# ENVIRONMENTAL IMPACT STATEMENT

## GREAT LAKES BASIN FRAMEWORK STUDY

# Great Lakes Basin Framework Study

# FINAL

# ENVIRONMENTAL IMPACT STATEMENT



GREAT LAKES BASIN COMMISSION

Published by the Public Information Office, Great Lakes Basin Commission, 3475 Plymouth Road, P.O. Box 999, Ann Arbor, Michigan 48106. Printed in 1976. *Cover photo by Kristine Moore Meves.*

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This *Environmental Impact Statement* for the *Great Lakes Basin Framework Study* was prepared by the Great Lakes Basin Commission in accordance with Public Law 91-190, the National Environmental Policy Act, and guidelines issued by the U.S. Council on Environmental Quality. The recommendations of the Great Lakes Basin Commission are included in the *Report.*

# OUTLINE

Report
Appendix 1: Alternative Frameworks
Appendix 2: Surface Water Hydrology
Appendix 3: Geology and Ground Water
Appendix 4: Limnology of Lakes and Embayments
Appendix 5: Mineral Resources
Appendix 6: Water Supply—Municipal, Industrial, and Rural
Appendix 7: Water Quality
Appendix 8: Fish
Appendix C9: Commercial Navigation
Appendix R9: Recreational Boating
Appendix 10: Power
Appendix 11: Levels and Flows
Appendix 12: Shore Use and Erosion
Appendix 13: Land Use and Management
Appendix 14: Flood Plains
Appendix 15: Irrigation
Appendix 16: Drainage
Appendix 17: Wildlife
Appendix 18: Erosion and Sedimentation
Appendix 19: Economic and Demographic Studies
Appendix F20: Federal Laws, Policies, and Institutional Arrangements
Appendix S20: State Laws, Policies, and Institutional Arrangements
Appendix 21: Outdoor Recreation
Appendix 22: Aesthetic and Cultural Resources
Appendix 23: Health Aspects
Environmental Impact Statement

# FOREWORD

## BASIN COMMISSION POLICY ON ENVIRONMENTAL IMPACT STATEMENT PROCESS

Since the public has expressed concern regarding the *Environmental Impact Statement* and its relationship to the implementation of the Framework Study, the Great Lakes Basin Commission, at its February 25, 1976 meeting, resolved to restate for the record the established policy regarding the environmental impact statement process.

It is the policy of the Great Lakes Basin Commission that:

(1) The *Environmental Impact Statement* for the Framework Study be revised in accordance with the recommendations as modified after the public review.

(2) The *Environmental Impact Statement* for the Framework Study will be considered part of the Commission's present and future planning process.

(3) The *Environmental Impact Statement* for the Framework Study is applicable only to the Framework Study (Level A) and should not be construed to apply to any individual recommendation or project contained therein, for which individual Environmental Assessments or Environmental Impact Statements may be prepared.

# SUMMARY

**Action: Great Lakes Basin Framework Study**

**Impact Statement Status: Final**

**Type of Action: Administrative**

**Responsible Office**

Great Lakes Basin Commission
P.O. Box 999
Ann Arbor, Michigan 48106
(313) 769-7431

**Brief Description of Action and its Purpose**

Preparation of a Framework Study evaluating the water and related land resources of the Great Lakes Basin, in an attempt to obtain a consensus among involved States and Federal agencies on the general rate at which future development of these resources should proceed, which types of development should be encouraged or discouraged, and which geographic areas should receive special consideration for development or preservation. The Framework Study is an overview of the entire Great Lakes Basin, and will serve as a guide to programs and studies needed to consider more specific resource problems and smaller geographic areas. As such, the Framework Study is the first stage of an ever-evolving "Comprehensive Coordinated Joint Plan."

The Commission has developed a Proposed Framework for the Basin through the year 2020, which envisions a rate of economic growth and development slightly lower than that which would follow from a projection of past growth trends. The Proposed Framework considers both structural and nonstructural programs for a number of resource use categories, and is not project-specific.

**Summary of Environmental Impacts and Adverse Environmental Effects**

It should be noted that this *Environmental Impact Statement* is on a conceptual study, not an authorized plan for construction. Therefore, unlike project-oriented impact statements, this statement is by necessity very general, with little description of detailed effects. It is believed that this statement adequately highlights the most significant impacts that can be covered in a Level A study.

Among the more significant environmental impacts envisioned for the year 2020 are those connected with the following (using 1970 as a base year):

(1) self-supplied industrial water consumption of more than 6 billion gallons per day (or 7.5 times the 1970 consumption); and a 2.5 billion gallon per day demand for irrigation water (4.5 times present demand)

(2) municipal effluent treatment requirements increasing by a factor of 2.2 to nearly 7 billion gallons per day

(3) growth of urbanized areas by a factor of 1.7 to cover over 12 million acres

(4) nearly 70,000 acres devoted to power plants (15 times the area used in 1970); and the need for 13.4 times as much cooling water as is now needed for power production.

**Summary of Major Alternatives Considered**

The Proposed Framework has been developed by studying three alternative growth rates:

(a) Normal—a rate based on historic trends of population and economic growth. It is slightly higher than the most recent projections.

(b) Accelerated—high population growth rate. It emphasizes exploitation of resources for economic gain.

(c) Limited—minimum population growth. It minimizes per capita demand for resources, and emphasizes preservation and restoration of natural environment.

**Federal, State, and Local Agencies and Other Parties From Which Comments Have Been Requested** (* denotes agencies from which comments have been received)

U.S. Environmental Protection Agency Regions: New York City, Philadelphia, Chicago*

U.S. Department of Agriculture*

U.S. Energy Research and Development Administration* (formerly U.S. Atomic Energy Commission)

U.S. Department of Commerce*

U.S. Department of Defense*

Federal Power Commission*

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

U.S. Department of Housing and Urban Development Regions: New York City, Philadelphia, Chicago

U.S. Department of the Interior*
U.S. Department of Labor
National Aeronautics and Space Administration*
U.S. Department of State
U.S. Department of Transportation
Secretarial Representatives: New York City, Philadelphia, Chicago
U.S. Coast Guard, Ninth District*
U.S. Council on Environmental Quality
U.S. Water Resources Council
U.S. Department of Justice
Great Lakes Commission
Illinois Department of Transportation
Indiana Department of Natural Resources*
Michigan Department of Natural Resources
Minnesota State Planning Agency
New York Department of Environmental Conservation*
Ohio Department of Natural Resources
Ohio Environmental Protection Agency*
Pennsylvania Department of Environmental Resources*
Wisconsin Department of Natural Resources*
Pennsylvania State Clearinghouse
Illinois State Clearinghouse
Indiana Budget Agency (State Clearinghouse)
Michigan Bureau of Management and Budget (State Clearinghouse)
Minnesota State Planning Agency
Ohio State Clearinghouse
Wisconsin Bureau of Planning and Budget (State Clearinghouse)
Lake County Regional Planning Commission (Illinois)
Northeastern Illinois Planning Commission*
McHenry County Regional Planning Commission (Illinois)
Three Rivers Coordinating Council (Indiana)
Michigan Area Council of Governments (Indiana)
Northeastern Indiana Regional Coordinating Council
Lake-Porter County Regional Transportation and Planning Commission (Indiana)
Bay Regional Planning Commission (Michigan)
Genesee County Metropolitan Planning Commission (Michigan)
Kent-Ottawa Regional Planning Commission (Michigan)
Jackson Metropolitan Area Regional Planning Commission (Michigan)
Kalamazoo Metropolitan County Planning Commission (Michigan)
Muskegon County Planning Commission (Michigan)
Saginaw County Metropolitan Planning Commission (Michigan)
Central Upper Peninsula Planning and Development Region (Michigan)
East Central Michigan Planning and Development Regional Commission
Southeast Michigan Council of Governments*
Genesee-Lapeer-Shiawassee Region Five Planning and Development Commission (Michigan)*
West Michigan Regional Planning Commission
Western Upper Peninsula Planning and Development Region (Michigan)
Region Two Planning Commission (Michigan)
South Central Michigan Planning and Development Council
Tri-County Regional Planning Commission (Michigan)
West Michigan Shoreline Regional Development Commission
Northeast Michigan Regional Planning and Development Commission
Eastern Upper Peninsula Regional Planning and Development Commission (Michigan)
Southwestern Michigan Regional Planning Commission
Northwest Michigan Regional Planning and Development Commission
Arrowhead Regional Development Commission (Minnesota)
Head of Lakes Council of Governments (Minnesota)
Black River-St. Lawrence Regional Planning Board (New York)
Erie and Niagara Counties Regional Planning Board (New York)
Genesee/Finger Lakes Regional Planning Board (New York)*
Southern Tier West Regional Planning and Development Board (New York)
Erie Regional Planning Commission (Ohio)
Northeast Ohio Areawide Coordinating Agency
Toledo Metropolitan Area Council of Governments (Ohio)
Erie Metropolitan Planning Department (Pennsylvania)
East Central Wisconsin Regional Planning Commission
Bay Lake Regional Planning Commission (Wisconsin)
Southeastern Wisconsin Regional Planning Commission
Upper Great Lakes Regional Commission
Upper Mississippi River Basin Commission
Ohio River Basin Commission
Sierra Club
Lake Michigan Federation
League of Women Voters*
American Association of University Women

**Date of Mailing Draft EIS to Council on Environmental Quality and Reviewers**

December 6, 1974

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# Section 1

# DESCRIPTION OF THE PROPOSED ACTION

## 1.1 Great Lakes Basin Framework Study

Some years ago the United States Congress recognized the need for a comprehensive and coordinated approach in planning for effective management of the nation's water resources. Congress wanted participation in the planning process not only by Federal agencies and the States, but by other levels of government, industry, associations, and individuals as well. With this in mind, Congress enacted Public Law 89-80, the Water Resources Planning Act of 1965. The Act established a National Water Resources Council under Title I, empowered the President to establish regional river basin commissions under Title II, and authorized financial assistance to States for comprehensive resource planning participation under Title III.

At the request of the Governors of Indiana, Michigan, Minnesota, Ohio, and Wisconsin, and with concurrence from Illinois, New York, Pennsylvania, and the Water Resources Council, the President signed Executive Order 11345, establishing the Great Lakes Basin Commission on April 20, 1967.

The Commission's principal charge is to prepare a long-range Comprehensive Coordinated Joint Plan (CCJP) for the conservation, preservation, and development of water and related land resources in the U.S. portion of the Great Lakes Basin. The Basin drains into the Great Lakes and the St. Lawrence River, and includes the tributaries of the St. Lawrence to the point where the river ceases to be the international boundary.

The CCJP is being prepared in stages, and the first of these is the Framework Study, a massive seven-year undertaking whose results are being published in 27 volumes. The heart of the Framework Study, and the end product ultimately derived from it, is the Proposed Framework (sometimes called the "PRO Framework" or simply "the Framework" hereafter), which is the principal subject of this environmental impact statement.

