49	118.70
V	29.10	28.29	82.19
VI	97.60	141.69	419.51
TOTAL	376.16	426.33	1,260.55

^{1/} Data shown is for unsatisfied needs, e.g., Demand minus Supply.

10. FISHING AND HUNTING NEEDS

Corollary to the recreation needs is the desire of the public to enjoy fishing and hunting activities. We probably have better techniques for measuring these needs — analysis of fishing and hunting licenses — than for the recreation needs. We find that increasing urbanization trends dampen considerably the growth in hunting requirements whereas fishing opportunities are desired by an increasing number of people but the annual fishing days per fisherman is down somewhat due to increased distance and time that the fisherman must travel to participate. To a great extent, however, there appears to be little hesitancy on the part of the hunter and fisherman to travel considerable distances and spend considerable time in travel if rewarded by a successful endeavor. Pollution of the Basin's streams has contributed significantly to a continued deterioration of stream fishing opportunities. Achievement of the stream water quality standards will revitalize the stream fishery resource. Additional measures will be needed for maximum viability of the streams for fishing. A summary of the hunting and fishing needs is presented in table C-27.

TABLE C-27. ANNUAL FISHING AND HUNTING NEEDS (1,000 MAN-DAYS)

Economic subarea	Present (1968)		1980		2020	
	Fishing	Hunting	Fishing	Hunting	Fishing	Hunting
East Fork White and Patoka	2,059.2	742.2	2,644.2	905.5	3,910.3	1,131.5
West Fork White	2,438.8	730.5	2,980.5	1,175.2	4,203.3	943.3
Little Wabash	444.6	236.7	555.8	254.0	766.0	304.3
Embarras and Middle Wabash (Illinois)	1,045.5	601.0	1,167.9	781.0	1,833.1	904.9
Middle Wabash (Indiana)	788.8	250.9	922.3	328.0	1,097.4	373.5
Upper Wabash	2,596.0	518.6	3,176.4	983.7	4,306.4	1,131.6
Total Demand	9,372.9	3,079.9	11,447.1	4,427.4	16,116.5	4,789.1
Total Anglers Available	614.7	278.2	807.5	457.3	1,117.3	591.1
Total Unsatisfied Net Demand for Wabash Basin ^{1/}			1,837.2	1,357.1	1,574.4	1,809.1

^{1/} Net demand for 1980, for example, is 1980 gross demand minus 1968 expressed demand plus opportunity lost minus opportunity gained. See Appendix I for details.

11. PRISTINE OPPORTUNITIES

Although a great majority of our population has demonstrated their desire to participate in the type of outdoor activities presented in paragraphs 9 and 10, a large and growing segment of our population desires to view and partake of the natural environment characteristic of our earlier historic era (pristine or pure and untouched) without crowding and in an atmosphere void of or with a minimum of human developments. We have no idea of the need or demand for this type of activity. However, we believe that this unquantified need and demand must be explicitly incorporated into the Plan Formulation. We therefore conclude that pristine opportunities should be preserved to the maximum extent feasible and that all relevant alternatives be considered when significant pristine opportunities are endangered by developments lest we lose in perpetuity significant portions of our natural and historical heritage. We must take those steps that reasonable people should take to assure that future generations have the opportunity to enjoy as good, if not better, pristine opportunities as we have enjoyed. We are convinced that the basin can sustain a viable and dynamic economic posture while at the same time protecting and preserving great portions of our natural and historical heritage. To do more might be desirable; to do less might be folly.

12. AGRICULTURAL WATER

In addition to the water supply needs as indicated in paragraph 6 there exists within the basin a need for water for farm domestic, livestock watering and other farm uses. Historically, the farmer has depended upon wells and small ponds to satisfy his requirements for water. However, as population pressures increase with resultant undesirable associated products emptying into our water courses and eventually into underground supplies, these historic sources are becoming undependable both in quantity and quality. In order to provide a satisfactory supply of water, Rural Water Districts are rapidly being formed to meet this need. It is proper and inevitable that each farm unit will soon have a safe and dependable water supply source just as farm units have been electrified by Rural Electric Administration programs. This study has not been directly concerned with distribution of these waters but rather with the adequacy of supply. A summary of these needs is presented in table C-28.

13. WATER FOR IRRIGATION

Historically, there has been only a nominal amount of irrigation in the basin, with normal rainfall patterns sufficing for economic crop production. However, as the pressures for increasing production mount, it is believed that irrigation would increase since increased production per acre and per farm unit would be required and larger farm units tend to make irrigation more of a prudent and profitable endeavor. In analyzing irrigation requirements, the suitable soil types and desirable root moisture conditions were concluded to be the dominant parameters. It was recognized that changes in technology and other circumstances, differing from those estimated, could significantly affect future irrigation practices. The amount of water projected to be required for irrigation is summarized in table C-29.

14. ELECTRIC GENERATING NEEDS

The demand for power is growing in the basin at a far greater rate than either the population or the production. This rapid rate of growth is attributable to several factors; namely, increasing use of electrical products in the home, industry and social institutions; the increased affluence of the populace; the desire of the populace to minimize discomfort; the increased use of electrical products in order to obtain more usable time; and the increasing use of electrical products as a substitute for manual labor. Although

TABLE C-28. PRESENT AND PROJECTED RURAL FARM DOMESTIC,
RURAL NON-FARM DOMESTIC AND LIVESTOCK WATER NEEDS

	Economic subarea 1	Economic subarea 2	Economic subarea 3	Economic subarea 4	Economic subarea 5	Economic subarea 6	Total
(million gallons per day)							
<u>Rural Farm Domestic^{1/}</u>							
1960	6.54	8.92	2.79	4.85	2.12	11.44	36.66
1980	5.85	7.07	2.44	3.74	1.76	9.56	30.42
2000	4.74	5.31	1.88	2.73	1.42	7.31	23.39
2020	3.38	3.70	1.37	1.79	1.05	5.28	16.57
<u>Rural Non-Farm Domestic^{1/}</u>							
1960	9.87	24.61	2.18	4.42	4.19	14.03	59.30
1980	12.16	30.84	3.02	6.39	5.14	18.51	76.06
2000	13.22	35.52	4.06	8.39	6.15	23.08	90.42
2020	13.57	38.59	5.06	9.87	6.90	26.84	100.83
<u>Livestock</u>							
1960	9.00	11.44	3.27	6.01	3.98	15.72	49.42
1980	10.98	15.83	5.41	8.42	6.66	19.74	67.04
2000	16.41	23.67	8.19	12.76	10.07	29.35	100.45
2020	22.11	32.01	11.12	17.32	13.67	39.65	135.88
<u>Total</u>							
1960	25.41	44.97	8.24	15.28	10.29	41.19	145.38
1980	28.99	53.74	10.87	18.55	13.56	47.81	173.52
2000	34.37	64.50	14.13	23.88	17.64	59.74	214.26
2020	39.06	74.30	17.55	28.98	21.62	71.77	253.28

^{1/} Not served by municipal water systems.

TABLE C-29. ESTIMATED WATER FOR PRESENT AND EXPECTED FUTURE IRRIGATION NEEDS

Economic subarea	Estimated 1968 use		1980		2020	
	Average year	Driest year	Average year	Driest year	Average year	Driest year
	(acre-feet)					
1. East Fork White and Patoka	1,900	3,200	3,150	5,350	6,050	10,400
2. West Fork White	900	1,515	1,500	2,550	2,760	4,750
3. Little Wabash	900	1,500	1,350	2,300	3,000	5,200
4. Emarras and Mid-Wabash (Illinois)	1,750	3,000	2,700	4,600	4,300	7,300
5. Mid-Wabash (Indiana)	950	1,600	1,400	2,450	2,800	4,800
6. Upper Wabash	<u>1,750</u>	<u>2,965</u>	<u>2,800</u>	<u>4,800</u>	<u>5,900</u>	<u>10,100</u>
TOTAL	8,150	13,780	12,900	22,050	24,810	42,550

NOTE: Water requirements for each projection year are gross estimates which are based on 75 percent application efficiency. Does not include storage or abnormal transmission losses.

there are many ways to cool electrical generating plants, the only ones in use today utilize water for cooling. A substantial problem faces the electrical generating industry at the present time. This problem may be simply stated as "How can the future requirements for electrical energy be met while at the same time minimizing the adverse effects on the environment and minimizing stream thermal pollution?" Reasonable solutions to this problem must be found by reasonable people reasoning together. A summary of the electrical energy and installed capacity needed to supply that energy is listed in table C-30.

At the present time the cooling for many of the existing plants in the basin utilizes "once through" water. The water, heated as it cools the generators, returns to the stream or water course several degrees warmer and thus may have an adverse effect on the stream's food chain support systems and perhaps on higher organisms. It has been determined that there are only a few locations within the basin where there is sufficient stream flow to support this kind of cooling in keeping with the established water quality standards. As indicated in Appendix K, it is projected that future cooling will utilize the "evaporative principle" whereby water is extracted from the stream and evaporated into the atmosphere. Cooling ponds are somewhat a combination of "once through" and evaporation principles utilizing substantial quantities of water; evaporating considerable; and recirculating the water without its returning to the water course with temperatures in excess of those allowed by the standards. The amount of makeup water projected to be required to satisfy the electrical energy generation demands is shown in table C-31.

15. WATER FOR PRESERVATION OF THE STREAM ENVIRONMENT

As the demands for consumptive use of water increases the stream environments as we know them today will deteriorate. As the population increases and more water is extracted from the streams for municipal and industrial uses, for cooling purposes, for agricultural uses, and for irrigation, less water will be available to support and maintain the stream environment. This reduced amount of water will be particularly critical during times

TABLE C-30. PROJECTED ELECTRIC POWER REQUIREMENTS
WABASH POWER REGION

Power subregion	Energy (million kwh)	Peak (1,000 kw)	Average annual energy growth rate (percent)
<u>1965</u>			
I	186	45	--
II	2,015	368	--
III	7,190	1,342	--
IV	3,837	703	--
V	3,051	577	--
VI	578	109	--
VII	387	72	--
VIII	<u>369</u>	<u>67</u>	--
TOTAL	17,613	3,283	--
<u>1980</u>			
I	508	123	6.9
II	5,502	1,009	6.9
III	19,523	3,660	6.9
IV	10,430	1,918	6.9
V	8,290	1,573	6.9
VI	1,575	300	6.9
VII	1,053	197	6.9
VIII	<u>1,005</u>	<u>183</u>	<u>6.9</u>
TOTAL	47,886	8,963	6.9
<u>2000</u>			
I	1,718	406	6.3
II	18,631	3,336	6.3
III	66,108	12,095	6.3
IV	35,316	6,340	6.3
V	28,068	5,199	6.3
VI	5,335	992	6.3
VII	3,568	652	6.3
VIII	<u>3,405</u>	<u>604</u>	<u>6.3</u>
TOTAL	162,149	29,624	6.3

TABLE C-30. PROJECTED ELECTRIC POWER REQUIREMENTS
WABASH POWER REGION (CONTINUED)

Power subregion	Energy	Peak	Average annual energy growth rate
	(million kwh)	(1,000 kw)	(percent)
		<u>2020</u>	
I	4,309	1,010	4.7
II	46,703	8,299	4.7
III	165,717	30,092	4.7
IV	88,528	15,772	4.7
V	70,359	12,934	4.7
VI	13,372	2,469	4.7
VII	8,942	1,621	4.7
VIII	<u>8,536</u>	<u>1,503</u>	<u>4.7</u>
TOTAL	406,466	73,700	4.7

TABLE C-31. MAKEUP WATER REQUIRED
FOR STEAM-ELECTRIC GENERATION

Hydrologic subbasin	Required acre-feet per year ^{1/}		
	Present	1980	2020
Patoka River	189	16	--
East Fork White River	90	--	--
West Fork White River	7,573	15,883	138,092
Upper Wabash River	636	188	93,234
Middle Wabash River	9,198	18,303	139,726
Embarras River	--	--	--
Little Wabash River	87	34	--
Lower Wabash River	<u>119</u>	<u>35</u>	<u>63,701</u>
TOTAL	17,892	34,459	434,753

^{1/} Amounts shown are evaporative losses incurred during power plant operation.

of drought, for then the greatest demands will be placed on the stream system. During these periods which will be more severe and more prolonged by virtue of increased demands on the stream's water, the stream's characteristic as a stream could be seriously altered - all fish life could be essentially eradicated, the plant life along the stream would be altered and many of the amphibians would be lost. In order that consideration be given to preventing such a catastrophe, the Plan Formulation Subcommittee has estimated the flow needs required at key points to sustain a viable stream environment.

16. PRESERVATION AND ENHANCEMENT OF THE BASIN'S FOOD AND FIBER PRODUCTIVE CAPABILITY

Historically, the Wabash Basin has had a dominant rural characteristic with agricultural pursuits as the prime economic endeavor. With the demise of the "family farm" there are strong indications of an emerging more industrial type agricultural economy. The amount of land available within the basin is fixed. The trend toward greater urbanization results in a withdrawal of land from agricultural production; thus placing relatively greater demand on the remaining farmland. With the land available for production decreasing, and the demand for food and fiber increasing the production per unit of farmland must be increased. To achieve this greater production capability several steps need to be taken:

- a. Improve land fertility by improved crop practice and by artificial means.
- b. Retain productive capability by adequate land treatment measures whereby the fertile topsoil is retained at the point of need rather than being transported to downstream points.
- c. Improve soil moisture condition by drainage or irrigation where a determination is made that crop production is the highest and best use of land.
- d. Reduce urban intrusions into the most productive lands.

Present projections indicate that by about the year 2000 additional resource development will be needed in the basin in order to help meet the national demand for food and fiber. The present and projected future use of land is given in tables C-32 and C-33.

17. PRESERVATION AND ENHANCEMENT OF THE BASIN'S FOREST RESOURCE CAPABILITY

As the population of the basin increases, so will the need for forest goods and services. The Basin's forests have the potential for providing substantially more goods and services than are being provided at the present time. To accomplish this will require that better forest management be practiced on private lands. There needs to be an improved balance between forest lands, farm lands and urban lands. There needs to be an improved balance between forest lands, farm lands and urban lands. Contrary to the short time it requires to convert lands to farm and urban uses, the time element required to develop a forest is quite long. Thus, a more enlightened future forest planning program is necessitated. Present forest acreage is shown in table C-32 and is projected to remain relatively constant.

TABLE C-32. PRESENT LAND USE (1968)

Economic subarea	Total agricultural land					Total land area
	Cropland	Pasture land	Forest	Urban	Other	
1	1,963,550	461,080	1,358,000	174,410	455,990	4,413,030
2	2,736,170	461,100	634,000	378,410	242,180	4,451,860
3	1,371,910	286,130	355,000	107,430	122,340	2,243,810
4	2,758,810	323,960	299,000	190,790	158,370	3,730,930
5	1,404,350	215,780	293,000	87,520	71,920	2,072,570
6	<u>3,856,040</u>	<u>375,030</u>	<u>412,240</u>	<u>262,250</u>	<u>203,010</u>	<u>5,108,570</u>
TOTAL	14,091,830	2,123,080	3,351,240	1,200,810	1,253,810	22,020,770

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TABLE C-33. PROJECTED LAND USE REQUIREMENTS
(million acres)

Land use	1980		2000	2020
	Without additional development	With additional development		
Cropland	13.14	13.07	13.27	12.97
Pasture	2.06	2.06	2.01	1.96
Idle	0.80	0.87	0.25	0.25
Forest	3.35	3.35	3.35	3.35
Urban	1.42	1.42	1.89	2.24
Other	<u>1.24</u>	<u>1.24</u>	<u>1.24</u>	<u>1.24</u>
TOTAL	22.01	22.01	22.01	22.01

SECTION III – NET NEEDS AFTER IMPACT OF “GOING PROGRAM”

18. GENERAL

The needs as previously presented are premised on certain projects – Federal, state, local and private, operable on 31 December 1968. Thus, the needs as previously presented represent the net needs after the effects of the operating program have been subtracted. Table C-34 indicates the operable projects.

In addition to the projects listed, there are a number of projects which we term the “going program”. These “going program” projects either became operable after 31 December 1968 or are authorized, approved, or under construction. A listing of these projects is included in table C-35 along with those needs which they will satisfy.

19. FLOOD DAMAGE REDUCTION

Of particular concern are the flood damages that could be reduced by sound flood plain management practices. At this stage in development of our flood prevention rationale it appears that flood plain management would have the greatest impact on future urban development. Consequently, the projected urban damages can be reduced in anticipation of management techniques being effected. Table C-36 depicts the flood damage picture after implementation of the going program with sound flood plain management, residual urban damages for the 2020 time frame could reasonably be expected to be reduced by 25 to 50 percent.

TABLE C-34. WABASH RIVER BASIN WATER RESOURCES PROGRAM
OPERABLE 31 DECEMBER 1968

MAJOR RESERVOIRS		
Cagles Mill	Monroe	Mississinewa
Mansfield	Salamonie	Huntington

LEVEES AND LOCAL PROTECTION PROJECTS		
Lyford	Levee Unit 8	Vincennes
Gill Township	Levee Unit 5	Indianapolis
Niblack	Delphi	Muncie
Brevoort	Terre Haute	

UPSTREAM WATERSHED PROJECTS		
Elk Creek	Little Wea Creek	Prairie Creek
Boggs Creek	French Lick Creek	Upper Wabash

TABLE C-35. WABASH RIVER BASIN WATER RESOURCE PROGRAM
1968 GOING PROGRAM

MAJOR RESERVOIRS

Big Blue	Downeyville	Lincoln
Big Pine	Helm	Louisville
Big Walnut	Lafayette	Patoka
Clifty Creek		

LEVEES AND LOCAL PROTECTION PROJECTS

Anderson	Deer Creek Prairie	Levee Unit 1
Levee Unit 3	Honey Creek	Levee Unit 2
Levee Unit 1	West Terre Haute	Levee Unit 1
Levee Unit 2	England Pond	Levee Unit 7
Levee Unit 3 & 4	Greenfield Bayou	Levee Unit 17
Levee Unit 9	Island Levee	McGinnis
Levee Unit 10	Rochester and McCleary's Bluff	New Harmony
Shoals	Tri-Pond	Raccoon
Sugar Creek	Bonpas Creek	Shufflebarger
Russell & Allison	Fletcher & Sunshine Gardens	Orleans
Levee Unit 6	Levee Unit 2	Mount Carmel
Adams	Levee Unit 1	Marion
Clinton, Indiana	Levee Unit 2	

UPSTREAM WATERSHED PROJECTS

Upper Wabash	Indian Creek	Busseron Creek
Rock Cr - Wells Co	Prides Creek	Kickapoo Creek
Mill Cr - Fulton Co	Stucker Fork	Prairie Cr - Vigo Co
Bachelor Run	DeWitt Creek	Little Raccoon Creek
Prairie Cr - Daviess Co	Twin Rush Creek	Scattering Fork
Lattas Creek	Upper Big Blue River	Seven Mile Creek
Mill Creek	West Boggs Creek	

TABLE C-36. SUMMARY OF AVERAGE ANNUAL FLOOD DAMAGES
December 1968 Price levels (\$1,000)

No	Subbasin and damage category	Average annual damages - no federal projects		Residual average annual damage existing projects		Residual average annual damages existing and authorized projects		Residual average annual damages existing, authorized and early action plan projects		Residual average annual damages existing, authorized early action and long range plan projects		
		1968	1968	1980	2020	1980	2020	1980	2020	1980	2020	
1	PATOKA RIVER											
	Crop and pasture	1,351.0	1,351.0	1,783.0	2,337.0	1,471.0	1,920.0	580.0	761.0	625.0		
	Other agriculture	255.0	255.0	336.0	441.0	270.0	354.0	79.0	103.0	71.0		
	Transportation	70.0	70.0	122.0	332.0	92.0	218.0	21.0	55.0	41.0		
	Urban	202.0	202.0	392.0	1,383.0	129.0	447.0	70.0	241.0	237.0		
	Other	225.0	225.0	310.0	531.0	278.0	474.0	108.0	174.0	129.0		
	TOTAL	2,103.0	2,103.0	2,943.0	5,024.0	2,240.0	3,413.0	858.0	1,334.0	1,103.0		
2	EAST FORK WHITE RIVER											
	Crop and pasture	4,681.0	4,602.0	6,009.0	7,881.0	4,784.0	6,268.0	3,013.0	3,950.0	3,834.0		
	Other agriculture	1,607.0	1,545.0	2,028.0	2,656.0	1,354.0	1,774.0	1,026.0	1,345.0	1,341.0		
	Transportation	698.0	623.0	1,061.0	2,807.0	735.0	1,971.0	528.0	1,405.0	1,397.0		
	Urban	897.0	890.0	1,355.0	5,309.0	705.0	2,810.0	654.0	2,565.0	2,506.0		
	Other	328.0	328.0	429.0	632.0	357.0	546.0	174.0	270.0	254.0		
	TOTAL	8,211.0	7,988.0	10,882.0	18,971.0	7,935.0	13,369.0	5,395.0	9,535.0	9,386.0		
3	WEST FORK WHITE RIVER											
	Crop and pasture	5,824.0	4,968.0	6,336.0	8,771.0	5,346.0	6,953.0	2,833.0	3,786.0	3,682.0		
	Other agriculture	3,815.0	2,817.0	3,630.0	4,803.0	3,050.0	3,971.0	967.0	1,257.0	1,252.0		
	Transportation	1,385.0	1,153.0	1,797.0	4,866.0	1,687.0	4,581.0	551.0	1,480.0	1,460.0		
	Urban	5,063.0	2,605.0	4,386.0	13,524.0	1,757.0	6,006.0	893.0	3,359.0	2,958.0		
	Other	292.0	274.0	349.0	528.0	292.0	443.0	181.0	281.0	299.0		
	TOTAL	16,379.0	11,817.0	16,498.0	32,492.0	12,132.0	21,954.0	5,425.0	10,163.0	9,651.0		
4	UPPER WABASH RIVER											
	Crop and pasture	2,321.0	2,052.0	2,637.0	3,380.0	2,394.0	3,121.0	1,540.0	2,032.0	1,649.0		
	Other agriculture	461.0	178.0	228.0	294.0	218.0	282.0	166.0	214.0	144.0		
	Transportation	101.0	60.0	78.0	269.0	71.0	265.0	52.0	196.0	175.0		
	Urban	714.0	288.0	413.0	1,508.0	398.0	1,450.0	388.0	1,428.0	853.0		
	Other	213.0	203.0	287.0	421.0	260.0	388.0	164.0	255.0	214.0		
	TOTAL	3,810.0	2,781.0	3,643.0	5,872.0	3,341.0	5,506.0	2,310.0	4,125.0	3,035.0		

TABLE C-36. SUMMARY OF AVERAGE ANNUAL FLOOD DAMAGES (CONTINUED)
December 1968 Price Levels (\$1,000)

No	Subbasin and damage category	Average annual damages - no federal projects		Residual average annual damages existing projects		Residual average annual damages existing and authorized projects		Residual average annual damages existing, authorized, and early action plan projects		Residual average annual damages existing, authorized, early action and long range plan projects	
		1968	1968	1980	2020	1980	2020	1980	2020	1980	2020
5	MIDDLE WABASH RIVER										
	Crop and pasture	3,945.0	2,928.0	3,592.0	4,623.0	3,027.0	3,894.0	2,049.0	2,633.0	1,999.0	
	Other agriculture	2,464.0	1,459.0	1,863.0	2,397.0	1,337.0	1,721.0	976.0	1,257.0	705.0	
	Transportation	481.0	338.0	343.0	1,138.0	283.0	957.0	204.0	690.0	491.0	
	Urban	592.0	291.0	377.0	1,173.0	341.0	1,064.0	187.0	563.0	473.0	
	Other	367.0	303.0	351.0	616.0	317.0	549.0	347.0	634.0	261.0	
	TOTAL	7,849.0	5,319.0	6,526.0	9,967.0	5,305.0	8,185.0	3,763.0	5,777.0	3,929.0	
6	EMBARRAS RIVER										
	Crop and pasture	1,879.0	1,879.0	2,386.0	2,988.0	1,500.0	1,879.0	685.0	858.0	641.0	
	Other agriculture	407.0	407.0	516.0	647.0	130.0	163.0	59.0	74.0	52.0	
	Transportation	209.0	209.0	296.0	870.0	102.0	296.0	38.0	112.0	76.0	
	Urban	117.0	117.0	141.0	524.0	88.0	305.0	83.0	292.0	254.0	
	Other	170.0	170.0	310.0	358.0	160.0	238.0	78.0	119.0	94.0	
	TOTAL	2,782.0	2,782.0	3,649.0	5,387.0	1,980.0	2,881.0	943.0	1,455.0	1,117.0	
7	LITTLE WABASH RIVER										
	Crop and pasture	2,876.0	2,876.0	3,803.0	4,953.0	2,880.0	3,748.0	2,032.0	2,646.0	2,104.0	
	Other agriculture	524.0	524.0	682.0	887.0	486.0	633.0	410.0	534.0	476.0	
	Transportation	230.0	230.0	318.0	815.0	203.0	561.0	172.0	444.0	404.0	
	Urban	114.0	114.0	193.0	685.0	126.0	409.0	104.0	369.0	308.0	
	Other	160.0	160.0	209.0	295.0	173.0	242.0	99.0	141.0	83.0	
	TOTAL	3,904.0	3,904.0	5,205.0	7,635.0	3,868.0	5,593.0	2,817.0	4,134.0	3,375.0	
8	LOWER WABASH RIVER										
	Crop and pasture	1,636.0	1,502.0	1,936.0	2,504.0	1,756.0	2,273.0	1,221.0	1,578.0	1,258.0	
	Other agriculture	1,014.0	938.0	1,202.0	1,550.0	948.0	1,222.0	868.0	1,119.0	1,028.0	
	Transportation	100.0	92.0	118.0	399.0	108.0	366.0	56.0	191.0	141.0	
	Urban	6.0	6.0	8.0	32.0	8.0	29.0	3.0	11.0	10.0	
	Other	115.0	107.0	149.0	354.0	140.0	236.0	71.0	122.0	84.0	
	TOTAL	2,871.0	2,645.0	3,413.0	4,739.0	2,960.0	4,126.0	2,219.0	3,012.0	2,521.0	

TABLE C-36. SUMMARY OF AVERAGE ANNUAL FLOOD DAMAGES (CONTINUED)
December 1968 Price Levels (\$1,000)

Subbasin and damage category	No	Average annual damages - no federal projects		Residual average annual damages existing projects		Residual average annual damages existing and authorized projects		Residual average annual damages existing, authorized and early action plan projects		Residual annual damages existing, authorized, early action and long range plan projects	
		1968	1968	1980	2020	1980	2020	1980	2020	1980	2020
TOTAL OF SUBBASINS											
Crop and pasture		24,513.0	22,158.0	28,482.0	37,437.0	23,138.0	30,056.0	13,953.0	18,244.0	15,793.0	
Other agriculture		10,547.0	8,123.0	10,485.0	13,675.0	7,793.0	10,120.0	4,551.0	5,903.0	5,069.0	
Transportation		3,274.0	2,775.0	4,133.0	11,516.0	3,281.0	9,215.0	1,622.0	4,573.0	4,184.0	
Urban		7,705.0	4,513.0	7,265.0	24,138.0	3,552.0	12,520.0	2,382.0	8,828.0	7,599.0	
Other		1,870.0	1,770.0	2,394.0	3,635.0	1,977.0	3,116.0	1,222.0	1,996.0	1,418.0	
TOTAL		47,909.0	39,339.0	52,759.0	90,401.0	39,761.0	65,027.0	23,730.0	39,544.0	34,063.0	

SECTION IV – ALTERNATIVE MEANS OF MEETING NET NEEDS

20. GENERAL

In developing a plan to meet anticipated needs, a myriad of alternative means must be considered. These alternative means, ranging from doing nothing to rather sophisticated systems, need to be costed as if the needs were to be met by single-purpose solutions. In general, the alternatives fall into several categories which are listed below:

a. Do Nothing

All too often when a need is anticipated the first inclination is to develop some kind of a "glamorous solution" whereas that apparent solution may create more problems for the future than it solves. Therefore, it may be that for certain kinds of needs "doing nothing" may be the most efficient solution. However, for other kinds of needs, particularly where the needs are physically satisfying as contrasted to spiritually satisfying, "doing nothing" is seldom, if ever, a viable alternative. For example, where the available water is insufficient to meet the domestic and industrial water needs of an area "doing nothing" is not a relevant alternative. Some means must be developed to bring the needed water to the point of need or to relocate the populace, or part of it, to where there is sufficient water and other resources so that the populace might live meaningfully.

b. Long Term Logic

In any planning for the use of natural resources to meet the need for a growing populace one is confronted with the realization that at some time there must be a limit on the number of people that the resource base can sustain. However, it is difficult for the natural resource planner to come to grips with population controls. This problem transcends many disciplines and institutions and goes to the heart of "individual preference". Although we recognize the necessity of population controls in the world, the nation and the basin, we have addressed ourselves to meeting the needs of the projected population for fifty years ahead. For a meaningful population control program to be effected it must first be established for the World and the Nation and the Wabash Basin fitted into that broad program. It will not be easy for it grates on the sensitivity of free institutions and individuals in many ways. However, it must be done for even with excellent foresight, optimum use of the resource base, scientific and technological advances, the supportive needs of an ever increasing populace will outstrip the available natural resource base at some time. We are convinced that everything we are planning and doing today is only temporary if the following measures are not effected for the long term.

(1) **Population Control.** Population growth needs to be kept in harmony with the available natural resource base and the availability of nature to renew that resource base.

(2) **Resource Recycling.** Technology needs to be applied to recycling of basic natural resources rather than continuing to deplete the basic natural resources base. Much of our present effort goes into "curing the disease" rather than "correcting the cause". For example we properly are concerned with "waste treatment" as a means of improving water quality. However, wastes as we know them are not wastes at all but rather a misplaced resource with a tremendous capability to benefit mankind if recycled properly. Another example lies in the low efficiency involved in the production of electrical energy. Present technology only allows us to extract about 40 percent of the energy in fossil fuels with the remainder being lost as a benefit to mankind. We need to either improve the efficiency

of electrical generating plants or determine how to efficiently use the unused energy. This would reduce the extraction of the relatively non-replaceable fossil fuel (or nuclear material) and reduce the input of heat energy into the atmosphere and water courses.

(3) **Population Demand.** With a fixed capability of the natural resource base to withstand population pressures at any given location, excess population pressures can stress the base beyond its assimilative capability. If the projected population growth is more evenly distributed the ability of the resource base to assimilate the load is significantly increased. It is a fact that any structure can withstand a greater load if the load is distributed rather than concentrated. We should apply this knowledge by encouraging population dispersal thereby assuring that the atmosphere and water courses can better assimilate those by-products of man's endeavors after maximum elimination of the undesirable by-products at their source.

21. STRUCTURAL MODIFICATIONS

Irrespective of any and all of the other alternatives, structural modification must be effected if the fixed resource base is to adjust to meet man's numbers, needs and desires. Structural modifications usually involve a rearranging of basic resources. Structural modifications – whether a dam, channel work, levee, parks or sewage treatment plants – represent man's endeavor to aid nature in doing what nature could do by itself if man were not accelerating his demands on nature faster than nature can adjust to accommodate man and man's needs. Structural modifications while neither the "panacea" nor "bug-a-boo" that are claimed by some are necessary if most efficient use is to be made of replaceable resources. The structural modifications considered in this study are discussed in the following paragraphs for each category of water and water related needs.

a. Municipal and Industrial Water Supply

There are several basic alternatives which are considered to meet present and future needs.

(1) **Storage of Water.** Storage of water – whether in lakes and ponds, or in geologic formations – provides a mechanism wherein excess water is "banked" until needed. Such storage has a dampening effect on both floods and droughts. The Wabash Basin has historically received about forty inches of precipitation each year. The runoff from this forty inches amounts to an average of about thirteen inches with the remainder being absorbed by plants, soil and atmosphere. Thus, only about one-third of the moisture that falls on the basin is useable for surface storage purposes and for dampening out the extreme low (drought) flows. Municipal and industrial water uses must be carefully considered lest the by-products of man's endeavors leave the water unuseable for the other purposes without an undue amount of corrective treatment. Storage can be effected in multiple purpose projects or in single purpose structures for municipal and industrial use. Multiple purpose structures are considered superior to single purpose structures since a greater resource use benefiting more people is possible. Thus in plan formulation multiple purpose structures were accorded a preferred position to single purpose structures.

(2) **Ground Water.** Where available in adequate quantity and quality, the use of ground water to meet municipal and industrial water supply needs was always considered. This takes the form of developing new ground water aquifers or expanding the use of presently developed aquifers. The use of ground water was concluded to be a "realistic" alternative only when that which was withdrawn could be replaced. This

replacement may be either through normal infiltration processes or by artificial (pumping) processes. Artificial recharge necessitates a dam or similar structure whereby a supply for recharge can be obtained. Thus artificial recharge storage water in the voids within the crust of the earth, can be compared with surface storage in a reservoir or lake. Normal infiltration or recharge takes place through seepage from both the earth's land surface and from water courses. In keeping with the principle of "retaining options" where it was not concluded that the water withdrawn could be replaced, other alternatives were considered. The subcommittee was concerned lest water withdrawn from ground aquifers would exceed replenishment rates and would cause lower water tables and significant changes in soil moisture conditions which among other things could radically alter the ecology of the affected area. We were greatly concerned with the lack of our present ability to predict what the total cost would be by overuse of the ground water resource. We were equally concerned that we should make optimum use of ground water and it was therefor given prime priority in meeting many municipal and industrial water supply needs.

(3) **Regional Systems.** A number of opportunities exist for communities to share in a system development for supplying and distributing water which would collectively be more efficient than each community operating independently. In a number of cases the most efficient thing for a community to do would be to buy water from neighboring communities which have an adequate source of supply. Our thinking regarding regional systems is in its infancy and the potentials are limited only by our imagination and initiative in furthering its use. In the future, large regional municipal and industrial water supply systems could be similar to electrical power grids in use at the present time. Such regionalized systems could minimize the adverse effects of localized drought conditions and minimize the reserves that must be maintained as insurance against droughts. In order for regional systems to be maximally effective, legislative constraints against interbasin transfers of waters would have to be relaxed. Unquestioned legislative constraints bias our thinking and preclude due consideration of regional systems which may be in the public interest.

(4) **Water Reuse.** Reuse of water has become a viable alternative with recent advances in technology, even though only on a small scale and at high cost if for domestic consumption. Reuse of treated wastewaters for industrial process water is now a fact in the Wabash River basin. We fully expect the reclamation and reuse of wastewaters for both domestic and industrial use to become more attractive in water-short areas prior to 2020. However, water reuse was not contemplated as one of the water supply alternatives in the Wabash River basin through the period of study. Later in the century, the use of reclaimed wastewaters may become more attractive as some areas approach the end to an inexpensive supply. Until that time, there is merit in developing the more inexpensive sources, both because they are economical and because their use keeps open all options for water supply. Water reuse then will provide for adequate supply far beyond the study period. Adequate health safeguards including fail-safe systems also pose a restriction on domestic water reuse.

(5) **Summary.** A summary of the specific alternatives considered for each subbasin is presented in table C-37.

b. **Water Quality Control**

The alternatives considered here consist of those methods which could contribute to meeting the established water quality standards. The specific measures are listed below.

(1) **Advanced Waste Treatment.** As used in our deliberations, normal waste treatment was defined as primary and secondary treatment plus chlorination of the effluent. These processes were projected to effect a 90 percent BOD removal plus other beneficial effects. When such normal waste treatment would not result in meeting the water quality standards of the receiving stream advanced waste treatment measures were considered. This additional treatment was nomenclatured as 95 percent, 97 percent, and 98

TABLE C-37. WATER SUPPLY FORMULATION CONSIDERATIONS
(For localities with supplies of 1,000,000 gallons/day or more in 1970)

Area	Additional needs		Remarks
	1980	2020	
PATOKA SUBBASIN			
Jasper	0.2	5.2	To be obtained from Patoka Reservoir.
Huntingburg	0.2	1.8	Small watershed project provides least cost alternative.
Princeton	0.2	4.0	Least cost alternative provided by ground water west of city.
EAST FORK WHITE SUBBASIN			
New Castle	--	10.1	9.6 mgd developable from ground water and stream flow; SCS project on Big Blue can provide remainder through 2020.
Shelbyville	--	5.5	Additional supplies to be furnished by ground water.
Greenfield	--	6.2	Develop ground water as needed southward, toward Big Blue River.
Edinburg	--	2.3	Least cost alternative is development of ground water.
Franklin	--	4.3	Least cost alternative is development of ground water.
Columbus	6.1	30.7	Needs can be met by ground water and stream flow.
Greensburg	--	2.6	Least cost alternative is to develop ground water and withdrawals from Downeyville Reservoir.
Vernon and North Vernon	--	2.0	Least cost alternative provided by SCS Vernon Fork project.
Bloomington	--	14.7	Can be met from storage in Monroe Reservoir.
Monroe County	0.5	2.3	Least cost alternative is development of local impoundments.
WEST FORK WHITE SUBBASIN			
Winchester	0.6	5.3	Least cost alternative is development of ground water and utilizing storage in Parker Reservoir near 2020.

TABLE C-37. WATER SUPPLY FORMULATION CONSIDERATIONS (CONTINUED)
 (For localities with supplies of 1,000,000 gallons/day or more in 1970)

Area	Additional needs		Remarks
	1980	2020	
WEST FORK WHITE SUBBASIN (CONTINUED)			
Mt. Summit	0.2	0.8	Ground water provides least cost alternative.
Muncie	2.8	39.2	Least cost alternatives include pumping from White River to Prairie Creek Reservoir development of additional ground water and utilization of 30 mgd from Parker Reservoir by 2020.
Fortville	--	0.3	Development of ground water is least cost alternative.
Anderson	--	21.3	Least cost alternatives are development of additional ground water with needs beyond 1985 met by Parker Reservoir.
Alexandria	0.3	3.3	Additional well fields seen as least cost alternative.
Elwood	0.3	4.8	Additional well fields seen as least cost alternative with possible future withdrawals White River.
Tipton	--	0.8	Additional ground water least cost alternative.
Noblesville	--	0.6	Additional ground water least cost alternative.
Indianapolis	14.0	200.0	Least cost alternative is development of additional ground water sources to 1980; after 1980, needs to be met by ground water and Fall Creek Parker, Big Walnut and Big Blue Reservoirs.
Brownsburg	--	2.0	Continued development ground water is least cost alternative.
Plainfield	--	2.3	Continued development ground water is least cost alternative.
Danville	--	0.2	Continued development ground water is least cost alternative.
Mooreville	--	0.5	Develop ground water as least cost alternative.
Martinsville	--	2.7	Develop ground water as least cost alternative.
Greencastle	--	8.8	Develop ground water as least cost alternative.
Brazil	--	3.1	Develop ground water as least cost alternative.
Linton	--	0.8	Develop ground water as least cost alternative.
Washington	--	1.8	Develop ground water as least cost alternative.
Bicknell	--	0.4	Develop ground water as least cost alternative.
UPPER WABASH SUBBASIN			
Huntington	--	3.7	Develop ground water as least cost alternative.
Bluffton	--	1.2	Develop ground water as least cost alternative.
Portland	0.05	4.8	Develop ground water as least cost alternative.
Union City	--	3.4	Develop ground water as least cost alternative.

TABLE C-37. WATER SUPPLY FORMULATION CONSIDERATIONS (CONTINUED)
 (For localities with supplies of 1,000,000 gallons/day or more in 1970)

Area	Additional needs		Remarks
	1980	2020	
(mgd)			
UPPER WABASH SUBBASIN (CONTINUED)			
Hartford City	1.5	9.4	Develop ground water as least cost alternative.
Marion	--	13.5	Develop ground water as least cost alternative.
Wabash	--	8.0	Develop ground water as least cost alternative.
North Manchester	--	0.5	Develop ground water as least cost alternative.
Warsaw	--	6.6	Develop ground water as least cost alternative.
Columbia City	--	2.4	Develop ground water as least cost alternative.
South Whitley	--	0.8	Develop ground water as least cost alternative.
Peru	--	4.3	Develop ground water as least cost alternative.
Rochester	--	0.7	Develop ground water as least cost alternative.
Winamac	--	2.3	Develop ground water as least cost alternative.
Kokomo	20.6	72.3	Least cost alternative in continued development of ground water, reuse of industrial water, possible withdrawals from Mississinewa Reservoir and possible utilization of storage in Pipe Creek Reservoir.
Frankfort	--	0.9	Least cost alternative is continued development of ground water.
Monticello	--	1.1	Least cost alternative is continued development of ground water.
Lafayette	--	41.6	Least cost alternative is ground water development and stream flows.
Flora	--	0.2	Least cost alternative is ground water development and stream flows.
Delphi	--	0.1	Least cost alternative is ground water development and stream flows.
MIDDLE WABASH SUBBASIN			
Lebanon	--	0.4	Least cost alternative is development of ground water.
Fowler	--	0.6	Least cost alternative is development of ground water.
Rural Warren County Industry	3.6	31.0	Least cost alternative is development of ground water.
Attica	0.1	2.8	Least cost alternative is development of ground water.
Crawfordsville	2.5	15.3	Development of ground water is least cost alternative with later withdrawals from surface water impoundments and stream flow. Early action Crawfordsville Reservoir available for future supply.
Rockville	--	0.4	Least cost alternative is to develop ground water.
Rural Vermillion County Industry	--	20.1	Least cost alternative is to develop ground water.