The Framework Study indentifies the next stages for orderly development of the dynamic, comprehensive plan for the Great Lakes Basin called for in the Water Resources Planning Act. Similar planning efforts under the authority of river basin commissions are being conducted in other areas of the United States. The Framework Study will establish flexible guidelines for specific projects and studies needed to solve resource problems in the Great Lakes Basin. As these projects and studies are completed, the Comprehensive Coordinated Joint Plan will take the form of a dynamic and growing tabulation of existing and completed resource programs, while serving as a guide to areas where future programs should be undertaken.

The Great Lakes Basin Framework Study provides for general guidelines for use by governmental and nongovernmental decision makers at the local, regional, State, and Federal levels in planning and development of priorities for meeting existing and projected demands for conservation, development, and use of the environment. The Framework Study will

(1) provide a comprehensive inventory of water and related land resources in the Great Lakes Basin

(2) indicate Basin subareas with environmental problems requiring prompt, detailed planning efforts

(3) identify compatibilities and conflicts between present and projected resource demand and supply

(4) present guidelines for baseline development that best meet social, environmental, and economic goals at the national, regional, State, and local levels

(5) indicate resource programs to solve existing and projected resource problems. Resource programs are broadly defined in this study to include the following:

(a) action-oriented projects which together manage one or more resources uses (for example, structural flood control projects like levees, floodwalls, or reservoirs; use of river valley parks for meeting recreational demand; and the construction of conventional wastewater treatment plants to solve water quality problems)

(b) legal and institutional arrangements

(c) research and data collection (to be needed for future resource policy decisions)

(d) special resource studies as needed.

In the Great Lakes Basin Framework Study, programs related to the following resource use categories will be covered:

(1) water withdrawals for municipalities, for

self-supplied industries, for rural domestic and livestock uses, for crop and golf course irrigation, for mining operations, and for thermal power cooling

(2) instream and water surface uses that include wastewater treatment for municipal and industrial discharges, hydroelectric power, water-oriented outdoor recreation, sports fishing and commercial navigation, management of lake levels and flows, and needed research related to the limnological system of the Great Lakes

(3) related land uses covering agricultural and forest land treatment, cropland drainage, shoreland erosion, streambank erosion, flood plain management, wildlife management, aesthetic and cultural opportunities, and water-oriented outdoor recreation.

The nature, timing, extent, and estimated general cost of resource programs for the above-mentioned categories are identified in the Proposed Framework for each of the three time periods between the 1970 base year and 1980, 2000, and 2020. This environmental impact statement describes general effects which could occur throughout the 50-year period, but their magnitude is quantified and presented for the year 2020. Although Proposed Framework programs meet resource needs for the U.S. portion of the Great Lakes Basin only, efforts have been made to coordinate U.S. and Canadian resource programs to accomplish common objectives. Although not official voting members, the Canadian Federal government and the Provincial government of Ontario are observers and active representatives on the Great Lakes Basin Commission.

The Proposed Framework also identifies needs for special studies and research in all of the above resource use categories. The Framework will not provide a basis for Congressional authorization of specific projects. However, it will enable Congress and planning and construction agencies to insure that project proposals are consistent with a regional comprehensive plan and thus achieve the advantages of coordinated planning.

Most of the information contained in this impact statement is derived from the Framework Study *Report* and 25 specialized appendixes listed in the Outline at the beginning of this volume. Other reports and environmental impact statements used and/or of possible interest to the reader are listed in Annex 2.

## 1.2 Environmental Setting for the Framework

### 1.2.1 The Study Area

The Great Lakes Basin is defined in this study by the drainage areas within the United States of Lakes Superior, Michigan, Huron, Erie, and Ontario, and of those streams entering the St. Lawrence River within the United States. It includes a land area of 118,000 square miles and a Great Lakes area of 61,000 square miles. This amounts to about 60 percent of the total of 299,000 square miles in the entire Great Lakes drainage basin. The Great Lakes Basin covers essentially all of Michigan and parts of seven other states, with 3,715 miles of mainland shores on lakes and waterways and 1,500 miles of island shores. The Great Lakes are connected by rivers and related waterways. These are: the St. Marys River from Lake Superior to Lake Huron, the Straits of Mackinac from Lake Michigan to Lake Huron, the St. Clair River from Lake Huron to Lake St. Clair, the Detroit River from Lake St. Clair to Lake Erie, the Niagara River from Lake Erie to Lake Ontario, and the St. Lawrence River from Lake Ontario to the Atlantic Ocean (Figure 1).

The International Boundary, which defines in general the northern geographic boundary of the Great Lakes Basin, passes through all of the Great Lakes and their connecting channels, with the exception of Lake Michigan, which lies wholly within the United States. Four of the Lakes are thus boundary waters with Canada. Counties completely or partially within the Basin serve as the base for planning factors such as economic and demographic data. These 191 counties comprise what is termed the Great Lakes Region.

### 1.2.2 The Human Environment

#### 1.2.2.1 Historical Development

Water and related land resources have historically played a key role in economic development and population distribution over the Great Lakes Basin. As early as 6,000 years ago, nomadic tribes known as Old Copper Indians mined copper in the Lake Superior region for making tools and weapons. With the decline of the Old Copper people around 1,000 B.C., groups of Indians known as Mound Builders migrated to the region from the south and west. Tribes of these peoples used copper and obsidian obtained from the northern por-

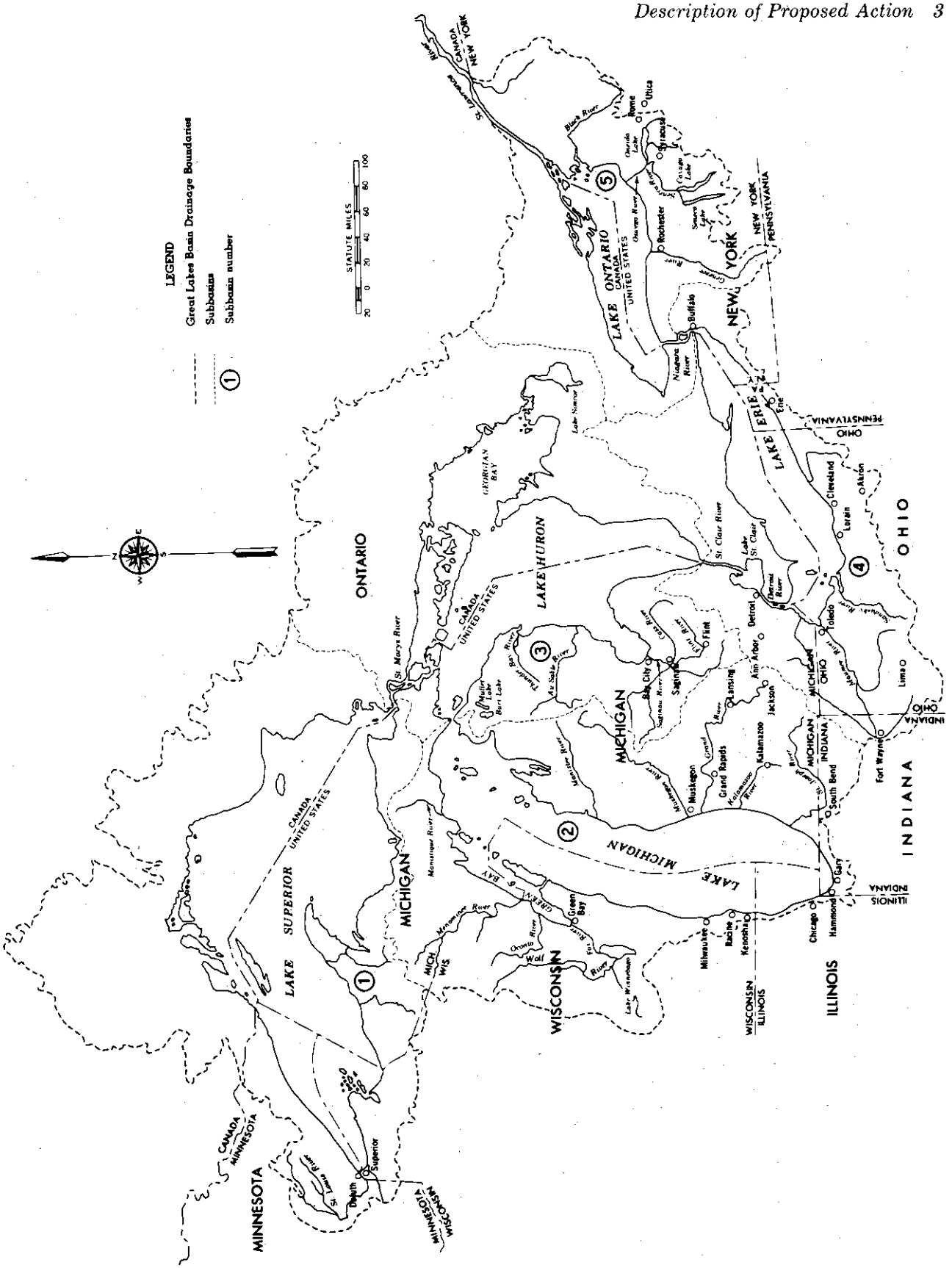



**FIGURE 1 Great Lakes Basin**

tion of the Basin for ceremonial ornaments and agricultural tools. Agriculture was first inroduced to the Great Lakes Region by these mound-building tribes. Like the Copper Indians, the Mound Builders also declined as a culture in the Basin. Between the years 800 and 1600, new Indian tribes dominated the Region, depending largely upon agricultural practices in northern areas. Slashing and burning of the forests in the southern Basin sections was a common Indian practice. About 100,000 Indians of the Sioux, Iroquois, and Algonquin nations populated the Great Lakes Region by 1600, when the early explorers and trappers were coming into the area.

Early European exploration of the Great Lakes Region pointed up the importance of the Great Lakes as an inland water route. When Jacques Cartier discovered the St. Lawrence River in 1536, he was stopped by the Lachine Rapids, just west of Montreal. The earliest shallow-draft transport began in 1700 with successive improvements over a period of 250 years which finally ended the inland isolation and the consideration of the Great Lakes merely as an inland water route.

Initially in the 1600s, exploitation of the beaver and other fur trade became a major reason for further exploration and settlement of the Great Lakes Region.

Wars among the French, British, Indians, and the Americans extended over much of the Great Lakes Region between the 1600s and 1800s and paved the way for pioneer settlement from the growing east coast. Trading vessels sailed the Great Lakes and major port cities grew up at Chicago, Detroit, Cleveland, and Buffalo. Interlake commerce hauling grain, flour, butter, pork, and lumber expanded, and service industries attracted great numbers of immigrants as well.

Abundance of copper and iron once again drew settlers to the Lake Superior region. Although located in isolated areas of the Basin, the valuable deposits became an important center of iron and copper mining in the United States. However, after exploitation of the ore deposits, mined-out areas have become economically depressed and environmentally degraded.

By 1850, the exploitation of copper, iron, timber, and agricultural resources had begun, and the Great Lakes were becoming a main commercial waterway for the nation. Railways came to the Lakes during this time, encouraging more settlement. Locks and canals built during this century provided Great Lakes ports and cities new opportunities for growth. In fact, the canal building era brought large numbers of new settlers who came originally as laborers for the construction. The Welland Canal Feeder was completed in 1829, and the original shallow-draft canal system on the St. Lawrence River was completed in 1847. These works added a new dimension to the traffic, industry, and culture of the Great Lakes Basin.

During the last half of the 19th century, the logging industry flourished in the Upper Great Lakes Region. In the eighty years from 1840 to 1920, most of the forests covering this area were chopped down and hauled away to support a growing nation. Farmers generally cut or burned forests to clear the land for agriculture, a practice which at times caused raging forest fires that covered thousands of square miles and took many lives.

The Great Lakes also supported a thriving commercial fishing industry during the first decades of the 20th century. Famous for whitefish, lake trout, and other species, the industry suffered setbacks from overfishing and the deadly effects of the sea lamprey, which was introduced through the man-made canal systems. High value commercial fish production has continued declining to the present time. However, control of the lamprey and introduction of new species of fish are changing the pattern. More recently, contamination by metals (mercury) and pesticides have affected both the commercial and sport fishery in some areas of the Region.

The Great Lakes Region's water supply, mineral resources, and transportation routes combined to create major industrial developments and population concentrations at former trade centers or port cities. Growth has been most rapid in the southern portion of the Basin around the lower lakes. The isolated areas of the northern Basin, which experience more harsh climatic conditions, have had declining population in recent years.

On April 25, 1959, the first deep-draft ocean vessels moved through the St. Lawrence Seaway. Since 1970, this system, comprised of the St. Lawrence River and the Great Lakes, has been known as "America's Fourth Seacoast." Origin and destination studies show that approximately one-quarter of U.S. waterborne foreign trade originated and terminated in the Great Lakes area.

#### 1.2.2.2 Present Population

Although it covers just 4 percent of the United States' land area, the Great Lakes Region was home for over 29 million people, or 14.4 percent of the nation's population, in 1970. It is estimated that 80 percent of the Region's residents live in urban communities, and that more than 85 percent of the total resident population lives within 50 miles of the shores of Lakes Erie and Michigan. Major metropolitan areas include Chicago, Illinois; Gary and Hammond, Indiana; Detroit, Michigan; Cleveland, Ohio; Buffalo, New York; and Milwaukee, Wisconsin.

### 1.2.2.3 Existing Economy

Population and employment growth in the Great Lakes Basin have paralleled national trends since 1929. The 11,302,302 people employed in the Basin accounted for 14.4 percent of total U.S. employment in 1970.

Industry in the Great Lakes Basin is oriented towards manufacturing. In 1970, nearly four million Basin residents were employed in manufacturing, representing about 35 percent of total number employed. The major manufacturing employers are producers of primary metals, food, and kindred products. Agriculture and mining employed 1.8 and 0.3 percent of the Basin's workers respectively. Agricultural employment decreased 50 percent between 1940 and 1960 nationwide and in the Great Lakes Basin. By 1970, it had decreased another 34 percent in the Basin to a total of 200,000 employed. The number employed in mining has decreased nationally but has remained fairly constant at about 39,000 in the Great Lakes Basin.

Industrial production is a key factor in the economic strength of the Great Lakes Region. The steel-producing districts in counties immediately adjacent to the Great Lakes and served by lake ports produced 50 million tons of steel in 1970, or 39 percent of the national total. The transportation of iron ore is considered to be confined to the Seaway, since no economically viable alternative exists. This demonstrates the importance of the Lakes themselves and the commercial navigation which supports Basin industries.

The Great Lakes Basin also contains significant concentrations of petroleum refining industries and manufacturers of chemicals, paper, and food products. These manufacturing industries account for about 80 percent of the Basin's industrial water requirements. This concentration of manufacturing contributes to water quality problems in the Basin which must be resolved. In the period 1940–1960, these industries maintained about 18 percent of the nation's total personal income while averaging over 20 percent higher per capita income than national levels. The heavy concentration of industrial activity in the Region has played a major role in its past performance and added significantly to the pollutant load. In 1970, total personal income in the Region neared $114 billion based on 1967 constant dollars.

## 1.2.3 The Natural Environment

### 1.2.3.1 Geology and Topography

The geological and topographical features of the Great Lakes Basin were created largely by Pleistocene glaciation. Repeated advances of the continental ice sheets, which were often more than 2,000 feet thick, scoured pre-glacial valleys. When the ice sheets receded they left vast irregular deposits of eroded bedrock and debris. Present land areas consequently have an irregular and varied topography, including depressions occupied by small lakes or marshes, level or sloping local plains, and low rolling hills or ridges. The overburden material varies greatly from place to place, ranging from clays to sand or gravel. The configuration of the Great Lakes has been altered very little since its glacial development. However, except where bedrock is exposed, the glacial overburden comprising the shores is still vulnerable to shoreline erosion.

The Great Lakes Region has a range of elevation from 152 feet above sea level along the St. Lawrence River near the International Boundary, to more than 4,500 feet above sea level in the Adirondack Mountains of New York.

The Basin's tributary surface drainage system is rudimentary, with few well-developed main and tributary valley systems. The divides separating basins are characteristically broad, and they vary from almost level plains to rolling low hills, except in minor areas at the east and west ends of the watershed. The topography is usually unfavorable to rapid surface runoff and is generally favorable to infiltration on medium to coarse-textured soils. Considerable areas of sandy or gravel soils are common. The numerous lakes, marshes, and peat bogs also reflect relatively poor development of surface drainage.

### 1.2.3.2 Climate and Hydrology

The Great Lakes Basin, located between latitudes 41° N and 50°N, could reasonably be expected to have the severe climate associated with these latitudes. However, the Great Lakes, by virtue of their large surface area and depth, have a decided tempering effect upon the summer and winter temperatures along their shores. Records from the period 1883–1957 indicate that average annual temperatures in the Great Lakes Basin range from 39.0°F on Lake Superior to 48.7°F on Lake Erie. Minimum and maximum monthly temperatures usually occur in February and July on all of the Lakes. Pressure systems that produce winds and storms are critical to the generation of waves, seiches, and surges on the Lakes. Studies of wind direction frequency show a strong tendency for the maximum wind vectors to be aligned with the long axes of the Lakes.

The mean annual precipitation for the entire Basin during 1883–1957 was about 31 inches, with a minimum of 25 inches in 1930 and a high of 37

inches in 1950. The average annual snowfall within the Great Lakes Basin ranges from about 40 inches to about 120 inches.

Estimates of the annual rate of evaporation on the surface of the Great Lakes range from a minimum of about 1.5 feet on Lake Superior to about 3.0 feet on Lake Erie. The Lakes are generally ice free from May to the early part of November. In general, an ice cover does not form on the Lakes except in bays and in sheltered areas between islands in the northern regions.

Enormous quantities of water are needed to cause relatively small changes in the levels of the Lakes, and large variations in supplies to the Lakes have little immediate effect on Lake levels. The Lakes absorb and modulate these variations, and flow rates in their outlet rivers are remarkably steady in comparison with the range of flows observed in other large rivers of the world. Such large steady flows with suitable head make the generation of large quantities of electric power economically feasible. The average outflows for the past 100 years through the natural outlets of the Great Lakes range from 75,000 cubic feet per second in the St. Marys River (Lake Superior outlet) to 240,000 cubic feet per second in the St. Lawrence River. Lake Michigan is connected to Lake Huron through the wide and deep Straits of Mackinac, and its outflow is estimated to average about 52,000 cubic feet per second into Lake Huron. The outflow from Lake Huron has averaged 188,000 cubic feet per second through the St. Clair-Detroit Rivers, and the outflow is 202,000 cubic feet per second from Lake Erie through the Niagara River and the Welland Canal. The average discharges above reflect diversions into and out of the Great Lakes Basin. The mean lake surface elevations of the Great Lakes during the past 109 years have been: Lake Superior, 600.4 feet; Lake Michigan-Huron, 578.7 feet; Lake Erie, 570.4 feet; and Lake Ontario, 244.8 feet. Maximum recorded depths of the Great Lakes range from 1,333 feet in Lake Superior to 212 feet in Lake Erie.

Detention time, the period required to introduce a volume of water equal to the volume of a lake, depends on the volume, runoff, outflow from upper lakes, outflow from the lake in question, precipitation, and evaporation. Detention times of water in the Great Lakes have been calculated at 191 years for Lake Superior, 99.1 years for Lake Michigan, 22.6 years for Lake Huron, 2.6 years for Lake Erie, and 7.9 years for Lake Ontario.

### 1.2.3.3 Water Resources

Surface and subsurface water resources are interconnected and in ample supply over the entire Great Lakes Basin. These water resources are constantly moving through a complex hydrologic cycle, in which water may be stored, captured, and used by local flora and fauna, or may evaporate or run off without use. Generally speaking, about 40 percent of the water that falls annually as precipitation over the Basin, or about 12 inches (63.2 bgd), runs off the land into streams, lakes, and ultimately to the Great Lakes. Variations from 9 to 38 inches in average annual runoff (Basin average is 11.6 inches) are due largely to differences in temperature, vegetation, glacial geology, and land use, rather than to differences in the distribution of annual precipitation. Area streams are generally short, and their average annual flows are low for basins of their drainage area size. Surface water area of inland lakes, streams, and minor Great Lakes embayments is estimated at over 2.9 million acres.

Surface water flow in the Region is fed to a significant extent by ground-water flow. Nearly half of the Basin's land area is underlain by aquifers that yield over a quarter million gallons per day per square mile. Well yields in the Basin can range upward to as much as 5,000 gallons per minute. Average annual yield from ground-water systems in the Basin is estimated at 26 billion gallons per day.

The Adirondack region of New York and the areas adjacent to Lake Superior have low yields because the underlying bedrock is the Precambrian crystalline complex. In New York, Pennsylvania, and Ohio, the sedimentary bedrock formations are also low-yielding aquifers. Fresh water is present throughout the Basin, but saline water may be encountered in one or more aquifers almost any place in the Basin.

Water resources are more thoroughly described in the following Framework Study appendixes: Appendix 2, *Surface Water Hydrology,* Appendix 3, *Geology and Ground Water,* Appendix 4, *Limnology of Lakes and Embayments,* and Appendix 11, *Levels and Flows.*

### 1.2.3.4 Land Resources

There are approximately 83.6 million acres of land in the Great Lakes Region. Private individuals and corporations own 80.4 percent of the land, the Federal government owns 7.4 percent (principally as national forests), and State and local governments own 12.2 percent. Urban areas dominate the western and southern shores of Lakes Michigan, Erie, and Ontario; forests are mainly concentrated in the northern areas of Minnesota, Michigan, Wisconsin, and New York; while agricultural lands are primarily found in eastern Wisconsin, northern

Indiana, northern Ohio, and southern Michigan.