TABLE C-37. WATER SUPPLY FORMULATION CONSIDERATIONS (CONTINUED)
 (For localities with supplies of 1,000,000 gallons/day or more in 1970)

Area	Additional needs		Remarks
	1980	2020	
MIDDLE WABASH SUBBASIN (CONTINUED)			
Terre Haute Area	12.2	95.7	Development of ground water is least cost alternative with withdrawals from Wabash furnishing bulk of supply by 2020.
Sullivan	--	0.7	Least cost alternative is to develop ground water.
Vincennes	--	13.3	Least cost alternative is to develop ground water.
Hoopeston	0.6	4.2	Development of ground water is least cost alternative.
Rossville	--	0.4	Development of ground water is least cost alternative.
Danville	8.4	35.8	State plans to build reservoir of 30 mgd capacity in near future. Later needs to be met by ground water development.
Georgetown	0.1	1.5	Least cost alternative likely to be development of surface water impoundment or develop source away from local area, possibly from State Reservoir near Danville.
Rantoul	--	1.2	Development of ground water is least cost alternative.
Urbana-Champaign	--	9.5	Development of ground water is least cost alternative.
Remainder of Champaign County	--	0.22	Development of ground water is least cost alternative.
Marshall	--	4.5	Development of ground water is least cost alternative.
Robinson	2.1	9.4	Development of ground water is least cost alternative.
Paris	2.4	7.3	Development of impoundment on Sugar Creek in conjunction with needed water quality control storage is least cost alternative
EMBARRAS SUBBASIN ^{1/}			
Lawrenceville	--	0.4	Development ground water as least cost alternative.
Newton	--	0.28	Least cost alternative for future supply likely to be stream flow releases from Lincoln Reservoir.
LITTLE WABASH SUBBASIN			
Mattoon	--	3.8	Least cost alternative is purchase of water from SCS project.
Olney	--	2.4	City is presently developing water supply reservoir on East Fork of Fox River which will meet needs through study period.
Fairfield	--	2.9	Least cost alternative is utilization of storage in authorized Lincoln Reservoir.

^{1/} Cities of Charleston, Arcola and Casey have present supplies of less than one mgd. Charleston presently uses 1.4 mgd and is planning for additional supply from the authorized Lincoln Reservoir to meet future needs. Arcola and Casey must develop new sources or obtain water outside of local area.

percent treatment which is premised on the BOD removal parameter and does not indicate the other parameters inherent in the processes achieving the indicated degree of BOD removal. This alternative is considered applicable only to collectable pollutants and other methods which need to be considered for uncollected pollutants.

(2) **Flow Augmentation.** Flow augmentation was considered as an alternative to advanced waste treatment but only after adequate treatment at the source (secondary treatment plus chlorination of the effluent). We did not consider flow augmentation as a viable substitute for treatment at the source or point of waste discharge into the water course. Flow augmentation was considered and costed as an alternate to advanced waste treatment and in combination with various degrees of treatment. We were concerned with achieving the least costly means of meeting water quality standards by either a single alternative or a combination of alternatives. In general, it was found that flow augmentation was most efficient only when it would contribute to meeting the standards for more than one community.

(3) **Dilution.** Dilution was considered as a means of meeting water quality standards only when the pollutants to be diluted are relatively uncollectable. We concluded that dilution was viable for agricultural pollutants such as nutrients and dissolved solids which wind their way into the water courses even though maximum effort has been effected at the source to prevent their induction into the water course. Dilution of water would need to be provided from storage structures or from ground water sources.

(4) **Regional Systems.** In many instances Regional Treatment Plants can be effective in providing the quality of desired stream flows in an economically efficient manner. A number of small communities may convert or combine with larger communities to provide advanced treatment more efficiently than they could acting independently after some degree of treatment has been provided at the point or near the point of collection. Small communities often lack the financial resources to construct and efficiently operate sophisticated treatment plants that are required to meet water quality standards. Regional waste water treatment systems operating in harmony with regional water supply systems have the potential of providing a total regional water management system.

c. **Flood Damage Reduction**

Flood damage reduction is applicable both to existing developments and land use as well as to those future developments on flood plain lands. There were three types of structures which were considered as alternatives for control of flood damages where they would occur.

(1) **Channel Development.** Channel development increases an existing water course's capacity to convey a given quantity of flow with a lesser amount of energy required to convey this flow. Consequently the flood heights are reduced in the area where the channel capacity has been increased. Channel development is most effective for smaller channels (streams) where damaging flood frequencies are low, and where provision of high degrees of protection is not efficient. Channel development is often compatible with storage development. Proper planning, design and construction of channel improvement will minimize any conflict with environmental objectives.

(2) **Protective Measures.** Protective measures such as levees and floodwalls may be used to serve as a physical barrier to keep overflows from the water course from entering floodwater damageable areas. The use of protective measures is most efficiently used along larger water courses and where the value of the area to be protected is very high.

TABLE C-38. DISCUSSION OF WATER QUALITY ALTERNATIVES
FOR MAJOR COMMUNITIES

Problem area	Remarks
PATOKA SUBBASIN	
Jasper	Secondary treatment and effluent disinfection plus flows augmented from Patoka Reservoir.
Huntingburg	Secondary treatment and effluent disinfection plus flows augmented from Patoka Reservoir.
Princeton	Secondary treatment and effluent disinfection, plus piping treated wastewaters to the Patoka River, taking advantage of flows augmented from Patoka Reservoir.
EAST FORK WHITE	
Greenfield Bloomington (South Plant) New Castle	Advance waste treatment needed. Has installed lagoon for additional treatment. With availability of SCS structures, secondary treatment and phosphate removal should be adequate through 1980. Facilities for 95 percent BOD removal until 2010. Advanced treatment needed by 2010.
Shelbyville Franklin	Flows from Big Blue Reservoir would be adequate. Transport waste waters to Sugar Creek as well as Youngs Creek until about 1985, then wastes transported to Big Blue River.
Rushville Columbus	Advance waste treatment with phosphate removal. Releases from Big Blue, Downeyville and Clifty Creek Reservoirs and waste water returns upstream estimated adequate.
Greensburg Mitchell	Advance waste treatment and phosphorus removal needed. Piping treated and disinfected waste waters four miles down Rock Lick Branch to East Fork White River.
Vernon-North Vernon	Effluents can be transported below mouth South Fork Vernon Fork to take advantage of storage potential of Otter Creek Reservoir.
Austin-Scottsburg Paoli, French Lick, West Baden	Advanced waste treatment needed. Flows in Lick Creek from three planned reservoirs adequate to about 2000; then advance waste treatment needed at Paoli.
Loogootee	Transport waste waters to mouth of Friends Creek at East Fork White River
Whiteland and New Whiteland	Advanced waste treatment in a combined plant.
WHITE RIVER AND WEST FORK WHITE	
Winchester Elwood Tipton Brazil Pendleton Linton	Advanced treatment needed. Advanced treatment needed. Advanced treatment needed. Advanced treatment needed. Advanced treatment needed. Advanced treatment needed.

TABLE C-38. DISCUSSION OF WATER QUALITY ALTERNATIVES
FOR MAJOR COMMUNITIES (CONTINUED)

Problem area	Remarks
WHITE RIVER AND WEST FORK WHITE (CONTINUED)	
Bloomington (Plant No. 2) Alexandria	Advanced treatment needed. Develop storage in SCS structure 82-I-A on Pipe Creek.
Muncie-Anderson-Indianapolis	95 to 97 percent BOD removal plus 90 cfs guaranteed low flow at Muncie; 95 to 97 percent BOD removal at Anderson and 97 percent BOD removal in the Indianapolis area with 50 cfs guaranteed low flow at mouth of Fall Creek, totalling a guaranteed low flow at Morris Street of 180 cfs.
Brownsburg-Plainfield-Mooresville	Flow from SCS project 60-VII on White Lick Creek. Brownsburg must pipe treated wastewaters below the dam.
Danville	Low flow releases from SCS project 60-IX until 1980, then advanced treatment needed.
Greencastle	Guaranteed low flow of 19 cfs from Big Walnut Creek Reservoir.
Bicknell-Washington-Petersburg	Transportation of waste waters to West Fork White River - optional AWT.
UPPER WABASH RIVER	
Celina, Ohio	Advanced waste treatment needed.
Dunkirk, Indiana	Advanced waste treatment needed.
Fairmount-Jonesboro-Gas City	Advanced waste treatment needed - costs can be minimized by adopting regional system.
Frankfort, Indiana	Advanced waste treatment needed.
Kokomo, Indiana	Advanced waste treatment needed.
Marion	Advanced waste treatment needed.
Portland	Advanced waste treatment needed.
Union City	Advanced waste treatment needed.
Montpelier	Advanced waste treatment needed.
Hartford City	Advanced waste treatment needed.
Grissom Air Force Base	Advanced waste treatment needed.
Warsaw-Winona Lake	Advanced waste treatment needed - costs can be reduced by a combined system.
Coldwater, Ohio	Pipe treated waste waters to Little Beaver Creek and augment low flows from SCS project 17-II.
Bluffton	Secondary treatment, disinfection and nutrient removal with augmentation of low flows from SCS reservoirs on Little Beaver Creek and Limberlost Creek.
Huntington	Augmentation of low flow from SCS reservoir projects on Little River, Little Beaver Creek and Limberlost Creek.
Wabash-Lagro	Low flow augmentation from reservoirs.
Peru	Low flow augmentation from reservoirs.
Columbia City	Pipe treated effluents to Eel River and add advanced waste treatment after 2000.

TABLE C-38. DISCUSSION OF WATER QUALITY ALTERNATIVES
FOR MAJOR COMMUNITIES (CONTINUED)

Problem area	Remarks
UPPER WABASH RIVER (CONTINUED)	
Rochester Lafayette-West Lafayette	Add nutrient removal facilities. Secondary treatment with flow augmentation from all proposed upstream reservoirs involving releases from Lafayette Reservoir.
MIDDLE WABASH RIVER	
Lebanon, Indiana	Advanced waste treatment needed.
Paxton, Illinois	Advanced waste treatment needed.
Georgetown, Illinois	Advanced waste treatment needed.
Sullivan, Indiana	Advanced waste treatment needed.
Hoopeston, Illinois	Advanced waste treatment needed.
Robinson, Illinois	Advanced waste treatment needed.
Champaign-Urbana, Illinois	Advanced treatment with combined system.
Rantoul-Chanute Air Force Base	Advanced treatment with combined system.
Danville, Illinois	Advanced waste treatment needed.
Crawfordsville, Indiana	AWT with alternative provided by Crawfordsville Reservoir.
Rockville, Indiana	Pipe effluents to Big Raccoon Creek
Terre Haute, Indiana	Secondary treatment and disinfection adequate until 1980, advanced waste treatment could be necessary by 2000.
Paris, Illinois	Using storage from SCS structure 44-1 on Sugar Creek until 1980, then providing 95% BOD removal.
Marshall, Illinois	Pipe effluents seven miles to Wabash River.
EMBARRAS RIVER	
Tuscola	Advanced waste treatment needed.
Charleston	Advanced waste treatment needed.
Mattoon	Advanced waste treatment needed.
Newton	Discharge to Embarras River in conjunction with releases from Lincoln Reservoir adequate.
LITTLE WABASH RIVER	
Effingham	Secondary treatment phosphorus removal, and piping effluents to the Little Wabash River.
Flora	Piping waste waters to the Little Wabash River with flow releases from Louisville Reservoir.
Olney	90 percent BOD removal with flows from SCS reservoir 39-IX.
Fairfield	Piping waste waters to Little Wabash River with releases from Louisville Reservoir.
Albion	Piping waste waters to the Wabash River below Grayville.
Carmi	90 percent BOD removal, augmenting flow from Helm and Louisville Reservoir.

TABLE C-38. DISCUSSION OF WATER QUALITY ALTERNATIVES
FOR MAJOR COMMUNITIES (CONTINUED)

Problem area	Remarks
LITTLE WABASH RIVER (CONTINUED)	
Wayne City	Maintain flow of at least 20 cfs in Skillet Fork, augmenting flows with releases from Helm Reservoir
LOWER WABASH RIVER	
None	

1/ In every case, a minimum of secondary waste treatment giving 90 percent BOD removal, plus effluent disinfection, is presupposed as a condition to further remarks.

(3) **Storage Structures.** Storage structures such as lakes, ponds, and reservoirs are useful in holding peak flood flows until they can be accommodated by the downstream water courses. Storage structures have a beneficial flood reduction effect for all areas downstream from them whereas the beneficial effects of protective measures and channel development are contiguous to or just upstream from the area of construction. Storage structures tend to optimize economic efficiency by being adaptable for multiple uses with usually lower added costs. For any water resource system the multiple purpose storage structures must always serve as the hub or nucleus of such a system. The big public question relates to the size of such structures. There is no generally applicable answer to such questions for each structure or combination of such structures needs to be sized to meet the specific problem area for which they are applicable.

22. NON-STRUCTURAL MODIFICATIONS

For many of the indicated needs, non-structural modifications may either take care of the need or some part of the need. In many cases needed damage reduction can be effected with nominal or little economic costs but the institutional costs may be high. However, in all cases, the subcommittee tried to use non-structural modification before applying structural modifications. Those non-structural modifications considered and their areas of application are as follows.

a. Flood Plain Management

Irrespective of how many reservoirs, levees, and channel development projects are built, it is clear that the annual flood damages will continue to rise unless institutional constraints and incentives are provided to prevent further development within the flood plain. The problem lies not in knowing what to do but more in how to do it in consonance with the "due process" clause in the Constitution and in consonance with the property rights of citizens.

b. Environmental Corridors

Environmental corridors have been called many things such as scenic streams and green belts. We prefer the broader connotation of "environmental corridors". These corridors in public ownership and/or management would tend to reduce flood damages by precluding subsequent development within the flood plain; would provide for spiritual enrichment of the public by preserving the best of the remaining streams and stream banks for use and enjoyment of present and future generations; and would "red flag" these areas for various uses consistent with good land use planning. There are two types of "environmental corridors", namely rural corridors and urban corridors. The rural corridors represent the best remaining vestiges of the historic stream cultures of the basin. The urban corridors represent the stream cultures that are easily accessible to the mass of the environmentally and often times economically deprived public. Environmental corridors in rural areas are intended to maintain a status quo on clearing and extending of agricultural pursuits onto existing relatively undisturbed environment. Scenic easements would be employed to the maximum extent practicable with fee acquisition limited only to those areas (parking, access, etc) necessary to assure public usability. It is not anticipated that riparian rights of contiguous land owners would be abridged without due compensation. The administration or stewardship of such corridors would be vested in non-Federal jurisdictions except in those rare instances, if any exist, where they are of such national interest that Federal stewardship is necessary or they are an integral part of a Federal project. Urban corridors on the other hand are intended to reconstruct a viable stream environment to one that has been deteriorated from human abuse. The urban corridors are expected to provide a segment of long range plan for urban reconstruction, or arresting of further degradation of urban quality. This should provide a central thrust in urban communities for application of Federal and non-Federal funds toward a long range objective. The objective here is clear - to provide for the highest and best use of flood prone lands and to minimize further encroachments onto flood plains and relocate existing developments outside of the flood plain as relocation or renovation of existing developments takes place.

c. Land Treatment

Land treatment, consisting of adjustments in cropping patterns, changed land use, reforestation, etc., has the potential for some reduction in flood damages, pollution abatement and conservation of the present and future productive capability of the land. Land treatment as we have traditionally thought of it has been related to short term increased productivity as well as long term preservation of the productive capability. The latter is of greater concern in planning for the basin and accordingly has been accorded the higher priority of the two. Additionally, high priority has been accorded to adequate treatment of those lands which are necessary to preserve and extend the functional life of water resource projects and to those lands which are deteriorating so rapidly at present that they require early remedial action or they will lose their resource viability.

TABLE C-39. SUMMARY OF ALTERNATIVE PROJECTS
CONSIDERED BY SUBBASIN

Reservoir	Stream	Reservoir	Stream
MAJOR RESERVOIR PROJECTS			
<u>Patoka River</u>		<u>Middle Wabash River (Continued)</u>	
Winslow	Patoka River	Danville	Vermilion River
Flat Creek	Flat Creek	Kickapoo	Middle Fork Vermilion
		Little Vermilion	Little Vermilion
<u>East Fork White River</u>		Mill Creek	Mill Creek
Millport	Muscatauck River	Montezuma	Wabash River
Shoals	East Fork White River	North Fork Vermilion	North Fork Vermilion
Vernon Fork	Vernon Fork	Sugar Creek	Sugar Creek
		Sugar Mill Creek	Sugar Mill Creek
<u>West Fork White River</u>		<u>Embarras River</u>	
Bean Blossom	Bean Blossom Creek		
Fortville	Fall Creek		
Frankton	Pipe Creek	North Fork Embarras	North Fork Embarras
Perkinsville	West Fork White River	Woodbury	Muddy Creek
Killbuck	Killbuck Creek	Crooked Creek	Crooked Creek
Spencer	West Fork White River		
Boy Scout	Fall Creek	<u>Little Wabash River</u>	
Mooresville	Whitelick Creek	Elm River	Elm River
Richland	Richland Creek	Wilcox Bridge	Little Wabash River
		Big Muddy	Weather-Big Muddy Creek
<u>Upper Wabash River</u>		Effingham	Little Wabash River
Tippecanoe	Tippecanoe River	Fox River	Fox River
Delphi	Wabash River	Horse Creek	Horse Creek
Petes Run	Wildcat Creek	Brush Creek	Brush Creek
<u>Middle Wabash River</u>		<u>Lower Wabash River</u>	
Big Creek	Big Creek		
Brouilletts	Brouilletts Creek	Bonpas	Bonpas Creek
SMALL WATERSHED PROJECTS			
Hydrologic subbasin and type	Potential number of sites	Hydrologic subbasin and type	Potential number of sites
<u>Patoka River</u>		<u>Middle Wabash River</u>	
Multiple-purpose	91	Multiple-purpose	109
Single purpose (FP or WS)	4	Single purpose (FP or WS)	35
Single purpose (WS only)	1	Single purpose (WS only)	51
<u>East Fork White River</u>		<u>Embarras River</u>	
Multiple-purpose	199	Multiple-purpose	57
Single purpose (FP or WS)	35	Single purpose (FP or WS)	43
Single purpose (WS only)	27	Single purpose (WS only)	7
<u>West Fork White River</u>		<u>Little Wabash River</u>	
Multiple-purpose	260	Multiple-purpose	88
Single purpose (FP or WS)	34	Single purpose (FP or WS)	64
Single purpose (WS only)	9	Single purpose (WS only)	15
<u>Upper Wabash River</u>		<u>Lower Wabash River</u>	
Multiple-purpose	27	Multiple-purpose	25
Single purpose (FP or WS)	18	Single purpose (FP or WS)	4
Single purpose (WS only)	18	Single purpose (WS only)	—

SECTION V – DEVELOPMENT OF NATIONAL INCOME EFFICIENCY PLAN

23. GENERAL METHODOLOGY

In developing the National Income Efficiency Plan several basic procedural criteria were used. These criteria include:

- a. Project proposals were developed by several agencies in accord with their particular expertise.
- b. Potential projects were compared with identified needs to determine which project or combination of projects could most efficiently meet the needs.
- c. Maximum net returns on investments provided the basis for plan element selections except where the maximum net return required a substantially higher investment than the next best maximum net return combination.
- d. Uniform interest rates were assumed for all investments. In determining the most efficient means of meeting needs, the selection of the best array of resource development is independent of the interest rate. However, the interest rate becomes of prime importance in determining when to proceed with a program.

24. SPECIFIC METHODOLOGY

In formulating the National Income Efficiency Plan, the Plan Formulation Subcommittee used a method which we shall call "progressive summation" for lack of a better term. Progressive summation simply means finding that project, or least combination of projects, which will meet the greatest number of needs. For example, if we let:

X,Y,Z each represent some need and A,B,C each be a project that can meet one or more of the needs:



Since A can satisfy X, Y, Z and B can satisfy Y, Z and C can satisfy X, we concluded that A was the most efficient way of satisfying X, Y, and Z; unless we found some other means of more efficiently satisfying X, Y, and Z. Then we looked at the incremental cost of meeting each of X, Y, and Z after meeting the other two.

Thus, we arrived at one economical solution for which each purpose was justified and thus exhibited an investment return of greater than unity.

When two or more solutions meet this criteria we applied the criteria of comparative efficiency. In comparative efficiency we compared: (a) net benefits (sum of annual benefits less sum of annual charges and (b) size of investment necessary to obtain net benefits. As an example; if we found that the net benefits for A were slightly more than for B and the cost of A was considerably more than B, we would select B.

25. SPECIAL STUDY CONSIDERATIONS OF THE NATIONAL INCOME EFFICIENCY PLAN

a. Grand Lake, Ohio

After consideration of the water and related land resources of Grand Lake, the Plan Formulation Subcommittee concluded that the determination of a solution would be well beyond the scope and resources of the current Wabash Comprehensive. The water resource problems in the Grand Lake - St. Marys, Ohio, area including those of an institutional nature, were considered to be of such a scope and nature that no particular solution was readily apparent. The Plan Formulation Subcommittee recommends that a detailed full survey scope study be undertaken to determine what feasible measures can be undertaken to restore and enhance Grand Lake and its tributary and related area as a viable natural resource. Subsequently, the Flood Control Act of 1970 has directed the Corps of Engineers to make such a study.

b. South Fork Patoka River

That portion of the Patoka River and its tributaries located mostly in Pike County, Indiana, are degraded by concentrations of iron, sulfate, manganese, acidity and coal fines. In particular, the South Fork Patoka River is severely polluted by mine drainage. Improperly reclaimed surface mines, coal refuse piles, slurry areas, and haul roads constructed of pyritic refuse materials are the sources of most of the mine drainage problems. The most significant is a 22.5 square mile area of the South Fork Patoka River watershed. Reclamation of this area, involving about 4,000 acres of extensive corrective work, would eliminate a major mine drainage pollution source in the Wabash Basin. Accordingly, the Plan Formulation Subcommittee recommends undertaking a demonstration mine reclamation project for principal polluting areas of the South Fork Patoka River, a high priority item of the early action plan.

c. That portion of the Busseron Creek and its tributaries located mainly in Sullivan County are degraded from drainage from improperly reclaimed surface mined areas. The majority of the most serious mine drainage problems are located in an area of about three square miles which drain into Mud Creek, Sulfur Creek and Buttermilk Creek, tributaries to Busseron Creek, having a combined drainage area of about 47 square miles, of which a little over eight has been surface mined. Accordingly, the Plan Formulation Subcommittee recommends undertaking a demonstration mine reclamation project for principal polluting areas of the Busseron Creek.

26. APPLICATION OF METHODOLOGY - STRUCTURAL ELEMENT

All projects in the Early Action phase of the Comprehensive Program have been studied in detail commensurate with that which is required for Type II studies. Selection of the projects presented herein as elements of the overall phase of development has been based on a prudent and systematic analysis. Each project has been investigated for its ability to meet the demands imposed upon it at present and the expected demands the project may be required to fulfill in future years, either alone or in combination with other projects and programs on a regulated, systematic basis to insure the fullest economic efficiency of the Comprehensive Plan.

A summary of the major projects studied in the Wabash Basin for this report, their purposes and capabilities for meeting those purposes as developed by the general and specific methodologies outlined in paragraph 24, are contained in tables C-40 through C-47.

TABLE C-40. PATOKA SUBBASIN

Project number	Project name	Location mileage code	Description	Purpose and benefits (\$1,000)	Total benefits (\$1,000)	Annual changes (\$1,000)	B/C ratio to 1.0	Net benefits (\$1,000)	Selected plan ^{1/}	Reason for selecting or rejecting ^{1/}
	Window Reservoir	95-42	DA-603	FC Rec 1,250 F&W 100	1,517	1,415	1.1	102	Rejected	Low B/C Ratio for FC
	Maltersville Reservoir	95-81-3	DA-62	FC Rec 183 337 F&W 48	568	559	1.0	9	LR	Provides FC & Rec for long range needs.
	Flat Creek Reservoir	95-62-2	DA-36	FC Rec 350 F&W 50	485	475	1.0	10	Rejected	Low B/C ratio for FC
	Levee Unit 2 (Agricultural)	95-25 to 28R	3.3 miles	FC 71	71	29	2.5	42	EA	Protects high yielding agric. land
	Levee Unit 3 (Agricultural)	95-26 to 30L	6.6 miles	FC 48	48	32	1.5	16	EA	Protects high yielding agric. land
	Levee Unit 4 (Agricultural)	95-29 to 32R	4.0 miles	FC 52	52	24	2.2	28	EA	Protects high yielding agric. land
	Levee Unit 5 (Agricultural)	95-32 to 33L	2.7 miles	FC 15	15	14	1.1	1	EA	Protects high yielding agric. land
	Levee Unit 6 (Agricultural)	95-34 to 35R	1.3 miles	FC 9	9	11	0.8	-	Rejected	Small area protected
	Levee Unit 7 (Agricultural)	95-48 to 52L	3.0 miles	FC 12	12	24	0.5	-	Rejected	Low B/C ratio
	Levee Unit 8 (Agricultural)	95-68 to 70R	1.3 miles	FC 5	5	11	0.5	-	Rejected	Low B/C ratio
	Levee Unit 10 (Agricultural)	95-78-80R	1.7 miles	FC 13	13	13	1.0	-	Rejected	Small area protected
	Patoka River Diversion Channel	95-88	6.4 miles	Data	Not Presently Available				Rejected	Low B/C ratio, hyd. & legal problems
	Patoka River Channel Improvement	95-0-36	35.5 miles	FC	495	330	1.5	165	EA	Provides more efficient disch. capacity
	Hunley-Elh Creeks Watershed	95-77-0	8 Structures 2 WS 2 WO 2 Rec	FC Rec 100 126 WS 57 55	423	308	1.4	115	EA	Provides FC benefits to 6300A + WS, WO
	Hall-Felt Creeks Watershed	95-81-3	8 Structures 2 WS 1 WO 1 Rec	Other 84 FC 106 Rec 75 6 WS 2	242	186	1.3	56	EA	FC benefits for 3100A + WS, WO
	Upper Patoka Tribes Watershed	95-118	5 Structures 1 WS 1 WO	Other 53 FC 30 WS 1	38	30	1.2	8	EA	WS for Hillman, FC benefits for 1000A
	Flat Creek Watershed	95-62-0	1 Structure 1 WS	Other 6 FC 6 WS 6	13	6	2.1	7	LR	Provides FC, was for long range needs
	Cup Creek Watershed	95-54-0	2 Structures 1 Rec 1 WS	Other 1 FC 9 Rec 50 WS 6	72	38	1.9	34	LR	Provides FC, WS & Rec
	Plus 26 Non-fraudible Watersheds			Other 7						

^{1/} Early Action projects in the National Income Efficiency Plan were selected by the process of progressive summation. This technique is discussed in Section V, page 63, under Specific Methodology.

TABLE C-41. EAST FORK WHITE SUBBASIN

Project number	Project name	Location mileage code	Description	Purpose and benefits (\$1,000)	Total benefits (\$1,000)	Annual charges (\$1,000)	B/C ratio to 1.0	Net benefits (\$1,000)	Selected plan $\sqrt{}$	Reason for selection or rejection $\sqrt{}$
	Azalia Reservoir	96-49-175-3	DA-250	FC Rec 1,620 F&W 30	2,324	1,848	1.4	476	EA	Reduces flood damages in White River
	Deputy Reservoir	96-49-130-52	DA-294	FC Rec 522 F&W 30	2,299	1,805	1.3	494	EA	Same, provides WO for Muscatatuck
	Milpeter Reservoir	96-49-130-4	DA-1,129	FC Rec 3,800 F&W 160	5,668	4,200	1.4	1,468	Reject	Low B/C ratio for FC
	Shoals Reservoir	96-49-61	DA-4,947	FC Rec 1,020 F&W 5,780	6,900	6,185	1.1	715	Reject	Low B/C ratio for FC
	Vernon Fork Reservoir	96-49-130-24-27	DA-226	FC Rec 580 F&W 35	1,563	1,464	1.1	99	Reject	Replaced by two watershed projects
	West Levee (Urban) $\sqrt{}$	96-49-239 to 244R	6.8 miles	FC Rec 18	100	75	1.3	25	EA	Protects 2,500A of mixed development
	Wemyer Levee (Urban)	96-49-185-41	1.2 miles	FC Rec 83	83	10	1.8	8	EA	Protects housing area
	Beatty Levee (Urban) $\sqrt{}$	96-49-239 to 243L	4.6 miles	FC Rec 97	97	71	1.2	12	EA	Area is suitable for industrial development
	Levee Unit 5 (Urban) $\sqrt{}$	96-49-236 to 240L	4.1 miles	FC Rec 38	38	74	1.3	23	EA	Agric. & commercial area
	Levee Unit 17 (Agricultural)	96-49-214 to 219L	4.3 miles	FC Rec 18	18	20	1.3	8	EA	High value crop land protected
	Levee Unit 4 (Agricultural)	96-49-229-234L	6.0 miles	FC Rec 24	24	28	0.6	-	Reject	Low B/C ratio for FC
	Levee Unit 15 (Agricultural)	96-49-65 to 73L	8.8 miles	FC Rec 24	24	63	0.4	-	Reject	Low B/C ratio for FC
	Levee Unit 16 (Agricultural)	96-49-187 to 199L	7.3 miles	FC Rec 24	24	49	0.5	-	Reject	Low B/C ratio for FC
	Alkman Creek Watershed	96-49-5	4 Structures	FC D 10	45	38	1.2	7	EA	Provides drainage for cropland
	Lost River Watershed	96-49-35	11 Structures 1 WS 4 Rec	FC D 271 WS 22 Rec 252	621	456	1.4	165	EA	Provides WS, FC, and intensive land treatment program
	Upper Vernon Fork Watershed	96-49-130-24-27	5 Structures 3 WS 1 Rec	FC D 285 WS 196 Rec 69	641	339	1.6	302	EA	Upper & Lower V.F.K. projects provide more benefits for affected areas than large Corps reservoir which was considered. Foundations also questionable for larger dam.
	Lower Vernon Fork Watershed	96-49-130-24-3	13 Structures 2 Rec	FC D 21 Rec 135	589	360	1.6	229	EA	
	White Creek-Beatty-Walker Watershed	96-49-148-6	14 Structures 2 Rec	FC D 305 Rec 278 Other 70	686	380	1.8	306	EA	FC benefits for 14,000A

TABLE C-4] EAST FORK WHITE SUBBASIN (CONTINUED)

Project number	Project name	Location mileage code	Description	Purpose and benefits (\$1,000)	Total benefits (\$1,000)	Annual charges (\$1,000)	B/C ratio to 1.0	Net benefits (\$1,000)	Selected plan ^{1/}	Reason for selection or rejection ^{2/}
	Lewis Creek Watershed	96-49-190R-16	Channel Improvement 27.5 miles	F/C D	24 88	81	1.4	33	EA	Substantial drainage improvement
	Upper Big Flatrock Creek Watershed	96-49-190R-42	2 Structures 1 WS 1 Rec	F/C D WS Rec	164 31 38 61	236	1.4	91	EA	Provides land treatment & Fish-wildlife improvements and WS
	Dolaney Creek Watershed	96-49-130-9	5 Structures 1 WS 1 Rec	Other F/C WS Rec	33 67 14 82	99	1.9	88	EA	Provides irrigation for expanding truck farming area & recreation + WS for rural area
	Pond Creek Watershed	96-49-130-11	2 Structures 1 Rec	Other F/C D	24 62 5	93	2.4	132	EA	Substantial recreation benefits
	Little Salt Creek Watershed	96-49-22-20	3 Structures 1 Rec	Other F/C Rec	136 22 2	37	1.0	0	EA	Complements nearby Corps project
	Denios Creek Watershed	96-49-184	3 Structures 1 Rec	Other F/C Rec	3 49 193	95	2.8	172	EA	Recreation & F/C
	Brandywine Creek Watershed	96-49-190R-15-19	Channel Improvement 26.2 miles	Other F/C D	156 13 3	88	2.0	84	EA	Land treatment and drainage
	Little Blue River Watershed	96-49-190R-15-25	1 Structure	Other F/C	85 4	71	1.3	18	EA	Flood damage reduction
	Sugar and Slate Creeks Watershed	96-49-22 and 24	6 Structures 1 Rec	F/C Rec	24 135	81	2.2	96	LR	Long Range projects will partially satisfy remaining F/C, WS, Rec needs in Wabash Basin after implementation of early action program
	Sulphate Creek Watershed	96-49-63-5	1 Structure 1 Rec	Other F/C	18 10	75	1.9	67	LR	Same
	Gulzbir Creek Watershed	96-49-101	3 Structures 1 Rec 1 WS	F/C Rec WS	30 132 27	139	1.5	70	LR	Same
	Buffalo Creek Watershed	96-49-126	2 Structures 1 Rec	Other F/C Rec	20 10 72	71	1.3	21	LR	Same
	McHargue Ditch Watershed	96-49-142	1 Structure	Other F/C D	10 10 2	8	1.9	8	LR	Same
	John Thompson Ditch Watershed	96-49-167	Channel Improvement 2.3 miles	Other F/C Other	2 17 1	9	1.9	9	LR	Same
	Big Slough Watershed	96-49-190R-5	Channel Improvement 7.3 miles	F/C Other	18 1	14	1.4	5	LR	Same
	Youngs Creek Watershed	96-49-190R-20-5	2 Structures	F/C Other	67 6	32	2.3	41	LR	Same
	Bear Creek Watershed	96-49-13	1 Structure 1 Rec	F/C Rec	4 132	32	2.9	100	LR	Same
	Plus 43 Non-feasible Watersheds			Other	16					

^{1/} Early Action projects in the National Income Efficiency Plan were selected by the process of progressive summation. This technique is discussed in Section V, page 61, under Specific Methodology.
^{2/} Compensatory roadway modifications will be required in the East Fork White River floodway in conjunction with those projects to prevent overtopping. Flood stages in the Columbus area.

TABLE C-42. WEST FORK WHITE SUBBASIN

Project number	Project name	Location mileage code	Description	Purpose and benefits (\$1,000)	Total benefits (\$1,000)	Annual charges (\$1,000)	B/C ratio to 1.0	Net benefits (\$1,000)	Selected plan \downarrow	Reason for selection or rejection \downarrow
	Bean Blossom Reservoir	96-173-4	DA=169	FC 334 Rec 950	1,284	1,330	1.0	—	Rejected	Low B/C ratio for FC
	Fortville Reservoir	96-223-26	DA=169	FC 948 Rec 970	1,918	1,525	1.3	392	Rejected	Alternate to Highland site
	Frankton Reservoir	96-278-11	DA=105	Rec 810 WO 1,190	2,000	1,670	1.2	330	Rejected	High relocations costs
	Perkinsville Reservoir	96-278	DA=711	Rec 1,800 WO 526	2,326	1,887	1.2	439	Rejected	Limited storage
	Parker Reservoir	96-330	DA=175	FC 918 Rec 1,610 WO 1,000	3,928	2,670	1.5	1,258	EA	Need for primary purposes of FC, WS, & WO
	Killback Reservoir	96-292-3	DA=93	Rec 1,190 WO 1,290	2,480	1,960	1.3	520	Rejected	Limited storage
	Spencer Reservoir	96-116	DA=2,950	FC 3,890 Rec 3,890	7,780	8,900	0.9	—	Rejected	Low B/C ratio
	Fall Creek Reservoir (Boy Scout Site)	96-233-14	DA=300	FC 1,084 Rec 2,783 WO 928	6,477	4,860	1.3	1,617	Rejected	Alternate to Highland site
	Fall Creek Reservoir (Highland Site)	96-233-17	DA=342	WS 1,682 FC 880 Rec 2,783 WO 700	5,348	3,700	1.5	1,658	EA	First priority project required for FC, WO & WS for Indianapolis
	Mooreville Reservoir	96-206-12	DA=210	WS 995 FC 670 Rec 635	1,305	1,910	0.7	—	Rejected	Low B/C ratio
	Richard Creek Reservoir	96-120-140	DA=88	FC 1,36 Rec 550	686	906	0.8	—	Rejected	Low B/C ratio for FC
	Martinsville Reservoir	96-206	DA=35	FC 4,103 Rec 2,620	6,723	3,600	1.9	3,123	LR	Provides major FC in White & Wabash River flood plains during long range phase
	Dunn, Harmon, and Remy Levee (Urban)	96-228 to 233	5.2 miles	FC 187	187	110	1.7	87	Rejected	Low FC benefits
	Lundersdale Levee (Agricultural)	96-218 to 223	5.0 miles	FC 73	73	42	1.7	31	Rejected	In Martinsville pool, low B/C ratio
	Levee Unit 13 (Urban-Martinsville LP)	96-191 to 196	3.5 miles	FC 191	191	44	4.3	147	Rejected	Martinsville Reservoir reduces benefits
	Levee Unit 12 (Agricultural)	96-187 to 194	4.7 miles	FC 162	162	19	8.7	143	Rejected	Martinsville Reservoir reduces benefits
	Levee Unit 11 A&B (Agricultural)	96-189 to 187	9.2 miles	FC 290	290	43	6.8	247	Rejected	Martinsville Reservoir reduces benefits
	Levee Unit 30 (Agricultural)	96-29 to 34	6.1 miles	FC 37	37	46	0.8	—	Rejected	Low B/C ratio
	Spencer Local Protection (Urban)	96-163 to 168	2.3 miles	FC 25	25	74	0.3	—	Rejected	Low B/C ratio
	Fores and Atkinson Levee (Agricultural)	96-75 to 87	7.3 miles	FC 54	54	64	0.9	—	Rejected	Martinsville Reservoir reduces benefits
	Vincent and Paddock Levee (Agricultural)	96-217 to 221	3.1 miles	FC 55	55	48	1.1	—	Rejected	In Martinsville pool
	Vaale Creek Watershed	96-56-0	4 Structures 1 Res.	FC 31 Rec 60 Other 10	101	57	1.8	44	EA	Benefits 1400A for FC, provides res.

TABLE C-42. WEST FORK WHITE SUBBASIN (CONTINUED)

Project number	Project name	Location mileage code	Description	Purpose and benefits (\$1,000)	Total benefits (\$1,000)	Annual charges (\$1,000)	B/C ratio to 1.0	Net benefits (\$1,000)	Selected plan \checkmark	Reason for selection or rejection \checkmark
	Black Creek Watershed	96-85-0	2 Structures 2 WO 1 Rec	FC 227 D 16 WO 8 Rec 52 Other 33 DATA NOT PRESENTLY AVAILABLE	336	169	2.0	167	EA	Provides wide range of benefits including flood control benefits for 9300A agricultural lands
	Sprague Creek Watershed	96-135-22								
	Black Creek Watershed	96-135-246	6 Structures 1 WO	FC 40 WO 31 Other 4	75	54	1.4	21	EA	Improves WO in central Clay County
	Jordan Creek Watershed	96-135-39	4 Structures 1 Rec	FC 24 Rec 103 Other 15	142	93	1.5	49	EA	Benefits 1500A flood plain
	Lagoon Ditch - Wash and Ene Canal Watershed	96-135-6&8	Channel Improvement 21.0 miles	FC 101 Other 7	108	38	2.8	70	EA	Provides drainage for 4540A
	Croy's Creek Watershed	96-135-48	3 Structures 1 Rec	FC 23 Rec 199 Other 26	248	122	2.0	126	EA	Benefits 1350A flood plain
	Deer Creek Watershed	96-135-51R-1	1 Structure 1 Rec	FC 361 Rec 172 Other 21	534	113	4.9	441	EA	Complements Cagles Mill Reservoir
	Little Walnut Creek Watershed	96-135-51L-14	3 Structures 1 Rec	FC 65 Rec 67 Other 12	144	98	1.5	46	EA	Complements Big Walnut Reservoir
	Rattlesnake Creek Watershed	96-157-0	1 Structure 1 Rec	FC 15 Rec 135 Other 17	167	96	1.8	71	EA	Provides localized flood control & Rec. benefits
	Bryant Creek Watershed	96-181-0	1 Structure 1 Rec	FC 7 Rec 51 Other 7	65	29	2.2	36	EA	Same
	Whitfield Creek Watershed	96-200-0	7 Structures 1 WO 1 Rec	FC 295 WO 119 Rec 228 Other 42	684	284	2.4	400	EA	Complements recommended LR Martinsville Reservoir
	Killbuck Creek Watershed	96-292-0	Channel Improvement 29.1 miles	FC 44 D 17 Other 9	70	53	1.3	17	EA	Improves hydraulic efficiency of sluggish stream
	Wilson Creek Watershed	96-32-0	1 Structure 1 WS 1 WO 1 Rec	FC 25 WS 5 WO 13 Rec 99 Other 2	144	50	2.9	94	EA	Improves WS, WO in southern Knox Co. especially for Monroe City area
	Pipe Creek Watershed	96-278-0	1 Structure	DATA NOT PRESENTLY AVAILABLE						
	Fish Creek Watershed	96-142-0	6 Structures 1 Rec	FC 35 Rec 150 Other 22	207	148	1.4	59	LR	Long Range projects, partially meet needs, expected during post 1985-2020 period Same
	Hop-McIntyre Watershed	96-135-37&40	2 Structures 2 Rec	FC 8 Rec 121 Other 10	139	60	2.3	79	LR	Same
	Six Mile Creek Watershed	96-135-35	5 Structures 1 Rec	FC 16 Rec 67 Other 10	93	52	1.8	41	LR	Same

TABLE C-4.2 WEST FORK WHITE SUBBASIN (CONTINUED)

Project number	Project name	Location mileage code	Description	Purpose and benefits (\$1,000)	Total benefits (\$1,000)	Annual charges (\$1,000)	B/C ratio to 1.0	Net benefits (\$1,000)	Selected plan	Reason for selection or rejection
	Doans Creek Watershed	96-115-0	2 Structures 1 Rec	FC 9 Rec 133	159	69	2.3	90	LR	Long Range projects partially meet needs expected during post 1985-2020 period
	Pond Creek Watershed	96-135-9	Channel Improvement 2.7 miles 6 Structures 1 Rec	Other 17 FC 5	5	3	1.8	2	LR	
	Luck Creek Watershed	96-135-3	6 Structures 1 Rec	FC 30 Rec 103	149	93	1.6	56	LR	Same
	Burkhart Creek Watershed	96-184-0	1 Structure 1 Rec	Other 16 FC 2	61	36	1.7	25	LR	Same
	Clear Creek Watershed	96-200-0	1 Structure 1 Rec	Other 6 FC 3	148	53	2.8	95	LR	Same
	Plus 72 Non-feasible Watersheds			Rec 130 Other 15						

U/ Early Action projects in the National Income Efficiency Plan were selected by the process of progressive summation. This technique is discussed in Section V, page 63, under Specific Methodology.

TABLE C-43. UPPER WABASH SUBBASIN

Project number	Project name	Location mileage code	Description	Purpose and benefits (\$1,000)	Total benefits (\$1,000)	Annual changes (\$1,000)	B/C ratio to 1.0	Net benefits (\$1,000)	Selected plan	Reason for selection or rejection
	Deer Creek Reservoir	329.4	DA-280	FC 970 Rec 544	1,514	1,732	0.9	--	LR	These LR projects expected to meet most future needs in Upper Wabash subbasin
	Denver (Eel River) Reservoir	354.25	DA-680	FC 1,380 Rec 1,525	2,905	2,830	1.0	75	LR	Same
	Pipe Creek Reservoir	363.6	DA-167	FC 778 Rec 530	1,308	1,293	1.0	15	LR	Same
	Impoundment Reservoir	322-112	DA-525	FC 870 Rec 669	1,539	2,667	0.6	--	Rejected	Low B/C ratio, shallow pool
	Delphi Reservoir	324	DA-4,460	FC 4,660 Rec 2,273	6,933	7,149	1.0	--	Rejected	Alternate to upper site, extensive relocation cost
	Delphi Reservoir (Upper Site)	334	DA-4,136	FC 2,510 Rec 1,942	4,452	4,691	1.0	--	LR	Retained to meet future needs in main stem Wabash
	Peto Run	317.46	DA-339	FC 985 Rec 906	1,891	1,452	1.3	439	Rejected	Small FC capability
	Levee Unit 22 (Urban)	312-317	5.5 miles	FC 28	28	30	1.0	--	Rejected	Low B/C ratio
	Little River Watershed	406-0	7 Structures 4 WQ 1 Rec	FC 117 D 33 WQ 161 Rec 108	465	243	2.0	222	EA	Provides needed benefits for rapidly urbanizing area
	Buckeye-Hooster Watershed	480	4 Structures 2 WQ 2 Rec	FC 268 D 2 WQ 43 Rec 440	851	615	1.4	236	EA	Provides benefits for wide area in Ohio Inad (17,900 acres)
	Salamonie River Watershed	394.46	1 Structure 1 Rec	FC 204 D 8	414	258	1.6	156	EA	Provides direct benefits from land treatment for Salamonie Reservoir
	Pony Creek Watershed	358.56	Channel Improvement 12.8 miles	FC 42 D 4	37	26	1.4	11	EA	Drainage improvement
	Lower Mississinewa River Watershed	375.0	2 Structures 2 Rec	FC 9 Rec 93	114	83	1.4	31	EA	Complements Mississinewa Reservoir
	Upper Mississinewa River Watershed	375.56	Channel Improvement 20.0 miles	FC 101 D 17	130	130	1.0	0	EA	Complements Mississinewa Reservoir
	Rock Creek Watershed (Cass County)	341.0	Channel Improvement 18.4 miles	FC 57 D 11	74	41	1.8	33	EA	Drainage improvement for 2100A
	House-Barren Watershed	322-78	Channel Improvement 20.3 miles	FC 44 D 15	67	49	1.4	18	EA	Drainage improvement for 2150A
	Clear Creek Watershed	405.0		Other 8	DATA NOT PRESENTLY AVAILABLE		EA			
	Sugar Creek Watershed	322.0	1 Structure 1 Rec	FC 20 D 18 Rec 163 Other 25	226	130	1.7	96	EA	Furnishes recreation, etc. for Delphi area

TABLE C-43. UPPER WABASH SUBBASIN (CONTINUED)

Project number	Project name	Location mileage code	Description	Purpose and benefits (\$1,000)	Total benefits (\$1,000)	Annual charges (\$1,000)	B/C ratio to 1.0	Net benefits (\$1,000)	Selected plan ^{1/}	Reason for selection or rejection ^{1/}
	Barnetts Creek Watershed	342-0	Channel Improvement 9.8 miles	FC 13 D 9	28	16	1.8	12	EA	EA projects below provide drainage improvement for approx. 8,100 acres of agricultural lands See above
	Crooked Creek Watershed	345-0	Channel Improvement 14.5 miles	FC 25 D 5	34	23	1.5	11	EA	
	Goose Creek Watershed	355-0	3 Structures	Other 4	DATA NOT PRESENTLY AVAILABLE				EA	See above
	Brown-Hill Watershed	322-34	Channel Improvement 31.5 miles	FC 60 D 105	190	70	2.7	120	EA	See above
	Big Moon Ditch Watershed	322-36	Channel Improvement 55.6 miles	FC 96 D 405	589	277	2.1	312	EA	See above
	Mud Creek Watershed	322-95	Channel Improvement 38.2 miles	FC 53 D 64	142	126	1.1	116	EA	See above
	Scuffle Creek Watershed	394-43	Channel Improvement 7.2 miles	FC 9 D 4	13	9	1.5	4	LR	LR projects below provide drainage improvements for agricultural lands No structures except for the Ed River project
	Ed River Watershed	354-58	1 Structure	DATA NOT PRESENTLY AVAILABLE					LR	
	Timmons Ditch Watershed	322-38	Channel Improvement 9.9 miles	FC 5 D 10	19	14	1.4	15	LR	See above
	Ackerman Ditch Watershed	322-45	Channel Improvement 6.3 miles	FC 11 D 7	21	10	2.1	11	LR	See above
	Ougley Marsh Ditch Watershed	322-65	Channel Improvement 6.0 miles	FC 44 D 21	74	8	8.9	62	LR	See above
	Full-Taylor Ditch Watershed	322-77	Channel Improvement 3.5 miles	FC 11 D 7	20	9	2.3	11	LR	See above
	Chapman Creek Watershed	322-86	Channel Improvement 3.0 miles	FC 8 D 5	14	3	4.4	11	LR	See above
	South Fork Wildcat Creek Watershed	317-8-14	Channel Improvement 16.8 miles	FC 41 D 247	288	240	1.2	48	LR	See above
	Deer Creek Watershed	329-0	Channel Improvement 95.5 miles	FC 2 D 3	6	6	0.9	—	LR	See above
	Pleasant Run Watershed	334-0	Channel Improvement 2.7 miles	FC 1 D 12	26	27	1.0	—	LR	See above
	Rattlesnake Creek Watershed	338-0	Channel Improvement 13.7 miles	FC 9 D 5	26	27	1.0	—	LR	See above
	Plus 88 Non-Feasible Projects									

^{1/} Early Action projects in the National Income Efficiency Plan were selected by the process of progressive summation. This technique is discussed in Section V, page 63, under Specific Methodology.

TABLE C-44 MIDDLE WABASH RIVER SUBBASIN

Project number	Project Name	Location mileage code	Description	Purpose & benefits (\$1,000)	Total benefits (\$1,000)	Annual charges (\$1,000)	B/C Ratio to 1.0	Net benefits	Selected plan I/	Reason for selection or rejection I/
	Big Creek Reservoir	196-3	DA-99	FC 195 Rec 396	591	738	0.80	-	Rejected	Low B/C Ratio for FC
	Brouillets Reservoir	226-5	DA-321	FC 613 Rec 590	1,203	1,530	0.79	-	Rejected	Low B/C Ratio for FC
	Coal Creek Reservoir	225-4	DA-256	FC 533 Rec 630	1,163	1,160	1.00	3	LR	Partially meets LR demands for this area
	Crawfordsville Reservoir	245-44	DA-423	FC 831 Rec 835 WO 575 WS 85	2,326	1,760	1.32	566	EA	Provides WS, WQ, & FC for Crawfordsville. Provides improved flows for recreational use. Alternate to Salt Fork
	Danville Reservoir	257-28	DA-970	FC 1,215 Rec 862 WO 1,060	3,137	2,610	1.20	527	Rejected	Alternate to Salt Fork
	Kickapoo Reservoir	257-34	DA-429	FC 664 Rec 920 WO 900	2,484	2,227	1.12	257	Rejected	State Res Site
	Little Vermilion Reservoir	248-12	DA-231	FC 513 Rec 558	1,071	1,171	0.91	-	Rejected	Low B/C Ratio for FC
	Mill Creek Reservoir	177-9	DA-107	FC 180 Rec 247	427	689	0.62	-	Rejected	Low B/C Ratio
	Montezuma Reservoir	241	DA=11,000	FC 5,054 Rec 2,470	7,524	21,500	0.35	-	Rejected	Low B/C Ratio
	North Fork Vermilion Reservoir	257-23-12	DA=250	FC 616 Rec 601	1,217	1,171	1.04	46	Rejected	Low B/C Ratio
	Salt Fork Reservoir	257-28-1	DA=515	FC 685 Rec 920 WO 986	2,591	2,208	1.17	383	EA	Partially meets needs in Danville area
	Sugar Mill Reservoir	245-11-2	DA-59	FC 39 Rec 582	621	781	0.80	-	Rejected	Low FC Benefits
	Sugar Creek Reservoir (Ill.)	210-11	DA-67	FC 213 Rec 224	739	719	1.03	-	Rejected	Small drainage area
	Young and Neal Levee (Agricultural)	285 to 287L	3.2 miles	WS 302 FC 23	23	30	0.77	-	Rejected	Low B/C Ratio
	Wabash & Fulton Levee (Agricultural)	260 to 265L	4.7 Miles	FC 38	38	48	0.80	-	Rejected	Low B/C Ratio
	Raccoon Creek Watershed (Ill.)	111-0	Channel Improvement 18.9 miles	FC 144 D 16 Other 18	178	93	1.9	85	EA	Benefits 3,700 acres through improved drainage
	Snapp Kelso Creek Watershed	129-0	1 structure 1 Rec.	FC 5 Rec 75 Other 3	83	59	1.4	24	EA	Provides Rec, FC in Vincennes area
	Marah Creek Watershed	135-0	2 structures	FC 94 D 2 Rec 15 Other 8	119	74	1.6	45	EA	Benefits 5,000 Ac.
	Turtle Creek Watershed	162-0	8 structures 2 WS 5 Rec	FC 37 WS 45 Rec 11 Other 18	111	68	1.6	43	EA	Provides FC Rec to Western Sullivan Co
	Mill Creek Watershed (Ill.)	177-0	8 structures 1 Rec.	FC 84 Rec 210 Other 27	321	211	1.5	110	EA	Flood control benefits to 4,550 Ac + Rec

TABLE C-4. MIDDLE WABASH RIVER SUBBASIN (CONTINUED)

Project number	Project name	Location mileage code	Description	Purpose and benefits (\$1,000)	Total benefits (\$1,000)	Annual charges (\$1,000)	B/C ratio to 1.0	Net benefits (\$1,000)	Selected plan/J	Reason for selection or rejection/J
	Honey Creek Watershed	204-0	8 structures 1 Rec	FC Rec 67	380	245	1.6	135	EA	EA projects below incl. Honey Cr provide FC benefits for 36,960 Ac of high yielding agric lands in addition to rec and drainage
	Other Creek Watershed	223-0	5 structures 1 Rec	Other FC 68 338	413	243	1.6	170	EA	
	Coal Creek Watershed	255-0	2 structures 1 Rec	Other FC 191 134	345	117	2.9	228	EA	
	Big Raccoon Creek Watershed	238-0	8 structures 7 Rec	Other FC 99 44	155	86	1.8	69	EA	
	Jordan Creek Watershed	257-23-23-0	Channel Improvement	Other FC 38 15	55	35	1.5	20	EA	
	Lye Creek Watershed	245-48-0	Channel Improvement	Other FC 107 19	139	73	1.9	66	EA	
	Fall Creek Watershed	286-0	42.9 miles 1 structure	Other FC 13 30	31	23	1.3	8	EA	
	Vieks Ditch Watershed	114-0	Channel Improvement	Rec FC 90 8	108	24	4.4	84	EA	
	City Ditch Watershed	118-0	13.2 miles Channel Improvement	Other FC 10 69 5	80	21	3.9	59	EA	
	Sugar Creek Watershed (Ill.)	210-0	10.8 miles 2 structures 1 WS 1 WQ	Other FC 60 62 25	162	88	1.8	74	EA	
	Lower Shaker Prairie Watershed	138-0	Channel Improvement	Other FC 15 39	44	19	2.2	25	EA	
	Snyder Creek Watershed	184-0	10.1 miles 1 structure	D Other FC 31	33	19	1.8	14	EA	
	Feather Creek Watershed	232-0	1 structure 1 Rec	Other FC 28 100	142	81	1.8	61	EA	
	Crawfish Creek Watershed	100-0	Channel Improvement	Other FC 14	Data Not Presently Available				LR	
	Turman Creek Watershed		2 structures	FC Other 35 3	38	38	1.0	—	LR	LR watershed projects below and next page encompass total project areas of 708 sq miles with structural control of 201 sq miles. Projects also furnish substantial recreation.
	Raccoon Creek Watershed (Illinois)	174-0	2 Structures 1 Rec	FC Rec 23 103	140	78	1.8	62	LR	
	Lost Creek Watershed	219-0	1 Structure	Other FC 16 14	17	27	0.7	—	LR	
	Big Creek Watershed (Illinois)	196-0	4 Structures 2 Rec	Other FC 48 235	316	158	2.0	158	LR	
	Clear Creek Watershed (Illinois)	206-0	2 Structures 1 Rec	Other FC 33 25 142	185	132	1.4	53	LR	

TABLE C-44. MIDDLE WABASH RIVER SUBBASIN (CONTINUED)

Project number	Project name	Location mileage code	Description	Purpose and benefits (\$1,000)	Total benefits (\$1,000)	Annual charges (\$1,000)	B/C ratio to 1.0	Net benefits (\$1,000)	Selected plan ^{J/}	Reason for selection or rejection ^{J/}
	Norton Creek Watershed	232-0	2 Structures J Rec	FC 9 Rec 131	157	75	2.1	82	LR	See preceding page
	Big Shawnee Creek Watershed	284-0	Channel Improvement 24.1 miles	Other 17 FC 6 D 21	35	44	0.8	--	LR	
	Coit Branch Watershed	257-9-0	1 Structure	Other 8 FC 2	3	10	0.3	--	LR	
	Stony Creek Watershed (Illinois)	257-28-10	Channel Improvement 16.5 miles	Other 1 FC 9 D 18	32	34	0.9	--	LR	
	Sugar Mill Watershed	245-11-2	3 Structures	Other 5 FC 24	123	68	1.8	55	LR	
	Little Sugar Creek Watershed	245-41-3	Channel Improvement 8.3 miles	Rec 99 FC 6 D 2	10	11	0.9	--	LR	
	Plus 74 Non-feasible Watersheds			Other 2						

^{J/} Early Action projects in the National Income Efficiency Plan were selected by the process of progressive summation. This technique is discussed in Section V, page 63, under Specific Methodology.

TABLE C-45. EMBARRAS RIVER SUBBASIN

Project number	Project name	Location mileage code	Description	Purpose and benefits (\$1,000)	Total benefits (\$1,000)	Annual charges (\$1,000)	B/C ratio to 1.0	Net benefits (\$1,000)	Selected plan \checkmark	Reason for selection or rejection \checkmark
	North Fork Embarras River Reservoir	122-44-26	DA=147	FC Rec	216 290	1,082	0.5	—	Rejected	Low B/C Ratio
	Woodbury Reservoir	122-81-7	DA=134	FC	218	378	0.5	—	Rejected	Low B/C Ratio
	Crooked Creek Reservoir	122-53-4	DA=73	FC Rec	81 198	653	0.4	—	Rejected	Low B/C Ratio
	Westport Levee (Agricultural)	122-13 to 29L	16.5 miles	FC	127	230	0.6	—	Rejected	Low B/C Ratio
	Lawrenceville Levee (Agricultural)	122-9 to 13L	3.3 miles	FC	7	55	0.1	—	Rejected	Low B/C Ratio
	Brady Creek Watershed	122-152-0	Channel Improvement	FC D	35 19	56	1.1	4	EA	Following EA watershed projects provide FC benefits for 35,210 A with total benefits (all purposes) of \$2.4 million annually.
	Muddy Creek Watershed	122-81-0	17.0 miles 6 Structures 1 WS 1 WQ 1 Rec	FC WS WQ Rec	181 19 15 205	304	1.5	146	EA	
	North Fork Embarras Watershed	122-44-0	12 Structures 2 WS 2 WQ 3 Rec	Other FC WS WQ Rec	30 702 33 74 389	646	2.0	615	EA	
	Crooked Creek Watershed	122-53-0	5 Structures 1 Rec	FC Rec	90 67	104	1.6	71	EA	
	Muddy Creek Watershed (17g-5)	122-13-0	2 Structures 1 WQ	FC D	116 25	194	1.7	70	EA	
	Brady Branch Creek Watershed	122-9-0	5 Structures 1 WQ 1 Rec	Other FC WQ Rec	14 19 118 8	121	2.2	144	EA	
	Otter-flower-Alison Watershed	122-0	Channel Improvement	Other FC	116 23	89	1.6	53	LR	These LR projects furnish benefits for 236 square miles of project area (total)
	Honey Creek Watershed	122-24-0	38.2 miles 2 Structures 1 Rec	Other FC Rec	40 27 42	73	1.9	66	LR	
	Range Creek Watershed	122-78-0	3 Structures 1 Rec	Other FC	14 59	138	1.3	42	LR	
	Hurricane Creek Watershed	122-94-0	2 Structures	Other FC	103 18	52	1.0	—	LR	
	Plus 23 Non-feasible Watersheds			Other	5					

\checkmark Early Action projects in the National Income Efficiency Plan were selected by the process of progressive summation. This technique is discussed in Section V, page 63, under Specific Methodology.

TABLE C-46. LITTLE WABASH RIVER SUBBASIN

Project number	Project name	Location mileage code	Description	Purpose and benefits (\$1,000)	Total benefits (\$1,000)	Annual charges (\$1,000)	B/C ratio to 1.0	Net benefits (\$1,000)	Selected plan	Reason for selection or rejection
	Elm River Reservoir	15-84-15	DA=155	FC 90	455	1,515	0.3	-	Rejected	Low B/C Ratio
	Waco's Bridge Reservoir	15-129	DA=1,130	Rec 365	1,914	5,260	0.4	-	Rejected	Low B/C Ratio
	Big Muddy Creek Reservoir	15-129-12	DA=105	FC 947	411	817	0.5	-	Rejected	Low B/C Ratio
	Ettingham Reservoir	15-207	DA=218	Rec 208	835	1,049	0.8	-	Rejected	Low B/C Ratio
	Fox River Reservoir	15-107-20	DA=84	FC 456	327	836	0.4	-	Rejected	Low B/C Ratio
	Horse Creek Reservoir	15-40-45-3	DA=98	FC 187	338	811	0.4	-	Rejected	Low B/C Ratio
	Brush Creek Reservoir	15-40-2	DA=42	Rec 248	290	297	1.0	-	Rejected	Low B/C Ratio
	Skillet Fork Levee Unit 1A (Agricultural)	15-40-6 to 9L	4.4 miles	Rec 180	16	67	0.2	-	Rejected	Low B/C Ratio
	Skillet Fork Levee Unit 1B (Agricultural)	15-40-16 to 19L	4.8 miles	FC 19	19	71	0.3	-	Rejected	Low B/C Ratio
	Skillet Fork Levee Unit 3 (Agricultural)	15-40-19 to 29L	8.4 miles	FC 44	44	160	0.3	-	Rejected	Low B/C Ratio
	Skillet Fork Levee Unit 3A (Agricultural)	15-40-19 to 36L	11.4 miles	FC 82	82	232	0.4	-	Rejected	Low B/C Ratio
	Eagle Slough - Main and Southern Outlet Levee System (Agricultural)	15-40-17 to 21R	31.3 miles	FC 291	291	453	0.6	-	Rejected	Low B/C Ratio
	Little Wabash Levee Unit 3 (Agricultural)	15-84-91R	9.0 miles	FC 90	90	127	0.7	-	LR	Regional development
	Little Wabash Levee Unit 7 (Agricultural)	15-114-121R	4.8 miles	FC 52	52	41	1.3	11	EA	Regional development
	Little Wabash Levee Unit 8 (Agricultural)	15-110-118L	3.6 miles	FC 39	39	45	0.9	-	EA	Regional development
	Little Wabash Levee Unit 9 (Agricultural)	15-129-136L	6.6 miles	FC 20	70	33	2.1	37	LR	Regional development
	Lick Creek Watershed	15-22	2 Structures 1 Rec	FC 40 131	189	85	2.2	104	EA	EA projects this group provide for FC benefits for \$1,900 A
	Auxler Big Creek Watershed	15-40-18	4 Structures 1 WS 1 Rec	Other 18 FC 161 D 58 WS 46 Rec 22	348	238	1.5	110	EA	EA projects this group provide for FC benefits for \$1,900 A Food chain work lands in addition to other benefits amounting to \$2 million annually.
	Big Mound Watershed	15-40-19	1 Structure	Other 61 FC 75 D 6	88	56	1.6	32	EA	
	Pond Creek Watershed	15-74	1 Structure 1 Rec	Other 7 FC 33 D 11 Rec 72 Other 15	131	107	1.2	24	EA	

TABLE C-46. LITTLE WABASH RIVER SUBBASIN (CONTINUED)

Project number	Project name	Location mileage code	Description	Purpose and benefits (\$1,000)	Total benefits (\$1,000)	Annual charges (\$1,000)	B/C ratio to 1.0	Net benefits (\$1,000)	Selected plan ^{1/}	Reason for selection or rejection ^{1/}
	Big Muddy Creek Watershed	15-129	7 Structures 2 Rec	FC 191 Rec 304 Other 56	551	305	1.8	246	EA	See preceding page
	Dry Fork Watershed	15-40-30	4 Structures 1 WS 1 Rec	FC 131 WS 15 Rec 184 Other 211	511	161	3.2	350	EA	
	Horse Creek Watershed	15-40-36	5 Structures 1 WS 1 Rec	FC 128 WS 25 Rec 178 Other 33	364	206	1.8	158	EA	
	Upper Little Wabash River Watershed	15-208	7 Structures 1 WS 1 WS 3 WO	FC 170 WS 4 WS 4 WO 61 Other 20	255	175	1.5	80	EA	
	Fox River Watershed	15-107	5 Structures 1 WS 1 WO 1 Rec	FC 171 WS 10 WO 38 Rec 152 Other 39	410	304	1.3	106	EA	
	Salt Creek Watershed	15-186	4 Structures 1 Rec	FC 51 Rec 93 Other 16	160	121	1.3	39	EA	
	Linekin Creek Watershed	15-40-8	Channel Improvement 4.8 miles 2 Structures	FC 22 D 3 Other 2 FC 66 Other 9	27	7	3.7	20	LR	
	Lost Creek Watershed	15-40-13	Channel Improvement 7.9 miles	FC 39 Other 3	42	14	2.9	28	LR	
	Beaver Creek Watershed	15-40-14	Channel Improvement 7.9 miles	FC 28 D 2 Improvement 3 Other 7	33	8	3.9	25	LR	
	Prairie Creek Watershed	15-40-16	Channel Improvement 4.8 miles 1 Structure 1 WS	FC 7 WS 20 FC 69 Other 5	29	18	1.6	11	LR	
	Nameless Creek Watershed	15-40-18	2 Structures	FC 26 Other 7	74	67	1.1	7	LR	
	Brook Creek Watershed	15-40-37	Channel Improvement 2.3 miles	FC 26 Other 1	27	8	3.4	19	LR	
	Elliot Creek Watershed	15-47	Channel Improvement 18.8 miles 13 Structures 2 Rec	DATA NOT PRESENTLY AVAILABLE						LR
	Big Creek Watershed	15-50								
	Elim River Watershed	15-84			576	480	1.2	96	LR	LR watersheds for this subbasin would involve 66.8 square miles of total project areas with 24 structures controlling 31.2 square miles of drainage area

TABLE C-46. LITTLE WABASH SUBBASIN (CONTINUED)

Project number	Project name	Location mileage code	Description	Purpose and benefits (\$1,000)	Total benefits (\$1,000)	Annual charges (\$1,000)	B/C ratio to 1.0	Net benefits (\$1,000)	Selected plan $\frac{1}{2}$	Reason for selection or rejection $\frac{1}{2}$	
	Crooked Creek Watershed	15-162	1 Structure	FC Other	16	20	0.9	-	LR	See preceding page	
	Dismal Creek Watershed	15-165	1 Structure	FC Other	25	30	1.0	-	LR		
	Bishop Creek Watershed	15-183	2 Structures 1 WS	FC WS Other	25 19 3	39	1.2	8	LR		
	Plus 27 Non-feasible Watersheds										

$\frac{1}{2}$ Early Action projects in the National Income Efficiency Plan were selected by the process of progressive summation. This technique is discussed in Section V, page 63, under Specific Methodology.

TABLE C-47. LOWER WABASH RIVER SUBBASIN

Project number	Project name	Location mileage code	Description	Purpose and benefits (\$1,000)	Total benefits (\$1,000)	Annual charges (\$1,000)	B/C ratio to 1.0	Net benefits (\$1,000)	Selected plan $\frac{1}{2}$	Reason for selection or rejection $\frac{1}{2}$	
	Bonpas Reservoir	65-24	DA-174	FC	261	1,135	0.7	-	Rejected	Low B/C Ratio	
	Wabash River Levee Unit 50 (Agricultural)	51-54L	7.2 miles	FC	550	34	1.1	4	EA	Protects 3,060 acres	
	Big Creek Watershed	28-0	10 Structures 1 Rec	FC D Rec	524 11 139	290	2.3	384	EA	EA watershed projects provide FC benefits for 30,200 A of highly productive cropland in addition to substantial recreation benefits	
	Gresham Creek Watershed	52-0	13 Structures 1 Rec	FC D Rec Other	64 7 222 76	161	2.0	162	EA		
	McHenry-Hawthorne Watershed	49-0		Other	76						
	Scott Ditch-Coffee Bayou Watershed	89-0	3 Structures 1 Rec	FC D Rec	99 52 321	213	2.5	327	EA		
	Bonpas Creek Watershed	65-0	9 Structures 1 WS 1 WO 1 Rec	FC D WS WQ Rec	263 79 13 15 194	471	1.4	171	EA		
	Black River Watershed	55-0	4 Structures 1 Rec	FC Rec	291 99	123	3.4	296	LR	LR projects this subbasin would include 121 square miles of total project area with 1.3 square miles of drainage area controlled by 6 structures	
	French Creek Watershed	62-0	2 Structures 1 Rec	FC Rec	37 137	92	2.1	101	LR		
	Plus 4 Non-feasible Watersheds										

$\frac{1}{2}$ Early Action projects in the National Income Efficiency Plan were selected by the process of progressive summation. This technique is discussed in Section V, page 63, under Specific Methodology.

27. FLOOD PLAIN MANAGEMENT ELEMENT

The basin cities are expanding; new buildings are being built; industries are constructing new plants; and most of this is taking place on previously undeveloped lands. This growth is most necessary and healthy so long as it respects the land on which it is built. Physical protection against floods, such as dams and floodwalls, cannot answer the complete problem as the rate of development in the flood plain exceeds any possible plan for complete physical protection. One-hundred and fifteen areas where some development has taken place in flood hazard areas or where there is an identified potential for development within the flood plain are listed in table C-48. These communities would benefit from intensive flood plain management practices including zoning, building codes, flood proofing, ample warning, or evacuation. Of the 115 areas, 53 were selected as having high priority need in the early action program and 59 areas are of lesser priority. Flood plain management reports have been completed for three communities.

28. LAND TREATMENT ELEMENT

Over 8,461,000 acres of land are included in the projects recommended for early action. Land treatment needed on these lands are included in the plan; treatment needs include measures that have a significant effect on reducing runoff, erosion, and sediment production. Essentially the early action recommendations consist of three principal elements. The first of these is the accelerated land treatment for watershed protection under Public Law 566; a second feature is the acceleration of land treatment in the drainage areas above major reservoirs in the basin. Third, would be the accomplishments expected under the going PL-46 program, the cooperative State-Federal forestry program and other going programs in all areas of the basin. Overall the 8.5 million acre program includes 6.5 million acres of cropland, 901 thousand acres of pasture, 680 thousand acres of forest land, 208 thousand acres of other land and 216 thousand acres of urban land. In addition to the early action program, land treatments that cannot be reasonably completed during the early action period are scheduled for completion in the long range program. The remaining program, not including maintenance on the existing and early action program measures, would include treatment of 5.1 million acres. Table C-49 summarizes the land treatment features.

The U.S. Forest Service in addition to forestry land treatment aspects, is interested in the development of recreational areas and in the enhancement of the environment as shown in the following tabulation.

<u>Recreational Developments</u>	<u>Unit</u>	<u>Quantity</u>
Land	Acres	152
Water	Acres	510
Roads and Trails	Miles	142
Scenic Drives (1)	Miles	23
Identification of Public Lands	Miles	600

TABLE C-48. COMMUNITIES IDENTIFIED FOR POTENTIAL FLOOD
PLAIN MANAGEMENT SERVICES BY SUBBASIN

<u>Patoka Subbasin</u>	<u>West Fork Subbasin (Cont'd)</u>	<u>Middle Wabash Subbasin (Cont'd)</u>
Dubois	Indianapolis ^{2/}	Eugene
Huntingburg ^{1/}	Beech Grove ^{2/}	Hutsonville, Illinois
Jasper ^{1/}	Lawrence ^{2/}	Lebanon
Patoka ^{1/}	Speedway ^{2/}	Montezuma
Winslow ^{1/}	Martinsville ^{1/}	Newport
	Mooreville ^{1/}	Paris, Illinois
<u>East Fork Subbasin</u>	Muncie ^{2/}	Paxton, Illinois
Austin ^{1/}	Noblesville	Rantoul, Illinois
Bedford	Petersburg	St. Joseph, Illinois
Bethel Village	Plainfield	Terre Haute ^{1/}
Bloomington	Spencer ^{1/}	Urbana, Illinois ^{1/}
Columbus ^{3/}	Tipton	Vincennes ^{1/}
Edinburg ^{1/}	Washington	West Terre Haute ^{1/}
Franklin ^{1/}	Winchester	York, Illinois
French Lick ^{1/}		
Greenfield	<u>Upper Wabash Subbasin</u>	<u>Embarras Subbasin</u>
Greensburg	Bluffton	Birds
Greenwood (Johnson County)	Delphi ^{1/}	Camargo
Knightstown ^{1/}	Edna Mills	Charleston, Illinois ^{2/}
New Castle ^{1/}	Fairmount	Lawrenceville, Illinois ^{1/}
New Whiteland	Gas City ^{1/}	Mattoon, Illinois
North Vernon ^{1/}	Hartford City ^{1/}	Newman
Orleans ^{1/}	Home Corner	Newton, Illinois
Paoli ^{1/}	Huntington	Tuscola, Illinois
Rushville	Kokomo ^{2/}	Villa Grove ^{1/}
Scottsburg ^{1/}	Lafayette ^{3/}	
Seymour ^{1/}	Logansport ^{1/}	<u>Little Wabash Subbasin</u>
Shelbyville ^{1/}	Marion ^{1/}	Carmi, Illinois ^{1/}
Shoals	Monitor	Clay City ^{1/}
West Baden ^{1/}	North Manchester	Concord (Emma)
	Peru ^{1/}	Crossville ^{1/}
<u>West Fork Subbasin</u>	Portland	Effingham ^{1/}
Alexandria	Union City	Fairfield
Anderson ^{2/}	Wabash ^{1/}	Golden Gate
Anderson, East Side ^{1/}	Warsaw	Louisville
Bicknell	West Lafayette ^{3/}	Mill Shoals
Brooklyn		New Haven
Brownsburg	<u>Middle Wabash Subbasin</u>	Springerton
Chesterfield ^{1/}	Attica ^{1/}	
Danville	Clinton ^{1/}	<u>Lower Wabash Subbasin</u>
Elwood	Covington	Grayville, Illinois
Greenwood	Crawfordsville ^{1/}	Mt. Carmel, Illinois ^{1/}
Linton	Danville, Illinois ^{1/}	New Harmony ^{1/}

^{1/} High priority - early action.

^{2/} Authorized flood plain management study.

^{3/} Completed flood plain management study.

TABLE C-49. LAND TREATMENT

Economic subarea	Cropland	Pasture	Forest	Urban	Other	Total
(1,000 acres)						
Early Action						
1	895	240	277	56	54	1,522
2	1,350	201	160	84	60	1,855
3	594	96	61	6	14	771
4	1,105	106	54	15	23	1,303
5	572	76	60	6	12	726
6	<u>1,940</u>	<u>182</u>	<u>68</u>	<u>49</u>	<u>45</u>	<u>2,284</u>
TOTAL	6,456	901	680	216	208	8,461
Long Range						
1	420	120	490	186	26	1,242
2	500	41	259	316	24	1,140
3	216	34	92	36	5	383
4	405	40	93	78	10	626
5	298	46	115	30	7	496
6	<u>840</u>	<u>68</u>	<u>93</u>	<u>177</u>	<u>23</u>	<u>1,201</u>
TOTAL	2,679	349	1,142	823	95	5,088

**SECTION VI – MODIFICATION OF NATIONAL INCOME EFFICIENCY PLAN
IN THE INTEREST OF REGIONAL DEVELOPMENT**

29. GENERAL

We have now developed a plan which meets a great portion of the projected needs of the basin and contributes to National Income Efficiency. We now need to determine what modifications to the plan are required in the interest of biased promotion of the basin's resource base for regional development. In its simplest terms, this means biased consideration for the Wabash basin as contrasted with other competing basins. Regional Development means transfer of opportunities from other regions to the Wabash. The Wabash is in a generally favorable position so far as per capita income is concerned as evidenced by table C-50. Those counties having a per capita income less than the national average are listed in table C-51. It is these latter counties which could be benefited by Regional Development.

30. REGIONAL OBJECTIVES

In order to objectively impute regionality into the planning process we need to articulate the regional objectives. This we have attempted to do for the Wabash basin. These objectives may be simply stated as:

- a. Provide an economic posture not in too great an imbalance with the economic posture of the Nation and competing regions.
- b. Provide opportunities for diversity of economic opportunities.
- c. Provide opportunities for orderly assimilation of projected population growth.

It should be remembered that regional development is dependent upon a variety of programs, means and availability of opportunities.

TABLE C- 50. PER CAPITA PERSONAL INCOME
UNITED STATES AND WABASH RIVER BASIN
1950-1968^{1/} AND 1980-2020^{2/}
(1967 dollars)

Area	Year					
	1950	1959	1968	1980	2000	2020
United States	2,065	2,441	3,301	4,764	8,288	14,259
White and Patoka	2,145	2,471	3,335	4,910	8,506	14,586
Wabash	1,747	2,095	2,976	4,483	7,889	13,645
Wabash River Basin	1,949	2,279	3,173	4,722	8,240	14,186

^{1/} SOURCE: U.S. Bureau of the Census, 1950, 1960 and 1970 reports.

^{2/} Preliminary projections prepared by the Office of Business Economics, U.S. Department of Commerce and the Economics Research Service, U.S. Department of Agriculture

TABLE C-51. LOW INCOME COUNTIES^{1/}
(Based on 1960 Dollars)

Economic subarea	County	Average income	Economic subarea	County	Average income
1	Brown	\$1,428	4	Clark	\$1,394
	Daviess	1,391		Coles	1,702
	Dubois	1,382		Crawford	1,731
	Jennings	1,272		Cumberland	1,313
	Martin	1,226		Douglas	1,615
	Orange	1,243		Edgar	1,460
	Pike	1,406		Jasper	1,239
	Posey	1,406		Lawrence	1,568
	Scott	1,370		Vermilion	1,746
	Washington	1,292		Wabash	1,714
	Owen	1,316		Sullivan	1,429
	Rush	1,422		Warren	1,412
	Clay	1,456		Darke	1,535
	Edwards	1,266		Mercer	1,442
	Effingham	1,429		Pulaski	1,406
	Gallatin	1,053			
	Hamilton	1,200			
Richland	1,534				
Wayne	1,421				
White	1,443				
2			5		
3			6		
			State of Illinois		\$2,181
			State of Indiana		1,832
			State of Ohio		1,957

^{1/} Counties having average aggregate income of \$400 or more below the state per capita aggregate incomes during 1960.
SOURCE: U.S. Bureau of the Census, County and City Data Book, 1967.

31. REGIONAL DEVELOPMENT THROUGH REDUCED FLOOD LOSSES

The dominant economic endeavor of the counties listed in table C-51 is agricultural production. In order to enhance agricultural pursuits and thus the flow of income through these counties a further reduction in flood damages over that reduction in National Income Efficiency would be beneficial. All of the flood control reduction elements and projects in the NIE plan will also be analyzed in authorization and other more detailed planning reports to determine if regional objectives could be partially met by increasing the flood control performance. Those projects which may fit into this category are listed in tables C-52 and C-53.

32. REGIONAL DEVELOPMENT THROUGH CONSUMPTIVE WATER USE

It is well established that some water using industries are attracted to specific locations due to the availability of water among other things. An example of this is the electric generating industry with its locational flexibility wherein its locational decisions are predicted primarily on market accessibility, raw resource availability, labor availability and water availability. These precepts are equally applicable to other types of industries. Those areas generally conducive to electrical generating development and other industries are indicated in plate C-2. A number of projects in the National Income Efficiency Plan can be modified to increase these opportunities, if needs are indicated. Institutional efforts should be expanded to encourage this industrial dispersal in the interest of upgrading the economic balance between agricultural pursuits and industry or manufacturing.

TABLE C-52. SMALL WATERSHED PROJECTS WHICH ARE CONSIDERED TO HAVE REGIONAL SIGNIFICANCE

Subbasin	County	Project name
Embarras	Clark, Crawford and Jasper, Illinois	North Fork Embarras
Lower Wabash	Posey, Vanderburg	Big Creek
Upper Wabash	Mercer, Ohio	Buckeye-Hoosier
East Fork of White	Adams and Jay, Indiana	Lost River
East Fork of White	Orange and Martin	Upper and Lower Vernon Fork
East Fork of White	Jennings and Jackson	White Creek
Mid-Wabash	Bartholomew and Jackson	Honey Creek
Lower Wabash	Bartholomew	Bonpas Creek
	Richmond, Edwards and Wabash, Illinois	

TABLE C-53. POTENTIAL ECONOMIC ENHANCEMENT OF DEPRESSED AREAS

Project	Economically depressed counties within 30 mile radius of project \downarrow	Remarks
EARLY ACTION Deputy Reservoir Azalia Reservoir	Jennings, Scott, Washington, Brown	Both Deputy and Azalia Reservoirs lie near the center of the geographical triangle bounded by the growing metropolitan areas of Indianapolis, Louisville and Cincinnati. The North Vernon, Indiana area has been identified as a potential location for a regional, international airport serving these cities with an interconnected rapid transit system supplementing the existing network of interstate highways. Future economic growth attendant to such development would be much in dependence upon these reservoir projects as a source of municipal and industrial water supply and for recreational use. Both projects have the potential for 50 to 75 percent expansion of their present planned capacity.
Parker Reservoir	Rush, Darke and Mercer, Ohio	Although this reservoir is formulated for maximum possible capacity as an early action project, possible reallocation of storage could provide for greater recreational potential for the project which would stimulate economic growth in the neighboring Ohio counties at the expense of reduced flood control and water quality benefits for the stream reaches below the dam in Indiana. A possibility exists for utilization of storage space in the divide area between New Castle and Muncie, transferring water from Parker Reservoir by channel during high stages and pumping at other times. Storage would be utilized for water quality and water supply at either of the cities noted above. Economic and institutional conflicts in such an arrangement have not been evaluated at present.
Crawfordsville Reservoir	Warren	Border line case; project would not likely improve the economic life of Warren County, most of which lies 35-45 miles to the north west.
Salt Fork Reservoir	Vermilion, Edgar, Douglas, Warren	Danville, Illinois represents the dominate trading center for most of the population of these four counties. The recommended Salt Fork Reservoir, centrally located to this four-county area, can stimulate industrial growth for the Danville area. While the project is presently planned for utilization of the full site capability, future water supply and recreation needs attendant to industrial growth in the area can be satisfied by readjustment and reallocation of present planned usage.
Levee Unit 2, Little Wabash R	Wayne, Edwards, White	Protects 7,360 acres of agricultural lands.
Levee Unit 7, Little Wabash R	Wayne, Edwards, White	Protects 7,010 acres of agricultural lands.
Levee Unit 8, Little Wabash R	Wayne, Edwards, White	Protects 13,400 acres of agricultural lands.