Over 38 percent of the Great Lakes Region is categorized as agricultural (cropland and pasture). The Soil Conservation Service land capability classification system describes the potential of the land for agricultural purposes on the basis of physical soil limitations. Land is grouped in eight capability classes. The Region has over 46.9 million acres in classes I through III. This land is suitable for sustained agricultural cultivation if good management practices are employed. An additional 11.1 million acres in class IV are suitable for occasional cultivation. Thus, over 58 million acres have potential for agricultural production. This represents 82 percent of the total non-Federal and nonurban land in the Region. Of this 58 million acres, about 32.0 million are actually under cultivation. The remaining 12.7 million acres in classes V through VIII have severe limitations which make them generally impractical for cultivated crops.

In the Great Lakes Region as a whole, land use is fairly consistent with land capabilities. Over 23 million acres, or 96 percent, of the total cropland is on land in capability classes I through IV. Within some planning subareas, some shifts in land use may be considered in order to bring land use and capabilities into better balance.

The Region includes a wide variety of farm activities, including forestry, dairying, potato growing, and truck and fruit crop farming. Farm types and their location in certain geographic areas are related to climate, soils, and markets. Appendix 13, *Land Use and Management* and Appendix 19, *Economic and Demographic Studies*, provide more information on the Basin's agricultural economy and soil constraints and capabilities.

The shorelands of the Great Lakes are diverse and unique natural resources that have been a major focus of economic and demographic development. There are 3,471 miles of mainland shore, 245 miles of connecting waterways, and 1,129 island miles of Great Lakes shoreline in the United States. Current use and development of the shoreland is determined by geographical location, accessibility, ownership, and shore type. A comprehensive treatment of shore use and erosion factors in the Basin is found in Appendix 12, *Shore Use and Erosion.*

### 1.2.3.5 Forest Resources

Approximately 39.6 million acres, almost 50 percent of the Basin, are classed as forest land. Most of the forest cover has been reestablished by natural regeneration and forest management practices. States with the highest percentage of the forest resources are Minnesota, Wisconsin, upper Michigan, and New York. Conifers (including pines, spruce, and fir) dominate the upper Basin and the New York mountainous regions, while hardwoods (including oak, hickory, elm, ash, maple, beech, birch, and aspen) cover much of the southern and central Basin. Agricultural land use in central lower Michigan, Ohio, Indiana, Pennsylvania, and New York has largely replaced extensive forested lands. Almost all of the Basin's forested acreage is classified as commercial forest land capable of producing commercial crops of timber.

### 1.2.3.6 Mineral Resources

The distribution of the rocks and sediments of each of the three geologic eras represented in the Great Lakes Basin define the type and location of mineral resources and mineral production within the Basin. Virtually all of the metal resources, including iron, zinc, lead, silver, and copper are found in Precambrian rocks. These resources are produced in the northwestern and extreme eastern parts of the Basin in Michigan, Minnesota, and New York. The Paleozoic rocks contain the mineral fuels of oil, gas, and coal, and nonmetallic minerals including limestone, dolomite, sandstone, shale, salt, gypsum, and natural brines. These minerals are largely found in lower Michigan, Ohio, Illinois, Indiana, and New York. The occurrence and production of these mineral fuels, metals, and nonmetals depend on the geographic distribution and accessibility of certain formations. The nonmetal deposits of sand, gravel, clay, marl, and peat are found throughout the Basin in the unconsolidated Cenozoic sediments. Principal mineral resources are well documented in Appendix 5, *Mineral Resources.*

### 1.2.3.7 Wildlife Resources

Nearly all of the Great Lakes Basin is potential wildlife habitat. There are about 75,000,000 acres of habitat or resource base out of a total of 84,000,000 acres. Of the total 610,000 acres of shoal waters in the U.S. portion of the Great Lakes, 491,000 acres are important to wildlife. The wetlands, shoal waters, and open waters of the Great Lakes provide ecosystems that support a wide variety of plant and animal organisms important to mankind's recreation, health, and aesthetic well-being. The waters of the Great Lakes and adjacent basin areas provide a flyway route for thousands of North American waterfowl and breeding territory for a smaller number of these birds. The value of this habitat varies greatly, but the important consideration is that most of the nonurbanized land,

some urban land, and most of the waters, have some value to wildlife. The area of the U.S. and Canadian Great Lakes Basin is 295,500 square miles, of which 95,000 square miles, or approximately one-third, is lake surface, and provides an environment for aquatic animal resources. The remaining habitat provides a mixed terrestrial and aquatic environment for species of plants and animals indigenous to the Great Lakes Region.

The types of Basin wildlife habitat include: northern wilderness forests, farmland woodlots, blocks of eastern hardwood forests, river-bottom woodlands, scrub and brushlands, open fields and meadows, cropland, and freshwater wetlands.

Generally, the supply of the wildlife habitat other than cropland is more abundant in the northern and northwestern areas of the Basin and is less abundant south of these areas. The country north of the Milwaukee-Buffalo line is forested and sparsely settled, while land south of this line is heavily settled and is primarily used for industrial and agricultural purposes. Although wildlife habitat is more abundant in northern portions of the Basin, some of this area has been reduced in quality. Wildlife carrying capacity has been reduced for some species, such as deer and ruffed grouse, because second growth early successional forests have grown out of browsing reach and have a thin understory. Many nongame wildlife species also inhabit the Basin. Some of these species, such as songbirds, are valuable because they keep insects and other pests in check. Other valuable species keep the habitat free of carrion. Some species, such as rodents, are considered pests because they destroy farm crops. Rodent populations are dampened by other nongame species, such as hawks and owls.

The spectrum of wildlife that occupies this habitat is diverse and can be grouped into the following major categories: big game, waterfowl, shorebirds, small game birds and animals, and furbearers.

The white-tailed deer is the Basin's most important game species, and is found throughout the Region. Squirrels and rabbits are the most important small game animals. The ring-necked pheasant is an important but declining game bird in the Basin. Its decline is closely tied to land-use changes.

Waterfowl and waterfowl habitat, while important economically, are more important due to their scarcity. The Basin's principal waterfowl areas are: shore and inland marshes of western Lake Erie; Lake St. Clair; Saginaw Bay; Green Bay; inland southern Wisconsin marshes, including Horicon; Lake Ontario and St. Lawrence River marshes; St. Marys River; eastern inland marshes of the Michigan Upper Peninsula; and southwestern Michigan marshes.

The eastern timber wolf, the Basin's most colorful wildlife species, is an endangered species, according to the Endangered Species Act of 1973. Other endangered species include the southern bald eagle, greater sandhill crane, greater prairie chicken, and Kirtland's warbler (listed in the *United States List of Endangered Fauna,* May, 1974).

Other species of interest and importance include: black bear, bobcat, Canada lynx, osprey, snowshoe hare, pine marten, fisher, bobwhite quail, common loon, mourning dove, prairie sharp-tailed grouse, turkey, moose, ruffed grouse, and woodcock.

Appendix 17, *Wildlife,* provides more detailed information on Basin wildlife resources.

### 1.2.3.8 Fishery Resources

The Great Lakes Basin contains a wide variety of fish species. Most of the important families of North American freshwater fishes are represented in the Great Lakes Basin. Over 237 species and subspecies of fish are now present in the waters of the Basin. Prime fish species (those which are marketable for profit or enjoyable for sport and food by the angler) include

(1) Commercial fish: channel catfish, lake trout, carp, lake whitefish, freshwater drum, cisco or lake herring, American smelt, bloater, northern pike, white bass, yellow perch, sauger, and walleye

(2) Sport fish: rainbow trout, brown trout, brook trout, lake trout, northern pike, muskellunge, smallmouth bass, largemouth bass, yellow perch, walleye, bullhead, and other panfish.

Habitat conditions vary in the five Great Lakes and the Basin's inland lakes and streams. Coldwater species dominate in the northern half of the Basin and warmwater species are most common in the southern portion. Trout and salmon fishing is good in many northern Minnesota, Wisconsin, and Michigan lakes and streams. Recent stocking of the Great Lakes with coho and chinook salmon has made these fish abundant in Lakes Michigan, Superior, and Huron. Trout fishing is popular in New York State waters and also occurs on a "put and take" basis in many Basin streams. Panfish abundant throughout the Basin include bluegill, rock bass, and perch.

The composition of fish species in the Great Lakes has been modified greatly by the introduction and immigration of exotic species. The carp was introduced the latter part of the 19th century, and substantial populations were well established by 1900. Smelt was stocked in a lake tributary to Lake Michigan in the 1920s, and in a relatively short time the species spread throughout the upper Great Lakes and into Lake Erie. The smelt is

native to Lake Ontario. The sea lamprey and the alewife, now abundant in most of the Lakes, were unknown except in Lake Ontario prior to the opening of the Welland Canal. The white perch is a recent immigrant. A large population is established in Lake Ontario in the Bay of Quinte, and in eastern Lake Erie. The relationship of these exotics to other species is as yet unknown, except for the sea lamprey, which has caused drastic decreases in the abundance of certain native fishes. However, carp and smelt have contributed substantially to the commercial take. Alewife has been marketed for pet food and fishmeal.

Appendix 8, *Fish*, has outlined and integrated long-range fishery development programs for the waters of the Great Lakes Basin predicated on the historical development of the fishery, present status and problems, and projections of future supply and demand. The report considers alternate approaches in response to various physical, ecological, social, economic, and institutional conditions that are expected in the future years.

The protection of water quality in the Great Lakes is of utmost importance. Some fish are the first organisms to respond to degradation of water quality. High water quality is essential for feeding, growth, reproduction, and survival of the important trout, salmon, whitefish, and other desirable species found in the Great Lakes.

### 1.2.3.9 Recreational Resources

The Great Lakes Basin possesses a great diversity of outstanding natural features, which are described in Appendix 21, *Outdoor Recreation.* Recreational landscapes include Great Lakes water surface and shoreline; thousands of inland lakes and associated beaches; mountains and rolling morainic hills; extensive forests; streams and marshland with high quality waters; and many islands, inlets, and bays. While a few of these resources are distributed near the large urban centers in the southern portion of the Basin, most are located in the drainage areas of Lake Superior, Lake Ontario, and the northern parts of Lakes Michigan and Huron.

Gross acreage of public recreation land and water surface in the Great Lakes Basin amounted to 17.8 million acres in 1970. About 13.5 million acres of land, 2.6 million acres of Great Lakes water surface, and 1.7 million acres of inland lakes water surface were available for recreation. In addition, there are over 100,000 miles of streams that provide fishing or other forms of recreation.

Tourism exerts considerable influence on the Basin's economy, with expenditures in the hundreds of millions of dollars annually. The most popular tourist areas in the Basin center around Lake Superior, northern Lake Michigan, northern Lake Huron, and Lake Ontario. The recreational resources within the Great Lakes Basin include many areas with exceptional scenic, natural, wilderness, and aesthetic qualities that make these areas nationally significant.