TABLE C-53. POTENTIAL ECONOMIC ENHANCEMENT OF DEPRESSED AREAS (CONTINUED)

Project	Economically depressed counties within 30 mile radius of project ^{1/}	Remarks
LONG RANGE Coal Creek Reservoir	Warren and Vermillion (Indiana), Edgar (Illinois)	The Coal Creek Reservoir is physically capable of being expanded about 15 percent in event the need for additional storage for recreation or other use is foreseen before construction is initiated. Warren and Vermillion Counties (Indiana) should profit from the leisure-recreation business which could be expanded from the base complex of the authorized Big Pine Reservoir and Coal Creek Reservoir and the natural areas of northwest Fountain County, all of which would be served by the recommended Wabash Scenic Parkway and Trail System. Northeastern Edgar County, Illinois may realize some economic stimulus from possible industrial growth attracted by the reservoir-recreation system outlined above.
Deer Creek Reservoir	Warren, Pulaski	These counties are unlikely to economically benefit from construction of Deer Creek Reservoir in that they are somewhat distant from the project area and are more geographically oriented to the existing developments on Tippecanoe River and the western Wabash region. The authorized Big Pine Reservoir is located in Warren County and its construction can be expected to accelerate economic growth of the county. The Deer Creek Reservoir is presently planned for development of maximum site capability in order to accommodate the water resource needs of the affected area.
Maltersville Reservoir	Dubois, Daviess, Martin, Orange, Pike	These counties have, based on 1960 dollars, an average of approximately 27 percent less per capita income than the Indiana average for 1960. Construction of the authorized Patoka Reservoir and the recommended Maltersville Reservoir can create long term industrial expansion for this five county area which has depended heavily on the agricultural and wood processing industries for employment. Considerable growth of travel and traditionally recreational oriented businesses can be expected in the communities near the proposed environmental fishery corridors which, in turn, will be enhanced by regulated releases from these reservoirs.
Martinsville Reservoir	Brown, Owen	Construction of the Martinsville Reservoir (Upper site) during the long range program should further increase the existing tourism recreation segments of the local economy in Brown County. Access to the Brown County State Park-Martinsville Reservoir complex would be improved by reconstruction and/or realignment of State Roads 135 and 252. Owen County would enjoy substantially reduced flood threats in the reaches of White River which flow through the county, especially in the Spencer area, and could expect dependable releases from Martinsville Reservoir for low flow control and industrial municipal use. The Owen County area also lies along an important transportation artery (State Road 67) which will bring recreationists through the county to the Martinsville project from southwestern Indiana. Owen County also lies in an advantageous location between the constructed Cagles Mill and Monroe Reservoirs.

^{1/} Counties having average aggregate income of \$4000 or more below the State per capita aggregate income during 1960.

33. REGIONAL DEVELOPMENT THROUGH "NEW COMMUNITY DEVELOPMENT"

As the population of the basin increases from the present 3,500,000 to some 6,500,000 (projected for the year 2020) it becomes imperative that population numbers and distribution be brought in close harmony with the available land and resource base. As the population doubles new cities or regional centers will develop and desirably so. These regional centers need to be planned with these objectives in mind.

- a. Developing residential areas in closer proximity to the employment area in order to cut down on commuting time, commuting distance, and the introduction of foreign material into the atmosphere.
- b. Develop environmental centers in close proximity to the residential areas so that the public or that segment of the public that so desires may enjoy a tranquil atmosphere not too far from their residence.
- c. Limiting the size of the "regional centers" by effecting planning and zoning to that which is conducive to administration, harmonious with the resource base and efficient in the use of resources.

Plate C-2 indicates areas which should be considered for regional centers. These areas have excellent availability to transportation routes, sufficient available resource base and sufficient water. The areas represent suggestions and detailed analysis would need to be made to ascertain for certain their adaptability.

34. REGIONAL DEVELOPMENT THROUGH IMPORT OF FINANCES

The preceding regional development precepts are regionally internal. There are certain concepts which are a combination of regional internal-external precepts. This involves an interaction between regions. One of the traditional precepts has to do with tourism and the economic activity stimulated thereby. The National Income Efficiency Plan provides a base which if properly utilized can stimulate an inflow of dollars into all of the economic subareas (if not inflow of dollars the plan at least tends to minimize the outflow of such dollars). In addition to the traditional recreation activities and their inherent financial flow, the Plan Formulation Subcommittee determined that there was a need for a central Wabash focus. This resulted in development of a broad plan of recreational development entailing consideration of the natural lake recreational developments existing in the upper portion of the basin, together with consideration of the Hoosier Lake National Recreation Area in the traditionally depressed south-central knobs area of southern Indiana. The latter could be developed in conjunction with other existing and planned recreational enterprises in the general area. These areas would be knit together by development of a Wabash Scenic Parkway and Trail system as depicted on Plate C-2. The system could focus on the Wabash River and contiguous features as part of the early development of mid-America and provide a central theme for the many attractions of the basin including historic, natural, archaeological and cultural features together with a broad, water oriented recreational system. The parkway and trail system and the considered Hoosier National Recreation Area with attendant areas, could provide a mecca for many Americans and could effect an imposed regional posture through importation of outside financial resources by sound promotion of the attributes of the area.

**SECTION VII – MODIFICATION OF THE NATIONAL INCOME EFFICIENCY AND
REGIONAL DEVELOPMENT PLAN IN THE INTEREST OF PRESERVATION
AND ENHANCEMENT OF THE ENVIRONMENT**

35. GENERAL

The present concern with the quality of the Nation's environment is long overdue. As the Nation expanded to its present population of over 200 million, a great abuse of natural resources was experienced. As long as the population levels were considerably lower than at the present we thought we had sufficient environmental resources to satisfy everyone. Then the day of awakening; it dawned that we were using and abusing resources faster than they could be replaced. As we cut our forests, overtilled soil, drained wetlands, abused the assimilation capacity of our streams and atmosphere, we created conditions that if not corrected, will deprive this generation and future generations of their rightful heritage. Thus today's society is attempting to right some of these environmental wrongs. This attempt is exemplified by a myriad of recent legislation such as the National Environmental Policy Act of 1969 – The Water Pollution Control Act – The Air Pollution Control Act and others. All of these are more of a corrective nature than of a protective and preservative nature. The Plan Formulation Subcommittee determined that we should fully implement the corrective laws in our plan. For maximum, long term benefits protective and preservative measures will have to be effected.

36. ENVIRONMENTAL CORRIDORS

To the plan for National Income Efficiency and Regional Development we decided to add Environmental Corridors. These environmental corridors were of two types:

a. Rural

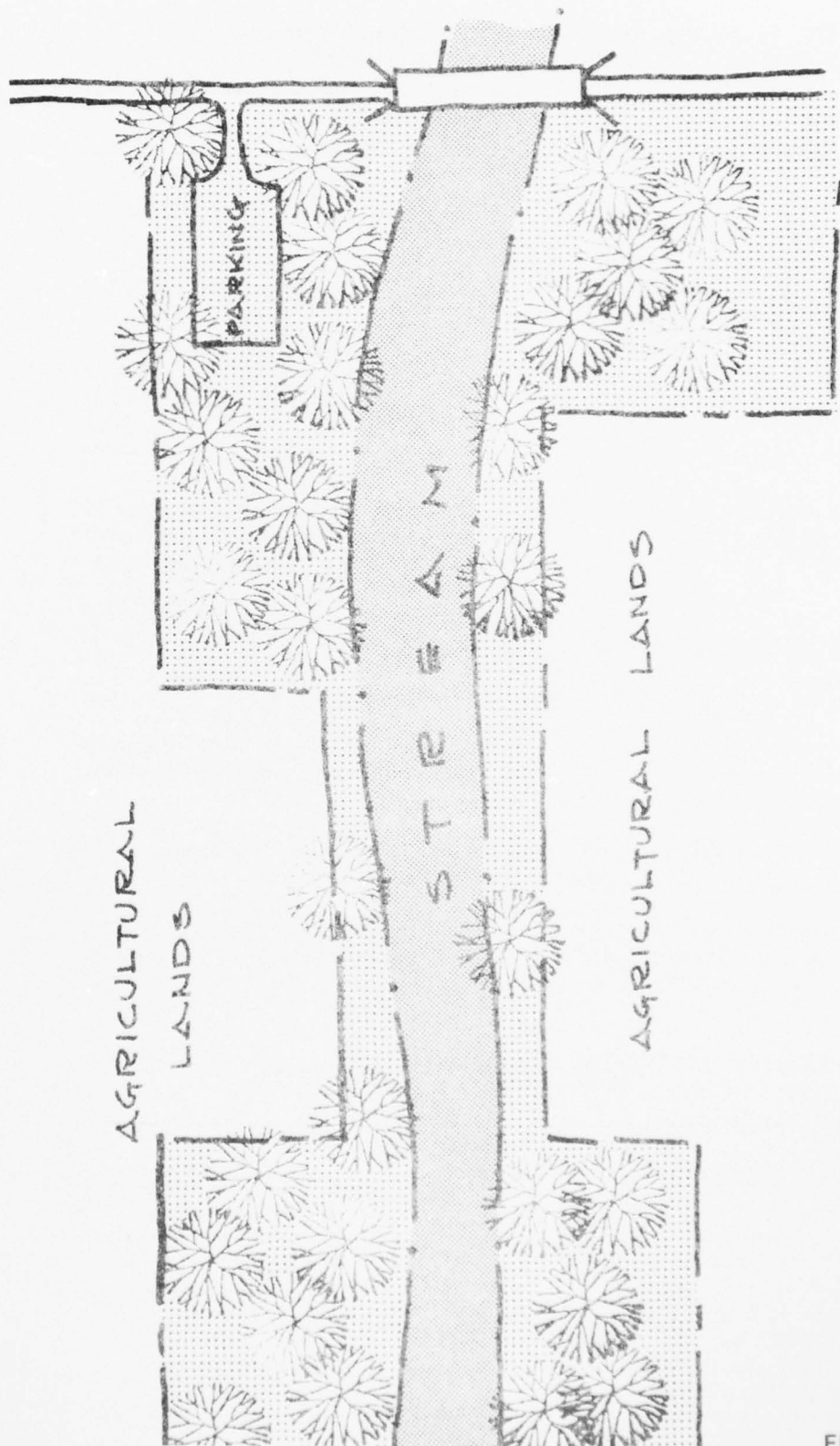
The rural environmental corridors selected represent the best of the stream environment that remains in the basin. Man in his normal productive pursuits has expropriated a great amount of the natural stream environment and converted it to other uses. The rural environmental corridors concept is depicted by figure C-2.

It is anticipated that much of the desired functional use of the stream corridor can be achieved by acquisition of scenic easements rather than acquisition by fee title. At selected places, however, a limited amount of fee title would need to be acquired to assure the public's right to ingress and egress. We concluded that the most expeditious administration of these areas could be performed by the states in which they are located in concert with the State Comprehensive Recreation Plan prepared in response to the Land and Water Conservation Fund Act. The recommended stream corridor system is shown on plate C-2. The length of corridor for each of the subareas is shown in table C-54.

b. Urban Corridors

Urban corridors were considered and selected in an effort to bring environmental opportunities to the public in some close proximity to their place of residence. The urban corridor may have low absolute environmental variety within the urban communities. They may be the only significant green areas that could and should break up the development monotony that exists.

We do not conclude that the urban corridors can be developed, designated and acquired as rapidly as can the rural corridors but we believe they represent a longer term



CONCEPTUAL ENVIRONMENTAL
STREAM CORRIDOR
RURAL SETTING

FIGURE C-2

TABLE C-54. ENVIRONMENTAL STREAM CORRIDORS
CONSIDERED FOR THE EARLY ACTION PLAN

Economic subarea	Environmental stream corridor (miles)
1	406
2	261
3	109
4	186
5	251
6	460
TOTAL	1,673

objective which could significantly contribute to an improvement in the quality of living in our urban areas. An example of the concept of urban corridors is illustrated by figure C-3. The communities for which detailed corridor plans should be developed are listed in table C-55.

c. Why Environmental Corridors

The corridors were conceived to serve a number of objectives, namely:

- (1) Protect and preserve the stream areas which in many instances provide the only remaining opportunities for plant and animal life generally requiring stream side or stream access conditions.
- (2) Minimize future flood damages by precluding developments or changed land use in the portion of flood plains covered by the corridors.
- (3) Identify the best of the stream environments so that those environmentally conflicting developments which by their nature need to be contiguous to streams can be located in more environmentally compatible areas.

TABLE C-55. PRIORITY LIST OF COMMUNITIES FOR WHICH DETAILED ENVIRONMENTAL CORRIDOR PLANS SHOULD BE DEVELOPED

Economic subarea	Community	Economic subarea	Community
1	Columbus, Indiana	5	Crawfordsville, Indiana
2	Anderson, Indiana		Kokomo, Indiana
	Indianapolis, Indiana	6	Logansport, Indiana
	Muncie, Indiana		Peru, Indiana
	Shelbyville, Indiana		Wabash, Indiana
3	Lawrenceville, Illinois		Marion, Indiana
	Danville, Illinois		

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WABASH RIVER BASIN COMPREHENSIVE STUDY. VOLUME IV. APPENDIX-C. --ETC(U)
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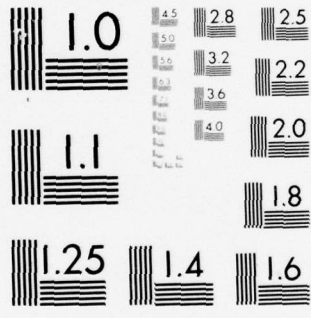
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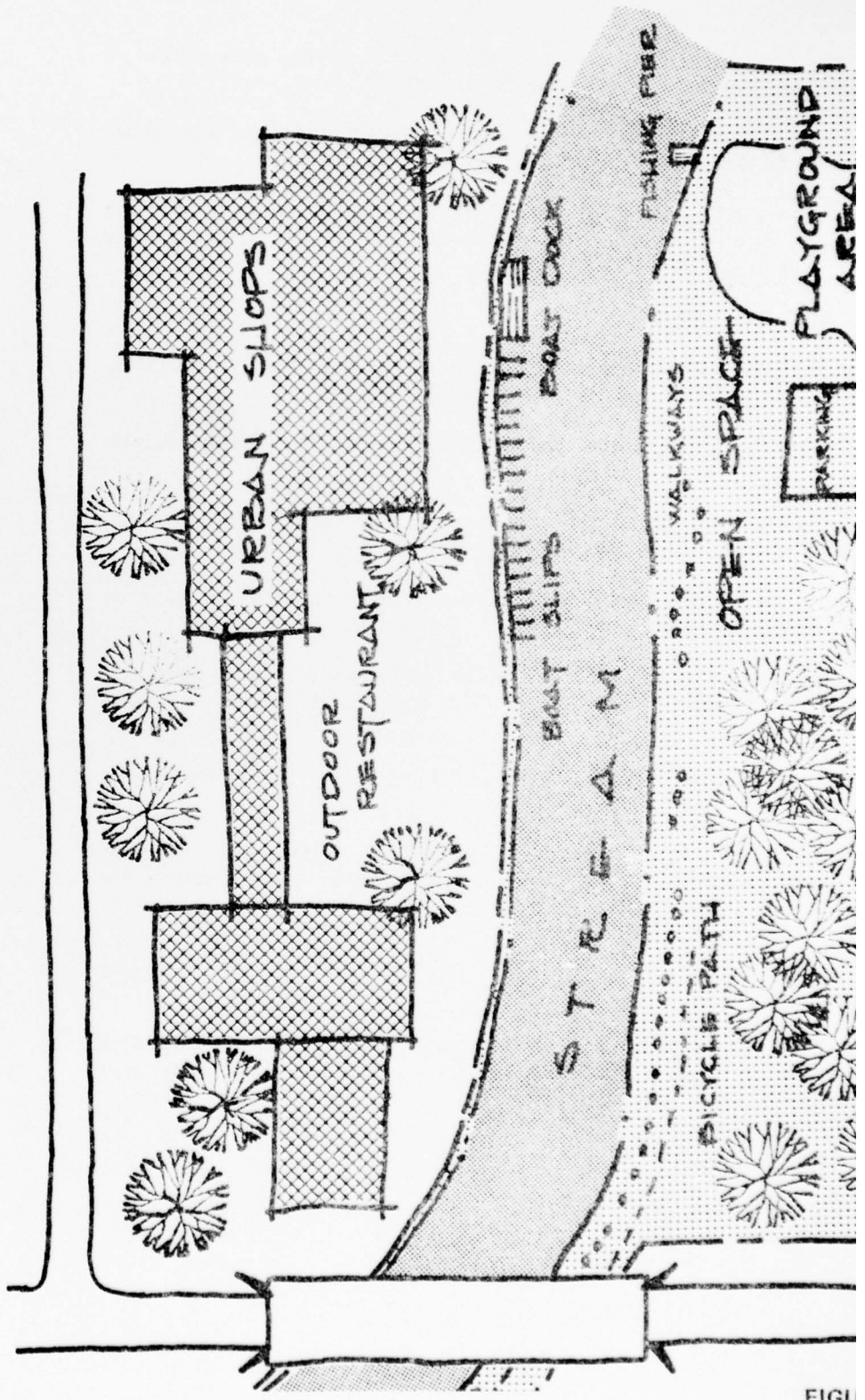
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(4) Be a part of an initial effort for a National Land Use policy. Most all land areas are related in some way to the basin's stream system.

(5) By acquiring scenic easements the riparian rights of contiguous owners can be preserved and existing uses of the land can be continued.

(6) The corridors are anticipated to require acquisition of an estate on about 40 acres of land per mile. It is further anticipated that some 80,000 acres would be involved at a total cost of about \$100 million.

37. STRUCTURAL MODIFICATIONS

Almost without exception the structural developments proposed were modified to some extent in the interest of the environment. Those changed included:

a. Provision of additional storage in lieu of channel improvements when feasible in watersheds.

b. Where channel modification is necessary confine it to one side of the stream where feasible, thus retaining some of the environmental alternatives of the area.

c. Establishment of riffles and pools in some channel modification plans to preserve or enhance the fishery resource.

d. As a part of channel modification any oxbow areas should be maintained and managed along with adjacent land areas for preservation and enhancement of fish and wildlife habitat.

e. Adjustment of damsite locations to avoid or minimize adverse environmental impact.

f. Where there were conflicts between environmental corridor areas and levee developments the levees were set back from the river to accommodate establishment of the environmental corridor.

38. OTHER CONSIDERATIONS

The Flood Plain Management Element and the Land Treatment Element are oriented toward the environment as much as toward National Income Efficiency and have been presented in the NIE plan.

SECTION VIII – CONFLICTS WITH PLAN ELEMENTS AND OTHER PROGRAMS

39. GENERAL

The conflicts of the plan as developed to this point are related more toward conflicts between developments and the environment than any other aspect. It is inevitable that all developments such as channel improvement, sewage treatment plants and other types of development conflict to some extent with the preservation of the existing natural environment. The only thing that can be done is to attempt to minimize conflicts and to assure that undisturbed environmental values be protected and preserved by the use of such alternatives as may be possible. The other aspect has to do with conflicts with other programs. We have attempted to minimize the conflicts with other programs by taking account of those programs in the selection of projects to meet main objectives.

There are very few conflicts with other programs that cannot be minimized or eliminated in authorization and other detailed studies when they are undertaken.

Table C-56 lists conflicts between structural elements of the early action and long range portions of the plan and the environment.

The Wabash River Basin plan is a part of the Ohio River Basin plan and as such we have compared economic and other projections for the plan with the Ohio Basin review. It should be remembered that the consideration in the Ohio River review in some instances was the reduction of flood damages along the main stem of the Ohio River. In the Wabash study, we have attempted to reduce flood damages in the Wabash basin rather than using the Ohio River main stem as the prime consideration; therefore, some modification or change from the storage estimates presented in the Ohio River basin review are necessary. Table C-57 presents a comparison of flood control projects formulated for the Ohio River and the Wabash River Basin Comprehensive Studies.

40. NAVIGATION

As mentioned earlier, a navigation study is being conducted to determine the feasibility of providing a navigable waterway from the Ohio River up the Wabash to various points on the Great Lakes. The study has not progressed sufficiently to conclude its feasibility or desirability; however, there have been three tentative routes selected for study. We have taken these three routes and tested to see what impact they would have on the plan developed for the Wabash River basin. Some projects and some environmental corridor areas would be affected. Table C-58 indicates those elements of the plan which would be affected by the various navigation routes being considered.

41. SUMMARY

The conflicts summarized in this section represent the best analysis at this time of the conflicts between the program elements. The conflicts between various elements of the plan (such as watersheds versus major reservoirs, etc.) have been resolved. The other conflicts are related to the basic conflicts between objectives such as national income efficiency versus protection and preservation of the environmental quality. The latter types are always inevitable since increased production of goods and services for human needs always impacts the environment in some way. As we have stated before, our objective is not to eliminate production of needed goods and services or to protect and preserve existing environment, but to provide for the production of needed goods and services and at the same time attempt to minimize the adverse impact on the environment. Now how can this

TABLE C-56. POTENTIAL CONFLICTS AND OPPORTUNITIES FOR DEVELOPMENT OF ENVIRONMENTAL FEATURES WITH PROJECTS RECOMMENDED FOR EARLY ACTION PLAN

Project	Natural areas	Historical sites	Archaeological sites	Covered bridges	Environmental stream corridors	Principal fishing streams	State forests	State fish and game areas	State parks	National forests
<u>Patoka River Subbasin</u>										
Patoka Levee Unit 2				2	1	1				
Patoka Levee Unit 3				2	1	1				
Patoka Levee Unit 4					1	1				
Patoka Levee Unit 5					1	1				
Patoka Channel Improvement					1	1				
Upper Patoka Watershed							1			1
Hall-Flat Creek										
<u>East Fork White River Subbasin</u>										
Azalia Reservoir				1		1				
Deputy Reservoir						1				
Columbus West Levee					1	1				
Wiemeyer Levee					1	1				
Beatty Levee					1	1				
Levee Unit 5					1	1				
Levee Unit 17						1				
Aikman Creek Watershed								1		
Lost River	4	2			1	1		1		1
Upper Vernon Fork	5				1	1			1	
Lower Vernon Fork		1			1	1		2		
Pond Creek										
Little Salt Creek					1					1
White Creek and Beatty					1					1
Walker Ditch										
Lewis Creek	1			1						
Upper Big Flatrock River				2						
Delaney Creek										
Brandywine Creek		1			1	1				1
Little Blue River		2	1		1	1				
<u>West Fork White River Subbasin</u>										
Parker Reservoir				1		1				
Fall Creek Reservoir					1	1				
Black Creek Watershed										1
Jordan Creek										1
Deer Creek				2						

TABLE C-56. POTENTIAL CONFLICTS AND OPPORTUNITIES FOR DEVELOPMENT OF ENVIRONMENTAL FEATURES WITH PROJECTS RECOMMENDED FOR EARLY ACTION PLAN (CONTINUED)

Project	Natural areas	Historical sites	Archaeological sites	Covered bridges	Environmental stream corridors	Principal fishing streams	State forests	State fish and game areas	State parks	National forests
<u>West Fork White River Subbasin (Cont'd)</u>										
Little Walnut	1			3			1			
Rattlesnake Creek							1			
Bryant Creek							1			
Whitelick Creek					1	1				
Killbuck Creek					1	1				
Wilson Creek	2									
<u>Upper Wabash River Subbasin</u>										
Clear Creek Watershed	1		1							
Little River	2									
Buckeye Hoosier					1	1		1		
Salamonie River	1		1		1	1				
Lower Mississinewa River	1			1	1	1				
Upper Mississinewa River	1			1	1	1				
Big Monon Ditch			1					1		
Sugar Creek										
<u>Middle Wabash River Subbasin</u>										
Crawfordsville Reservoir	1			1	1	1				
Salt Fork Reservoir					1	1				
City Ditch Watershed		8	1							
Snapp-Kelso										
Turtle Creek		2	1		1	1			1	
Mill Creek										
Honey Creek				1						
Sugar Creek					1	1		1		
Otter Creek	1									
Coal Creek	1			2	1	1				
Fall Creek	2									
Big Raccoon Creek				1	1	1				
Lye Creek	2									
<u>Embarras River Subbasin</u>										
Brushy-Birch Creek Watershed			1							
Muddy Creek										
North Fork Embarras River	2				1	1				1
Muddy Creek					1	1				

TABLE C-56. POTENTIAL CONFLICTS AND OPPORTUNITIES FOR DEVELOPMENT OF ENVIRONMENTAL FEATURES WITH PROJECTS RECOMMENDED FOR EARLY ACTION PLAN (CONTINUED)

Project	Natural areas	Historical sites	Archaeological sites	Covered bridges	Environmental stream corridors	Principal fishing streams ^{2/}	State forests	State fish and game areas	State parks	National forests
<u>Little Wabash River Subbasin</u>										
Levee Unit 7					1	1				
Levee Unit 8					1	1				
Fox River Watershed	2				1					
Upper Little Wabash River	3				1	1				
<u>Lower Wabash River Subbasin</u>										
Levee Unit 50					1	1				
Big Creek Watershed			1		1	1				
Gresham Creek		1	1							
Scott Ditch and Coffee Bayou	3									
Bompas Creek	1				1	1				
Total Structural Projects	20	7	9	14	38	39	7	6	4	4
Total Environmental Items	37	27	9	21	38	39	7	7	4	4

^{1/} Location taken from map prepared by Outdoor Recreation, Fish and Wildlife and Environmental Task Force. Probably this is not a complete list.

^{2/} Does not include all spawning areas upstream from the fishing stream.

TABLE C-57. COMPARATIVE ANALYSIS AND SUMMARY OF WATER RESOURCES PROGRAMS IN WABASH BASIN

Purposes	Requirements as projected by Ohio River Comp Study, 1/2/		Major impoundments				Watersheds				Summary of quantities in Plan	
	1980	2020	Authorized Dec. 1968	Early action 1980	Long range 2020	Authorized Dec. 1968	Early action 1980	Long range 2020	Early action 1980	Long range 2020	Early action 1980	Long range 2020
Flood Control (1,000 acre feet)	4,000.0	14,656.0	1,750.4	2,231.2	3,453.1	101.2	696.3	906.0	2,927.5	4,359.1		
Water Quality (1,000 acre feet)	1,388.7	2,622.4		253.0		2.5	84.8		337.8			
(Conservation Use) ^{4/}			(434.3)					(106.8)	(434.3)	(541.1)		
Water Supply (1,000 acre feet)	441.0	1,129.5		111.7		8.6	68.0		179.7			
Local Protection (Miles)	85	272	312.1	371.1	386.1				378.1	386.1		
Outdoor Recreation (million recreation days)	73.2	196.1	10.0	23.6	36.7	0.9	6.8	9.1	30.4	45.8		
Watershed Land Treatment (1,000 acres)	4,012.7	11,290.6				802.0	9,235.0	14,335.0	9,238.0	14,335.0		
Channel Improvement (miles)	568	1,701	7	42.5		510.5	1,946.2	2,513.6	1,988.7	2,513.6		
Irrigation (1,000 acres)	75.4	472.8				13.8 ^{3/}	35.8 ^{3/}	78.3 ^{3/}	35.8	78.3		
Drainage (1,000 acres)	2,184.0	2,819.0					206.8	292.6	206.8	292.6		

1/ Requirements in addition to that provided by existing (1965) programs.

2/ Amounts are accumulative for all columns.

3/ Irrigation existing and/or expected.

4/ Includes both water supply and water quality control storage.

5/ Includes ongoing program.

TABLE C-58. COMPREHENSIVE PLAN ELEMENTS WHICH MAY BE AFFECTED
BY THE CROSS-WABASH VALLEY WATERWAY

Major Reservoir Projects

Delphi, Upper

Levees and Local Protection Projects

Levee Unit 2, Wabash

Levee Unit 5, Wabash

Levee Unit 50, Wabash

Niblack Levee

Gill Township Levee

Island Levee

Greenfield Bayou Levee

Environmental Corridors

Montezuma, Ind. to Attica, Ind.

Logansport, Ind. to Huntington, Ind.

Danville, Ill. to Wabash River

At Lake Shafer

Upstream Watershed Projects

Black River

Busseron Creek

Turman Creek

Prairie Creek

Coal Creek

Goose Creek

Coal Branch

Little River

Big Monon Ditch

Natural Areas

Old Dam, New Harmony Cut-off

The Rapids

Hanging Rock

Big Four Cut

Historical Sites

Grand Rapids

be done? Basically by assuring in the array of alternatives that there are environmental oriented alternatives that may distress the efficiency objectives and then in making investment decisions give equal weight to environmental protection as to other objectives. The great difficulty is not in the area of goals or objectives but rather in developing an acceptable methodology whereby environmental values may be explicitly imputed into the decision making model. In the absence of specific methodology many objectives outside of the National Income Efficiency objective will be based on personal preference and thus strongly subjective rather than articulate and objective.

SECTION IX – PLAN EFFICIENCY AND DEFICIENCIES

42. GENERAL

As indicated in Section II there were a number of needs to which the plan would be addressed or which we were trying to eliminate. The best way of determining plan efficiency is to analyze how well the plan meets those needs. Accordingly, where the needs have been tabulated we will retabulate them to show how effective the plan is in meeting the indicated needs.

43. PLAN EFFICIENCY

In analyzing the efficiency of the plan we decided to compare the products of the plan with the needs as previously established. Analysis on a need by need basis as follows:

a. Municipal and Industrial Water Supply

Table C-59 indicates municipal and industrial water supply requirements and in each case how the needs for municipal and industrial water supply can be met through the year 2020 for each point of need.

b. Water Quality Control

The plan as developed meets the water quality control objective in every instance where the water quality objectives can be met by storage and by advanced waste treatment at the source.

c. Flood Damage Reduction

Figure C-4 indicates efficiency of the plan in reducing flood damages.

d. Recreation

Figure C-5 indicates the efficiency of the plan in meeting recreation needs and demands in the basin.

e. Fishing and Hunting

Figures C-6 and C-7 shows the efficiency of the plan in meeting fishing and hunting demands in the basin.

f. Pristine Opportunities

Pristine opportunities as we have defined them in Section II will be met or nearly met by virtue of the environmental corridors which have been presented therein and by the implementation of the National Forest Program recommended in Appendix H.

g. Agricultural Water

Agricultural water requirements will be met by the plan by virtue of the structural elements of the plan. In many instances the agricultural water can be obtained from ground water without depletion or mining of the ground water.

TABLE C-59. EVALUATION OF OPTIMUM RESOURCE DEVELOPMENT
TO MEET PROJECTED WATER SUPPLY NEEDS

Problem area ^{1/}	Optimum resource plan considered for meeting needs
PATOKA SUBBASIN	
Jasper	Patoka Reservoir, under construction, can supply needs through study period.
Huntingburg	SCS reservoir P20-II, west of city, is most promising of available alternates. Program can furnish water to St. Anthony and Birdseye. Purchase of storage from Patoka Reservoir would be an alternate solution.
Ferdinand	SCS site P21-II on Green Creek, 1.3 miles north of town is cheaper source than Patoka River or Patoka Reservoir
Oakland City	Pumping from Patoka River to existing reservoir appears cheaper than development of well field 12 miles north in White River basin.
EAST FORK WHITE SUBBASIN	
New Castle	<i>Development of ground water to 2010 with supplemental supply from four SCS reservoirs for remainder of study period.</i>
Greenfield	Further development of existing ground water aquifers followed by expansion southward toward Big Blue River
Greensburg	Development of additional ground water followed by purchase of water from Downeyville Reservoir
Scottsburg	Additional water available from projects in Stucker Fork SCS project, Quick Creek Reservoir and Deputy Reservoir.
Vernon-North Vernon	Future needs through 2020 can be supplied by SCS structures in Vernon Fork watershed.
Orleans	Poor ground water availability due to Karst topography. Water can be made available from Mitchell, storage in Structure No. 2 (Lost River SCS project); and regional supply from Patoka Reservoir.
Paoli-French Lick-West Baden	Cheapest prospect appears to be storage in Lost River Watershed Project - Structures 11, 13, 14, and 15. A regional distribution of storage from Patoka Reservoir for these communities would likely be next favorable.
WEST FORK WHITE SUBBASIN	
Winchester	Development of one or more new well fields as needs develop is least cost plan

TABLE C- 59. EVALUATION OF OPTIMUM RESOURCE DEVELOPMENT
TO MEET PROJECTED WATER SUPPLY NEEDS (CONTINUED)

Problem area ^{1/}	Optimum resource plan considered for meeting needs
WEST FORK WHITE SUBBASIN (CONTINUED)	
Muncie	Increasing pumped storage in Prairie Creek Reservoir, development of additional ground water and eventual use of storage in Parker Reservoir is lowest cost plan.
Anderson	Due to water quality needs downstream, Anderson should continue development of ground water resources with post-1980 needs supplied by Parker Reservoir.
Elwood	New well fields within ten miles or so are least cost solution.
Indianapolis Area (Includes Marion County and adjacent areas north and south)	Development of additional ground water to supplement existing surface impoundments will meet 98 percent of 1980 requirements. Additional early action needs to be met by Fall Creek Reservoir or other sources Post-1980 needs are expected to be satisfied by increased ground water, increased waste water return from up-stream communities and storage in Parker, Fall Creek, Big Walnut and Big Blue Reservoirs. (Total needs by 2020 projected to be 390 mgd)
Plainfield	Ground water development can satisfy needs through study period with alternatives from Big Walnut Reservoir (pipe line to Indianapolis) and SCS site 60-VIII.
Greencastle	Ground water available in Big Walnut Creek valley furnishes a least cost alternative to purchasing storage in Big Walnut Reservoir.
UPPER WABASH SUBBASIN	
Kokomo	Kokomo will be unable to meet its projected water supply needs from locally available ground and/or surface water resources. Future supplies may be drawn from ground water southwest of Kokomo or by reallocated storage from Mississinewa Reservoir. Reuse of waste water by industries as done at present, can extend supplies. Further sources may include reservoir supplies from Pipe Creek and Lafayette Reservoir.
MIDDLE WABASH SUBBASIN	
Crawfordsville	Expansion of well fields will meet 1980 needs; post-1980 needs can be met by developing storage in Crawfordsville Reservoir or by purchasing water from Mansfield Reservoir.
Georgetown, Illinois	Purchase of water from Danville or development of well field in Wabash River valley ten miles away appear to be the best prospects.

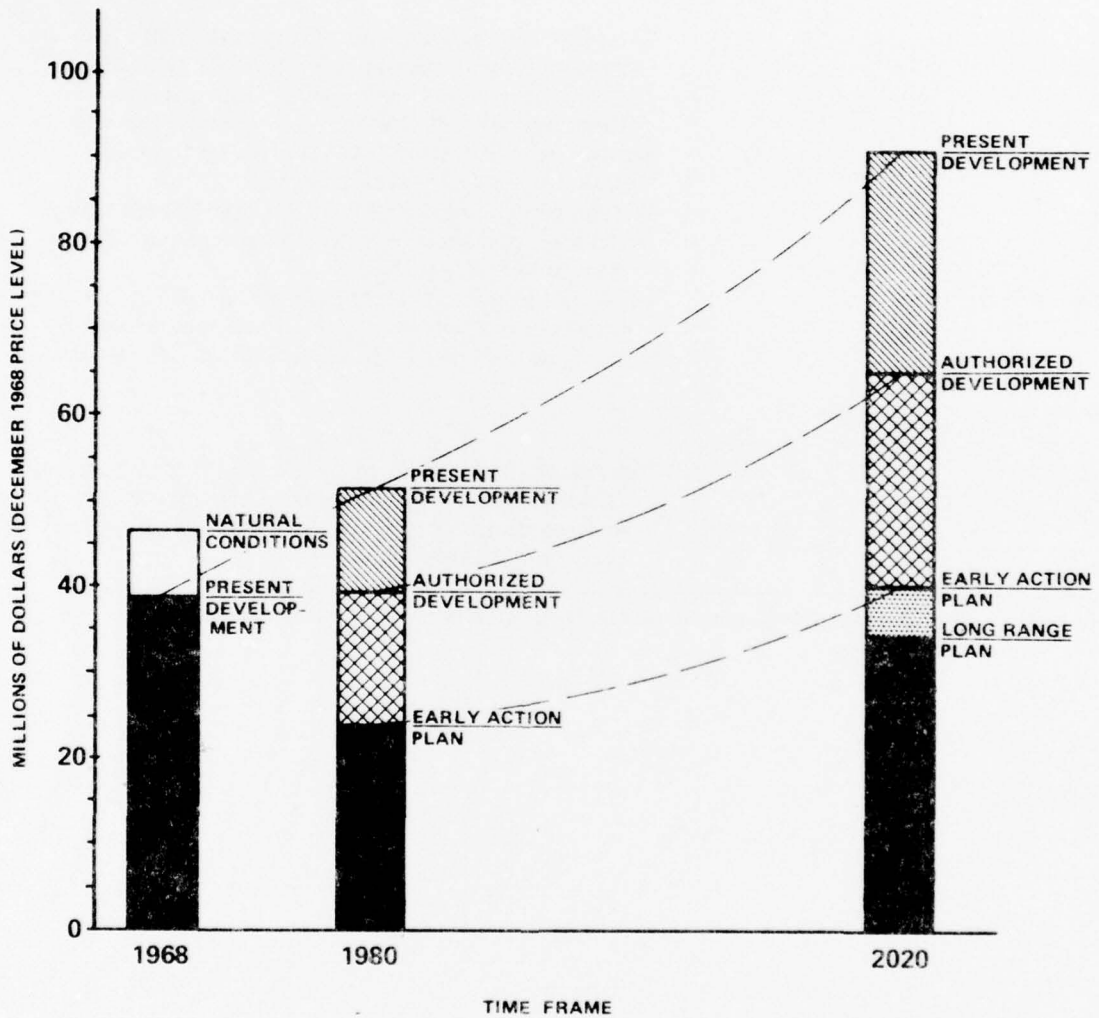
TABLE C-59. EVALUATION OF OPTIMUM RESOURCE DEVELOPMENT
TO MEET PROJECTED WATER SUPPLY NEEDS (CONTINUED)

Problem area ^{1/}	Optimum resource plan considered for meeting needs
MIDDLE WABASH SUBBASIN (CONTINUED)	
Paris, Illinois	Early needs can be met by storage in SCS site 44-I on Sugar Creek. Other possibilities include a well field in Wabash valley, piping surface water from Wabash River or obtaining storage from authorized Lincoln Reservoir.
EMBARRAS SUBBASIN	
Charleston, Illinois	Water purchased from authorized Lincoln Reservoir or from State identified reservoir site on Polecat Creek offer most feasible solution. SCS has also identified several potential sites in the area.
Casey	Present supply can meet needs through 1980. Further needs can be met by developing new well field west of Casey in the Embarras River valley, or by utilization of storage in SCS sites 11-I and 11-IV, or developing surface water supply from Embarras River.
Newton	Least cost alternative is to develop wells in Wabash valley east of Newton, use of flow in Embarras River, or use SCS reservoir sites in the area.
Arcola, Illinois	Well field expansion can provide needs to 1980 or 1990 with later alternative or water purchased from authorized Lincoln Reservoir.
LITTLE WABASH SUBBASIN	
Olney	City is presently developing a new reservoir on West Fork Fox River which will satisfy demand through study period.
Fairfield	Least cost future supply would be storage in authorized Lincoln Reservoir.
Cisne	Future supplies can be extracted from well fields in Raccoon Creek or Elm River valleys, each about five miles away.
Enfield	Well field development in Little Wabash valley offers best alternative source.
Clay City	Storage in authorized Louisville Reservoir offers best source to satisfy past 1980 needs.
Flora	Needs after 1980 can most cheaply be met by utilization of storage from authorized Louisville Reservoir. An alternative exists for development of an SCS identified reservoir site 43-II.
Louisville	Authorized Louisville Reservoir can furnish supply for post-1980 needs with alternative storage available from SCS identified site 44-IV on tributary of Panther Creek.

TABLE C- 59. EVALUATION OF OPTIMUM RESOURCE DEVELOPMENT
TO MEET PROJECTED WATER SUPPLY NEEDS (CONTINUED)

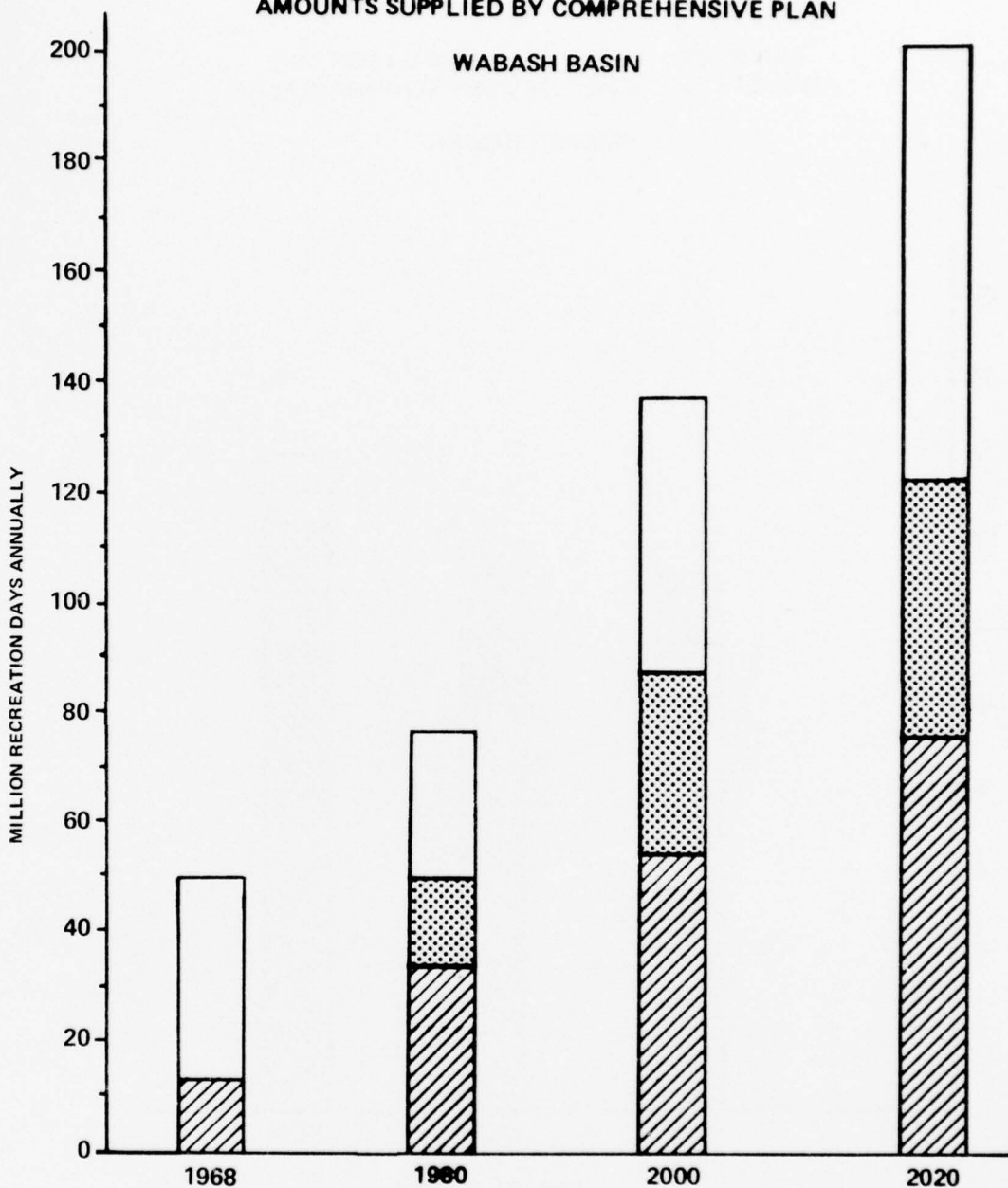
Problem area ^{1/}	Optimum resource plan considered for meeting needs
LITTLE WABASH SUBBASIN (CONTINUED)	
Mattoon	Least cost alternative for satisfying post-1980 needs appears to be storage in SCS site 52-IV with other alternatives of purchasing water from Shelbyville Reservoir or from authorized Louisville Reservoir.
Altamont	Storage from SCS site 52-XVIII provides the least cost alternative for future needs.
Dieterich	Development of new well field in Little Wabash valley is a least cost solution with alternate of purchasing storage in SCS site 50-III.
Edgewood-Mason	Least cost solution to meet pre-1980 needs is to develop well field in Little Wabash valley with alternate of purchasing storage in SCS site 46-II on Dismal Creek.
LOWER WABASH SUBBASIN	
West Salem	Needs for post-1980 time frame can be met by purchase of additional water from nearby Albion or it can acquire storage in SCS site MS-100-X to be located on Crooked Creek.




^{1/} Areas for which projected water supply needs cannot be met from locally available ground or surface water resources.



RESIDUAL AVERAGE ANNUAL DAMAGES
 DECEMBER 1968 PRICE LEVEL
 WABASH RIVER BASIN

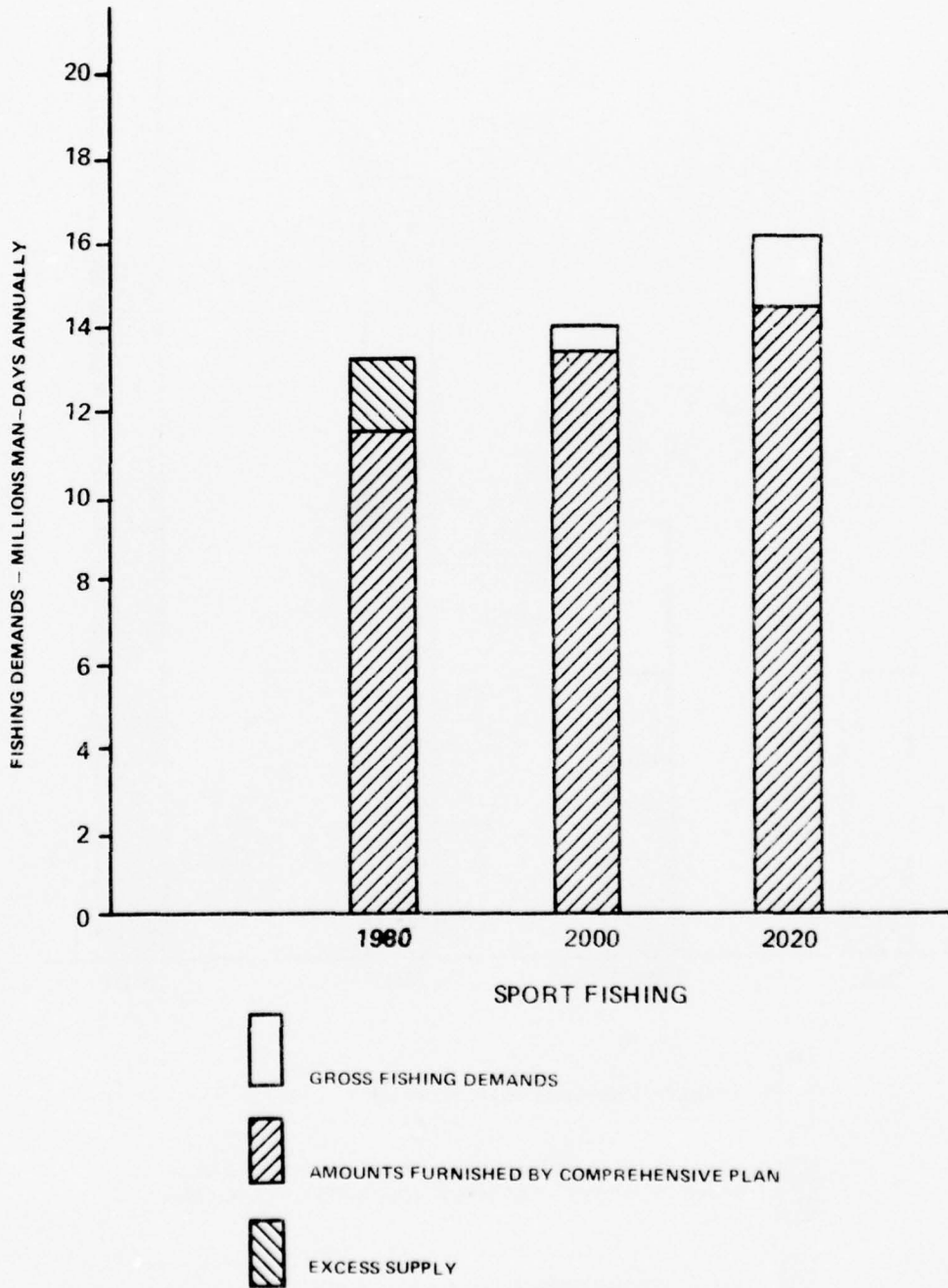
PROJECTED OUTDOOR RECREATION DEMANDS AND AMOUNTS SUPPLIED BY COMPREHENSIVE PLAN



-  TOTAL OUTDOOR RECREATION DEMAND
-  RECREATION FURNISHED BY EXISTING, AUTHORIZED AND GOING PROGRAMS - DEC 1968 (TOTAL SUPPLY, ALL SOURCES)
-  RECREATION FURNISHED BY RECREATION PLAN

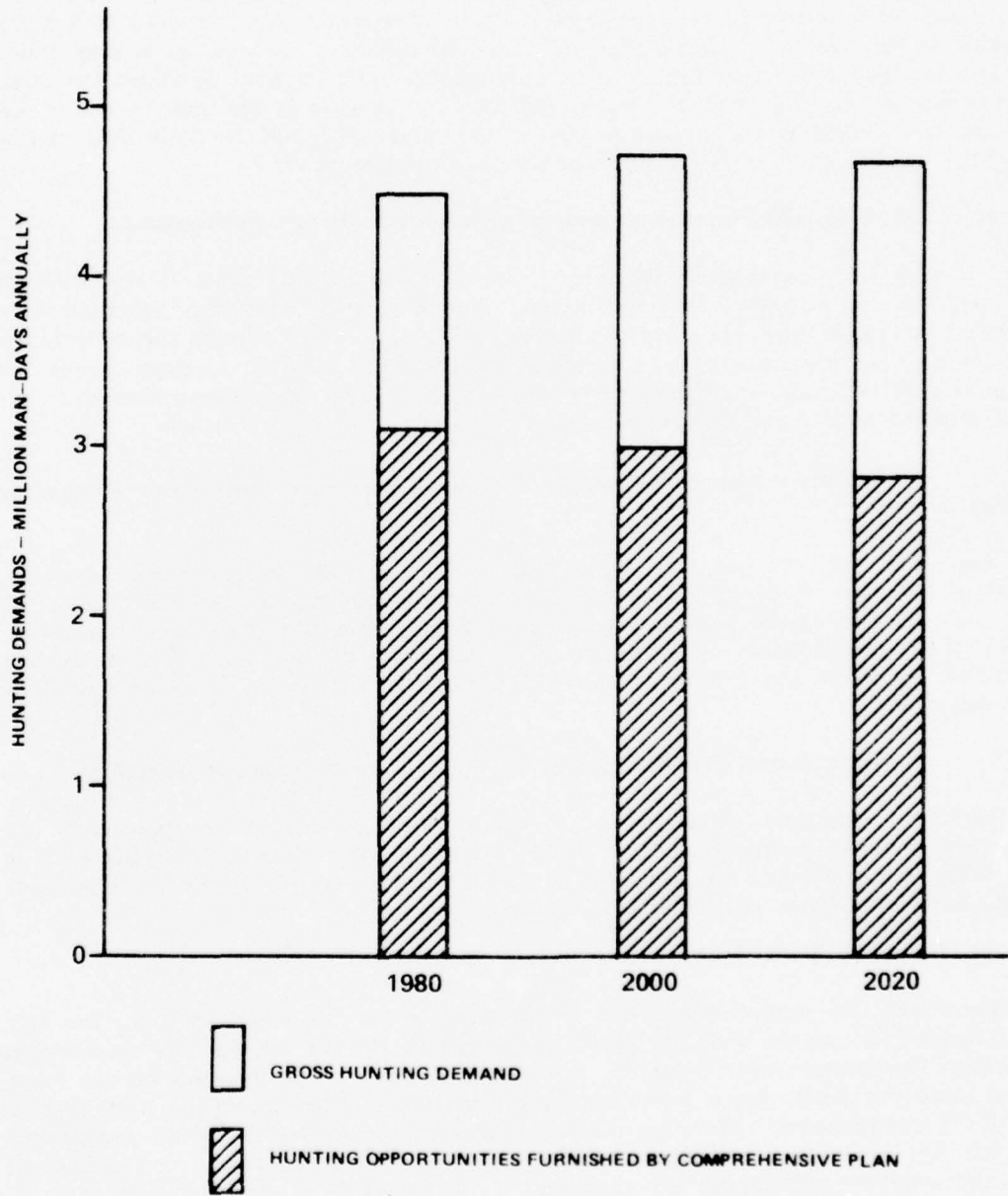
PROJECTED GROSS FISHING DEMANDS AND
AMOUNTS FURNISHED BY COMPREHENSIVE PLAN

WABASH BASIN



PROJECTED GROSS HUNTING DEMANDS AND
AMOUNTS FURNISHED BY COMPREHENSIVE PLAN

WABASH BASIN



h. Irrigation

The irrigation demands of the basin are somewhat small. We find that the plan as presented has the capability of completely meeting the projected irrigation needs of the basin.

i. Water for Cooling

There will be sufficient makeup water for cooling of thermal power stations in the Wabash Basin for the amount of power that is projected to be produced within the Wabash Basin, provided that off-channel, recirculating type cooling facilities are provided at all new plants to be constructed and at some present plants. Discretion must be used in locating new plants so that the water at the chosen locations is sufficient for making up evaporation losses and its use would not detract from meeting the water quality standards for other purposes. We believe that with the water that will be flowing in the streams and if the plants are not located in the environmental corridor area, there will be little difficulty in meeting the water requirements for the production of electric power.

j. Water for the Preservation and Enhancement of Stream Environment

We have had considerable difficulty in the analysis of this need. It was difficult determining how much stream flow was needed. However, with the elements planned there is sufficient storage so that regulated discharges to the stream will provide the opportunity for protection and preservation of the stream environment. With an adequate supply the problem is then relegated to distribution which can and should be further addressed at the detailed stage of project and plan development.

k. Preservation and Enhancement of the Basin Food and Fiber Production Capability

This need will be met to a great extent by the land treatment and structural elements of the plan. Preservation of productive capacity requires that we leave fertile soil on the land. It also means that we must reduce flood damages to agricultural endeavors. Both of these requirements are inherent and vital parts of the plan. The production requirements for food and fiber needs can be met through drainage, irrigation and flood control measures.

l. Preservation and Enhancement of the Basin's Forest Resource Capability

The land treatment element of the plan provides a substantial opportunity for reforestation or forest improvement and also conversion of some marginal cropland back to forests. With implementation of the land treatment element of the plan, forest resource capability within the basin will be significantly improved.

44. PLAN DEFICIENCIES

There are two major deficiencies in the plan as we have developed it. The first major deficiency has to do with our inability to meet all the projected recreation demands in the basin. The second major deficiency is the lack of water regulation plan for the basin. With the numerous lakes, major reservoirs, watershed projects that are in the plan, there is a need for a comprehensive water regulation or water management plan for the basin. Such a plan has not been developed at this time, since this detailed regulation was considered beyond the scope of developing the plan and is recognized as a deficiency or potential deficiency of the plan.

SECTION X – DISPOSITION OF PLAN DEFICIENCIES

It was previously indicated that there are two basic deficiencies in the plan as developed. The next question is, what can be done about these deficiencies.

45. REGULATION

The first deficiency has to do with the comprehensive regulation plan for water management in the entire basin. We conclude that the only way to correct this deficiency in the plan is to seek authorization for a comprehensive regulation plan which has to be coordinated among the members of the coordinating committee to assure that the regulation of waters in the basin are meeting all objectives efficiently. This comprehensive regulation plan would need to take into account all objectives: flood control, water supply, water quality, fish and wildlife, recreation, environment and regional objectives and incorporate therein all of the structures that are included in the early action plan as well as the long range plan. Many of the watersheds include uncontrolled floodwater retarding structures. The regulated structures within the watershed need to have a built-in compatibility with these unregulated structures.

46. RECREATION

The second deficiency that we have noted is our inability in the plan as presented to meet the recreation demands for the basin. There are the environmental corridors which will contribute to some degree to increased opportunities for recreation. However, in view of the parameters that were imputed into the recreation demands, these environmental corridors will not nearly meet the projected unsatisfied recreation demands. The subcommittee concludes that there are 3 primary ways of meeting this deficiency.

First, there needs to be a change in the use patterns of recreation facilities. We find that the recreation facilities are taxed to their limit during the summer weekends while they are not nearly used to their capabilities during the week. If the work characteristics of the populace could be changed, to, in essence a two weekend week, then the same recreation facilities, with no increase in capital, would increase the recreation supply by approximately 30 to 40 percent, thereby, greatly reducing the gap between supply and demand. In addition, we find that some projects which have been previously developed have the capability of expanding their recreation use. We conclude that these projects should be reexamined as early as practicable to determine if in fact that additional recreation facilities and recreational lands are warranted and desirable and could be acquired in conformance with existing laws and legislation. For example, we believe that the Cagles Mill Lake and Mansfield Lake which have been in operation for some time have the ability with a nominal amount of additional expenditure to assimilate some portion of the excess recreation demands and thus increase the supply from these specific projects. We believe that authorization should be sought to increase this recreation capability for all completed projects if in fact non-federal interests have met the requirements under existing legislation. In other words, if the requirements of Public Law 566 or Public Law 89-72 have been met, then these projects would be eligible for incorporation for additional recreational facilities. Thirdly, time zoning of the use of waters could provide for substantially greater use than presently or potentially exists without time zoning.

The subcommittee concludes that if the three ways of meeting recreation deficiencies are implemented, all or substantially all of the excess needs can be met by the plan.

SECTION XI – PRIORITY FOR IMPLEMENTING PLAN

47. CRITERIA FOR ESTABLISHING PRIORITIES

There are certain criteria which have been used in establishing priorities for implementing each of the four elements of the plan. These priorities are discussed below for each element of the plan.

48. FLOOD PLAIN MANAGEMENT ELEMENT

The objectives of the Flood Plain Management element is to reduce flood damages by zoning or control of future developments in that portion of the flood plain which is subject to flooding. The criteria that will be used for establishing priorities is to determine which areas are most likely to be developed and to set up a flood plain management plan for those areas. Generally, these areas are contiguous to urban communities. Therefore, a judgement decision has been made regarding the areas most likely to be developed and a flood plain management plan would need to be prepared for these areas which are likely to be developed. Table C-48 indicates a priority for the flood plain management program as a part of the flood plain management element.

49. ENVIRONMENTAL CORRIDORS

There are two basic priorities for the environmental corridors. One would be those areas which have the highest absolute value and another would be those areas where if something isn't done in the immediate future the resource is likely to be lost for future generations. Table C-60 indicates the priorities accorded the environmental corridor element in the early action plan.

50. LAND TREATMENT ELEMENT

The land treatment element is also accorded two priorities. One priority would be for those areas which if not adequately treated would adversely affect other programs. For instance, on those lands above impoundments, if erosion is not reduced it would adversely impact the economic and functional life of the impoundments. Into another category of this priority would be placed those lands which are deteriorating today at such a rate that if early action is not effected these lands would be lost as a viable resource. All other lands would fall into a second general priority category.

51. STRUCTURAL ELEMENTS

The general priorities for structural elements are indicated somewhat by their placement in either the long range or early action plan. However, we have further designated certain elements in the early action plan that need to be implemented before other elements. In establishing the priorities for the early action plan we have accorded a *priority consideration* to those elements within the early action plan that will contribute to the water supply needs and to the improvement of the quality of flows in the stream. These two criteria were the principal ones used to establish the priorities for implementing the early action plan. Table C-6J indicates the priorities accorded the structural elements in the early action plan.

TABLE C-60. PRIORITY OF ENVIRONMENTAL STREAM CORRIDORS

<u>PRIORITY 1</u>	
(1) Wabash River	(13) Busseron Creek
(2) Tippecanoe River	(14) Salt Fork
(3) Wildcat Creek (including Middle Fork and South Fork)	(15) Embarras River
(4) Eel River (Cass Co. to Whitley Co.)	(16) Little Wabash River (including Fox River)
(5) Mississinewa River	(17) Eel River (Putnam Co. to Hendricks Co.)
(6) Big Lick Creek	(18) White Lick Creek (including East Fork)
(7) Salamonie River	(19) Eagle Creek
(8) Loblolly Creek	(20) West Fork White River
(9) Sugar Creek (Park Co. to Clinton Co.)	(21) Fall Creek
(10) Sugar Mill Creek	(22) Patoka River
(11) Vermilion River	(23) Muscatatuck River
(12) Big Raccoon Creek (including Little Raccoon and Leatherwood Creeks)	(24) Lost River
<u>PRIORITY 2</u>	
(1) Big Wea Creek	(9) Indian Creek
(2) Deer Creek (Carroll Co.)	(10) Driftwood River
(3) Little Vermilion River	(11) Flatrock River
(4) Bonpas Creek	(12) East Fork White River
(5) Deer Creek (Putnam Co.)	(13) Vernon Fork Muscatatuck River
(6) Sugar Creek (Johnson Co. to Hancock Co.)	(14) Big Graham Creek
(7) Big Blue River	(15) Little Salt Creek
(8) Brandywine Creek	(16) Black Creek

TABLE C-61. PRIORITY LISTING EARLY ACTION STRUCTURAL PLAN

Recommended Priorities for Major Reservoirs	
1. Fall Creek	4. Salt Fork
2. Crawfordsville	5. Azalia
3. Parker	6. Deputy
<u>Recommended Priorities for Local Protection Projects</u>	
1. Columbus, Indiana – West Levee, Wiemeyer Levee, Beatty Levee and Levee Unit No. 5	
2. Patoka River – Channel improvement lower 35 miles. Levee Units 2, 3, 4, and 5.	
3. Little Wabash River – Levee Units 7 and 8.	
4. Lower Wabash River – Levee Unit 50	
<u>Watershed Projects</u>	

SECTION XII – LEGISLATIVE AND INSTITUTIONAL CONSTRAINT MODIFICATION NECESSARY TO IMPLEMENT THE PLAN

52. GENERAL

In implementing the plan which has been developed and presented in preceding paragraphs, it has become evident that there are a number of institutional and legislative constraints that need to be removed in order to equitably and efficiently implement the plan. These constraints if unrectified or uncorrected would pose real impediments to developing a comprehensive and viable water resource plan for this basin or any basin. A brief summary and proposals thereon follows:

53. WATER QUALITY CONTROL

Public Law 566 under which a number of the structural components of the plan would be constructed does not provide for any federal participation for storage for water quality control. It would appear only equitable and fair that the criteria for including water quality control in small projects would be the same as if a large project were built and that federal interests would be the same in both cases. In other words, where the beneficiaries are wide spread and augmentation of low stream flow is not provided in lieu of adequate treatment at the source that there should be a uniform federal responsibility in financing the cost for storage for water quality control.

54. ENVIRONMENTAL CORRIDORS

There is existing legislation which provides general authority for undertaking the development of an environmental corridor system as recommended in the plan. The Wild and Scenic Rivers Act has not considered any streams in the Wabash Basin. Irrespective of that we believe and conclude that although none of the environmental corridors, in isolation, have national significance, the system as included in the plan has a significant national objective. Accordingly, we believe that the funding for the environmental corridors should be cost shared between the federal government and non-federal interests in a 50-50 basis. In other words following the intent of Public Law 89-72, the Federal Water Project Recreation Act and Public Law 566, would enable the federal government to cost share with non-federal interests on an equal basis. We could not determine that there was any equitable difference between the traditionally accepted specific water using recreation activity and the more pastoral type recreation activity which would be provided by an environmental corridor system. Accordingly, it is felt that equity could best be served if there was a 50-50 cost sharing on the environmental corridors.

55. WATER SUPPLY

The postage stamp theory for water supply supports the theory of everyone paying the same price for the water they use. Some discussion has been accorded to the postage stamp theory for water supply. However, at this time the subcommittee is not prepared to make a specific recommendation thereon. However, we believe that this is a matter that needs to be addressed by the Coordinating Committee. For example, we could not agree that equity was being served wherein the cost brought about by the locational condition of one community would require it to pay considerably more than another community for raw water supply.

56. RECREATION

In trying to develop a basin plan for water resource development, we find that Public Law 89-72, the Federal Water Projects Recreation Act puts a considerable crimp into developing efficient plans. We believe that this crimp obtains by the language in 89-72 which pertains to the level of recreation benefits that are inherent in any particular project. P. L. 89-72 concludes that not more than 50 percent of the cost can be allocated to recreation in any project. In developing basin plans we are concerned with overall efficiency, the overall basin objectives, rather than the specific efficiency of a project and the specific objectives of a project. In many cases we find that the best balanced basin plan is made up of unbalanced projects. Accordingly, although the basin plan should meet the requirements of Public Law 89-72, it may be that specific projects would not meet that requirement. We believe that Public Law 89-72 should be revised to reflect that when a project is part of a comprehensive basin plan that it would not have to meet the 50 percent rule if in fact that project was unbalanced in order to provide the most efficient plan. Public Law 89-72 should also be revised to provide for continuing developments at authorized or completed projects wherein non-federal interests have or will have meet their obligations under Public Law 89-72.

57. GROUND WATER

We conclude that there must be or needs to be greater identification by virtue of research and study on the quantity and quality of ground water. In all of our deliberations we find that the greatest unknown regarding the specific quantity and quality of the resource lay in the area of ground water.

58. FLOOD PLAIN REGULATION

The States and subdivisions thereof should be encouraged to develop sound flood plain use plans designated to prevent unwise developments in the flood plain. To this end, no monies should be expended by Federal interests for flood control or flood insurance projects after 1976; unless, adequate and acceptable flood plain planning has been certified to be in effect by the states or subdivisions thereof for areas receiving project benefits.

59. SITE PRESERVATION

That compatible Federal and state legislative authority be obtained to acquire protect and preserve the water storage sites where such sites are required for the long term welfare of the populace and that interim uses be made of these sites for recreation fish and game management, agricultural production and forest management in accord with land use plans to be prepared by Federal and non-federal interests.

60. WATER SUPPLY STORAGE

That Title III of Public Law 85-500 (and comparable portion of Public Law 566) be modified to enable the Federal Government to underwrite the cost of providing added storage in projects for municipal and industrial water supply purposes. Provided there is a reasonable expectation that such storage will be required during the functional life of the project; and provided further, that non-federal interests indicate their intent to utilize this water at the time of need with payment and interest to begin at the time of use.

61. LAND TREATMENT

It is recommended that legislation be enacted that will place special emphasis upon early implementation of conservation land treatment and management practices above all major reservoirs in the basin as outlined in the comprehensive plan and similar to that carried out in small watershed projects.

62. INTERRELATED WATERSHED PROJECTS

Provide special authorization for the approximately thirty small watersheds which are closely interrelated with other developments in the early action plan (table H-86 of the Appendix H - Agriculture). Because of these interrelationships, concurrent or timely planning and installation of the related projects is essential to provide the most effective and efficient combination of measures.

SECTION XIII – PUBLIC RESPONSE TO PLAN

63. GENERAL

Special efforts have been effected throughout the late study period, particularly since final plan formulation was initiated, to involve the public in the planning process. This effort has been multiple-pronged ranging from small informal meetings with local groups on local problems to public forums with several hundred present. In those instances where there was little or no local controversy regarding the plan we generally found an uninterested public. Conversely, where there was something in the plan which was locally controversial we found an interested and informed public. There were two main avenues by which the Coordinating Committee sought a public response; namely, open Coordinating Committee meetings and Public Forums.

64. COORDINATING COMMITTEE MEETINGS

There have been twenty-seven Coordinating Committee meetings of which the last ten or eleven have been devoted primarily to plan formulation. As a tentative plan was formulated for each subbasin the Plan Formulation Subcommittee reported thereon to the Coordinating Committee. These meetings were attended by interested citizens and representatives of organizations having an interest in the specific subject area being covered since the meetings were held in the area for which a plan was being considered. At each meeting the attending public was invited to comment on the information and proposals made by the subcommittee so that the Coordinating Committee would have the benefit of the public views before finalizing their plan. In many instances, due to the comments and interests of the public the Coordinating Committee directed the Plan Formulation Subcommittee to reexamine its proposals in light of information presented by the public. Accordingly, the plan as presented has a considerable amount of public input resulting from the open Coordinating Committee meetings.

65. PUBLIC FORUMS

After the plan was essentially complete the Coordinating Committee held a series of five public forums to present the plan and secure the public reaction to it. These public forums were held at Carmi, Illinois; Columbus, Terre Haute, Wabash, and Indianapolis, Indiana, and were attended by approximately 1800 people. The response was almost unanimously favorable to the plan with the only objection coming from conservation organizations who objected primarily to planning for more people and not to specifics of the plan as presented.

SECTION XIV – DISCUSSION OF PLAN

66. GENERAL

The plan as developed has four basic elements – 1) Flood Plain Management; 2) Environmental Corridors; 3) Land Treatment; and 4) Structural. A summary of these elements is presented.

67. FLOOD PLAIN MANAGEMENT ELEMENT

The element consists of principal guidance to local communities and a priority listing of 47 communities where flood plain information reports should be effected. In addition as noted in Section XII there is a broad flood plain zoning requirement before implementation of the flood control portion of the structural element.

68. ENVIRONMENTAL CORRIDOR ELEMENT

In the interest of protecting and preserving the best of the remaining stream environments the element consists of some 1,700 miles of rural corridors and urban corridors in 35 urban communities. The cost of acquiring the necessary real estate for these corridors would be equally divided between Federal and non-Federal interests or in accord with other existing legislation where the acquisition would further other programs.

69. LAND TREATMENT ELEMENT

This element consists of measures to reduce erosion, improve production capability, improve forest stands and to provide for meeting long term food and fiber production goals on 14.1 million acres of land (64 percent of the basin).

70. STRUCTURAL ELEMENTS

The structural element consists of:

a. Eighty-five watersheds for the Early Action Plan and 62 watersheds for the Long Range Plan. These watersheds are proposed to be implemented in accord with Public Law 566. A list of these watersheds is provided in Appendix H.

b. Six multiple purpose lakes for Early Action Plan and seven multiple purpose lakes for the Long Range Plan. These lakes are proposed to be implemented in accord with applicable Flood Control and related purpose legislation.

c. One hundred twelve Advanced Waste Treatment facilities for the Early Action Plan and 64 Advanced Waste Treatment facilities for the Long Range Plan. These facilities are proposed to be implemented in accord with the Water Pollution Control Act.

d. Fourteen Local Protection Projects for Early Action Plan and two Local Protection Projects for the Long Range Plan. These projects are proposed to be implemented in accord with applicable Flood Control legislation.

e. Two Pilot Strip Mine Restoration Projects for the Early Action Plan.

f. One applied research type study for Early Action Plan for Grand Lake area, Ohio, designed to restore the viability of this water resource. This study is proposed to be prosecuted under existing authority in accord with Congressional Resolution.

71. DISCUSSION

The plan if and when implemented will provide for the current and future needs of the basin in an efficient and timely manner. There has been some concern that later population projections for the year 2020 have exceeded those used in formulation of this plan. We have been most concerned with the impact this added population load would have on the water supply requirements. We have made a gross analysis of the consequences of under-estimating population growth and have concluded that this increased population would not over utilize the available water. Some reallocation of storage and/or greater degrees of waste treatment may need to be effected, but the plan has sufficient resource flexibility to accommodate such measure. The greatest challenge in adapting the plan to accommodate more people than present projects would be eradicating the rigidity established by institutions and legislation. For example if institutions are unable to encourage people to locate where the water is then water must be brought to where the people are. This could well require diversion of water from one area to another. We would need to approach this problem with the premise that water is a common and public property that runs somewhat counter to the riparian doctrine. Table C-62 depicts the means by which greater water supply demands could be met by the plan.

The various Task Groups made a number of recommendations pertaining to their specific areas of interest. The Plan Formulation Subcommittee reviewed each recommendation and made disposition thereof within the purview of the total study and plan objectives. The objective of this action was to integrate parochial or limited objective recommendations into a comprehensive plan with a comprehensive set of recommendations. A summary of the recommendations from the several Task Groups along with the disposition thereof follows in tables C-63 through C-65. After this action a number of the Task Groups elected to modify their recommendations; some did not so elect and these were either rejected or incorporated into the Subcommittee recommendations to the Coordinating Committee. The Plan Formulation Subcommittee was not passing judgement on the merits of the recommendations but was passing judgement on the applicability of the recommendations as they pertained to the Comprehensive Study. A basis of judgement was that each recommendation needed to be covered and documented in the Appendix. Without such documentation there was little or no basis for the Plan Formulation Subcommittee or the Coordinating Committee to reach sound conclusions.

In establishing projects and programs, the Plan Formulation Subcommittee has provided units consisting of plan elements which are interrelated. The Plan Formulation Subcommittee concludes that optimum development of the Basin's water and related land resources can best proceed by units rather than by elements. For example a unit may consist of the elements as depicted on figure C-8. In which case joint authorization and concurrent implementation is extremely desirable. We recognize the legislative and institutional constraints against such unit development but conclude that institutions should diligently strive to eliminate those legislative constraints which trend to preclude optimum development. In recognition of the desirability of the unit approach a listing rationale and summary of units and priorities thereof follows for each subbasin and for the basin in general.

a. Basin Implementation Priorities - General

The four basic elements of the early action plan (land treatment, environmental corridors, flood plain management and structural) as they apply in each of the basin's eight subbasins, have been categorized in three priority five-year time frame periods. The three five-year time periods cover the fifteen-year 1970 to 1985 early action plan implementation

TABLE C-62. PROJECTED MUNICIPAL-INDUSTRIAL WATER REQUIREMENTS ASSUMING 25% EXCEEDENCE OF OBERS POPULATION PROJECTIONS

Hydrologic subbasin	Projected demands for plan					Net increase in demand with 25% exceedence of projected population ^{1/}					Additional net reservoir capacity required at specific sites			Availability of additional storage
	1970 (mgd)	1980 (mgd)	2020 (mgd)	1970 (mgd)	1980 (mgd)	2020 (mgd)	1970 (ac-ft)	1980 (ac-ft)	2020 (ac-ft)	1970 (ac-ft)	1980 (ac-ft)	2020 (ac-ft)		
Patoka	5	8	20	1	2	5	1,400	2,000	7,600	Can be met by storage in Patoka Reservoir.				
East Fork	57	81	220	14	20	55	5,400	8,100	27,000	Could be met by either Deputy or Azalia Reservoirs				
West Fork	210	259	575	52	65	144	25,000	35,000	110,000	Could be met by reallocation of storages in Fall Creek, Big Walnut, Parker and Big Blue Reservoirs and diversions from other impoundments.				
Upper Wabash	110	147	381	28	37	95	12,000	17,000	58,000	Possible reallocation of Denver Reservoir storage. ^{2/}				
Middle Wabash	160	133	384	25	33	96	13,000	20,000	120,000	Coal Creek Reservoir could supply through 1980-1990. ^{3/}				
Embarras	12	14	22	3	4	6	2,800	5,600	8,400	Can be met by storage in Lincoln Reservoir. ^{4/}				
Little Wabash	9	12	36	2	3	9	2,100	4,200	13,000	Can be met by storage in Louisville and Helm Reservoirs. ^{4/}				
Lower Wabash	3	4	11	1	1	3	1,000	1,600	5,000	Can be met by a number of upstream reservoirs. ^{4/}				
TOTAL	506	658	1,649	126	164	412	62,000	94,000	346,000					
Project Population (x 1,000)														
Proj Pop - Wab	3,750	4,250	6,381											
Basin														
Proj Pop + 25%	4,687	5,312	7,976											
Proj per capita	135	155	258											
Cons														

1/ Assumes same per capita consumption noted above.

2/ No additional storage available in recommended projects; future services would be from reallocated storage, ground water or other single purpose site.

3/ Only Coal Creek Reservoir has reserve capacity available (30,000 acre feet).

4/ Storage available in reservoir sites as noted, from ground water or other impoundments.

TABLE C-63. DISPOSITION OF RECOMMENDATIONS -- APPENDIX D

Recommendation number	Recommendation subject	Disposition by Plan Formulation Subcommittee (PFS)
1	Structural portion of flood damage reduction plan	Concur
2	Support of flood plain management program	Concur - with elimination of word "mandatory"
3	Early implementation of environmental stream corridor program	Concur
4	Special legislation for watershed elements of Early Action Plan	Concur - with addition of "Federal and State" between the words special and legislation
5	Special treatment for stream channel modification	Concur - with deletion of "and drainage purposes" and addition of "or not physically possible" at end of first sentence
6	Emphasis on early land treatment above damsites	Concur
7	Development of a flood control project regulation model	Concur - with elimination of last sentence regarding cost of study

TABLE C-64. DISPOSITION OF RECOMMENDATIONS - APPENDIX I

Recommendation Number	Recommendation Subject	Disposition by Plan Formulation Subcommittee (PFS)
1	Priorities be given to parts of the plan which have significant environmental impact. Also structural parts should be studied in detail.	The PFS concurs in general, however, there may be conflicts among project purposes and therefore a broader perspective is needed. The PFS has taken into consideration the priorities in developing the Plan.
2	State legislation and implementation of a comprehensive land and water use plan, including environmental aspects.	The PFS concurs, however, the comprehensive land use plan is not in the recommended plan but the Coordinating Committee should encourage the states to effect such a plan.
3	Acquisition of substantial areas of natural and environmental resources.	The PFS concurs and a significant length of environmental corridor is included in the plan.
4	Federal funds be withheld on projects until a state approved, land and water use plan is established which regulates downstream floodplain and assures conservation of environmental floodplain areas.	The PFS concludes that flood plain management is necessary and desirable but does not concur with the remainder of the recommendation as stated.
5	Monetary incentives to land owners for wildlife benefits. Example: Local tax reduction and more federal money.	The PFS concludes that local institutions should be encouraged to protect and benefit wildlife on private lands through incentive tax structure or other applicable means.
6	Public Law 566 be amended to provide more money for (1) public access to impoundments and (2) recreation development where needed or where a potential exists	The PFS concurs but concludes that suitable watersheds should be construed as pertaining to those watersheds which have State and local governmental sponsorship.
7	Encouragement of private sectors to develop recreation areas on private lands.	The PFS concurs.
8	State and local governments require sand and gravel quarry operations to prepare a plan of rehabilitation as a part of their quarry permit and after rehabilitation give governmental bodies first opportunity to purchase area for public recreation use.	The PFS concurs and concludes that all other extractors and users of the stream bank should be included. The subcommittee notes that this would be a part of recommendation 2 above.
9	The government acquire or lease presently abandoned strip mined land and develop it for recreational use.	The PFS generally agrees but only a part has been included in the plan. It is not conclusive that this land can be used for the purposes stated and this needs to be demonstrated.
10	The state water quality standards be met, for human body contact at multiple purpose impoundments and for streams which (1) are principal fishery streams (2) flow through environmental corridors or (3) have low flow augmentation.	The PFS concludes that the water quality should be consistent with the states water quality standards but only in consonance with the intended use of that body of water.
11	More Federal promotion of research and development projects, to test water re-use after advanced waste treatment.	The PFS concurs but believes that re-use should not be limited to or related to advanced waste treatments.

TABLE C-64. DISPOSITION OF RECOMMENDATIONS — APPENDIX I (CONTINUED)

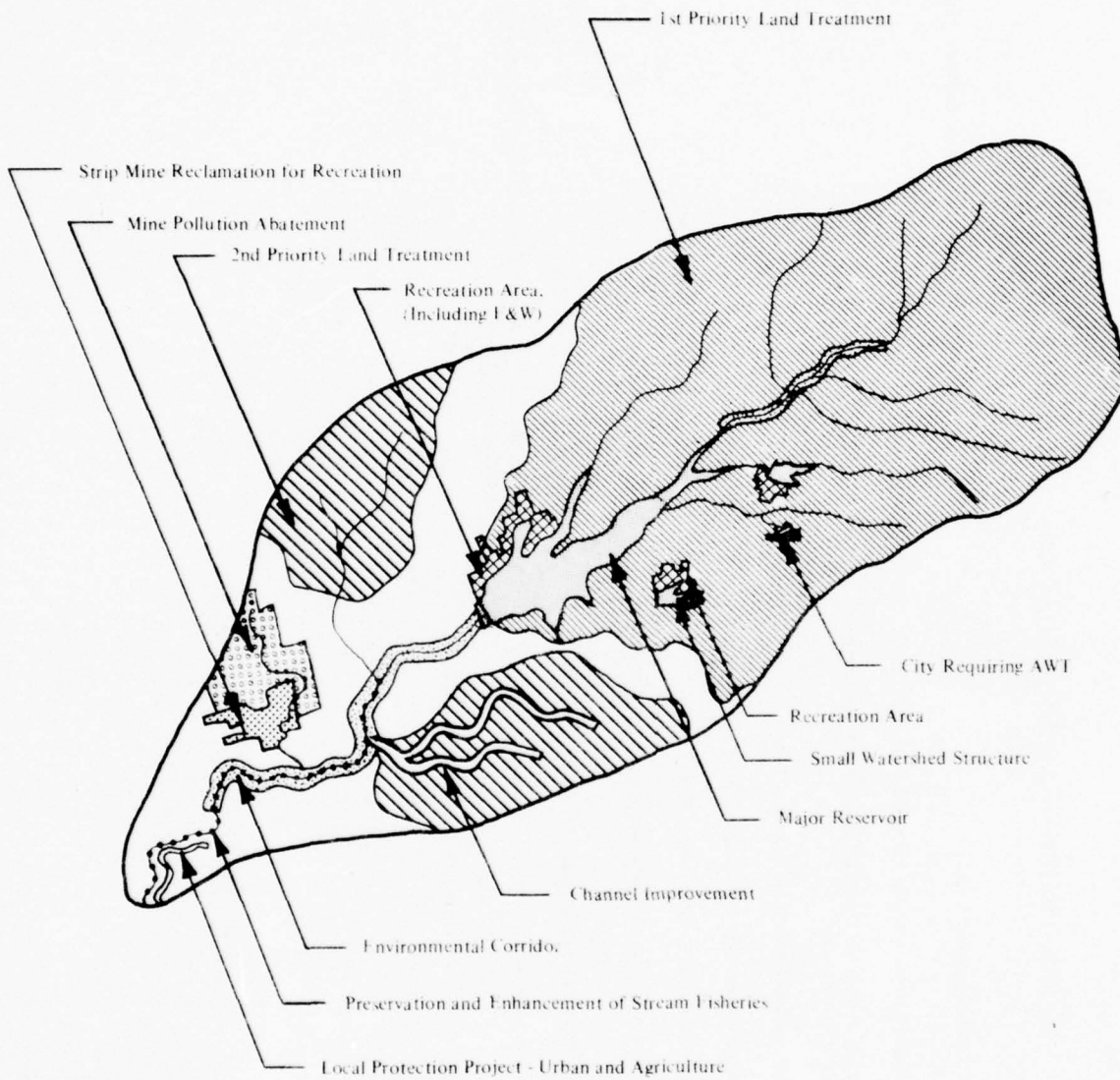
Recommendation Number	Recommendation Subject	Disposition by Plan Formulation Subcommittee (PFS)
12	Expanding of archaeological research near impoundments and corridors.	The PFS concurs and believes that impoundments should have priority over environmental corridors.
13	Surplus military lands with potential for public recreation and fish and wildlife management be converted to those uses.	The PFS believes that all such land should be considered for public recreation and fish and wildlife uses but other uses may have higher priority and should be investigated before a final determination is made.
14	Additional stream corridor segments be studied, particularly along urban flood plains.	The PFS concurs.
15	Soil erosion and water runoff retention land treatment programs benefiting fish and wildlife be accelerated	The PFS concurs and notes that such an acceleration is included in the land treatment element of the plan.
16	Structural works proposals be subject to widely advertised public hearings by the sponsoring agency.	The PFS concurs, believes this to be presently in effect and also feels that non-structural elements should be included in the same proposal.
17	Emphasis on providing access and facilities for shore and boat fishing, especially near urban areas.	The PFS concurs and notes that the first part is included in the environmental element of the plan and the second part will continue to receive priority consideration.
18	Existing impoundments be investigated for potential increase in opportunities for fishing, hunting and recreation.	The PFS concurs and notes that such a recommendation is included in the plan.
19	Compensating for the loss of fishing and hunting habitat of projects be made in kind.	The PFS believes that the Fish and Wildlife Coordination Act of 1958 (PL 85-624) adequately covers this.
20	Development of projects to meet the unsatisfied fishing, hunting and recreation demands in subareas 2 and 6.	The PFS recognizes the unsatisfied demands in certain areas and they have been considered in establishing priorities for implementing the plan.
21	Study of the Shoals Reservoir site as a potential national recreation area.	The PFS believes that legislation exists for a study if and when local interests want it. It further concludes that the needs of subareas 2 and 6 should be given priority over this consideration in consonance with preceding recommendations.
22	The states and electric power companies coordinate power plant and transmissions line siting to minimize adverse environmental effects.	The PFS believes that these requirements presently exist.
23	Hunting Mourning Doves be legalized in the basin.	The PFS concludes that there is insufficient information available to make such a recommendation and such is presently within the purview of authority of existing institutions.
24	State and local construction agencies be required to prepare environmental impact statements.	The PFS concurs in the general intent of this recommendation and trust that report distribution will be such as to call attention of the state legislation to the needs relating to this matter.