### 1.2.3.10 Historic, Aesthetic, and Cultural Resources

The customs and cultures of many ethnic and racial groups are represented in the Great Lakes Basin. The presence of seemingly endless natural resources provided raw materials for the growth of hunting and trapping, lumbering, farming, commercial fishing, and the emergence of manufacturing and industry over a period of less than 300 years. The historical patterns of land and water use in the Basin have resulted in a region rich in cultural heritage.

Significant resource features such as important geologic formations, unique wildlife areas, and archeological and historical sites have been identified and mapped in Appendix 22, *Aesthetic and Cultural Resources.* This inventory shows that more than 90 percent of the Great Lakes Basin's aesthetic and cultural resource features are located parallel to water systems or in areas of strong physiographic relief. These systems have been categorized as

(1) Urban buffer zones: environmental systems which, because of their close proximity to existing urban concentrations, serve as natural buffers to urban expansion

(2) Linkage corridors: environmental systems (such as stream valleys) that form linking corridors between concentrated urban areas

(3) Shore zones: environmental systems that parallel and/or encompass portions of the shorelines of the Basin's lakes, streams, and wetlands

(4) Other zones: environmental systems which do not fall into the first categories (such areas may include significant groupings of resources or single resource features; e.g. unique bog habitat or virgin timber area)

(5) Resource clusters: groupings of similar or dissimilar resource features important enough to be identified either separately or as part of the environmental systems containing them (While these features might not be important individually, when four or more are closely associated as a group, they warrant special planning and management consideration.)

(6) Single scattered resource features: features located outside environmental zones, corridors, or clusters. It is possible that these single resource

features possess the potential of affecting development and use patterns around them. For this reason, while they are not as great a planning consideration as the zones, corridors, and resource clusters, their identification is important.

Proposed Framework programs attempt to provide for conservation and preservation, as well as appreciation and use of the Region's historic, aesthetic, and cultural resources.

## 1.3 Alternatives for Future Growth, and Evolution of the Proposed Framework

Nonstructural and structural programs are set forth in the Proposed (PRO) Framework and serve as guides to future studies and efforts in resource conservation, preservation, and development over the next 50 years. Proposed Framework programs are general in nature and do not represent approved projects. The PRO Framework was assembled through joint efforts of State, Federal, local, and nongovernmental personnel. The detailed procedures followed and the program descriptions are best documented in Appendix 1, *Alternative Frameworks.* This environmental impact statement is intended to complement the detailed program description in Appendix 1 as an objective evaluation of the potential environmental impact of the PRO Framework and the alternatives to it.

Environmental impact assessment is extremely difficult in a Level A framework study, which does not identify resource programs by geographic location. Nevertheless, this statement provides, to the extent possible and feasible, definitive environmental impact information relating to the various types of programs identified in the Framework Study.

The Proposed Framework has been developed by studying three alternative growth rates for the future in the Great Lakes Basin. Future growth means changes over the next fifty years in the levels of population, income, and employment that we experience today. These complex estimated growth changes, also called projections, provide a base upon which environmental resource demands are estimated. Each of the following three growth alternatives entails meeting different levels of water and land resource demands. Each alternative assumes the objective of providing a certain minimum level of social, economic, and environmental well-being to residents of the Great Lakes Region. The extent to which economic or environmental objectives are emphasized varies for the three growth alternatives.

### 1.3.1 Normal Growth Rate

The normal (NOR) level of growth is that traditionally associated with resource investment to enhance national economic development. NOR growth projections represent historical trends of population and resource demands. This is a middle ground approach to growth, but the rate is slightly higher than present projections of anticipated growth.

### 1.3.2 Accelerated Growth Rate

The accelerated (ACC) level of growth is associated with extremely high economic, demographic, and per capita demand increases. It assumes that regional development is of primary importance and will increase above the national economic development level at the expense of some other areas of the country. This level assumes an increased willingness to exploit natural resources and to relegate cultural, aesthetic, and environmental factors to a position of secondary importance. An emphasis on economic efficiency, including structural alternatives for resource management, is implied.

### 1.3.3 Limited Growth Rate

The limited (LIM) level of growth is characterized by a minimum level of population growth and minimization of per capita demands for resources. It is based on the assumption that preservation and restoration of the natural environment are of primary importance. A heavy emphasis on the natural, cultural, and aesthetic aspects of resource management is implied. Population is projected on a base approaching zero population growth, and unit demands for energy, goods, and services relative to the normal growth level are substantially reduced and assumed to level off over the projected period.

Figure 2 uses population data to illustrate the general concept of accelerated and limited growth and their relationship to normal growth.

### 1.3.4 Evolution of the Proposed Framework

The most comprehensive set of recommended resource programs was initially based on the normal growth assumption. These are part of the Normal (NOR) Framework, which consists of the fullest possible projection of resource demands and supplies under normal growth conditions, an at-

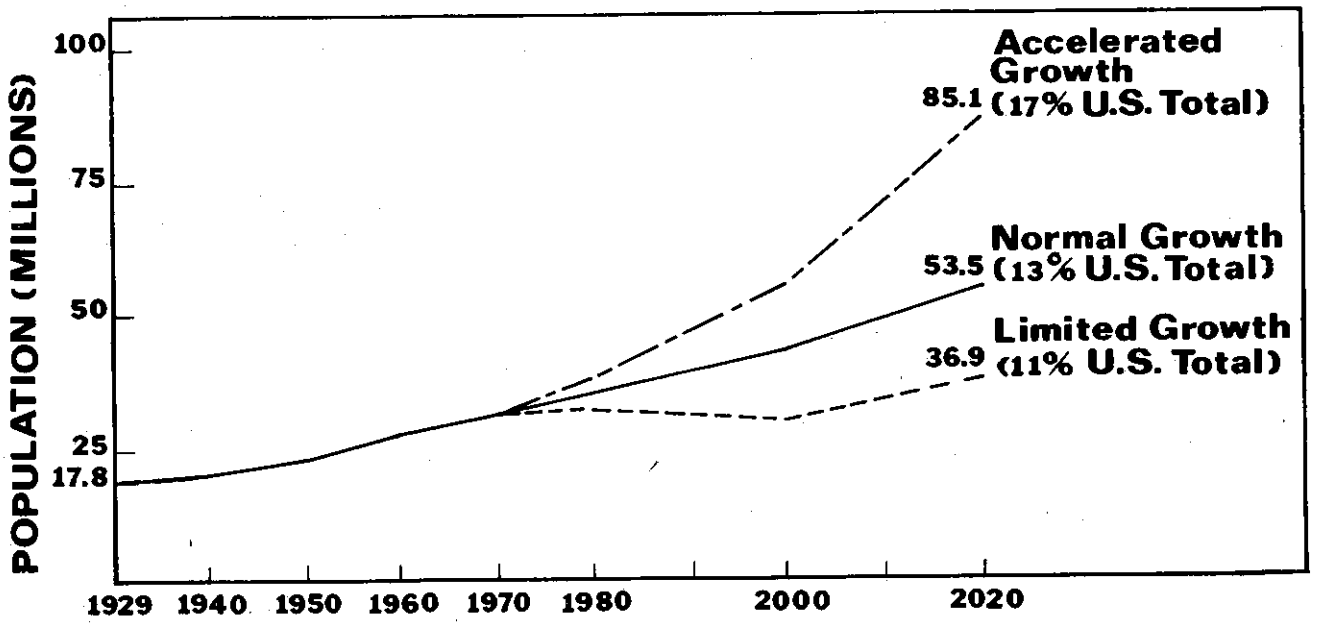



**FIGURE 2 The Range of Alternative Growth Assumptions**

tempt to derive from these projections a comprehensive description of future resource problems, and a general description of alternative programs to solve these problems. However, the Great Lakes Basin Commission felt that alternative growth patterns and resource programs should be considered parameters for true planning, rather than simply as possible projections. The Commission held fifteen public meetings and numerous plan formulation meetings to evaluate the broader implications of planning choices facing the Great Lakes Basin.

The resource program recommendations which emerged from this process were eventually incorporated into the Proposed (PRO) Framework, which was a modification of the Normal Framework. Specific elements of the Proposed Framework and its impacts are described in Section 3 of this statement, and the consequences of the normal, limited, and accelerated growth alternatives are more briefly outlined in Section 4.

The numerous tabular displays in this statement are intended to make easier a comparison of the Proposed Framework with the alternatives to it. A precautionary word should be included at this point regarding the tabular displays in Annex 1, which attempt to reflect in a very condensed form some judgment as to environmental impacts of Proposed Framework programs. The display sheets in Annex 1 were originally developed as a starting point for preparation of narrative discussion. Because local conditions vary widely, programs or projects having a given effect in one area may have a different impact in another portion of the same basin. The annex displays should be considered only as generalizations regarding probable impact over a Basin-wide area.

## Section 2

# RELATIONSHIP TO OTHER LAND USE PLANS, POLICIES, AND CONTROLS

Public Law 89–80, the Water Resources Planning Act of 1965, provides that each river basin commission shall "prepare and keep up to date, to the extent practicable, a comprehensive, coordinated, joint plan for Federal, State, interstate, local and nongovernmental development of water and related resources: *Provided*, That the plan shall include an evaluation of all reasonable alternative means of achieving optimum development of water and related land resources of the basin or basins, and it may be prepared in stages, including recommendations with respect to individual projects."

The Framework Study for the Great Lakes Basin is the critical first step in the continuing Comprehensive Coordinated Joint Plan (CCJP) process. The Proposed Framework should guide both public and private entities over the coming years in planning for the type of development of water and related land resources which will serve the best interests of Basin residents and, to a lesser degree, the nation at large. The CCJP, beginning with the Framework Study, identifies economic and environmental issues that must be studied in more detail, and geographic areas in which more detailed planning studies should be made. The Great Lakes Basin Commission is a joint Federal-State body, and it generates a product, the CCJP, which by joint agreement is followed as a guide to optimum development or nondevelopment of water and related land resources. Implementation of the Proposed Framework and the CCJP rests with local, State, Federal, and international institutions. Priorities for future programs are established by these groups and reported periodically by the Commission to the President, Congress, and the legislatures of the eight Great Lakes States. The Proposed Framework is flexible and presents no major conflict with related land planning presently conducted by States and their subdivisions.

Compliance of the on-going CCJP with new Federal and State legislation and executive policy is a continuing responsibility, and a prime reason for the fluid character of the CCJP. The Proposed Framework is in compliance with all currently applicable legislative mandates, including Public Law 92–500, the Federal Water Pollution Control Act Amendments of 1972. The Commission evolved the Normal, Accelerated, and Limited Growth objectives before passage of this law, and all three objectives assume prepassage conditions and legislative requirements. The Proposed Framework, however, complies fully and is consistent with P.L. 92–500. As with all elements of the CCJP, there will be a continuing dialogue with the involved agencies (in this case, primarily the Environmental Protection Agency) to assure that Commission activities are consistent with both the letter and spirit of applicable laws and other policy changes.

Preparation of Coastal Zone Management (CZM) plans by the States, under provisions of P.L. 92–583, should be facilitated by the Framework Study. The Commission will follow development of each State plan, provide requested technical assistance to the degree possible, and take any actions necessary to eliminate conflict between the CCJP and each CZM plan. The Commission also acts as a forum to resolve issues of concern (for example, a common definition of what constitutes the coastal zone) through its Standing Committee on Great Lakes Coastal Zone Management.

The Proposed Framework is consistent with P.L. 93–523, the Safe Drinking Water Act. The Act declares that a State has primary enforcement responsibility for public water systems, and allows the State to grant variances from an applicable national primary drinking water regulation to one or more public water systems within its jurisdiction. The Act provides for the protection of underground sources of drinking water through underground injection control programs, and among other things, directs the Administrator of the Environmental Protection Aency to enter into arrangements with public or private entities to conduct a survey of the quantity, quality, and availability of rural drinking water supplies.

At this writing, Federal land use planning legislation is still in Congress. If passed, it will involve the States in a comprehensive land use planning process which would envelop not only planning for water and related land resources, but also most single-purpose or program planning activities (transportation, outdoor recreation, etc.) now car-

ried on. It is difficult to anticipate at present what the relationship of the Basin Commission's activities to comprehensive land use planning will be. The Framework Study defines in general terms how much land will be needed in various basins for such uses as commercial port facilities, water treatment plants, and other elements of land use plans, but does not pinpoint specific locations.

New legislative or executive policy initiatives may require either minor or extensive changes to the Proposed Framework. They might include such items as an energy policy pronouncement which would accelerate exploration and development of offshore resources in the Great Lakes or greatly alter the degree of energy self-sufficiency of the Region. Likewise, major new initiatives which would affect the volume of waterborne commerce or the length of the shipping season could also require changes in the Proposed Framework.

Great Lakes Basin Commission activities have had a significant influence on planning for water-based transportation in the Basin, some impact on other program planning (such as recreation, and fish and wildlife), and relatively little impact on others (such as highway planning). In all cases, the Proposed Framework was a general planning guide rather than a definition of policy regarding specific projects. Due to the broad makeup of the Commission and the general nature of framework planning, the Proposed Framework is expected to be consistent with any land use plans in the Basin, and the Commission is unaware of any specific instances of conflict.

# Section 3

# PROPOSED FRAMEWORK PROGRAMS AND PROBABLE IMPACTS

## 3.1 The Proposed (PRO) Framework Programs

The Proposed (PRO) Framework alternative represents a level of resource conservation, preservation, and development associated with the multiple objectives of environmental quality, economic development, and social well-being, and is based primarily on projections lower than those associated with a projection of historical trends of population and resource use demands. This Framework represents a middle ground approach to growth, but is based on projections that are slightly higher than present projections of anticipated population growth based upon recent data. The environmental impact displays presented in Annex 1 of this statement are based upon the Proposed Framework alternative.

The Proposed Framework represents a mixture of general program components, which consist of structural and nonstructural solutions, to provide for resource needs and solve projected resource problems. The extent, by percent, to which these general programs meet needs for each function studied in the Framework Study is indicated in the displays presented in Annex 1. Unsatisfied needs in the Proposed Framework are either transferred or left unmet. The quantification of structural and nonstructural solutions to resource needs is not always possible in a framework study analysis. Certain programs could have a significant yet nonquantifiable effect upon each of the resource use categories. The impacts of these nonquantifiable programs are not indicated in the annex displays, although it is recognized that these programs, like the quantified programs, will have environmental effects.

### 3.1.1 Water Withdrawal Programs

The Proposed Framework program of surface and subsurface water management (including transfers from outside the Basin) provides for all water withdrawal needs through 2020 with the exception of irrigation and mining. In particular areas, other uses of land are given higher priority, and water is not always supplied for uses such as irrigation and mining. Based on an evaluation of the concentration of demand and availability of supply, it is anticipated that municipal, self-supplied industrial, and electrical power cooling water requirements would be supplied mainly from Great Lakes sources. Inland lakes and streams and ground water do become increasingly significant sources for meeting interior demands for water withdrawals. Because of an increasing dependence upon inland lakes, streams, and ground water to meet industrial and irrigation demands, it may be well to highlight the potential conflicts with water quality, recreation, sports fishing, and aesthetics which may accompany dependence upon those sources of water in the future. The Proposed Framework indicates that some of the irrigation water needs in the Lake Erie and Ontario basins can be supplied from potential storage impoundments. It is not anticipated that impoundments will be required to satisfy water supply needs in most parts of the Great Lakes Basin. However, in the event that future demands upon the inland lakes, streams, and ground water exceed supply, additional impoundments have a significant potential for providing water for inland industries, municipalities, and other users in the Basin.

There are many aspects of energy production that infringe upon water quality and that may degrade the water enough to preclude further or multiple use. The discharge of power plant cooling water into lakes or streams may degrade water quality sufficiently to affect species diversity or abundance; may reduce the dissolved oxygen capacity of the water; and may indirectly affect aquatic organisms by causing changes in metabolic rate, respiration, behavior and migration, feeding rate, growth and reproduction, and by increasing susceptibility to parasites and diseases. Although the Great Lakes represent a tremendous volume of fresh water, offshore currents tend to concentrate pollutants or contaminants along the beach or littoral zones of the Lakes. Research in Lake Michigan has demonstrated that at times large percentages of the heated water discharge to the Lake are cir-

culated into the beach water zone, and studies of model plumes have indicated that the influence of heated water from a single discharge can cover many square miles of the Lake. It should be emphasized that the littoral zone of all the Great Lakes is in many respects the most important portion. In addition to being the most biologically productive, this zone is the most intensively used for a multitude of recreational purposes as well as for municipal and industrial supplies. Therefore, an increase in water temperature may cause degradation of water quality, significantly affect the ecological systems of the littoral zone, and serve as a limiting factor to resource utilization.

Another potential water quality problem associated with cooling water is the use of chlorine to keep aquatic growths from fouling the plumbing of the plant. The chlorine is then discharged with the cooling water, and, if the residual concentration is great enough, may have detrimental effects on aquatic organisms and the discharge channels and receiving waters. Blow down water, which is that portion of recycled cooling water that is discharged to reduce solids built up in the cooling system, is frequently concentrated with chlorine-contaminated water in supplemental cooling systems, and when released from the plant, becomes a significant potential contributor to water quality degradation.

Thermal discharge and power plant blow down may significantly affect the ecological community. As already indicated, the littoral zones of the Great Lakes are the most biologically productive portions of the Lakes. The possible disruption of the food chain, alteration of species diversity-abundance relationships, and reduction of the stability of the ecological system in the littoral zone are all extremely important ecological considerations.

The impingement of fish on power plant intake screens may contribute to significant mortality of fish. Entrainment of planktonic organisms in cooling systems may, through thermal shock or mechanical means, induce lethal or sublethal effects on organisms. This may result in a significant reduction of fish food, especially in the littoral zone, depending on the proportion of cooling waters to the total volume of the receiving body. Thermal shock also occurs as a result of stopping or reducing thermal discharges during cold weather periods. The suddenness of temperature change may be lethal to fish that were attracted to the warmer water.

The effects of power plant thermal discharges via once-through cooling systems or closed-cycle cooling systems (such as cooling towers or ponds) on various hydrologic and meteorologic systems are also important considerations. As more power plants are located along the shoreline, the potential for some alteration of the meteorologic systems in the local region may be significant. It is possible that these potential long-range hydrologic and meteorologic changes may be more deleterious than environmental consequences experienced with once-through cooling systems. The potential for weather modification in the form of ice and fogging is an environmental consequence of great concern. The effects of accelerated thermal dissipation into the Lakes should be fully researched as soon as possible.

An environmental program may have beneficial impacts as well as adverse ones. While intelligent power plant siting should use the Great Lakes' heat-absorbing capacity to minimize harmful effects, both thermal discharge from power plants and the Lakes' heat capacity should be evaluated as potential resources in a broader ecological perspective. This heat could prove useful in heating greenhouses, protecting crops against frost, increasing fish production and recreational use along shoreline areas, or even the development of year-round aquaculture (marine farming) systems. Major regional initiatives to properly utilize this energy should be explored more fully.

Another potential environmental impact that should be included in the analysis is the possible alteration of the hydrologic cycle in the Great Lakes due to increased evapo-transpiration resulting from power plant cooling systems, on-land municipal sewage effluent disposal, irrigation, storage reservoirs, and other consumptive uses of water. Any modification of the hydrologic cycle may influence the supply of water throughout the Basin. Several of the programs and policy measures outlined in the Framework Study may have significant impact on this dimension of the hydrologic cycle and should be assessed as far as adverse and negative environmental impacts are concerned.

Although water quality is not a Basinwide problem, the Proposed Framework does recognize that the quality of the water supply in some areas may be adversely affected by water quality conditions. Continued surveillance of the quality of water within the Basin should be maintained to assure that an adequate high quality supply is available for protected uses.

Conservation of energy was not specifically addressed during development of the PRO Framework, although the rate of growth projected was conservative, considering the 1970 data base used (5.4 percent). The issue of energy has changed radically since the projections were made, and developments have prompted much concern. The exact amount of reduction in electric energy consumption through conservation cannot be determined. An August 1973 report by the Forecast Review Task Force Technical Advisory Committee, Federal

Power Commission National Power Survey, indicated a possible savings of about 17 percent in kWh generation in the year 2000 by a concerted conservation effort. This will not solve long-term problems of adequate energy supplies, but conservation of energy is still desirable and should be encouraged. It reduces the consumption of raw energy materials and related resources. Also, it provides additional time to research and develop alternative energy sources.

### 3.1.2 Nonwithdrawal Programs

Numerous structural and nonstructural alternative programs are included in the Proposed Framework to manage the variability in quantity and quality of area stream flows in the Basin. The Framework provides for wastewater management measures; the institution of flood plain management programs, including nonstructural (i.e., legislative) and structural measures that provide for multiple use; and programs for improving commercial navigation facilities and providing future opportunities for navigation expansion.

#### 3.1.2.1 Water Quality Programs

Water quality programs in the Proposed (PRO) Framework are based on compliance with the goals of P.L. 92–500, the Federal Water Pollution Control Act Amendments of 1972:

(1) to achieve wherever possible by July 1, 1983, water clean enough for recreational uses, and clean enough for the protection and propagation of fish, shellfish, and wildlife

(2) to have no discharges of pollutants into Great Lakes Basin waters by 1985.

P.L. 92–500 extends the Federal pollution control requirements to all U.S. waters; in the past only interstate waters were covered by Federal legislation. The PRO Framework prescribes that municipal and industrial wastewater discharges will be given best available treatment and that nonpoint pollution sources will be controlled by 1983.

To carry out these programs, the PRO Framework continues and expands the water quality standards program initiated under previous legislation, establishes a new system of permits for all point source waste discharges, and streamlines enforcement machinery, with heavy penalties to speed compliance with the law.