TABLE C-64. DISPOSITION OF RECOMMENDATIONS - APPENDIX I (CONTINUED)

Recommendation Number	Recommendation Subject	Disposition by Plan Formulation Subcommittee (PFS)
25	Federal cost sharing funds for natural area preservation	The PFS concurs in the general intent but such a study is beyond the water and water related land resources scope of the study.
26	Determination flow discharges from multiple-purpose impoundments to enhance fisheries be made through fishery biologists.	The PFS concurs and further concludes that the views of recreation specialists, ecologists, and sanitary engineers should be considered. The PFS notes cost sharing would be required in many instances under applicable Federal legislation. This is now being effected prior to construction.
27	Programs be developed to take advantage of the recreational fish and wildlife potential in highway construction.	The PFS concurs with the desirability of such but recognizes the practical difficulties in implementation and concludes that implementation should be on a selective basis, with sound management.
28	Acquisition rate of forest lands be increased.	The PFS concurs and accordingly additional amounts of forest lands are included in the plan.
29	States purchase additional hunting areas to maintain the 1968 ratio of State public hunting acreage to licensed hunters.	The PFS could recommend additional acres if it was shown that the 1968 ratio was right and that other recommendations did not satisfy the needed ratio.
30	Public lands be zoned against "off the road" vehicles.	The PFS concludes that some public land should be so zoned and that this is being accomplished in going programs.
31	Forest, recreation and wildlife management practices be coordinated and accelerated.	The PFS concurs and notes that such practices are presently in effect.
32	Federal and State natural resource agencies be funded and staffed to facilitate the inclusion of fish, wildlife and recreation elements into project plans.	The PFS concurs but notes that there is no evidence presented to indicate that such agencies are understaffed at the present time.
33	States develop state wide fish and wildlife plans and incorporate in the state comprehensive outdoor recreation plan.	The PFS concurs and believes that such a requirement should be partially funded through the Land and Water Conservation Act Fund.

TABLE C-65. DISPOSITION OF RECOMMENDATIONS - APPENDIX J

Recommendation number	Recommendation subject	Disposition by Plan Formulation Subcommittee (PFS)
1	Continue gathering data on water use by the mineral industry	Concur
2	Study relationship of construction materials production to construction indexes in projecting local demand	Concur
3	Continue research on coal mine water pollution problems	Concur
4	Collect data, determine trends, and make projections of land use needs	Concur
5	Perform fundamental research on surface mined lands	Combine with recommendation #3.
6	Perform research in slope stabilization, erosion control and acid water formation	Concur
7	Locate and define abandoned underground mines near urban areas	Concur
8	Collect, prepare and publish data on land requirements for mineral production	Considered as a part of overall land use study. Expand to include reclamation procedures
9	Conduct studies of dissolved chemicals in mineral industries discharges	Concur



TYPICAL UNITIZED PROGRAM

period. As explained in the following paragraphs, interrelated elements have been grouped in the same priority period.

Implementation of environmental corridors along with stream fishery areas and access sites simultaneously with structural measures in all areas of the Wabash River basin is recommended. Twenty-four environmental corridor systems were recommended as first priority and sixteen were placed in second priority. These corridors would assist in satisfying recreation demands although substantial unmet demands will remain.

Land treatment implementation upstream from major reservoirs was recommended in the same priority time period as the specific major reservoir. Land treatment within the watershed project areas would be implemented when the watershed project was developed. No priorities were established for the long range program. It is assumed that non-structural programs initiated in the early action time frame would be continued.

Fifty-four communities in the Wabash River basin are recommended for Flood Plain Management Studies during the early action time frame. Priority within the early action period would be dependent on the size of the community and the projected growth potential. Sixty-one smaller communities having little growth potential were placed in the long range Flood Plain Management Studies program.

b. Patoka River Subbasin Implementation Priorities

The principal problem in the Patoka Basin is the need for flood damage reduction and major drainage. The general approach in formulation of a flood control plan was to improve flood flow conditions in the lower Patoka so that peak flows could be discharged ahead of the Wabash River main stem peak flow, while at the same time, impounding optimum flood runoff in the upper Patoka Subbasin with releases scheduled to fill in behind the main stem peak flood flows for the Wabash River.

Accordingly with these regulation objectives, the authorized Patoka Reservoir with upstream land treatment measures, and Hall-Flat, Hunley-Ell, and Upper Patoka Tributary watersheds are recommended for planning as a unit of the early action plan. The channel modification, environmental corridor and local flood protection development in the lower Patoka are recommended for planning as another second unit. Implementation of the entire Patoka River Basin Plan is recommended as a first priority within the early action plan. It would be desirable to implement the entire early action plan for the Patoka River basin as a single program. However, separate implementation of the plan elements for the upper or lower basin should not be inconsistent with the overall orderly development of the Patoka River Basin Plan.

Advanced waste treatment for the Patoka River basin should be implemented as priority 1 in order to meet present and near future needs for stream water quality management. Action indicated by the State Implementation Plan calls for Advanced Waste Treatment for Jasper, Huntingburg and Princeton by 1977. About 70 percent of the area disturbed by surface mining in the Patoka Basin is in the South Fork Patoka River watershed. Implementation of mine pollution abatement was placed in the second five years or priority 2 since the study would have to be completed first.

The potential for ground water development in the Patoka Subbasin is small and the projected municipal and industrial water demands are increasing. Therefore water supply has been placed in the first priority to meet present and near future needs.

The long range plan should be implemented to meet those additional needs as they develop in the future.

c. East Fork White River Implementation Priorities

The principal water resources problem in the East Fork White River Subbasin is the need for flood damage reduction. A major consideration in the formulation of such a plan was to provide control on as many tributaries as possible. This includes the Muscatatuck River on which extensive coordinated studies were undertaken, and seven different plans were considered.

The recommended plan includes the authorized Clifty Creek, Downeyville and Big Blue major reservoirs and the authorized Upper Big Blue River and Stucker Fork watershed projects. The Upper Big Blue watershed project, upstream of the Big Blue major reservoir, is recommended as a first priority construction element to be planned with but precede the Big Blue Reservoir which will follow as a second priority construction element. Clifty Creek Reservoir was placed in a first priority category due to its flood damage reduction contribution in the high flood damage reach from Columbus to the confluence of the Muscatatuck River. The Twin Rush Creek watershed was included in the first priority category in view of its under construction status and needs within the watershed area. Other watershed projects included in a first priority status because of urgency of needs within the watersheds are Dewitt Creek, West Boggs Creek, Delaney Creek, Upper Vernon Fork, Lower Vernon Fork, Lost River, White Creek - Beatty Walker Ditch and Denios Creek. Downeyville Reservoir is recommended as a second priority construction element along with upstream Upper Big Flatrock Creek watershed and the downstream Lewis Creek watershed. Aikman Creek watershed located near the mouth of the East Fork White River has been placed in a second priority category based on needs within the watershed project area relative to priority needs in other watershed project areas.

Deputy Reservoir on Big Creek, Azalia Reservoir on Sand Creek and Pond Creek, Little Salt Creek, Little Blue River and Brandywine Creek watershed projects are included as generally independent projects in the third priority category based on relative urgency of the needs satisfied by the various projects. In all instances, land treatment measures should be installed above major reservoirs during or before the appropriate priority period.

Among the numerous factors which require timely and coordinated planning and implementation of proposed developments in this subbasin are: (1) the high average annual damages, which amount to more than 20% of the 1968 damages for the total Wabash Basin; (2) the large number of planned impoundments, 18 small watershed projects and 5 major reservoirs; (3) the physical location of the planned major reservoirs and watershed projects as each will affect downstream flood and low flows on the East Fork. This latter situation emphasizes the need for development of a flow regulation model for the East Fork as an integral part of that proposed for the entire Wabash River basin.

First priority recommendations include Advanced Waste Treatment for seventeen communities in the East Fork Subbasin based on their need to provide such treatment or an acceptable alternative prior to 1980. Fourteen other communities would need to provide AWT to meet the long range needs developing in the future.

Water supply for the East Fork Subbasin is recommended as first priority to provide an additional 18 mgd total needed supply by 1980. The long range water supply plan would provide for additional needs of about 136 mgd by 2020.

d. West Fork White River Subbasin Implementation Priorities

The principal problems in the West Fork Subbasin include flood damages, water supply and stream water quality problems. The upper half of the subbasin is highly

urbanized and water resources problems are related to this urban situation. The West Fork Subbasin is also within the area of the highest unsatisfied recreational demands. Approximately one-third of the flood damage problems are urban and concentrated in urban areas of Muncie, Anderson, Noblesville and Indianapolis. The Indianapolis area has the most pressing water supply and water quality problems in the basin. Accordingly, major reservoirs which serve the Indianapolis area, i.e., the authorized Big Walnut Reservoir, or its alternative, and the recommended Parker and Fall Creek Reservoirs are included as first priority projects in the early action plan, in addition to land treatment measures recommended for these reservoir drainage basins. The Whitelick Creek watershed project also has an influence on the Indianapolis area and is included as a first priority project in the early action plan. Other first priority upstream watershed projects include the authorized Indian Creek, Prides Creek, Mill Creek, the partially completed Lattas Creek in addition to the recommended Little Walnut Creek, Killbuck Creek, Black Creek, Veale Creek, Croys Creek and Wilson Creek. Of these projects Mill Creek and Little Walnut Creek were placed in first priority, due to their relationship to the completed Cagles Mill Reservoir and the authorized Big Walnut Creek Reservoir, respectively. Indian Creek, Prides Creek, Killbuck, Black Creek, Veale Creek and Croys Creek watershed projects were all placed in a first priority position due to the urgency of needs within these watershed project areas.

Second and third priority recommendations for the remaining watershed projects were based on the relative urgency of meeting water resources development needs within the respective watersheds. Second priority recommendations include the following watershed projects: Birch Creek, Splunge Creek, Jordan Creek and Rattlesnake Creek.

The remaining early action watershed projects comprise the third priority recommendations. These consist of Deer Creek, Bryant Creek and Lagoon Ditch.

Serious organic pollution exists in most of the West Fork White River from Muncie to Spencer. This reach also furnishes part of the water supply for Muncie, Anderson and Indianapolis. Twenty-eight communities in the West Fork Subbasin need to provide advanced waste treatment or an acceptable alternative during the early action period. In order to meet these near future needs, installation of advanced waste treatment facilities was recommended as first priority for these communities.

Fourteen other communities in the subbasin are included in the long range recommendations for needs developing during the planning period 1980 to 2020.

Additional water supply sources to meet present and near future needs for the communities of Muncie, Elwood, Winchester, Indianapolis, Greencastle, Anderson and Plainfield is a first priority development need.

Approximately eighty other communities throughout the subbasin are identified for development of municipal and industrial water supply by 2020 as a part of the long range plan.

e. Upper Wabash River Subbasin Implementation Priorities

Flooding and drainage have been major problems throughout the Upper Wabash River subbasin. Flood conditions on the Wabash River have been modified significantly by the operation of three major reservoirs: Huntington, Mississinewa and Salamonie Reservoirs. Priority categories were determined primarily on the basis of relative water resource needs within various watersheds.

First priority recommendations include the authorized Lafayette Reservoir, Marion Local Flood Protection, Rock Creek, Wells County watershed project in addition to the

partially completed Mill Creek, Fulton County in Bachelor Run watershed. Other first priority recommendations include the Buckeye Hoosier watershed on the Wabash River above Huntington Reservoir, Salamonie River watershed and above Salamonie Reservoir, Rock Creek, Cass County, watershed and Goose Creek watershed at Logansport. The second priority recommendations include the following small watershed projects: Clear Creek, Little River, Pony Creek, House-Barte and Upper and Lower Mississinewa River watersheds. Third priority recommendations include six watershed projects as follows: Brown-Hill, Big Monon Ditch, Mud Creek, Sugar Creek, Burnetts Creek, and Crooked Creek. These six projects consist primarily of channel improvements due to the flatness of the topography in the absence of structure site location.

The flat to depressional topography which characterizes the upper reaches of this subbasin has reduced the possibility of developing the combination of upstream and downstream flood control measures. However, the effects of the watershed projects upstream from the three operating major reservoirs should be studied and the projects operated as a system for optimum flood control as is consistent with the authorized project purposes. Land treatment measures above the authorized Lafayette Reservoir should be implemented as soon as practicable in relation to its initial construction phase.

In order to meet the near future needs in the Upper Wabash Subbasin, installation of advanced waste treatment facilities was recommended as first priority for seventeen communities. Ten of these are required by the State of Indiana to adopt effective control measures before 1978.

Another 24 communities in the subbasin are included in the long range plan recommendations for needs developing during the planning period 1980 to 2020.

Of the 52 areas for which water supply demands were individually projected, 21 would need additional water supply by 1980. However, only Kokomo cannot meet its projected need from locally available ground sources. This is a first priority development need.

Ground water supplies the bulk of municipal and industrial use and is generally available over the area, usually in plentiful supply for all except the larger communities. These communities are recommended for long range municipal and industrial water supply development by 2020.

f. Middle Wabash River Subbasin Implementation Priorities

Major problems include flood damage and drainage and water quality control. The major urban centers of Terre Haute, Vincennes, and Danville are included in the subbasin although urban damage constitutes less than ten percent of the total subbasin damages.

The recommended plan includes the authorized Big Pine Reservoir and the partially completed watershed projects on Busseron Creek, Kickapoo Creek - Vigo County and Little Raccoon Creek. In view of the need for additional surface water supply in the Crawfordsville - Montgomery County the development of the Crawfordsville Reservoir has been assigned a first priority. The Lye Creek watershed is planned as a compatible project with Crawfordsville Reservoir and included for unit development in a first priority category. The environmental corridors both upstream and downstream of Crawfordsville Reservoir are also recommended for development as a unit with Crawfordsville Reservoir in a first priority category. The following watershed projects are also recommended for inclusion in the plan on a first priority category based on the urgency of water resources development needs within the respective project areas: Mill Creek, Snyder Creek and Sugar Creek in

Illinois; and Snapp-Kelso, Mariah Creek, Otter Creek, Fall Creek, Feather Creek, Big Raccoon Creek and Jordan Creek in Indiana, with particular emphasis on land treatment measures for watersheds above the existing authorized and early action major reservoirs in the subbasin.

Second priority recommendations in the early action plan include Salt Fork Reservoir in Illinois and Turtle Creek, Honey Creek and Coal Creek watershed projects in Indiana.

The Coal Creek watershed would be planned to provide minimum conflict with the long range plan of development for Coal Creek Reservoir. Strong Creek watershed located upstream of Salt Fork Reservoir is included in the long range plan, however, it is recommended that local interests be encouraged to accelerate development of the watershed project commensurate with the major reservoir. Third priority recommendations based on relative development needs within these watersheds are: Vieke Ditch, City Ditch, Lower Shaker Prairie Ditch in Indiana and Raccoon Creek in Illinois. These projects would be developed separately and not as part of any unit. The environmental corridors on the Vermilion River, the main stem Wabash River and on Raccoon Creek downstream of Mansfield Reservoir are recommended for implementation with Salt Fork Reservoir in the second priority time frame.

Fifteen communities in the Middle Wabash Subbasin need to provide advanced waste treatment or an acceptable alternative during the early action period. In order to meet these near future needs, installation of advanced waste treatment facilities was recommended as first priority for these communities. Fifteen other communities in the subbasin are included in the long range recommendations for advanced waste treatment needs developing during the planning period 1980 to 2020.

Pool quality runoff from surface mined areas was found in Vermilion County, Illinois, Vermillion County, Vigo County, and Sullivan County, Indiana. Implementation of mine pollution abatement was recommended in the second five year period or priority two, since the study would have to be completed before implementation.

Six communities in the Middle Wabash Subbasin indicate a need for additional water supply by 1980. Additional water supply was recommended as first priority to supply an additional 180 mgd to meet the near future needs of the subbasin.

Approximately twenty other communities would need additional water supply by 2020 and are recommended for development of municipal and industrial water supply of 330 mgd as a part of the long range plan.

g. Embarras River Subbasin Implementation Priorities

The principal problems in the Embarras River subbasin are flood damage and drainage. Generally, the flat topography to the north (upstream) of Charleston, Illinois, has primarily drainage problems and the areas to the south has primarily flood problems. Coordinated studies centered on the analysis of alternative major reservoirs and upstream watershed projects on the North Fork Embarras, Muddy Creek, and Crooked Creek tributaries. The selected plan was that which provided for maximum net benefits, with a high degree of flood damage reduction on the Embarras River.

The first priority projects recommended for unit implementation consist of the authorized Lincoln Reservoir, Scattering Fork Watershed which is partially completed, and the projects on the North Fork Embarras, Juddy Creek (E-21), Brushy - Birch Creek. The second priority Brushy Creek would be added during the second five year period. This project, in

addition to the partially completed Scattering Fork project, will meet a significant portion of the drainage needs requiring project action in this portion of the Wabash Basin. The Embarras River environmental corridor system is recommended for first priority development.

Recommendations for the third priority segment of the plan consist of the Muddy Creek (E-5) watershed project and Crooked Creek. These projects would be developed downstream from the first priority projects.

The recommended plan for the Embarras Subbasin will provide significant flood damage reductions in the major tributary watersheds, and likewise on the Embarras River itself. Land treatment measures applied upstream of Lincoln Reservoir would be an important part of the total subbasin first priority program. Of major importance in planning will be the timing of controlled flood discharges to provide maximum flood damage reductions on major tributaries and the Embarras River. Analytical model studies should be undertaken to ensure that planned developments are constructed and operated so as to maximize the net overall flood damage reduction benefits.

In order to meet the near future need for water quality in the Embarras Subbasin installation of advanced waste treatment facilities was recommended as first priority for fourteen communities. The long range plan implementation was recommended to meet the additional water quality needs as they develop between 1980 and 2020.

Although ground and surface water both are utilized to meet municipal and industrial water needs of the Embarras Subbasin ground water is presently the chief source of water supply for most subbasin communities.

Arcola and Charleston, Illinois, indicate a need for additional water supply by 1980 and are recommended as first priority. Newton and Casey, Illinois, must also develop new water supply resources or move outside their local areas for development of available resources.

About seven additional communities indicate water supply needs by 2020 and are recommended for long range development to meet those additional needs.

h. Little Wabash River Subbasin Implementation Priorities

Major problems in the Little Wabash River subbasin include flood damage, primarily agricultural, impaired drainage and water supply problems in scattered small communities. Limited channel capacity on the Skillet Fork tributary accentuates the flooding and drainage outlet problems in the lower half of that tributary.

To facilitate main stem flood damage reduction, the recommended first priority portion of the early action plan includes the authorized Louisville Reservoir and the Seven Mile Creek watershed project. The Upper Little Wabash River and Salt Creek watersheds upstream of Louisville Reservoir should be planned and implemented in conjunction with the Louisville Reservoir.

The Big Muddy and Fox River watersheds, having first priority and located downstream of Louisville Reservoir would be developed as separate units. First priority development in the Skillet Fork would place Auxier-Big Creek and Pond Creek watersheds in operation followed by Helm Reservoir as second priority and Lick Creek, Big Mound, Dry Fork and Horse Creek as second priority watershed developments downstream of Helm Reservoir. These developments in the Skillet Fork are generally independent and can be

implemented separately. Land treatment measures in drainage areas above the major reservoirs should be installed before or concurrently with the reservoir development.

The urgency of meeting the needs in the subbasin for flood control, water supply and allied purposes have necessitated that all project proposals be met on a first or second priority basis. There are therefore no third priority project proposals. The environmental corridor system for the Little Wabash River is recommended as a first priority development.

Except for the upper Little Wabash and Salt Creek watershed projects, all other recommended early action watersheds are located downstream from Louisville and Helm Reservoirs. This places additional emphasis on the need for development of an analytical model to study the timing of controlled releases from watershed projects in conjunction with releases from the two major reservoirs. Levee Units 7 and 8 are located on opposite sides of the Little Wabash River and should be constructed simultaneously in addition to the authorized Levee Unit 2 further downstream.

Sixteen communities in the Little Wabash River subbasin have been identified as needing improvements in their sewer systems. Fifteen of these need to provide advanced waste treatment or an acceptable alternative prior to 1980. The construction of treatment systems for these communities is recommended as first priority in order to meet present and near future needs.

Seven communities indicating additional needs for water supply before 1980 are recommended as first priority to meet present and near future needs. In addition to these, four other communities are included in the long range development plan to provide 36.3 mgd for municipal and industrial water supply in 2020.

i. Lower Wabash River Subbasin Implementation Priorities

Since this subbasin is comprised of the furthestest downstream reaches of the mainstem Wabash River plus the several smaller tributaries which outlet into these reaches, it is apparent that it will be affected more by developments in the other seven subbasins than by any projects which can be recommended internally. This subbasin is also subject to backwater effects from the Ohio River.

There are no authorized major reservoirs or watershed projects in the subbasin. First priority recommendations include levee units, along with Bonpas Creek, Illinois and Gresham Creek, Indiana watershed projects. The environmental corridor on Bonpas Creek is included as a first priority development to be implemented with the Bonpas Creek watershed. The environmental corridor along Black River is recommended for acquisition as a first priority element. The second priority recommendation includes authorized Levee Units No. 1 and 2 and the Big Creek watershed project in Indiana. Third priority recommendations include authorized Levee Units No. 3 and 4 and Levee Unit No. 50, plus the watershed project on McHenry-Hawthorne in Illinois, and Scott Ditch-Coffee Bayou in Indiana.

SECTION XV – CONCLUSIONS

The Plan Formulation Subcommittee concludes that the plan as presented is the best that can be developed at this time. We recognize the limitation of planning for the future but at the same time realize that the quality of living in the future is dependent to a great extent on the quality of today's planning for the future. If there is one overriding conclusion that we have reached it is that "Regional water management is mandatory if man is to continue to enjoy a full life, for without regional water management excess resources are used." We further conclude that there must be a continued eradication of bureaucratic and institutional bias in resource planning and management lest we are merely exploiting the resource base rather than planning for the wise use and reuse of the resource base. This study and the communications established therein have contributed significantly to eradication of the bureaucratic bias. This trend needs to be continued and furthered. The Plan elements and features are shown by subbasin in tables C-66 through C-73. The overall basin plan is summarized in table C-74. These tables also include a listing of priorities. These priorities are in accord with the principles established in Section XI except that an additional priority has been established for a number of watersheds in accord with instructions from the Coordinating Committee whereby specified legislation will be secured to advance the watershed program faster than normal. The location of the project and plan elements are shown for each hydrologic subbasin on plates C-2 through C-10. The basin wide plan of development for major reservoirs, watershed projects and local protection projects is shown on plate C-1.

TABLE C-66. PATOKA SUBBASIN - PLAN FEATURES AND FINANCIAL DATA

Project or program	Project no and priority ^{4/}	Purpose ^{1/}	Federal first cost (\$1,000)	Non-federal first cost (\$1,000)	Project first cost (\$1,000)	Totals (\$1,000)
EARLY ACTION AND LONG RANGE STRUCTURAL MEASURES						
EXISTING, UNDER CONSTRUCTION AND AUTHORIZED						
<u>Major Reservoir Projects</u>						
Patoka Reservoir ^{2/}	11-1	FC,WQ,WS,R			29,324	29,324
RECOMMENDED FOR INCLUSION IN EARLY ACTION PLAN						
<u>Upstream Watershed Projects</u>						
Hunley-Ell ^{5/}	194-1	FC,R,WQ,WS	3,689	1,549	5,238	
Upper Patoka ^{5/}	198-1	FC,WQ,WS	518	153	671	
Hall-Flat Creek ^{5/}	199-1	FC,R,WQ,WS	2,111	825	2,936	8,845
<u>Local Protection Projects</u>						
Patoka Levee Unit 2	80-1	FC	470	25	495	
Patoka Levee Unit 3	81-1	FC	500	57	557	
Patoka Levee Unit 4	82-1	FC	377	44	421	
Patoka Levee Unit 5	83-1	FC	225	21	246	
Patoka Channel Improvement	84-1	FC	4,000	500	4,500	6,219
<u>Advanced Waste Treatment</u>	- 1	WQ	---	730	730	730
<u>Mine Pollution Abatement</u>	- 2	WQ	4,000	---	4,000	4,000
<u>Water Supply</u>	- 1	WS	---	250	250	250
RECOMMENDED FOR INCLUSION IN LONG RANGE PLAN						
<u>Major Reservoir Projects</u>						
Maltersville	23-L/R	FC,R	7,191	1,969	9,160	9,160
<u>Upstream Watershed Projects</u>						
Flat Creek	260-L/R	FC,WS	72	41	113	
Cup Creek	261-L/R	FC,R,WS	328	251	579	692
<u>Advanced Waste Treatment</u>	~ L/R	WQ	---	2,000	2,000	2,000
<u>Water Supply</u>	~ L/R	WS	---	2,000	2,000	2,000

TABLE C-66. PATOKA SUBBASIN - PLAN FEATURES AND FINANCIAL DATA (CONT'D)

Project or program	Project no and priority ^{4/}	Purpose ^{1/}	Federal first cost (\$1,000)	Non-federal first cost (\$1,000)	Project first cost (\$1,000)	Totals (\$1,000)
EARLY ACTION AND LONG RANGE ENVIRONMENTAL REGIONAL AND SOCIAL MANAGEMENT AND OTHER MEASURES						
RECOMMENDED FOR INCLUSION IN EARLY ACTION PLAN						
<u>Environmental Corridors</u>	- 1	E,R,FW	1,560	1,560	3,120	3,120
<u>Stream Fishery</u>	- 1	E,R,FW	205	205	410	410
<u>Access Sites</u>	- 1	E,R,FW	67	67	134	134
<u>Flood Plain Management</u>	- 1	FC,E	63	---	63	63
<u>Use of Surface Mined Areas for Recreation</u>	- 2	E,R,FW	257	257	514	514
<u>Land Treatment</u>	- 1	E,SC	3,108	3,080	6,188	6,188
RECOMMENDED FOR INCLUSION IN LONG RANGE PLAN						
<u>Land Treatment</u>	- L/R	E,SC	1,411	1,398	2,809	2,809
<u>Flood Plain Management</u>	- L/R	FC,E	50	---	50	50
<u>Use of Surface Mined Areas for Recreation</u>	- L/R	E,R,FW	730	730	1,460	1,460
TOTALS^{3/}						
Federal First Cost			30,932			
Non-Federal First Cost				17,712		
Subbasin Grand Total					48,644	48,644

1/ Purpose index, see table 66. (Main Report).

2/ Authorized. Land acquisition has been started.

3/ Subbasin plan does not include basinwide measures.

4/ Priorities within Early Action Plan time frame (10-15 years)

1 - 1st five year period.

2 - 2nd five year period.

3 - 3rd five year period.

L/R - Long Range Plan (No priorities designated within Long Range Plan).

N/A - Not applicable.

5/ Special authorization for these projects is highly desirable for the timely interagency planning and installation of interrelated projects.

TABLE C-67. EAST FORK SUBBASIN - PLAN FEATURES AND FINANCIAL DATA

Project or program	Project no and priority ^{4/}	Purpose ^{1/}	Federal first cost (\$1,000)	Non-federal first cost (\$1,000)	Project first cost (\$1,000)	Totals (\$1,000)
EARLY ACTION AND LONG RANGE STRUCTURAL MEASURES						
EXISTING, UNDER CONSTRUCTION AND AUTHORIZED						
<u>Major Reservoir Projects</u>						
Big Blue	13-2	FC,R			34,982	
Downeyville	14-2	FC,R,WS			41,421	
Clifty Creek	10-1	FC,R,WS,WQ			21,268	
Monroe (Existing)	3-N/A	FC,R,WS,WQ			14,836	112,507
<u>Upstream Watershed Projects</u>						
Elk Creek (Existing)	91-N/A	FC,I,FW			861	
French Lick Creek (Existing)	93-N/A	FC,FW			1,084	
Boggs Creek (Existing)	92-N/A	FC			689	
Stucker Fork (Existing)	104-N/A	FC			3,900	
Twin Rush Creek (Existing)	106-1	FC,WS,R			1,184	
Dewitt Creek	105-1	FC			339	
Upper Big Blue River	107-1	FC,WS,WQ,R			10,928	
West Boggs Creek	108-1	FC,R			2,136	21,121
<u>Local Protection Projects</u>						
East Fork Levee Unit 2 ^{2/}	45-N/A	FC				
East Fork Levee Unit 3 ^{2/}	43-N/A	FC				
Shoals Local Protection ^{2/}	49-N/A	FC				
Orleans Local Protection	77-3	FC			646	646
RECOMMENDED FOR INCLUSION IN EARLY ACTION PLAN						
<u>Major Reservoir Projects</u>						
Deputy	18-3	FC,R,WQ	27,294	2,306	29,600	
Azalia	17-3	FC,R,WQ	22,282	7,018	29,300	59,900
<u>Upstream Watershed Projects</u>						
Aikman Creek	145-2	FC,D	592	178	770	
Lost River	146-1	FC,R,WS	5,257	2,455	7,712	
Upper Vernon Fork ^{6/}	147-1	FC,R,WS,WQ	4,050	4,322	8,372	
Lower Vernon Fork ^{6/}	148-1	FC,R,D	5,727	2,490	8,217	
Pond Creek	149-3	FC,R,D	792	603	1,395	
Little Salt Creek	150-3	FC	576	144	720	
White Creek-Beatty Ditch ^{6/}	151-1	FC,R,D	4,180	2,151	6,331	
Denios Creek	152-1	FC,R	675	530	1,205	
Lewis Creek	153-1	FC,D	886	370	1,256	

TABLE C-67. EAST FORK SUBBASIN - PLAN FEATURES AND FINANCIAL DATA (CONT'D)

Project or program	Project no and priority ^{4/}	Purpose ^{1/}	Federal first cost (\$1,000)	Non-federal first cost (\$1,000)	Project first cost (\$1,000)	Totals (\$1,000)
Upper Big Flat Rock River ^{6/}	154-2	FC,WS,FW,D	2,128	1,697	3,825	
Delaney Creek	155-1	FC,I,R	997	484	1,481	
Brandywine Creek	156-3	FC,D	1,073	337	1,410	
Little Blue River ^{6/}	157-3	FC	1,041	260	1,301	43,996
<u>Local Protection Projects</u>						
Wiemeyer	86-1	FC	165	30	195	
Beatty	87-1	FC	1,185	125	1,310	
Levee Unit 5	88-N/A	FC	1,250	123	1,373	
Columbus West	85-1	FC	1,190	185	1,375	4,823
Levee Unit 17	89-2	FC	470	100	570	4,823
<u>Advanced Waste Treatment</u>	- 1	WQ	---	9,800	9,800	9,800
<u>Water Supply</u>	- 1	WS	---	3,500	3,500	3,500

RECOMMENDED FOR INCLUSION IN LONG RANGE PLAN

Upstream Watersheds

Sugar and Slate Creeks	220-L/R	FC,R	723	467	1,190	
Sulphur Creek	221-L/R	FC,R	602	490	1,092	
Guthrie Creek	222-L/R	FC,R,WS	1,407	949	2,356	
Buffalo Creek	223-L/R	FC,R	663	534	1,197	
McHargue Ditch	224-L/R	FC,D	113	39	152	
John Thompson Ditch	225-L/R	FC	119	30	149	
Big Slough	226-L/R	FC	177	44	221	
Youngs Creek	227-L/R	FC	388	97	485	
Bear Creek	228-L/R	FC,R	328	311	639	
<u>Advanced Waste Treatment</u>	- L/R	WQ		12,000	12,000	12,000
<u>Water Supply</u>	- L/R	WS		21,000	21,000	21,000

EARLY ACTION AND LONG RANGE ENVIRONMENTAL, REGIONAL AND SOCIAL MANAGEMENT AND OTHER MEASURES

RECOMMENDED FOR INCLUSION IN EARLY ACTION PLAN

<u>Environmental Corridors</u>	- 1	E,R,FW	6,120	6,120	12,240	12,240
<u>Stream Fishery</u>	- 1	E,R,FW	1,746	1,746	3,492	3,492
<u>Access Sites</u>	- 1	E,R,FW	360	360	720	720
<u>Flood Plain Management</u>	- 1	FC,E	302	---	302	302

TABLE C-67. EAST FORK SUBBASIN - PLAN FEATURES AND FINANCIAL DATA (CONT'D)

Project or program	Project no and priority ^{4/}	Purpose ^{1/}	Federal first cost (\$1,000)	Non-federal first cost (\$1,000)	Project first cost (\$1,000)	Totals (\$1,000)
<u>Use of Surface Mined Areas for Recreation</u>	- 2	E,R,FW	775	775	1,550	1,550
<u>Land Treatment</u>	- 1	E,SC	24,073	23,863	47,936	47,936
RECOMMENDED FOR INCLUSION IN LONG RANGE PLAN						
<u>Land Treatment</u>	- L/R	E,SC	10,507	10,415	20,922	20,922
<u>Flood Plain Management</u>	- L/R	FC,E	490	---	490	490
<u>Use of Surface Mined Areas for Recreation</u>	- L/R	E,R,FW	<u>2,200</u>	<u>2,200</u>	<u>4,400</u>	<u>4,400</u>
TOTALS^{3/}						
Federal First Costs			132,903			
Non-Federal First Costs				120,648		
Subbasin Grand Total					387,825 ^{5/}	387,825 ^{5/}

1/ Purpose index, see table 66. (Main Report)

2/ Authorized.

3/ Subbasin plan does not include basinwide measures.

4/ Priorities within Early Action Plan time frame (10-15 years).

1 - 1st five year period.

2 - 2nd five year period.

3 - 3rd five year period.

L/R - Long Range Plan (No priorities designated within Long Range Plan).

N/A - Not applicable.

5/ Includes \$22,500 for constructed projects (\$1,000).

6/ Special authorization for these projects is highly desirable for the timely interagency planning and installation of interrelated projects.

TABLE C-68. WEST FORK SUBBASIN - PLAN FEATURES AND FINANCIAL DATA

Project or program	Project no and priority ^{5/}	Purpose ^{1/}	Federal first cost (\$1,000)	Non-federal first cost (\$1,000)	Project first cost (\$1,000)	Totals (\$1,000)
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EARLY ACTION AND LONG RANGE STRUCTURAL MEASURES

EXISTING, UNDER CONSTRUCTION AND AUTHORIZED

Major Reservoir Projects

Cagles Mill (Existing)	1-N/A				4,256	
Big Walnut	12-1				40,864	45,120

Upstream Watershed Projects

Prairie Creek (Davies) (Existing)	99-N/A	FC,R			3,189	
Lattas Creek (Existing)	100-N/A	FC			1,888	
Mill Creek (Existing)	101-N/A	FC,R			8,655	
Indian Creek	102-1	FC,R			4,010	
Prides Creek	103-1	FC,R			1,541	19,283

Local Protection Projects

Levee Unit 17	72-2	FC			1,254	
Levee Unit 1 ^{2/}	70	FC				
Levee Unit 7 ^{2/}	71	FC				
Levee Unit 8 ^{2/}	34	FC				
Shufflebarger Levee ^{2/}	76	FC				
McGinnis Levee ^{2/}	73	FC				
Levee Unit 9 ^{2/}	47	FC				
Levee Unit 10 ^{2/}	48	FC				
Eel Levee Unit 1 ^{2/}	66	FC				
Eel Levee Unit 2 ^{2/}	65	FC				
Fletcher, Sunshine Gardens Levee ^{2/}	64	FC				
Indianapolis-White River and Fall Creek (Channel)	41-N/A	FC			13,630	
Anderson Local Protection ^{2/}	42	FC				
Muncie Local Protection	33-N/A	FC			908	15,792

RECOMMENDED FOR INCLUSION IN EARLY ACTION PLAN

Major Reservoir Projects

Parker	19-1	FC,R,WQ,WS	31,884	11,916	43,800	
Fall Creek (Highland)	20-1	FC,R,WQ,WS	32,833	27,767	60,600	104,400

Upstream Watershed Projects

Veale Creek	131-1	FC,R	687	320	1,007	
Black Creek ^{6/}	132-1	FC,R,WQ,D	1,992	626	2,618	

TABLE C-68 WEST FORK SUBBASIN - PLAN FEATURES AND FINANCIAL DATA (CONT'D)

Project or program	Project no. and priority ^{5/}	Purpose ^{1/}	Federal first cost (\$1,000)	Non-federal first cost (\$1,000)	Project first cost (\$1,000)	Totals (\$1,000)
Lagoon Ditch, Wabash and Erie Canal ^{6/}	133-3	FC	480	120	600	
Splunge Creek	134-2		---	---		---
Birch Creek	135-2	FC,WQ	939	134	1,073	
Jordan Creek	136-2	FC,R	927	603	1,530	
Croys Creek	137-1	FC,R	983	614	1,597	
Deer Creek ^{6/}	138-3	FC,R	940	803	1,743	
Little Walnut Creek	139-1	FC,R	996	530	1,526	
Rattlesnake Creek	140-2	FC,R	823	680	1,503	
Bryant Creek	141-3	FC,R	229	181	410	
Whitelick Creek ^{6/}	142-1	FC,R,WQ	3,365	1,624	4,989	
Killbuck Creek	143-1	FC,D	611	252	863	
Wilson Creek	144-1	FC,R,WQ,WS	368	310	678	20,137
<u>Advanced Waste Treatment</u>	- 1	WQ	---	28,500	28,500	28,500
<u>Water Supply</u>	- 1	WS	---	2,500	2,500	2,500

RECOMMENDED FOR INCLUSION IN LONG RANGE PLAN

Major Reservoir Projects

Upper Martinsville	24-L/R	FC,R,WQ	54,218	4,782	59,000	59,000
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Upstream Watershed Projects

Doans Creek	211-L/R	FC,R	527	398	925	
Lick Creek	212-L/R	FC,R	1,019	488	1,507	
Pond Creek	213-L/R	FC	36	9	45	
Six Mile Creek	214-L/R	FC,R	548	273	821	
Hog-McIntyre	215-L/R	FC,R	435	373	808	
Fish Creek	216-L/R	FC,R	1,498	1,061	2,559	
Burkhart Creek	217-L/R	FC,R	300	274	574	
Clear Creek	218-L/R	FC,R	329	314	643	
Pipe Creek	219-L/R	FC,R	No Data Available			

<u>Advanced Waste Treatment</u>	- L/R	WQ	---	52,000	52,000	52,000
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<u>Water Supply</u>	- L/R	WS	---	48,000	48,000	48,000
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EARLY ACTION AND LONG RANGE ENVIRONMENTAL, REGIONAL AND SOCIAL MANAGEMENT AND OTHER MEASURES

<u>Environmental Corridors</u>	- 1	E,R,FW	3,750	3,750	7,500	7,500
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<u>Stream Fishery</u>	- 1	E,R,FW	1,521	1,521	3,042	3,042
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TABLE C- 68 WEST FORK SUBBASIN - PLAN FEATURES AND FINANCIAL DATA (CONT'D)

Project or program	Project no. and priority ^{5/}	Purpose ^{1/}	Federal first cost (\$1,000)	Non-federal first cost (\$1,000)	Project first cost (\$1,000)	Totals (\$1,000)
<u>Access Sites</u>	- 1	E,R	260	260	520	520
<u>Flood Plain Management</u>	- 1	FC,E	463	---	463	463
<u>Use of Surface Mined Areas for Recreation</u>	- 2	E,R,FW	2,070	2,070	4,140	4,140
<u>Land Treatment</u>	- 1	E,SC	28,716	28,465	57,181	57,181
RECOMMENDED FOR INCLUSION IN LONG RANGE PLAN						
<u>Land Treatment</u>	- L/R	E,SC	11,775	11,671	23,446	23,446
<u>Flood Plain Management</u>	- L/R	FC,E	819		819	819
<u>Use of Surface Mined Areas for Recreation</u>	- L/R	E,R,FW	<u>5,850</u>	<u>5,850</u>	<u>11,700</u>	<u>11,700</u>
TOTALS^{3/}						
			192,191			
				239,039		
					511,425 ^{5/}	511,425 ^{5/}

1/ Purpose index, see table 66. (Main Report)

2/ Authorized.

3/ Subbasin plan does not include basinwide measures.

4/ Priorities within Early Action Plan time frame (10-15 years)

1 - 1st five year period.

2 - 2nd five year period.

3 - 3rd five year period.

L/R - Long Range Plan (No priorities designated within Long Range Plan)

N/A - Not applicable.

5/ Includes \$17,988 in costs for completed projects (\$1,000).

6/ Special authorization for these projects is highly desirable for the timely interagency planning and installation of interrelated projects.

TABLE C-69. UPPER WABASH SUBBASIN - PLAN FEATURES AND FINANCIAL DATA

Project or program	Project No and priority ^{4/}	Program ^{1/}	Federal first cost (\$1,000)	Non-federal first cost (\$1,000)	Project first cost (\$1,000)	Totals (\$1,000)
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EARLY ACTION AND LONG RANGE STRUCTURAL MEASURES

EXISTING, UNDER CONSTRUCTION AND AUTHORIZED

Major Reservoir Projects

Huntington (Existing)	6-N/A	FC,R			19,432	
Salamonie (Existing)	4-N/A	FC,R			16,403	
Mississinewa (Existing)	5-N/A	FC,R,WQ			23,739	
Lafayette	7-1	FC,R			42,743	102,817

Upstream Watershed Projects

Upper Wabash - Ohio	95-N/A	FC,D			N/A	
Rock Creek - Wells County	96-1	FC,D			5,345	
Mill Creek - Fulton County (Existing)	101-N/A	FC,D			937	
Bachelor Run (Existing)	98-N/A	FC,D			1,051	7,333

Local Protection Projects

Deer Creek - Prairie Levee ^{2/}	55-L/R	FC				
Delphi Local Protection	37-N/A	FC			162	
Marion Local Protection	79-1	FC			1,560	1,722

RECOMMENDED FOR INCLUSION IN EARLY ACTION PLAN

Upstream Watershed Projects

Clear Creek	115-2	FC,D	310	167	477	
Little River ^{6/}	116-2	FC,D,R,WQ	3,767	773	4,540	
Buckeye Hoosier ^{6/}	117-1	FC,D,R,WQ	6,807	2,873	9,680	
Salamonie River	118-1	FC,D,R	3,435	911	4,346	
Pony Creek	119-2	FC,D	337	90	427	
Lower Mississinewa River	120-2	FC,R,FW	533	451	984	
Upper Mississinewa River	121-2	FC,D	1,997	545	2,542	
Brown Hill	122-3	FC,D	864	578	1,442	
Big Monon Ditch	123-3	FC,D	3,018	1,501	4,519	
House-Bartee	124-2	FC,D	572	222	794	
Mud Creek	125-3	FC,D	1,373	690	2,063	
Sugar Creek	126-3	FC,D,R	1,072	958	2,030	
Rock Creek	127-1	FC,D	753	289	1,042	
Burnetts Creek	128-3	FC,D	183	72	255	
Crooked Creek	129-3	FC,D	291	80	371	
Goose Creek	130-1	FC,R	---	---	---	35,512

Advanced Waste Treatment

(Indiana)	- 1	WQ	---	14,000	14,900	
(Ohio)				900	14,900	14,900

TABLE C-69. UPPER WABASH SUBBASIN - PLAN FEATURES AND FINANCIAL DATA (CONT'D)

Project or program	Project no. and priority ^{4/}	Program ^{1/}	Federal first cost (\$1,000)	Non-federal first cost (\$1,000)	Project first cost (\$1,000)	Totals (\$1,000)
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Water Supply (Indiana)	- 1	WS	---	6,550	6,550	6,550
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RECOMMENDED FOR INCLUSION IN LONG RANGE PLAN

Major Reservoirs

Deer Creek	25-L/R	FC,R	25,730	2,670	28,400	
Denver	26-L/R	FC,R	40,935	5,465	46,400	
Pipe Creek	27-L/R	FC,R	19,014	2,186	21,200	
Upper Delphi	28-L/R	FC,R	72,452	4,448	76,900	172,900

Upstream Watershed Project

Scuffle Creek	200-L/R	FC,D	122	57	179	
Eel River	201-L/R	FC	No data available			
Timmons Ditch	202-L/R	FC,D	148	80	228	
Ackerman Ditch	203-L/R	FC,D	107	58	165	
Quigley Marsh Ditch	204-L/R	FC,D	87	47	134	
Fell Taylor Ditch	205-L/R	FC,D	70	38	108	
Chapman Ditch	206-L/R	FC,D	34	18	52	
South Fork Wildcat Creek	207-L/R	FC,D	No data available			
Deer Creek	208-L/R	FC,D	2,676	2,420	5,096	
Pleasant Run Creek	209-L/R	FC,D	68	36	104	
Rattlesnake Creek	210-L/R	FC,D	293	157	450	6,516

Advanced Waste Treatment

(Indiana)	- L/R	WQ	---	22,000		
(Ohio)				1,000	23,000	23,000

Water Supply

(Indiana)	- L/R	WS	---	44,900		
(Ohio)				100	45,000	45,000

**EARLY ACTION AND LONG RANGE ENVIRONMENTAL,
REGIONAL AND SOCIAL MANAGEMENT AND OTHER MEASURES**

RECOMMENDED FOR INCLUSION IN EARLY ACTION PLAN

Environmental Corridors

(Indiana)	- 1	E,R,FW	7,975	7,975		
(Ohio)				0	15,950	15,950

Stream Fishery

(Indiana)	- 1	E,R,FW	2,053	2,053		
(Ohio)				0	4,106	4,106

TABLE C-69. UPPER WABASH SUBBASIN - PLAN FEATURES AND FINANCIAL DATA (CONT'D)

Project or program	Project no. and priority ^{4/}	Program ^{1/}	Federal first cost (\$1,000)	Non-federal first cost (\$1,000)	Project first cost (\$1,000)	Totals (\$1,000)
<u>Access Sites</u>						
(Indiana)	- 1	E,R,FW	442	442		
(Ohio)				0	884	884
<u>Flood Plain Management</u>						
(Indiana)	- 1	FC,E	311	---	311	311
<u>Use of Surface Mined Areas for Recreation</u> (Indiana)	- 2	E,R,FW	775	775		
(Ohio)				0	1,550	1,550
<u>Land Treatment</u>						
(Indiana)	- 1	E,SC	44,123	41,112		
(Ohio)				2,624	87,859	87,859
RECOMMENDED FOR INCLUSION IN LONG RANGE PLAN						
<u>Land Treatment</u> (Indiana)	- L/R	E,SC	19,266	17,951		
(Ohio)				1,146	38,363	38,363
<u>Flood Plain Management</u>						
(Indiana)	- L/R	FC,E	598	---	598	598
<u>Use of Surface Mined Areas for Recreation</u>	- L/R	E,R,FW	<u>2,200</u>	<u>2,200</u>	<u>4,400</u>	<u>4,400</u>
TOTALS^{3/}						
Federal First Costs			264,791			
Non-Federal First Costs						
(Indiana)				187,838		
(Ohio)				5,770		
Subbasin Grand Total					569,771 ^{5/}	569,991 ^{5/}

^{1/} Purpose index, see table 66. (Main Report)

^{2/} Authorized.

^{3/} Subbasin plan does not include basinwide measures.

^{4/} Priorities within Early Action Plan time frame (10-15 years)

1 - 1st five year period.

2 - 2nd five year period.

3 - 3rd five year period.

L/R - Long Range Plan (No priorities designated within Long Range Plan)

N/A - Not applicable.

^{5/} Includes \$61,724 in costs for completed projects (\$1,000).

^{6/} Special authorization for these projects is highly desirable for the timely interagency planning and installation of interrelated projects.

TABLE C- 70 MIDDLE WABASH SUBBASIN - PLAN FEATURES AND FINANCIAL DATA

Project or program	Project no and priority ^{4/}	Purpose ^{1/}	Federal first costs (\$1,000)	Non-federal first costs (\$1,000)	Project first costs (\$1,000)	Totals (\$1,000)
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EARLY ACTION AND LONG RANGE STRUCTURAL MEASURES

EXISTING, UNDER CONSTRUCTION AND AUTHORIZED

Major Reservoirs

Mansfield (Indiana)(Existing)	2-N/A	FC,R			6,280	
Big Pine (Indiana)	8-1	FC,R			24,567	30,847

Upstream Watershed Projects

Busseron Creek (Indiana) (Existing)	109-N/A	FC,WS,R			9,671	
Little Wea Creek (Indiana)	94-N/A	N/A			N/A	
Kickapoo Creek (Indiana)	110-N/A	FC,D			418	
Prairie Creek (Vigo County) (Indiana)	111-N/A	FC,D			787	
Little Raccoon Creek (Indiana)	112-N/A	FC,R			4,799	15,675

Local Protection Projects

Adams ^{2/} (Indiana)	53	FC				
Raccoon ^{2/} (Indiana)	75	FC				
Lyford (Indiana) (Existing)	32-N/A	FC			291	
Clinton ^{2/} (Indiana)	54	FC				
Conover (Indiana) (Existing)	36-N/A	FC			15	
West Terre Haute (Indiana)	57-1	FC			1,290	
Sugar Creek ^{2/} (Indiana)	50	FC				
Honey Creek ^{2/} (Indiana)	56	FC				
Greenfield Bayou (Indiana)	59-1	FC			3,221	
Levee Unit 6 (Illinois)	52-1	FC			1,216	
Island (Indiana)	60-1	FC			2,094	
Tri Pond (Illinois)	62-1	FC			2,050	
Gill Township (Indiana) (Existing)	31-N/A	FC			581	
Niblack (Indiana) (Existing)	40-N/A	FC			2,574	
Russell and Allison (Illinois)	51-1	FC			7,365	
England Pond (Illinois)	58-1	FC			932	
Vincennes (Indiana) (Existing)	38-N/A	FC			6,120	
Brevoort (Indiana) (Existing)	30-N/A	FC			3,585	31,334

RECOMMENDED FOR INCLUSION IN EARLY ACTION PLAN

Major Reservoirs

Crawfordsville (Indiana)	21-1	FC,WS,R,WQ	24,996	3,904	28,900	
Salt Fork (Illinois)	22-2	FC,R,WQ	31,995	4,205	36,200	65,100

TABLE C-70. MIDDLE WABASH SUBBASIN - PLAN FEATURES AND FINANCIAL DATA (CONT'D)

Project or program	Project no and priority ^{4/}	Purpose ^{1/}	Federal first costs (\$1,000)	Non-federal first costs (\$1,000)	Project first costs (\$1,000)	Totals (\$1,000)
<u>Upstream Watershed Projects</u>						
Raccoon Creek (Illinois)	159-3	FC,D	1,170	349	1,519	
Snapp-Kelso (Indiana)	161-1	FC,R	506	428	934	
Mariah Creek (Indiana)	162-1	FC,D,R	969	282	1,251	
Turtle Creek (Indiana)	164-2	FC,R,I	928	477	1,405	
Mill Creek (Indiana)	164-1	FC,R	1,939	1,084	3,023	
Honey Creek (Indiana)	167-2	FC,R	3,249	936	4,185	
Otter Creek (Indiana)	169-1	FC,R	2,371	1,613	3,984	
Coal Creek (Indiana) ^{6/}	170-2	FC,R	1,269	673	1,942	
Big Raccoon Creek (Indiana)	173-1	FC,R,FW	1,722	714	2,436	
Jordan Creek (Indiana)	174-1	FC,D	585	210	795	
Lye Creek (Indiana) ^{6/}	175-1	FC,D	791	420	1,211	
Fall Creek (Indiana)	171-1	FC,R	193	181	374	
Vieke Ditch (Indiana)	158-3	FC,D	364	114	478	
City Ditch (Indiana)	160-3	FC,D	253	83	336	
Sugar Creek (Illinois)	168-1	FC,WS,WQ	875	902	1,777	
Lower Shaker Prairie (Indiana)	163-3	FC,D	243	70	313	
Snyder Creek (Illinois) ^{6/}	166-1	FC	262	65	327	
Feather Creek (Indiana)	172-1	FC,R	767	504	1,271	27,555
<u>Advanced Waste Treatment</u>						
(Illinois)	- 1	WQ	--	8,000		
(Indiana)				4,000	12,000	12,000
<u>Mine Pollution Abatement</u>						
(Indiana)	- 2	WQ	1,000	1,000	2,000	2,000
<u>Water Supply</u>						
(Illinois)	- 1	WS		2,300		
(Indiana)				4,220	6,520	6,520
RECOMMENDED FOR INCLUSION IN LONG RANGE PLAN						
<u>Major Reservoir Projects</u>						
Coal Creek (Indiana)	29-L/R	FC,R	16,835	2,165	19,000	19,000
<u>Upstream Watershed Projects</u>						
Crawfish Creek (Illinois)	229-L/R	FC,D	147	37	184	
Turman Creek (Illinois)	230-L/R	FC	610	153	763	
Raccoon Creek (Illinois)	231-L/R	FC,R	778	442	1,220	
Big Creek (Illinois)	232-L/R	FC,R	1,491	935	2,426	
Clear Creek (Illinois)	233-L/R	FC,R	1,277	945	2,222	
Lost Creek (Indiana)	234-L/R	FC	341	85	426	

TABLE C-70. MIDDLE WABASH SUBBASIN - PLAN FEATURES AND FINANCIAL DATA (CONT'D)

Project or program	Project no and priority ^{4/}	Purpose ^{1/}	Federal first costs (\$1,000)	Non-federal first costs (\$1,000)	Project first costs (\$1,000)	Totals (\$1,000)
Norton Creek (Indiana)	235-L/R	FC,R	644	469	1,113	
Big Shawnee Creek (Indiana)	236-L/R	FC,D	460	248	708	
Coal Branch (Indiana)	237-L/R	FC	169	42	211	
Stony Creek (Illinois)	238-L/R	FC,D	370	200	570	
Sugar Mill Creek (Indiana)	239-L/R	FC,R	802	413	1,215	
Little Sugar Creek (Indiana)	240	FC,D	111	66	177	
<u>Advanced Waste Treatment</u>						
(Illinois)	- L/R	WQ		11,000		
(Indiana)				13,000	24,000	24,000
<u>Water Supply</u>						
(Illinois)	- L/R	WS		19,000		
(Indiana)				32,000	51,000	51,000

EARLY ACTION AND LONG RANGE ENVIRONMENTAL,
REGIONAL AND SOCIAL MANAGEMENT AND OTHER MEASURES

RECOMMENDED FOR INCLUSION IN EARLY ACTION PLAN

<u>Environmental Corridors</u>						
(Illinois)	- 1	E,R,FW	7,218	5,256		
(Indiana)				1,962	14,436	14,436
<u>Stream Fishery</u>						
(Illinois)	- 1	E,R,FW	2,359	1,353		
(Indiana)				1,006	4,718	4,718
<u>Access Sites</u>						
(Illinois)	- 1	E,R	403	205		
(Indiana)				198	806	806
<u>Flood Plain Management</u>						
	- 1	FC,E	294		294	294
<u>Use of Surface Mined Areas for Recreation (Illinois)</u>						
(Indiana)	- 2	E,R,FW	1,420	710		
				710	2,840	2,840
<u>Land Treatment</u>						
(Illinois)	- 1	E,SC	19,315	10,482		
(Indiana)				8,693	38,490	38,490

RECOMMENDED FOR INCLUSION IN LONG RANGE PLAN

<u>Land Treatment</u>						
(Illinois)	- L/R		9,193	4,249		
(Indiana)				4,863	18,305	18,305

TABLE C-70 MIDDLE WABASH SUBBASIN - PLAN FEATURES AND FINANCIAL DATA (CONT'D)

Project or program	Project no and priority ^{4/}	Purpose ^{1/}	Federal first costs (\$1,000)	Non-federal first costs (\$1,000)	Project first costs (\$1,000)	Totals (\$1,000)
Flood Plain Management	- L/R	FC,E	606	---	606	606
Use of Surface Mined Areas for Recreation (Illinois) (Indiana)	- L/R	E,R,FW	4,020	2,010 2,010	8,040	8,040
TOTALS ^{3/}						
Federal First Costs			145,310			
Non-Federal First Costs (Indiana)				86,678		
(Illinois)				72,798		
Subbasin Grand Total					382,642 ^{5/}	382,642 ^{5/}

1/ Purpose index, see table 66. (Main Report)

2/ Authorized.

3/ Subbasin plan does not include basinwide measures.

4/ Priorities within Early Action Plan time frame (10-15 years).

1 - 1st five year period.

2 - 2nd five year period.

3 - 3rd five year period.

L/R - Long Range Plan (No priorities designated within Long Range Plan).

N/A - Not applicable.

5/ Includes \$29,117 in costs for constructed projects (\$1,000).

6/ Special authorization for these project is highly desirable for the timely interagency planning and installation of interrelated projects.

TABLE C-71, EMBARRAS SUBBASIN - PLAN FEATURES AND FINANCIAL DATA

Project or program	Project no and priority ^{3/}	Purpose ^{1/}	Federal first cost (\$1,000)	Non-federal first cost (\$1,000)	Project first cost (\$1,000)	Total (\$1,000)
EARLY ACTION AND LONG RANGE STRUCTURAL MEASURES						
EXISTING, UNDER CONSTRUCTION AND AUTHORIZED						
<u>Major Reservoirs</u>						
Lincoln	9-1	FC,R,WS,WQ	42,706	2,742	45,448	45,448
<u>Upstream Watershed Projects</u>						
Scattering Fork	113-1				1,376	1,376
RECOMMENDED FOR INCLUSION IN EARLY ACTION PLAN						
<u>Upstream Watershed Projects</u>						
Muddy Creek (17g-5)	177-1	FC,D,WQ	1,291	452	1,743	
Muddy Creek (17g-21) ^{4/}	180-1	FC,R,WQ,WS	2,707	1,736	4,443	
North Fork Embarras River ^{4/}	178-1	FC,R,WQ,WS	7,167	3,270	10,437	
Crooked Creek ^{4/}	179-3	FC,R	1,295	446	1,741	
Brushy-Birch Creek	176-1	FC,R,WQ	1,321	551	1,872	20,236
<u>Advanced Waste Treatment</u>	- 1	WQ	---	1,560	1,560	1,560
<u>Water Supply</u>	- 1	WS	---	750	750	750
RECOMMENDED FOR INCLUSION IN LONG RANGE PLAN						
<u>Upstream Watershed Projects</u>						
Otter-Beaver-Allison Creeks	241-L/R	FC,D	950	512	1,462	
Honey Creek	242-L/R	FC,R	815	355	1,170	
Range Creek	243-L/R	FC,R	1,686	692	2,378	
Hurricane Creek	244=L/R	FC	829	208	1,037	6,047
<u>Advanced Waste Treatment</u>	- L/R	WQ		2,000	2,000	2,000
<u>Water Supply</u>	- L/R	WS		5,000	5,000	5,000
EARLY ACTION AND LONG RANGE ENVIRONMENTAL, REGIONAL AND SOCIAL MANAGEMENT AND OTHER MEASURES						
RECOMMENDED FOR INCLUSION IN EARLY ACTION PLAN						
<u>Environmental Corridors</u>	- 1	E,R,FW	1,385	1,385	2,770	2,770
<u>Stream Fishery</u>	- 1	E,R,FW	700	700	1,400	1,400

TABLE C-71. EMBARRAS SUBBASIN - PLAN FEATURES AND FINANCIAL DATA (CONT'D)

Project or program	Project no and priority ^{3/}	Purpose ^{1/}	Federal first cost (\$1,000)	Non-federal first cost (\$1,000)	Project first cost (\$1,000)	Total (\$1,000)
<u>Access Sites</u>	- 1	E,R,FW	105	105	210	210
<u>Flood Plain Management</u>	- 1	FC,E	122		122	122
<u>Use of Surface Mined Areas for Recreation</u>	- 2	E,R,FW	775	775	1,550	1,550
<u>Land Treatment</u>	- 1	E,SC	8,813	8,735	17,548	17,548
RECOMMENDED FOR INCLUSION IN LONG RANGE PLAN						
<u>Land Treatment</u>	- L/R	E,SC	3,576	3,545	7,121	7,121
<u>Flood Plain Management</u>	- L/R	FC,E	294		294	294
<u>Use of Surface Mined Areas for Recreation</u>	- L/R	E,R,FW	<u>2,200</u>	<u>2,200</u>	<u>4,400</u>	<u>4,400</u>
TOTALS^{2/}						
Federal First Cost			78,737			
Non-Federal First Cost				37,719		
Subbasin Grand Total					117,832	117,832

1/ Purpose index, see table 66. (Main Report)

2/ Subbasin plan does not include basinwide measures.

3/ Priorities within Early Action Plan time frame (10-15 years).

1 - 1st five year period.

2 - 2nd five year period.

3 - 3rd five year period.

L/R - Long Range Plan (No priorities designated within Long Range Plan).

N/A - Not applicable.

4/ Special authorization for these projects is highly desirable for the timely interagency planning and installation of interrelated projects.

TABLE C- 72 LITTLE WABASH SUBBASIN - PLAN FEATURES AND FINANCIAL DATA

Project or program	Project no and priority ^{4/}	Purpose ^{1/}	Federal first cost (\$1,000)	Non-federal first cost (\$1,000)	Project first cost (\$1,000)	Total (\$1,000)
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EARLY ACTION AND LONG RANGE STRUCTURAL MEASURES

EXISTING, UNDER CONSTRUCTION AND AUTHORIZED

Major Reservoirs

Helm	15-2	FC,R			23,500	
Louisville	16-1	FC,R			30,900	54,400

Upstream Watershed Projects

Seven Mile Creek	114-1	FC			1,992	1,992
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Local Protection Projects

Levee Unit 1 ^{2/}	68-N/A	FC				
Levee Unit 2 ^{2/}	67-N/A	FC				

RECOMMENDED FOR INCLUSION IN EARLY ACTION PLAN

Upstream Watershed Projects

Lick Creek ^{5/}	187-2	FC,R	747	499	1,246	
Auxier-Big Creek ^{5/}	188-1	FC,R,WS,D	2,678	2,273	4,951	
Big Mound Creek	189-2	FC,D	675	297	972	
Pond Creek ^{5/}	192-1	FC,R	1,068	547	1,615	
Big Muddy Creek ^{5/}	194-1	FC,R	3,638	1,374	5,012	
Dry Fork ^{5/}	190-2	FC,R,WS	1,890	774	2,664	
Horse Creek ^{5/}	191-2	FC,R,WS	2,379	1,003	3,382	
Upper Little Wabash River ^{5/}	196-1	FC,WS,WQ	2,818	528	3,346	
Fox River ^{5/}	193-1	FC,R,WS,WQ	4,077	1,026	5,103	30,363
Salt Creek ^{5/}	195-1	FC,R	1,439	633	2,072	

Local Protection Projects

Levee Unit 7	79a-3	FC	670	26	696	
Levee Unit 8	79b-3	FC	780	30	810	1,506

<u>Advanced Waste Treatment</u>	- 1	WQ	---	4,980	4,980	4,980
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<u>Water Supply</u>	- 1	WS	---	310	310	310
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RECOMMENDED FOR INCLUSION IN LONG RANGE PLAN

Upstream Watershed Projects

Limekiln Creek	247-L/R	FC,D	77	42	119	
Lost Creek	248-L/R	FC	390	98	488	

TABLE C-72. LITTLE WABASH SUBBASIN - PLAN FEATURES AND FINANCIAL DATA (CONT'D)

Project or program	Project no and priority ^{A/}	Purpose ^{L/}	Federal first cost (\$1,000)	Non-federal first cost (\$1,000)	Project first cost (\$1,000)	Total (\$1,000)
Beaver Creek	249-L/R	FC	188	47	235	
Prairie Creek	250-L/R	FC,D	88	47	135	
Nameless Creek	251-L/R	FC,WS	154	204	358	
Brush Creek	252-L/R	FC	998	250	1,248	
Elliott Creek	253-L/R	FC	128	32	160	
Big Creek	254-L/R	FC	No data available			
Elm River	255-L/R	FC,R	6,388	2,238	8,626	
Panther Creek	256-L/R	FC	602	151	753	
Crooked Creek	257-L/R	FC	320	80	400	
Dismal Creek	258-L/R	FC	453	113	566	
Bishop Creek	259-L/R	FC,WS	581	181	762	
<u>Local Protection Projects</u>						
Levee Unit 3	90a-L/R	FC	2,030	280	2,310	
Levee Unit 9	90b-L/R	FC	520	80	600	2,910
<u>Advanced Waste Treatment</u>	- L/R	WS	---	3,000	3,000	3,000
<u>Water Supply</u>	- L/R	WS	---	8,000	8,000	8,000
EARLY ACTION AND LONG RANGE ENVIRONMENTAL REGIONAL AND SOCIAL MANAGEMENT AND OTHER MEASURES						
RECOMMENDED FOR INCLUSION IN EARLY ACTION PLAN						
<u>Environmental Corridors</u>	- 1	E,R,FW	1,296	1,296	2,595	2,592
<u>Stream Fishery</u>	- 1	E,R,FW	602	602	1,204	1,204
<u>Access Sites</u>	- 1	E,R,FW	37	37	74	74
<u>Flood Plain Management</u>	- 1	FC,E	150	---	150	150
<u>Use of Surface Mined Areas for Recreation</u>	- 2	E,R,FW	258	258	516	516
<u>Land Treatment</u>	- 1	E,SC	11,701	11,599	23,300	23,300
RECOMMENDED FOR INCLUSION IN LONG RANGE PLAN						
<u>Land Treatment</u>	- L/R	E,SC	4,572	4,531	9,103	9,103
<u>Flood Plain Management</u>	- L/R	FC,E	353	---	353	353
<u>Use of Surface Mined Areas for Recreation</u>	- L/R	E,R,FW	<u>730</u>	<u>730</u>	<u>1,460</u>	<u>1,460</u>

TABLE C-72 LITTLE WABASH SUBBASIN - PLAN FEATURES AND FINANCIAL DATA (CONT'D)

Project or program	Project no and priority ^{4/}	Purpose ^{1/}	Federal first cost (\$1,000)	Non-federal first cost (\$1,000)	Project first cost (\$1,000)	Total (\$1,000)
TOTALS ^{3/}						
Federal First Cost			55,475			
Non-Federal First Cost				48,196		
Subbasin Grand Total					160,063	160,063

1/ Purpose index, see table 66. (Main Report)

2/ Authorized.

3/ Subbasin plan does not include basinwide measures.

4/ Priorities within Early Action Plan time frame (10-15 years).

1 - 1st five year period.

2 - 2nd five year period.

3 - 3rd five year period.

L/R - Long Range Plan (No priorities designated within Long Range Plan).

N/A - Not applicable.

5/ Special authorization for these projects is highly desirable for the timely interagency planning and installation of interrelated projects.

TABLE C-73. LOWER WABASH SUBBASIN - PLAN FEATURES AND FINANCIAL DATA

Project or program	Project no and priority ^{4/}	Purpose ^{1/}	Federal first cost (\$1,000)	Non-federal first cost (\$1,000)	Project first cost (\$1,000)	Total (\$1,000)
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EARLY ACTION AND LONG RANGE STRUCTURAL MEASURES

EXISTING, UNDER CONSTRUCTION AND AUTHORIZED

Local Protection Projects

Mt. Carmel (Illinois) (Existing)	78-N/A	FC			2,081	
Rochester-McCleary's Bluff (Illinois)	61-1	FC			1,310	
Levee Unit 5 (Indiana) (Existing)	35-N/A	FC			5,471	
Bonpas Channel (Illinois)	63-2	FC			1,263	
New Harmony ^{2/} (Indiana)	74	FC				
Levee Units 3 and 4 (Illinois)	46-3	FC			15,580	
Levee Units 2 (Indiana)	69-2	FC			2,119	
Levee Unit 1 (Illinois)	70-2	FC			4,526	32,350

TABLE C-73. LOWER WABASH SUBBASIN - PLAN FEATURES AND FINANCIAL DATA (CONT'D)

Project or program	Project no and priority ^{4/}	Purpose ^{1/}	Federal first cost (\$1,000)	Non-federal first cost (\$1,000)	Project first cost (\$1,000)	Total (\$1,000)
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RECOMMENDED FOR INCLUSION IN EARLY ACTION PLAN

Upstream Watershed Projects

Big Creek (Indiana)	182-2	FC,R,D	4,390	1,612	6,002	
Gresham Creek (Indiana)	193-1	FC,R,D	1,362	883	2,245	
McHenry-Hawthorne (Indiana)	184-3	N/A	---	---	---	
Scott Ditch-Coffee Bayou (Indiana)	185-3	FC,R,D	1,731	1,249	2,980	
Bonpas Creek (Illinois) ^{6/}	186-1	FC,R,WQ,D,WS	5,147	2,595	7,742	18,969

Local Protection Projects

Levee Unit 50 (Indiana)	90-3	FC	545	62	607	607
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<u>Advanced Waste Treatment</u>	- 1	WQ	---	---	---	---
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Water Supply

(Illinois)	- 1	WS	---	40	220	220
(Indiana)	- 1			180	220	220

RECOMMENDED FOR INCLUSION IN LONG RANGE PLAN

Upstream Watershed Projects

Black River (Indiana)	245-L/R	FC,R	1,320	514	1,834	
French Creek (Illinois)	246-L/R	FC,R	830	555	1,385	3,219

<u>Advanced Waste Treatment</u>	- L/R	WQ	---	---	---	---
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<u>Water Supply (Indiana)</u>	- L/R	WS	---	1,000	1,000	1,000
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EARLY ACTION AND LONG RANGE ENVIRONMENTAL,
REGIONAL AND SOCIAL MANAGEMENT AND OTHER MEASURES

RECOMMENDED FOR INCLUSION IN EARLY ACTION PLAN

Environmental Corridors

(Illinois)	- 1	E,R,FW	810	666	1,620	1,620
(Indiana)	- 1			144	1,620	1,620

Stream Fishery

(Illinois)	- 1	E,R,FW	514	249	1,028	1,028
(Indiana)	- 1			265	1,028	1,028

TABLE C-73. LOWER WABASH SUBBASIN - PLAN FEATURES AND FINANCIAL DATA (CONT'D)

Project or program	Project no. and priority ^{4/}	Purpose ^{1/}	Federal first cost (\$1,000)	Non-federal first cost (\$1,000)	Project first cost (\$1,000)	Totals (\$1,000)
<u>Access Sites</u>						
(Illinois)	- 1	E,R,FW	69	34	138	138
(Indiana)	- 1			35	138	138
<u>Flood Plain Management</u>						
	- 1	FC,E	75	---	75	75
<u>Use of Surface Mined Areas for Recreation (Indiana)</u>						
	- 2	E,R,FW	125	125	250	250
<u>Land Treatment</u>						
(Illinois)	- 1	E,SC	4,870	1,747		
(Indiana)	- 1			3,080	9,697	9,697
RECOMMENDED FOR INCLUSION IN LONG RANGE PLAN						
<u>Land Treatment</u>						
(Illinois)	- L/R	E,SC	2,122	708		
(Indiana)	- L/R			1,396	4,226	4,226
<u>Flood Plain Management</u>						
	- L/R	FC,E	100	---	100	100
<u>Use of Surface Mined Areas for Recreation (Indiana)</u>						
	- L/R	E,R,FW	360	360	730	730
TOTALS^{3/}						
Federal First Cost			24,370			
Non Federal First Cost						
(Illinois)				6,594		
(Indiana)				10,905		
Subbasin Grand Total					74,219 ^{5/}	74,219 ^{5/}

1/ Purpose index, see table 66. (Main Report)

2/ Authorized.

3/ Subbasin plan does not include basinwide measures.

4/ Priorities within Early Action Plan time frame (10-15 years).

1 - 1st five year period.

2 - 2nd five year period.

3 - 3rd five year period.

L/R - Long Range Plan. (No priorities designated within Long Range Plan).

N/A - Not applicable.

5/ Includes \$7,552 in costs for constructed projects (\$1,000).

6/ Special authorization for these projects is highly desirable for the timely interagency planning and installation of interrelated projects.

TABLE C-74. SUMMARY OF PLAN FEATURES AND FINANCIAL DATA FOR WABASH BASIN

Subbasin	Early Action Plan						Long Range Plan											
	Structural Element Cost (\$1,000)		Land Treatment Element Cost (\$1,000)		Environmental Corridors (\$1,000)		Flood Plain Management (\$1,000)		Use of Surface Mined Areas (\$1,000)		Structural Element Cost (\$1,000)		Land Treatment Element Cost (\$1,000)		Flood Plain Management (\$1,000)		Use of Surface Mined Areas (\$1,000)	
	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal
Pataoka	15,890	4,154	3,108	3,080	1,832	1,832	63	257	257	7591	6,261	1,411	1,398	50	730	730	730	730
East Fork	81,810	39,208	24,073	23,863	8,226	8,226	302	775	775	4,520	35,961	10,507	10,415	490	2,200	2,200	2,200	2,200
West Fork	78,057	77,880	28,716	28,465	5,531	5,531	463	2,070	2,070	58,910	107,972	11,775	11,671	819	5,850	5,850	5,850	5,850
Upper Wabash	25,312	30,750	44,123	41,112	10,570	10,470	311	775	775	161,736	84,580	19,266	17,951	598	2,200	2,200	2,200	2,200
		900		2,624						1,100		1,146						
Middle Wabash	76,447	15,821	19,315	10,485	9,980	6,814	294	1,420	710	24,035	32,712	9,193	4,249	606	4,020	2,010	2,010	2,010
		20,913		8,693		3,166		710		46,323		4,863						
Embarras	56,487	11,507	8,813	8,738	2,190	2,190	122	775	775	4,280	8,767	3,576	3,545	294	2,200	2,200	2,200	2,200
Little Wabash	22,859	14,300	11,701	11,599	1,935	1,935	150	258	258	12,917	14,843	4,572	4,531	353	730	730	730	730
Lower Wabash	13,175	2,635	4,870	1,747	1,393	949	75	125	125	2,150	555	2,122	708	100	360	360	360	360
		3,986		3,080		444				1,514			1,396					
TOTAL	370,037	176,491	144,719	108,293	41,557	29,669	1,780	6,455	4,712	276,139	282,611	62,422	47,694	3,310	18,290	13,350	13,350	13,350
Indiana		900		2,624						1,100		1,146						
Ohio		44,263		32,563		11,888		1,743		56,877		13,033						
Illinois																		

1/ Indiana
2/ Ohio
3/ Illinois

SECTION XVI – RECOMMENDATIONS OF PLAN FORMULATION SUBCOMMITTEE TO COORDINATING COMMITTEE

The recommendations are arranged in three basic categories, namely – philosophical, policy – legislative and implementary.

72. PHILOSOPHICAL

a. General

That the sound development and management of the Basin's water and related land resources is vital to sustaining a desirable posture of health, welfare and economic stability of the basin.

That other existing programs that contribute to improvement of the health and welfare of the Basin's present and future populace be continued and increased where appropriate.

That other new programs that would contribute to an improved quality of living in the basin be developed and implemented.

Plan elements should be integrated for development and management in accord with their formulation, as a subbasin system.

b. Specific

Water Quality – That regionalized management be encouraged in developing solutions to water quality problems of more than local people, without closing off options for individual initiative and ingenuity.

Ground Water Use – That due to inherent advantages with regard to treatment and easy availability, ground water be utilized for water supply to the capability of the aquifer, without, however, exceeding the average recharge rate, and that present ground water studies be expanded to locate and determine the potential of aquifers in the basin.

Water Reuse Systems – The research and demonstration of efficient, safe and workable water reuse systems after advanced waste treatment in the interest of optimum use of the Basin's water resources and in the interest of minimizing adverse effects on the environment be pursued.

Water Quality Monitoring Systems – The present water quality monitoring systems of the Wabash River basin be studied with the aim of expanded coverage including but not limited to 1) additional stations, especially downstream from major wastewater discharges; 2) a more extensive pesticide monitoring program; 3) systematic and extensive monitoring for heavy metals; 4) additional time of travel studies; 5) stream flows wherever needed; 6) continuous temperature monitoring at selected stations; 7) nutrient content and related studies in larger reservoirs; and 8) study of brine concentrations in potable aquifers in oil field areas.

73. POLICY – LEGISLATIVE

a. That the Wabash Coordinating Committee be continued on an "on call" basis until the Chairman is advised by the Chairman of the Ohio River Basin Commission that the continuation of the Coordinating Committee is no longer required.

b. That the needed legislative modification as enumerated below be pursued with maximum vigor.

LEGISLATIVE MEASURES

Area of Concern	Measure
Water Quality	<p>That the adoption of and especially the enforcement of sewer use ordinances become widespread in the basin. These sewer use ordinances should include regulations that control or prohibit type of waste introduced that may be injurious to the sewer or disrupting to the treatment process and system of surcharges that provides equitable proportionate payment of cost.</p> <p>That nutrients from municipal sources be prevented from entering streams where practicable by:</p> <p>Prohibition of phosphorus-bearing detergents, as sufficient quantities of safe and efficient phosphorus-free detergents become available, or</p> <p>Making phosphorus removal part of the advanced waste treatment process where needed, as shown in the water quality control plan, and</p> <p>Making nitrogen removal part of the advanced waste treatment process at larger communities, especially those located upstream from a present or proposed reservoir, as shown in the water quality control plan outlined in the subbasin sections.</p> <p>Public Law 566 under which a number of the structural components of the plan would be constructed does not provide for any Federal participation for storage for water quality control. It would appear only equitable and fair that the criteria for including water quality control in small projects would be the same as if a large project were built and that Federal interests would be the same in both cases. In other words, where the beneficiaries are wide spread and augmentation of low stream flow is not provided in lieu of adequate treatment at the source that there should be a uniform federal responsibility in financing the cost for storage for water quality control.</p>
Environmental Corridors	<p>There is existing legislation which provides general authority for undertaking the development of an environmental corridor system as recommended in the plan. The Wild and Scenic Rivers Act has not considered any streams in the Wabash Basin. Irrespective of that we believe and conclude that although none of the environmental corridors, in isolation, have national significance, the system as included in the plan has a significant national objective. Accordingly, we believe that the funding for the environmental corridors should be cost shared between the Federal government and non-Federal interests in a 50-50 basis. In other words following the intent of Public Law 89-72, the Federal Water Project Recreation Act and Public Law 566, which enable the federal government to cost share with non-Federal interests on an equal basis. We could not determine that there was any activity and from the more pastoral type recreation activity which would be provided by an environmental corridor system. Accordingly, it is felt that equity could best be served if there was a 50-50 cost sharing on the environmental corridors.</p>
Other Environmental	<p>The basin states be encouraged to develop guidelines and the local governments adopt and implement zoning standards and building and sanitary codes designed to protect and enhance the public investment and the recreational, fish and wildlife, and environmental values inherent in natural and impounded waters.</p> <p>Public lands in the basin be zoned against indiscriminate use by "off the road" vehicles in order to preserve the quality of the natural environment and to prevent the harassment of wildlife.</p>

Area of Concern	Measure
Water Supply	The postage stamp theory for water supply supports the theory of everyone paying the same price for the water they use. Some discussion has been accorded to the postage stamp theory for water supply. However, at this time the subcommittee is not prepared to make a specific recommendation thereon. However, we believe that this is a matter that needs to be addressed by the Coordinating Committee. For example, we could not agree that equity was being served wherein the cost brought about by the locational condition one community would require it to pay considerably more than another community for raw water supply.
Recreation	In trying to develop a basin plan for water resource development, we find that Public Law 89-72, the Federal Water Projects Recreation Act adds considerable difficulty to developing efficient plans. This difficulty results from the language in 89-72 which pertains to the level of recreation benefits that are inherent in any particular project. P L 89-72 concludes that not more than 50 percent of the cost can be allocated to recreation in any project. In developing basin plans we are concerned with overall efficiency, the overall basin objectives, rather than the specific efficiency of a project and the special objectives of a project. In many cases we find that the best balanced basin plan is made up of imbalanced projects. Accordingly, although the basin plan should meet the requirements of Public Law 89-72, it may be that specific projects would not meet that requirement. We believe that Public Law 89-72 should be revised to reflect that when a project is part of a comprehensive basin plan that it would not have to meet the 50 percent rule if in fact that project was unbalanced in order to provide the most efficient plan. Public Law 89-72 should also be revised to provide for continuing developments at authorized or completed projects wherein non-federal interests have or will have met their obligations under Public Law 89-72.
Ground Water	We believe that there must be or needs to be greater identification by virtue of research and study on the quantity and quality of ground water. In all of our deliberations we find that the greatest unknown regarding the specific quantity and quality of the resource lay in the area of ground water.
Flood Plain Regulation	The States and subdivisions thereof should be encouraged to develop sound flood plain use plans designated to prevent unwise developments in the flood plain. To this end, a priorities system should be implemented for Federal flood control programs considering first, those areas where adequate and acceptable flood plain zoning has been effected.
Site Preservation	That compatible Federal and state legislative authority be obtained to acquire protect and preserve the water storage sites where such sites are required for the long term welfare of the populace and that interim uses be made of these sites for recreation fish and game management, agricultural production and forest management in accord with land use plans to be prepared by Federal and non-federal interests.
Water Supply Storage	That Title III of Public Law 85-500 (and comparable portion of Public Law 566) be modified to enable the Federal Government to underwrite the cost of providing added storage in projects for municipal and industrial water supply purposes. Provided there is a reasonable expectation that such storage will be required during the functional life of the project; and provided further, that non-federal interests indicate their intent to utilize this water at the time of need with payment and interest to begin at the time of use.