#### 3.1.2.2 Flood Damage Prevention Programs

The Proposed (PRO) Framework assumes that for the immediate time period, damage to existing development in the flood plain can be reduced most expeditiously by structural measures. Further, it assumes that through 1980, nonstructural measures will be implemented where existing legislation will permit and enforcement is adequate. In the Great Lakes Basin, the PRO Framework would prevent a major share of the projected average annual damages in urban and rural areas in 1980. The PRO Framework assumes that by 1980, 10 percent of the projected average annual damages due to growth will be alleviated through implementation of flood plain legislation. The Framework assumes that by the year 2000 flood plain legislation could alleviate some 40 percent of the projected increase in average annual damages due to growth between the years 1980 and 2000. It is estimated that during the period 2000 to 2020 75 percent of the growth in average annual damages can be prevented through flood plain legislation implementation. It is estimated that by the year 2020, through the use of both structural and nonstructural measures, 93 percent of the average annual damages can be prevented in the urban flood plains and approximately 56 percent in the rural flood plains. There may be significant changes that affect the role nonstructural measures play in the PRO Framework. Legislation passed subsequent to the development of the Framework may put more emphasis on nonstructural measures in the immediate time frame.

Effective flood plain management programs can have significant effects, including both beneficial and adverse impacts on wildlife, recreation, and aesthetic enjoyment of an area's natural resources. In addition, the proposed impoundments used to alleviate flood damages could be utilized to enhance wildlife, fishing, recreational boating, and other beneficial resource uses in the future.

#### 3.1.2.3 Fishery Programs

It is the goal of the Proposed Framework to insure that Great Lakes fishery management decisions are designed for the maximum public benefit and to meet projected fishery needs. In doing so, it combines the creation of additional habitat with the management of and provision of access to existing habitat. An accelerated fish restocking program to attain an optimum yield based on the productive capacity of the Lakes is also recommended. Improvement in stream flow conditions and creation of additional water area should improve the fishery. A provision of adequate wastewater treatment should enhance fishery production in the Basin and provide additional opportunities for anadromous fish to use upstream areas. Additional public access to the

Basin's inland lakes and streams, reservoirs, and the Great Lakes should provide additional opportunity to meet angler-day demands.

Harbor improvements usually are located at river mouths and include dredging, filling, and spoiling of shallow water areas and wetlands. These operations degrade water quality, adversely affecting fish and wildlife habitats. Pleasure craft use also can adversely affect sport fishing. Increased sport fishing can cause excessive fishing pressure that reduces the quality of the fishing experience and can adversely affect most high value fisheries by depleting local fish stocks.

### 3.1.2.4 Commercial Navigation Programs

To the extent technically feasible, economically justifiable, and environmentally acceptable, the Great Lakes Basin Commission favors the maintenance of efficient, low cost, deep draft navigation and the provision of incremental improvements to the navigation system in the Great Lakes and St. Lawrence Seaway, including connecting channels, shipping and receiving harbors, compensating works, additional locks, canals, dams, and extension of the navigation season. Interpretation of this policy statement means that with consideration for environmental quality and economic efficiency the Proposed Framework would

(1) provide 31-foot depths at Silver Bay, Duluth-Superior, and Taconite Harbors and in connecting channels in Lake Superior and Sault St. Marie

(2) provide 31-foot depths in harbors at Escanaba, Chicago, Milwaukee, Marquette, and Calumet; at Port of Indiana and Indiana Harbor, and in connecting channels in Lake Michigan

(3) provide for a 34-foot depth in a control structure in the St. Clair River

(4) provide 31-foot depths in harbors at Detroit, Toledo, Sandusky, Loraine, Cleveland, Conneaut, Erie, Buffalo, and connecting waterways

(5) extend the Great Lakes commerical navigation season for:

(a) six weeks for segments of the system from western Lake Superior through the Soo Locks, St. Marys River, and to southern Lake Michigan; through the St. Clair and Detroit Rivers and Lakes St. Clair and Erie; and,

(b) if approved by Canada, six weeks through the Welland Canal into Lake Ontario, and four weeks through the St. Lawrence River system

(6) provide additional lockage and channel capacity in the U.S. section and urge comparable changes in the Canadian section of the St. Lawrence Seaway to include depth over sills equal to that in the new Poe Lock, but with 125–ft width and 1200–ft length in new lockage for container and general cargo ships, and with incremental improvements, as needed, of up to 30 feet in the channels for ore traffic to be made between 1980 and 2000.

More detailed on-going studies pertaining to Proposed Framework programs need to be completed as soon as practical so further action can be decided upon.

### 3.1.3 Related Land Use Programs

A range of structural and nonstructural management programs are proposed in the PRO Framework to meet the needs of agriculture, wildlife, and recreation; to handle problems associated with shore use and erosion; and to provide for land treatment. On the Framework Study level, it is particularly difficult to quantify all programs associated with meeting needs of aesthetic, cultural, and wildlife resources. More detailed studies are required to establish specific sites and recommendations for the provision of these valuable resources.

### 3.1.3.1 Land Use and Management Programs

The Proposed Framework programs for the land use and management function include land acquisition and/or management programs to enhance recreational, aesthetic, and wildlife resources; to provide land for projeted agricultural, mineral, and forest production through reservation of lands deemed to be most suitable for those uses; and to provide land for the production of energy. Land treatment programs on agricultural and forest lands will be accomplished to enhance their productivity potential as well as to minimize the degradation of the land resources. Land treatment programs have a significant benefit in reducing overall erosion problems, sedimentation problems, and drainage problems in the Basin.

Drainage project actions are also proposed for cropland in the Proposed Framework and are included under the agricultural land treatment category. Most channelization projects produce both beneficial and detrimental effects, just as do all other measures in developing water resources. However, channelization can make fertile lands available for crop production by improving drainage and by reducing the frequency of flood overflow. In the long run, the increased efficiency in the Region's agricultural production may be a desirable consequence of channelization. However, some of the detrimental effects may be acceleration of erosion, increase in the frequency and magnitude of

downstream floods, loss of valuable habitat for fish and wildlife, and loss of the aesthetic values of a natural area. Excessive erosion can be reduced by making proper provisions in the planning of such projects for bank protection and other measures required to stabilize the new channels. Control of erosion and sedimentation have been judged to have significant effect on water quality conditions in an area's lakes and streams.

### 3.1.3.2 Recreation Programs

Resource functions included in the water surface use category are the water-oriented outdoor recreation function, and the recreational navigation function. The potential for multiple-purpose use of proposed recreational facilities is substantial in the Great Lakes Basin. Proposed single- and multiple-purpose storage impoundments are estimated to provide for a significant portion of the recreation needs in the future, particularly in eastern portions of the Basin. Land use changes, including acquisition and reservation of flood plain areas and recreational sites, can provide a much needed recreational resource for area residents. Several new State parks are projected in the Proposed Framework, as well as an emphasis upon the increased utilization and efficient use of existing forest lands. The designation of river valley preserves can provide a focus for aesthetic enjoyment as well as a haven for wildlife species. Scenic easements will be instituted through legislative measures and are projected to provide open space areas for aesthetic and recreational opportunities and complement the existing park systems. The proposed programs for enhancing recreational opportunities include the provision of access to impounded and other inland waters and the improvement of harbors and marinas on the Great Lakes. In addition to the structural elements of the recreational navigation program, a significant level of needs can be met by zoning and management measures, which must necessarily accompany the institution of structural programs.

### 3.1.3.3 Aesthetic and Cultural Resources Programs

Specific programs previously listed under the recreational category, which included scenic easements, valley preserves, and scenic areas, provide a great opportunity for meeting recreational and aesthetic needs. Overall, the aesthetic and cultural function can be enhanced by increased planning efforts in order to ensure the existence of environmental systems. Valuable natural resource corridors should link major metropolitan systems and serve to ensure open space in projected urban growth areas. Continuing attention should also be given to the development and management of linkage corridors along the Great Lakes shores and in upstream areas.

Naturally, improvements in water quality should enhance the value of aesthetic enjoyment of the preserved resources in the Basin. Based upon the inventory developed for this study, several hundred unique historical sites in the Basin ought to be preserved. In addition, sites of unique modern structures have been identified and should be preserved. Many sites and objects of early Indian cultures have been identified and should be preserved. Proposed surface water impoundments will have a significant impact on the aesthetic values of several of the river basin complexes. Proper planning and management of the facilities which would be associated with these impoundments are necessary to assure a pleasing aesthetic experience.

### 3.1.3.4 Wildlife Programs

The Proposed Framework programs for the enhancement of wildlife resources include

(1) technical assistance to rural landowners for the development of a sound wildlife management program

(2) land acquisition for preservation of upland game species, and for providing public hunting lands to offset the trend toward diminished private land access

(3) legislative zoning to increase emphasis on green belts and open space

(4) wetlands acquisition

(5) improvement of wildlife management practices on existing public lands

(6) State fish and game agency educational programs to promote better landowner-hunter relationships

(7) other management measures.

In addition to these specific program elements for the wildlife function, the overall effect of increasing water quality will be beneficial to the wildlife species in the Region. Preventing the degradation of existing wetlands from drainage and filling operations along the Great Lakes shores and in inland areas is of considerable importance. Better working arrangements with the agencies involved could help alleviate the conflicts associated with the development of either shore protection measures or construction of harbors. The many islands in the Great Lakes also offer a unique opportunity for effective and useful wildlife management programs.

### 3.1.3.5 Shore Use and Erosion Programs

In addition to the historical mismanagement of the shoreline, some competition for shoreland resources exists among industrial complexes, thermal power plants, and recreational and residential developments along the shoreline. It should be stressed that recreational pressures on a lake's shoreline represent a significant source of competition for resource utilization. The ecological quality of the coastal zone, the adequacy of public access and recreational facilities, and the quality of sport fishing are vitally important to both the Basin's economy and the residents' enjoyment. Therefore the location of industrial complexes, power plants, and other developments may be in conflict with recreational demands and intelligent natural resource management. If properly planned, however, certain developments can coexist with general recreational use.

It is now recognized that comprehensive land use planning of shorelines, flood plains, and estuarine regions is a mandatory prerequisite for reduction of flood damage and preservation of valuable ecological systems. The need for systematic and coordinated planning is very critical in controlling shoreline erosion, because haphazard structural placement results in temporary control devices at best, and at worst, merely transfers the erosion problem to another section of the beach.

An evaluation of the potential development of the Great Lakes shoreline area indicates that many areas have possible national environmental significance. Specific investigations should be developed to evaluate the potential of these areas. The protection of the shoreline from critical erosion is proposed as part of the Proposed Framework. The on-going study of level regulation for the Lakes may have significant impact on the extent of shore erosion and flooding.