74. IMPLEMENTATION

a. To Implement

(1) That the Comprehensive Plan, described in Section XVI of this report, be adopted as the basic plan for the conservation, use, development and proper preservation of the water and related land resources of the Wabash River basin.

(2) That the plan be implemented as early as financially practicable in accord with the time frames indicated.

(3) That timely authorization be obtained where necessary by each agency to implement elements of each of the subbasin plans.

(4) It is recommended that special authorization be provided to place priority emphasis upon early implementation of conservation land treatment and management practices above all major reservoirs in the basin as outlined in the comprehensive plan and similar to that carried out in small watershed projects.

(5) Provide special authorization for approximately thirty small watersheds identified in Section XV which are closely interrelated with other developments. Because of these interrelationships concurrent or timely planning and installation of the related projects is essential to provide the most effective and efficient combination of measures.

(6) That the plan elements be subject to modification as necessary and desirable — as more detailed studies progress, in the interest of improved efficiency, increased environmental consideration, the evolving regional requirements and the well being of the populace — all within the framework and thrust of the plan as presented.

(7) That a systematic approach and immediate action be taken to solve water quality problems caused by combined storm-sanitary or sewers, applying sound engineering principles to solve each problem on a case-by-case basis to achieve the most benefit for the least cost, taking into consideration results from present and future research projects as new approaches become available.

(8) That the plan be reviewed and updated periodically each decade to assure that it continues to meet the Basin's needs as the projected needs are transformed into real needs.

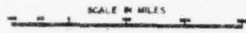
(9) The Committee recognizes that channel alterations may be detrimental to environmental values, but the Committee is not convinced that channel alterations must necessarily be detrimental. There is present technology and techniques for channel alterations which can minimize this damage or even improve natural channel conditions. The Committee concludes that each channel alteration be examined in the light of a multiple objective approach within the purview of the National Environmental Policy Act of 1969 (Public Law 91-190) and in consonance with the Fish and Wildlife Coordination Act. Pending this examination such channel alterations should be in accordance with the best practical technology available.

b. To Support

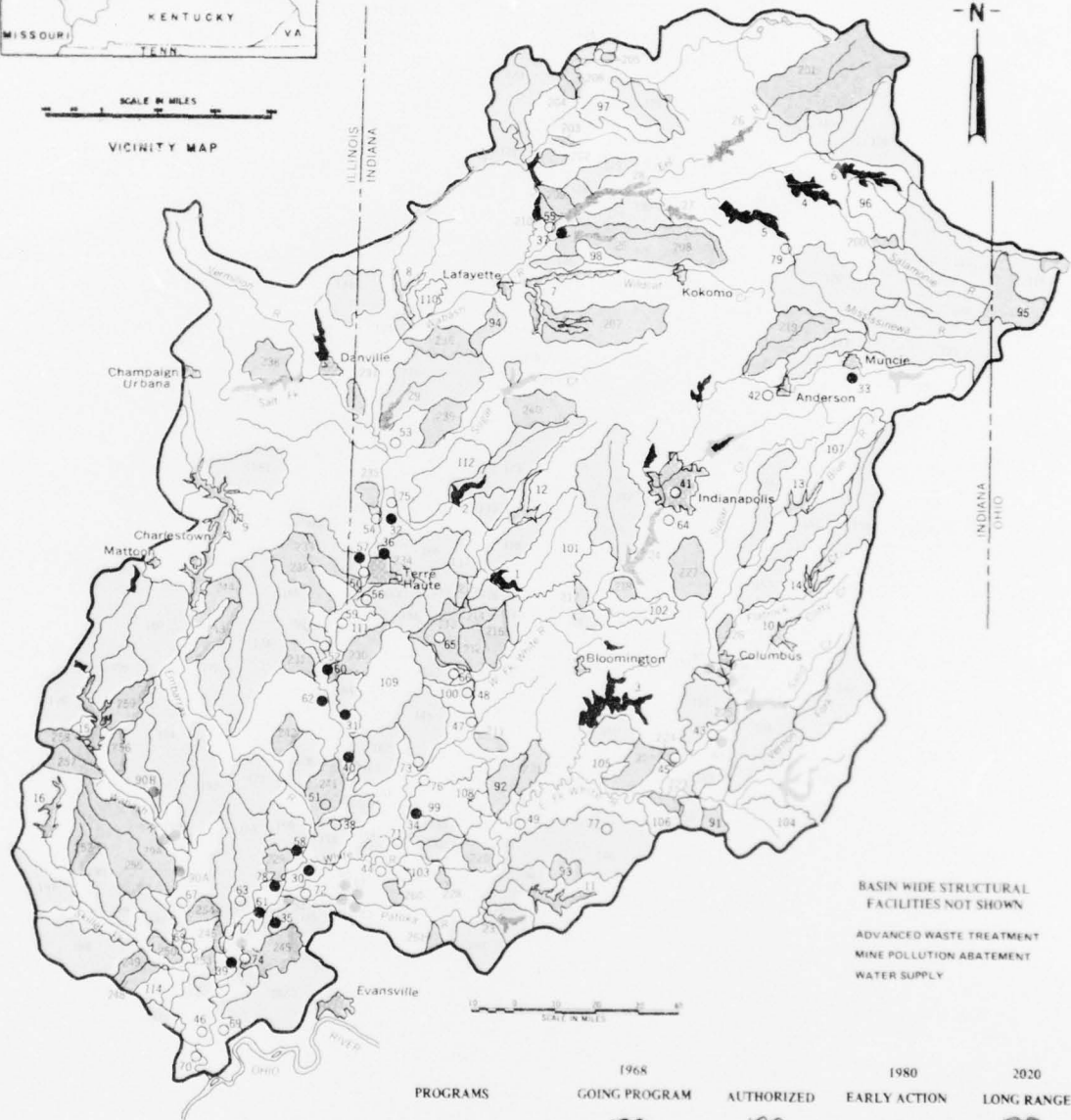
Development of a Comprehensive Water Regulation Plan with an environmental approach commensurate with the natural ecosystems of the basin.

A Comprehensive Environmental Open Space—Land Use Study be initiated, in which particular emphasis be given detailed planning for the environmental corridor and stream fishery systems commensurate with public visitation and wildlife habitat needs and features identified in the environmental inventory be further explored for proper public use or preservation objectives.

STRUCTURAL MEASURES



VICINITY MAP



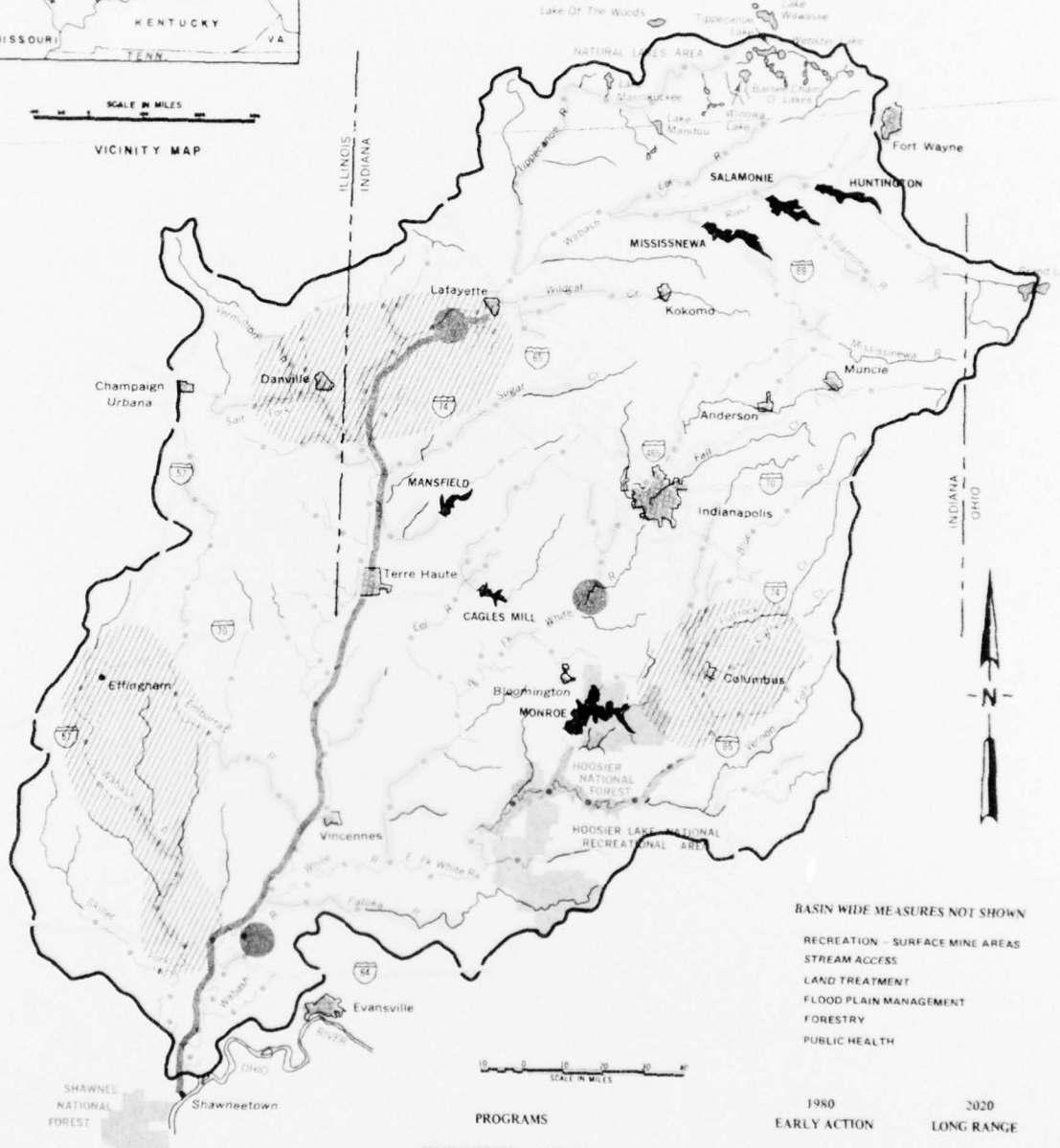
BASIN WIDE STRUCTURAL FACILITIES NOT SHOWN
 ADVANCED WASTE TREATMENT
 MINE POLLUTION ABATEMENT
 WATER SUPPLY

PROGRAMS	1968	1980	2020
	GOING PROGRAM		
MAJOR RESERVOIR			
WATERSHED PROJECT			
LOCAL PROTECTION			

ENVIRONMENTAL, REGIONAL AND SOCIAL MANAGEMENT AND OTHER MEASURES



SCALE IN MILES



BASIN WIDE MEASURES NOT SHOWN

- RECREATION - SURFACE MINE AREAS
- STREAM ACCESS
- LAND TREATMENT
- FLOOD PLAIN MANAGEMENT
- FORESTRY
- PUBLIC HEALTH

PROGRAMS

- ENVIRONMENTAL CORRIDORS
- STREAM FISHERY
- SCENIC PARKWAY
- PROPOSED OR COMPLETED INTERSTATE HIGHWAY
- POTENTIAL POWER DEVELOPMENT AREAS
- REGIONAL CENTERS

1980 EARLY ACTION 2020 LONG RANGE

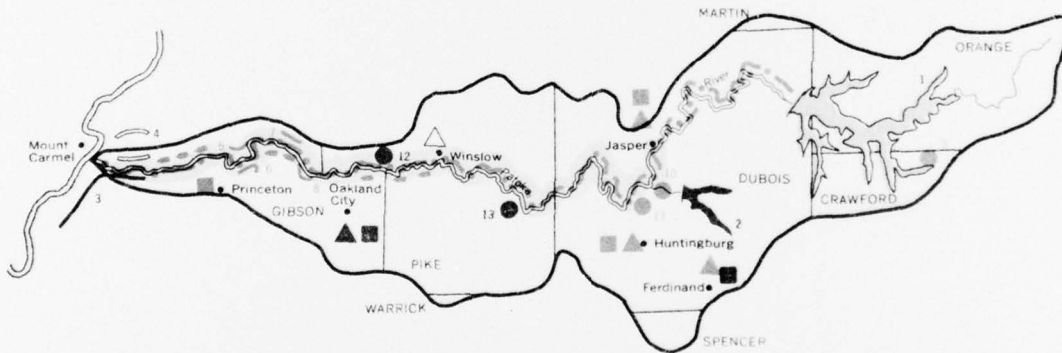
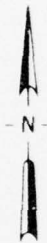
PLATE C-2

PATOKA SUBBASIN PLAN

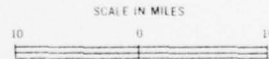


VICINITY MAP

PROGRAMS	1968	1980	2020
MAJOR RESERVOIR	GOING PROGRAM (Wavy line)	AUTHORIZED (Wavy line)	EARLY ACTION (Wavy line)
WATERSHED PROJECT	GOING PROGRAM (Circle)	AUTHORIZED (Circle)	EARLY ACTION (Circle)
LEVEES	GOING PROGRAM (Solid line)	AUTHORIZED (Dashed line)	EARLY ACTION (Dashed line)
CHANNEL IMPROVEMENT	GOING PROGRAM (Dashed line)	AUTHORIZED (Dashed line)	EARLY ACTION (Dashed line)
STREAM FISHERY	GOING PROGRAM (Dashed line)	AUTHORIZED (Dashed line)	EARLY ACTION (Dashed line)
ENVIRONMENTAL CORRIDORS	GOING PROGRAM (Dashed line)	AUTHORIZED (Dashed line)	EARLY ACTION (Dashed line)



PROBLEM AREAS	EXISTING	1980	2020
WATER QUALITY (Major Communities)	Open square	Shaded square	Black square
WATER SUPPLY	Open triangle	Shaded triangle	Black triangle



PROGRAMS NOT SHOWN

- ADVANCED WASTE TREATMENT
- MINE POLLUTION ABATEMENT
- WATER SUPPLY
- RECREATION SURFACE MINE AREAS
- STREAM ACCESS
- LAND TREATMENT
- FLOOD PLAIN REGULATION
- FORESTRY
- PUBLIC HEALTH

EAST FORK WHITE SUBBASIN PLAN



PROGRAMS	1968	1980	2020
MAJOR RESERVOIR	GOING PROGRAM (Wavy line)	AUTHORIZED (Wavy line)	EARLY ACTION (Wavy line)
WATERSHED PROJECT	GOING PROGRAM (Circle)	AUTHORIZED (Circle)	EARLY ACTION (Circle)
LEVEES	GOING PROGRAM (Solid line)	AUTHORIZED (Dashed line)	EARLY ACTION (Dashed line)
CHANNEL IMPROVEMENT	GOING PROGRAM (Dashed line)	AUTHORIZED (Dashed line)	EARLY ACTION (Dashed line)
STREAM FISHERY	GOING PROGRAM (Dashed line)	AUTHORIZED (Dashed line)	EARLY ACTION (Dashed line)
ENVIRONMENTAL CORRIDORS	GOING PROGRAM (Dashed line)	AUTHORIZED (Dashed line)	EARLY ACTION (Dashed line)

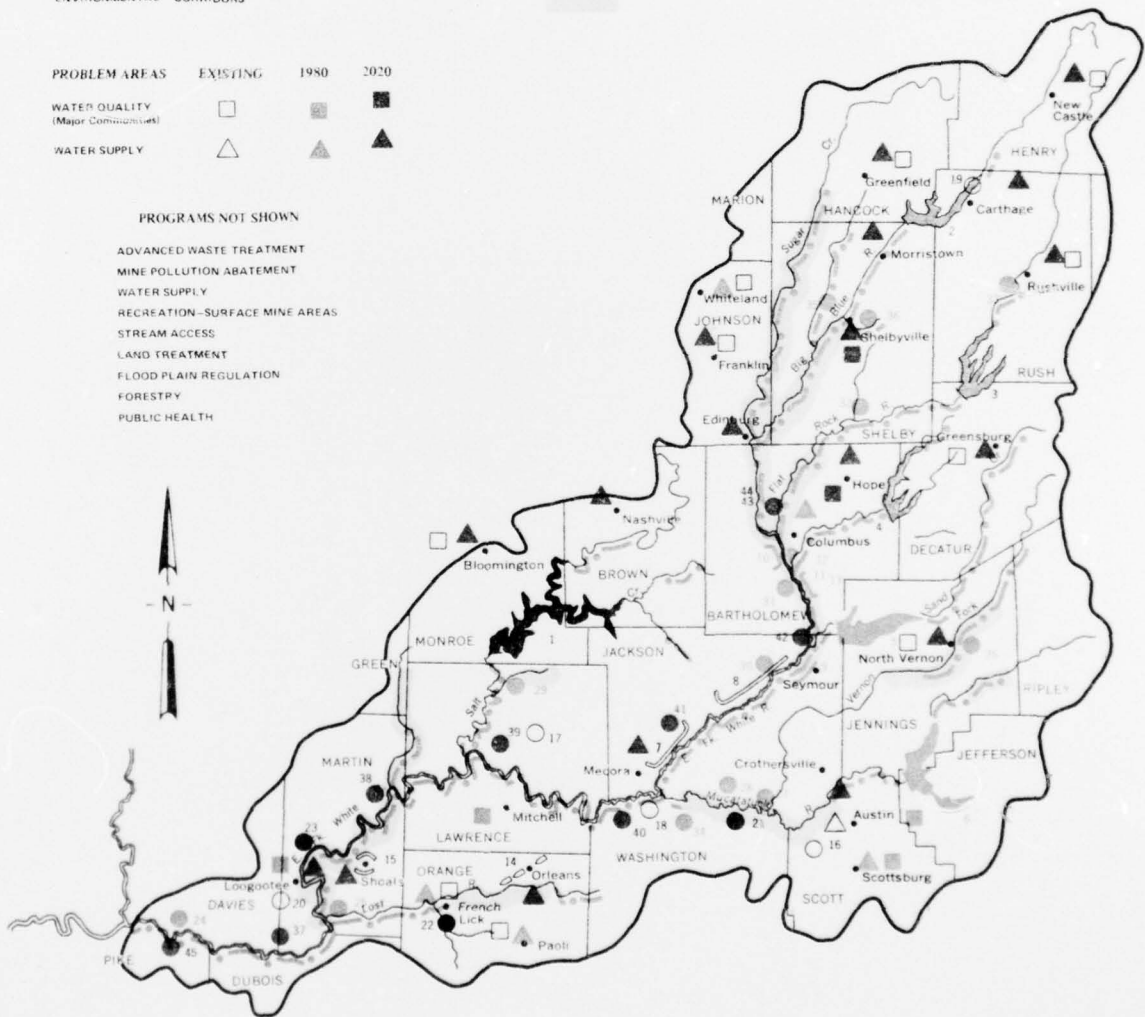
SCALE IN MILES

VICINITY MAP

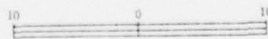
PROBLEM AREAS	EXISTING	1980	2020
WATER QUALITY (Major Contaminants)	Open square	Shaded square	Black square
WATER SUPPLY	Open triangle	Shaded triangle	Black triangle

PROGRAMS NOT SHOWN

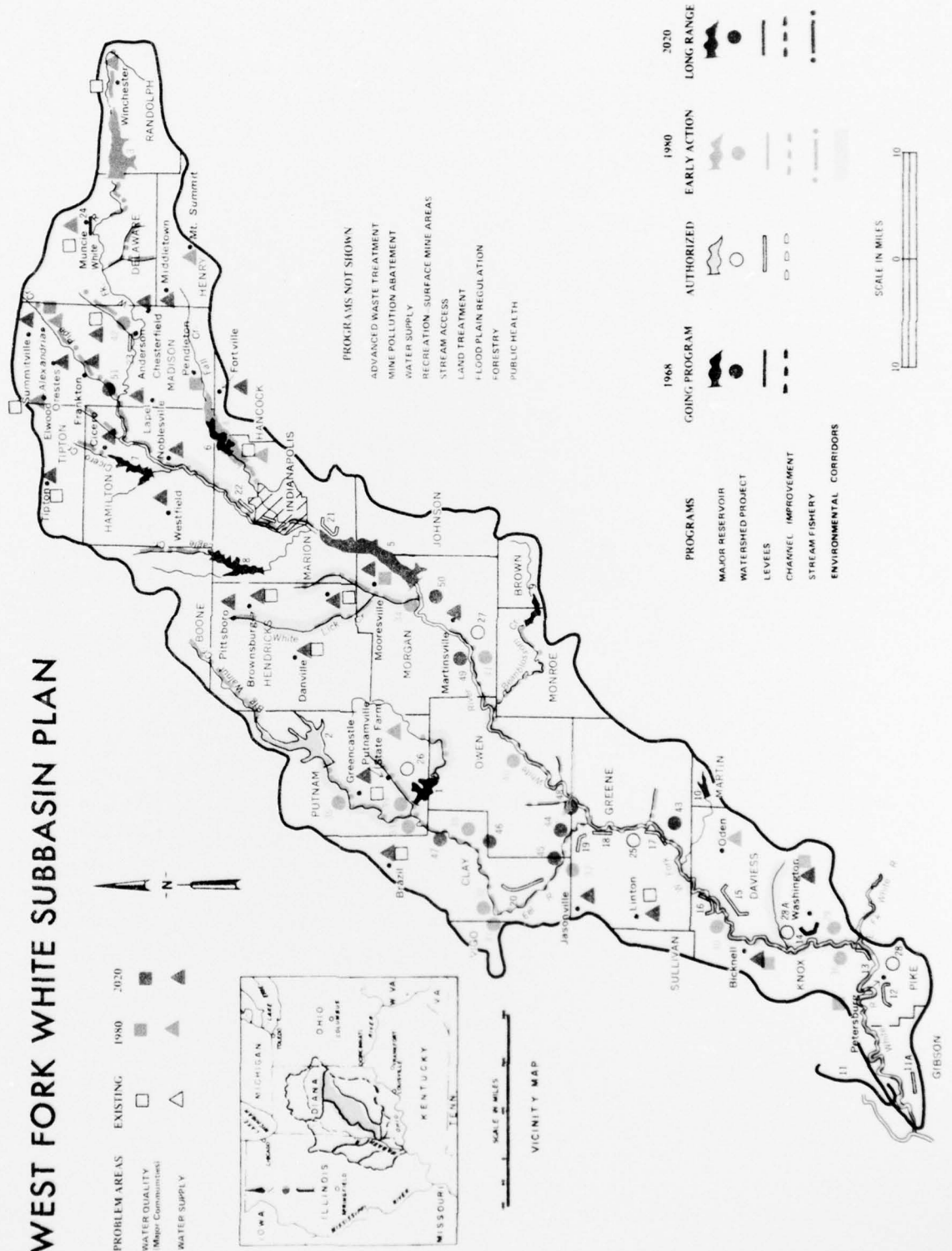
- ADVANCED WASTE TREATMENT
- MINE POLLUTION ABATEMENT
- WATER SUPPLY
- RECREATION - SURFACE MINE AREAS
- STREAM ACCESS
- LAND TREATMENT
- FLOOD PLAIN REGULATION
- FORESTRY
- PUBLIC HEALTH



SCALE IN MILES

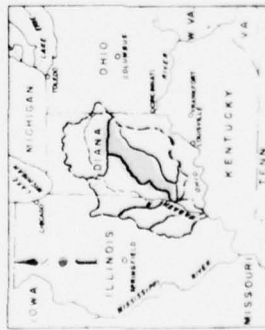


WEST FORK WHITE SUBBASIN PLAN



PROBLEM AREAS

EXISTING	1980	2020
WATER QUALITY (Major Commisies)	■	■
WATER SUPPLY	△	△



PROGRAMS NOT SHOWN

- ADVANCED WASTE TREATMENT
- MINE POLLUTION ABATEMENT
- WATER SUPPLY
- RECREATION - SURFACE MINE AREAS
- STREAM ACCESS
- LAND TREATMENT
- FLOOD PLAIN REGULATION
- FORESTRY
- PUBLIC HEALTH

PROGRAMS	1968	1980	2020
MAJOR RESERVOIR	●	●	●
WATERSHED PROJECT	○	○	○
LEVELS	—	—	—
CHANNEL IMPROVEMENT	—	—	—
STREAM FISHERY	—	—	—
ENVIRONMENTAL CORRIDORS	—	—	—
GOING PROGRAM	—	—	—
AUTHORIZED	—	—	—
EARLY ACTION	—	—	—
LONG RANGE	—	—	—

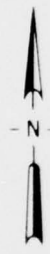
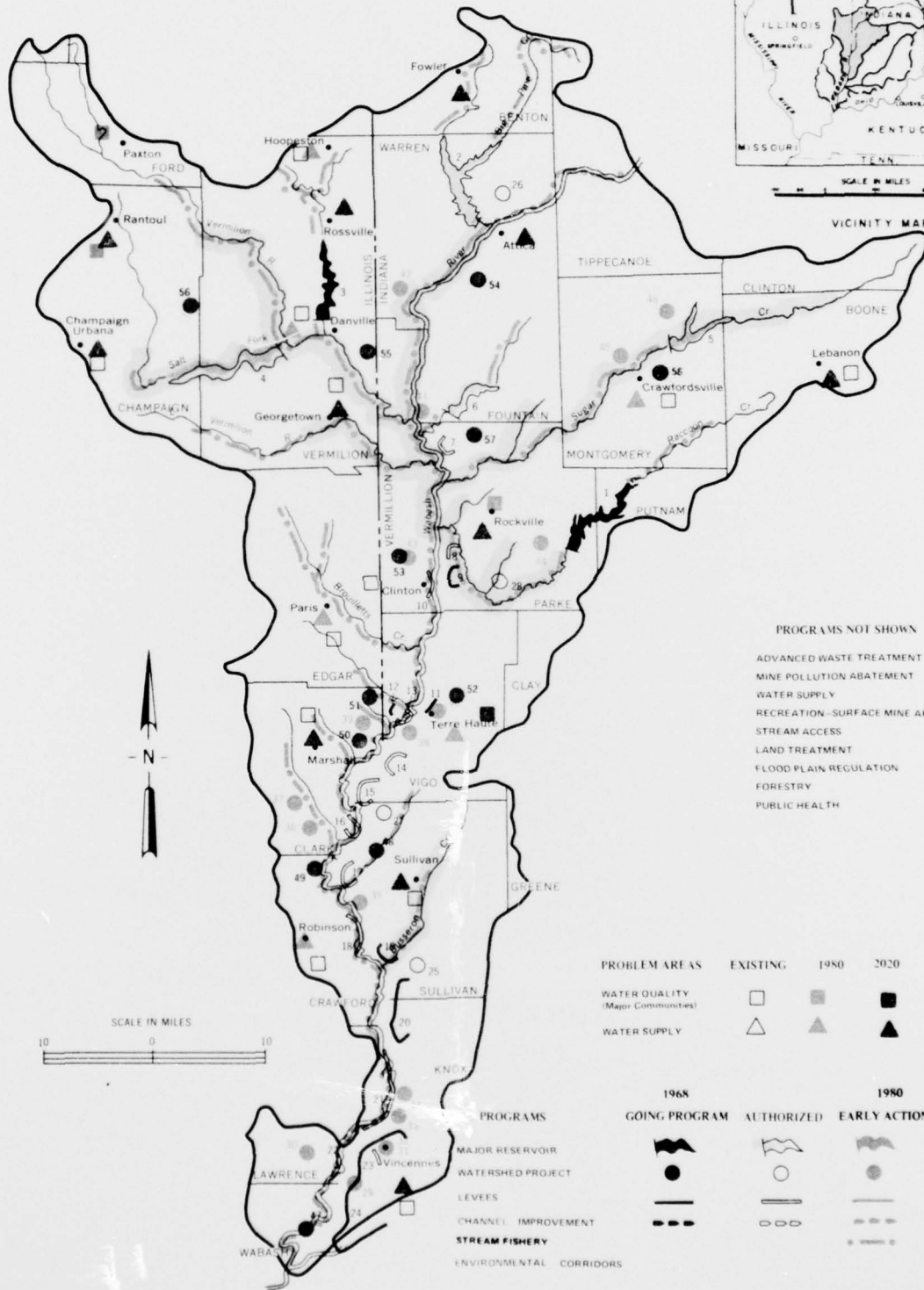


MID WABASH SUBBASIN PLAN



SCALE IN MILES
0 10 20

VICINITY MAP



SCALE IN MILES
0 10 20

- PROGRAMS NOT SHOWN**
- ADVANCED WASTE TREATMENT
 - MINE POLLUTION ABATEMENT
 - WATER SUPPLY
 - RECREATION - SURFACE MINE AREAS
 - STREAM ACCESS
 - LAND TREATMENT
 - FLOOD PLAIN REGULATION
 - FORESTRY
 - PUBLIC HEALTH

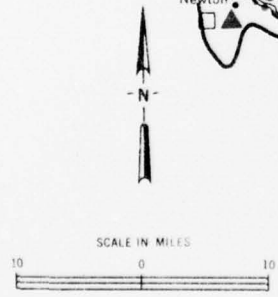
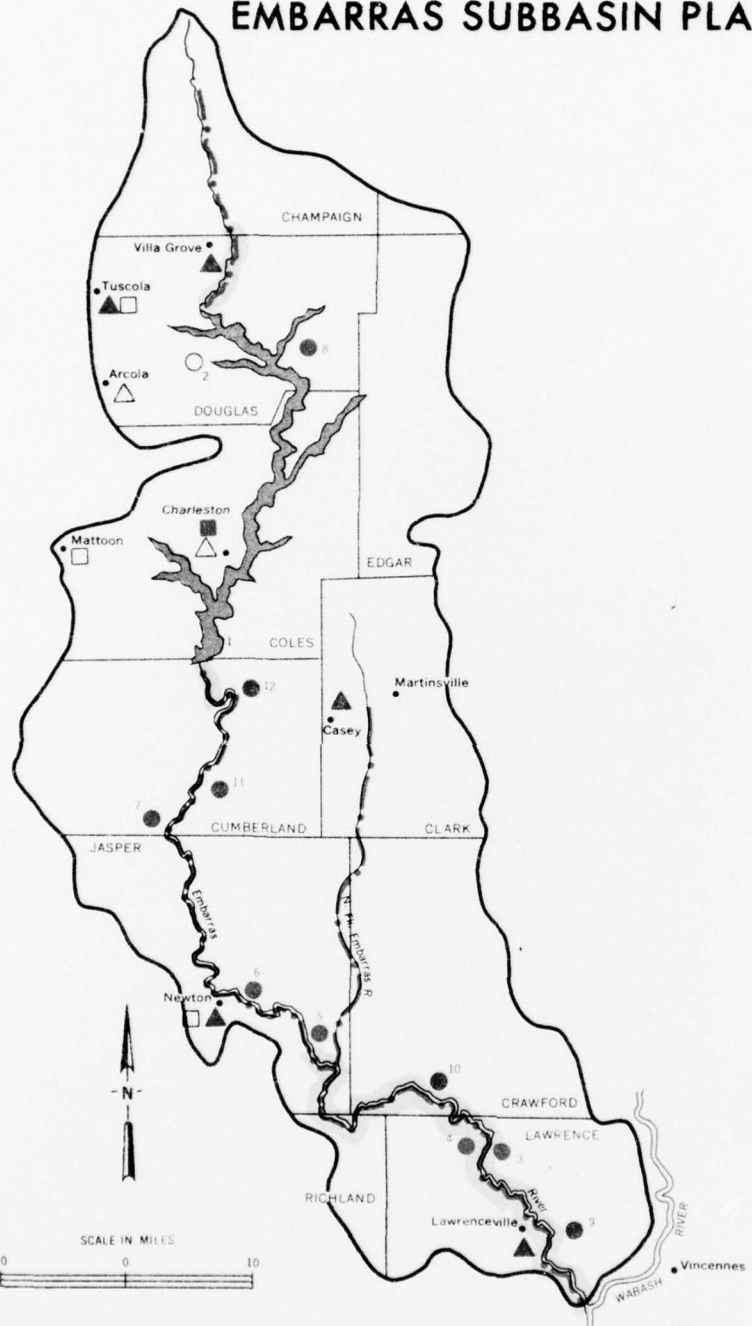
PROBLEM AREAS	EXISTING			1980			2020		
	□	△	○	■	▲	●	■	▲	●
WATER QUALITY (Major Communities)	□	△	○	■	▲	●	■	▲	●
WATER SUPPLY	□	△	○	■	▲	●	■	▲	●

PROGRAMS	1968		1980		2020	
	GOING PROGRAM	AUTHORIZED	EARLY ACTION	LONG RANGE	GOING PROGRAM	AUTHORIZED
MAJOR RESERVOIR	■	○	■	○	■	○
WATERSHED PROJECT	●	○	●	○	●	○
LEEVES	—	—	—	—	—	—
CHANNEL IMPROVEMENT	—	—	—	—	—	—
STREAM FISHERY	—	—	—	—	—	—
ENVIRONMENTAL CORRIDORS	—	—	—	—	—	—

EMBARRAS SUBBASIN PLAN



SCALE IN MILES
VICINITY MAP



- PROGRAMS NOT SHOWN**
- ADVANCED WASTE TREATMENT
 - MINE POLLUTION ABATEMENT
 - WATER SUPPLY
 - RECREATION-SURFACE MINE AREAS
 - STREAM ACCESS
 - LAND TREATMENT
 - FLOOD PLAIN REGULATION
 - FORESTRY
 - PUBLIC HEALTH

PROBLEM AREAS	EXISTING	1980	2020
WATER QUALITY (Major Communities)	□	■	■
WATER SUPPLY	△	▲	▲

PROGRAMS	1968	1980	2020
	GOING PROGRAM	AUTHORIZED	FARLY ACTION
MAJOR RESERVOIR			
WATERSHED PROJECT			
LEVEES			
CHANNEL IMPROVEMENT			
STREAM FISHERY			
ENVIRONMENTAL CORRIDORS			

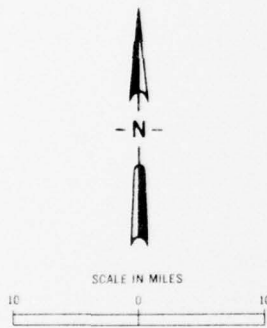
LITTLE WABASH SUBBASIN PLAN



SCALE IN MILES
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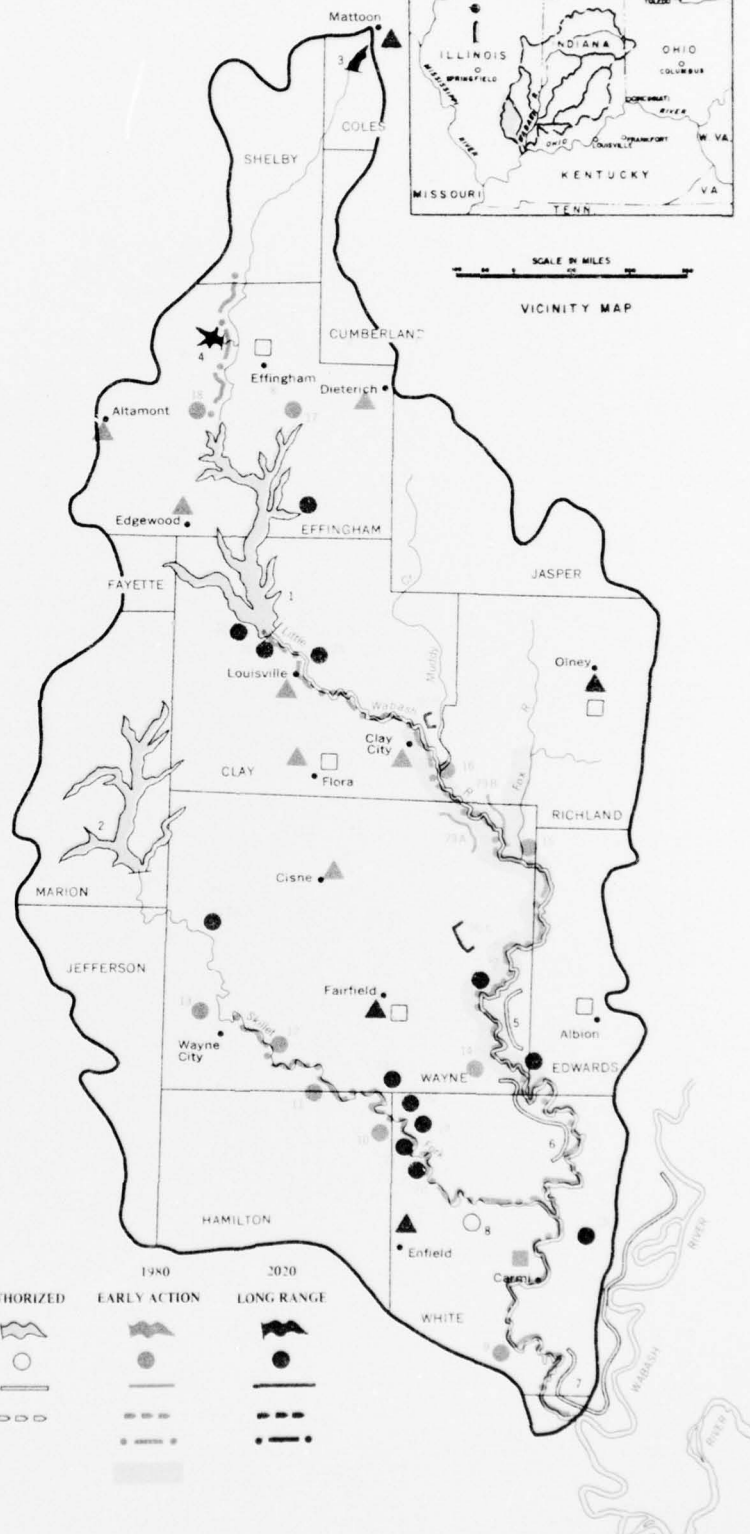
VICINITY MAP

- PROGRAMS NOT SHOWN**
- ADVANCED WASTE TREATMENT
 - MINE POLLUTION ABATEMENT
 - WATER SUPPLY
 - RECREATION—SURFACE MINE AREAS
 - STREAM ACCESS
 - LAND TREATMENT
 - FLOOD PLAIN REGULATION
 - FORESTRY
 - PUBLIC HEALTH



PROBLEM AREAS	EXISTING	1980	2020
WATER QUALITY (Major Communities)	□	■	■
WATER SUPPLY	△	▲	▲

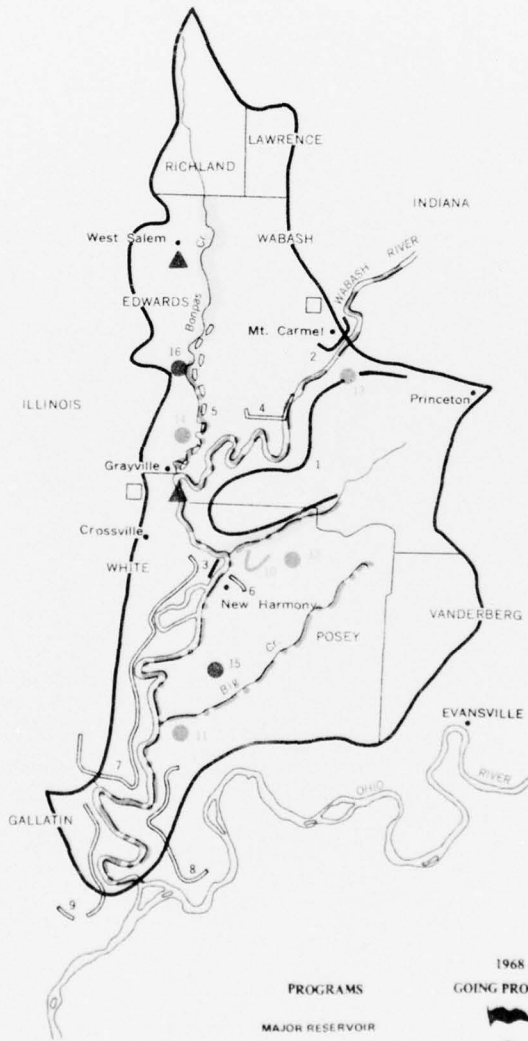
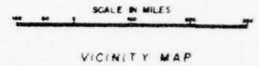
PROGRAMS	1968 GOING PROGRAM	AUTHORIZED	1980 EARLY ACTION	2020 LONG RANGE
MAJOR RESERVOIR	⌋	⌋	⌋	⌋
WATERSHED PROJECT	●	○	●	●
LEVEES	—	—	—	—
CHANNEL IMPROVEMENT	- - -	○ ○ ○	- - -	- - -
STREAM FISHERY			—	—
ENVIRONMENTAL CORRIDORS			—	—



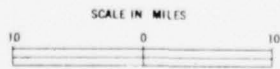
LOWER WABASH SUBBASIN PLAN



PROBLEM AREAS	EXISTING	1980	2020
WATER QUALITY (Major Communities)	□	■	■
WATER SUPPLY	△	▲	▲



- PROGRAMS NOT SHOWN**
- ADVANCED WASTE TREATMENT
 - MINE POLLUTION ABATEMENT
 - WATER SUPPLY
 - RECREATION-SURFACE MINE AREAS
 - STREAM ACCESS
 - LAND TREATMENT
 - FLOOD PLAIN REGULATION
 - FORESTRY
 - PUBLIC HEALTH



PROGRAMS	1968 GOING PROGRAM	AUTHORIZED	1980 EARLY ACTION	2020 LONG RANGE
MAJOR RESERVOIR	●	○	●	●
WATERSHED PROJECT	—	—	—	—
LEVELS	—	—	—	—
CHANNEL IMPROVEMENT	—	—	—	—
STREAM FISHERY	—	—	—	—
ENVIRONMENTAL CORRIDORS	—	—	—	—