## 3.1.4 Summary of Proposed Framework Programs

In summary, the Proposed Framework uses multiple-objective programs to resolve present and future resource problems. Among programs projected for year 2020 in the Great Lakes Basin are:

(1) provision of more than 112 billion gallons of safe water per day for residential, commercial, industrial, agricultural, mining, and power uses, in addition to current supply

(2) water quality management that includes a high level of municipal and industrial wastewater treatment for nearly 16 billion gallons every day

(3) full support of the recommendations of the Great Lakes Water Quality Agreement between the U.S. and Canada

(4) maintenance dredging, as required, to 27-foot depths for existing harbors and channels in the Great Lakes Basin commercial navigation system with increased depths and improvements in Lakes Superior, Michigan, and Erie

(5) provision for an additional 190 million outdoor recreation days and 11 million recreational boating days beyond the 1970 level

(6) treatment and management of about 40 million acres of forest and agricultural land

(7) shoreline protection and management techniques for over 200 miles of Great Lakes shore.

### 3.1.4.1 Estimated Dollar Costs of Proposed Framework Programs

Table 1 shows the estimated dollar costs of Proposed Framework programs for each time period and resource category. Both capital investment costs and annual operation, maintenance, and replacement costs, where appropriate, were developed for programs associated with most of the 22 resource use categories identified in this study. Using the best available information, these costs were determined for each of the three time periods involved (1970-1980, 1970-2000, and 1970-2020), for each of the 15 river basin groups, and for each of the two Alternative Frameworks (NOR and PRO). All costs assume a base price year of 1970 and apply to programs implemented after 1970. Operation, maintenance, and replacement (OM&R) costs for existing program activities are, therefore, not included in this study. In addition, all the costs developed in the Framework Study for the various programs associated with the development, utilization, and conservation of the resources concerned are considered to be of a preliminary or reconnaissance nature.

Capital costs refer to first-time cost, including installation costs, and such related nonstructural program costs as technical and financial assistance.

The costs were not broken down into subitems, but the totals include all costs for labor, material, equipment, rights-of-way, water rights, relocations, contingencies, and the costs for engineering and administration. This degree of detail was not shown in the preparation of any of the cost estimates, but the items were included in the estimating process used. General criteria for capital and OM&R costs and a complete definition of capital costs are provided in Appendix 1, *Alternative Frameworks.*

The breakdown between Federal, non-Federal, and private cost is also included in Appendix 1, *Alternative Frameworks.* This breakdown in cost

**TABLE 1 Great Lakes Basin Proposed Framework Programs: Estimated Cost Summary**

| Resource Use Categories | PRO Framework Cost[2] ($ millions) 1970 to 1980 | 1970 to 2000 | 1970 to 2020 |
|---|---|---|---|
| Water Supply[1] | 732.5 | 3,381.9 | 9,780.0 |
| Irrigation | 23.0 | 53.4 | 104.3 |
| Mining | 14.0 | 73.0 | 246.9 |
| Thermal Power Cooling | 360.9 | 2,289.9 | 6,743.8 |
| Municipal Wastewater Discharge | 8,892.7 | 21,762.7 | 40,613.6 |
| Sport Fishing | 94.0 | 167.4 | 323.1 |
| Recreational Boating | 334.9 | 1,112.0 | 2,295.8 |
| Commercial Navigation | 331.6 | 2,120.4 | 2,888.8 |
| Agricultural Land--Treatment | 149.6 | 452.6 | 673.4 |
| --Cropland Drainage | 123.7 | 351.6 | 520.3 |
| Forest Land--Treatment | 192.8 | 608.0 | 1,058.2 |
| Shoreland Erosion | 30.5 | 94.0 | 181.5 |
| Streambank Erosion | 21.0 | 94.7 | 242.6 |
| Flood Damage Prevention | 548.6 | 952.9 | 1,079.5 |
| Wildlife Management | 127.2 | 357.0 | 586.1 |
| Outdoor Recreation | 869.6 | 2,587.3 | 5,246.9 |

[1]Municipally supplied, self-supplied industrial, and rural domestic and livestock.

[2]Preliminary estimates of capital plus operation, maintenance, and replacement costs.

sharing is based upon current legal and institutional arrangements. In the case of municipal wastewater discharges and shoreland erosion control, the percentages presented reflect possible future cost sharing developed through new legislation.

## 3.2 Environmental Impacts

### 3.2.1 Impacts of National and Regional Growth

In 1970, about 14 percent of the nation's population resided within the Great Lakes Region. The Proposed Framework aims to meet future resource needs of a resident population living in the eight Basin States and projected to increase nearly twofold, from 29.3 million to 53.5 million persons, by 2020.

Population and employment growth in the Great Lakes Basin have paralleled national trends since 1929. For planning purposes and Framework Study assumptions, population growth in the Great Lakes Basin is projected to be less rapid in the future than in the recent past, declining from an annual rate of increase of 1.6 percent to 1.2 percent. The labor force participation rate is expected to increase from 37 percent to 40 percent as jobs increase more rapidly than population. The rate of increase of total personal income, which is a measure of total economic growth, is projected at 4 percent annually. Per capita income in the Great Lakes Basin is expected to be only 3 percent higher than in the nation in 2020, although Basin per capita income was 11 percent higher than the nation's in 1962. Total employment is projected to reach more than double its present level between 1960 and 2020, while employment in the manufacturing sector is seen as increasing only 50 percent. Projected em-

**TABLE 2 Significant Environmental Changes Due to Growth and Proposed Framework Programs: Great Lakes Basin**

| Resource Use Categories | Units | Base Year (1970) Condition | Projected (2020) Condition | Future Change--Ratio of 2020 to 1970 Condition |
|---|---|---|---|---|
| Water Supply[2] | MGD | 15,427.9 | 31,351.7 | 2.0 |
| Irrigation | MGD--Consumption | 682.1 | 2,763.5 | 4.1 |
| Mining | 1000 Acres Disturbed | 65.4 | 571.8 | 8.7 |
| Thermal Power Cooling | MGD--Cooling Consumption | 165 | 2,220 | 13.4 |
| | 1000 Acres of Plants[1] | 4.6 | 68.9 | 15 |
| Municipal Wastewater Discharge | MGD--Effluent Requiring Treatment | 3,063.7 | 9,787.0 | 3.2 |
| Sport Fishing | 1000 Angler Days | 80,700.0 | 153,500.0 | 1.9 |
| Recreational Boating | 1000 Boat Days | 29,010.0 | 39,850.0 | 1.4 |
| Commercial Navigation | Million Tons/Year Accommodated | 343.0 | 754.3 | 2.2 |
| Agr. Land--Treatment | 1000 Acres | 20,453.0[4] | 15,500.0 | .76 |
| --Cropland Drainage | 1000 Acres | 6,213.0[4] | 2,610.0 | .42 |
| Forest Land--Treatment | 1000 Acres | 27,930.0[4] | 21,800.0 | .78 |
| Shoreland Erosion | Miles Protected by structures | 317.7 | 521.8 | 1.6 |
| Streambank Erosion | Miles Protected | 346.5 | 3,277.0 | 9.5 |
| Flood Damage Prevention | Thousand $ AAD | 60,609.0 | 222,548.0 | 3.7 |
| Wildlife Management | 1000 Acres | 74,818.0[3] | 79,739.0 | 1.1 |
| Outdoor Recreation | 1000 Recreation Days | 637,167.0 | 1,863,787.0 | 2.9 |

[1]Assumes maximum land required for plants at .17 acres per megawatt of installed capacity
[2]For municipal, self-supplied industrial, and rural-domestic water supplies
[3]1960 Data
[4]Land requiring treatment-ratio of 2020 to 1970 indicates portion of these needs met

ployment in the services sector should more than offset the declines in employment in the agriculture and mining sectors and the less-than-proportional growth in the manufacturing sector.

Eighty percent of the people in the Great Lakes Basin lived in urban areas in 1970, compared to a national proportion of 74 percent. With an expected decline of 66 percent in the number of people employed in agriculture between 1960 and 2020, the trend toward increased urbanization is expected to continue. A highlight summary of significant environmental changes resulting from meeting Proposed Framework resource needs through water and related land programs is shown in Table 2. However, it is recognized that this Environmental Impact Statement is of a general nature and that there may be additional impacts not covered in Table 2. Those changes listed provide sufficient coverage for a Level A study.

The complex social, economic, and environmental consequences of future population growth in the Great Lakes Region cannot be completely described or quantitatively measured in this study. We do know, however, that the growth experienced by the Great Lakes Region in the past has brought substantial benefits. Population growth has been accompanied by even more rapid economic expansion, enabling the Great Lakes Region to enjoy an above-average standard of living. In the Great Lakes Region, as in the nation generally, the patterns of migration from rural to urban areas and from one region of the country to another have brought population concentration closer to employment opportunities. Urban development and suburban growth have given millions of American families better housing, facilities, and services. The automobile and the extensive highway system, which are probably the most important forces in-

fluencing the pattern of growth in the post-World War II period, have increased the mobility of American families and provided them with greater access to jobs, housing, recreation, and shopping. Population changes, technological development, and economic expansion will almost certainly continue during the foreseeable future.

Population growth has also brought substantial problems to the Great Lakes Region, where 80 percent of the residents now live on 8 percent of the land. The U.S. Department of Housing and Urban Development, in its First Biennial Report on National Growth, cites five typical problems accompanying recent growth. These also prevail in the Region, and are discussed in Subsections 3.2.1.1–3.2.1.5.

### 3.2.1.1 The Decline of Rural Areas and Small Towns

The nation's total rural population, the number of persons living in unincorporated areas or in municipalities with less than 2,500 inhabitants, has remained relatively constant over most of this century. Nevertheless, changes in population composition and economic activity have produced a number of serious problems for many small towns and other rural areas.

Since the 1940s, farm population has declined so rapidly that it now constitutes less than one-fifth of total rural population. At the same time, the number of market and service centers needed by the farm population has fallen, and many small towns are no longer able to serve their original function.

While some growth in nonfarm employment did occur in nonmetropolitan areas during the 1960s, the increase was unevenly distributed. In fact, half of the nation's counties experienced no growth in nonfarm employment during that decade, because of their remoteness from large-volume markets, lack of natural resources and skilled labor, inadequate public facilities, absence of recreational and cultural activities, financial difficulties of local governments, and limited pools from which to draw effective leadership.

Where employment opportunities have failed consistently to match the number of jobseekers, many younger and better educated persons have sought jobs in larger towns and cities, leaving behind an older and less skilled population and deteriorating economies. The result is often a tax base inadequate to finance basic public services or to attract new job-producing investment (which would augment the tax base).

Consequently, many social and economic indicators show nonmetropolitan areas lagging behind metropolitan areas. For example, in 1970, 13.8 percent of nonmetropolitan families were below the official poverty level as compared with 7.9 percent of metropolitan families, and the median income of families in nonmetropolitan areas was $2,000 less than that of families in metropolitan areas. The percentage of high school and college graduates in the rural population is also typically smaller. Rural areas have fewer medical and dental personnel in proportion to their population. The incidence of substandard housing is about three times higher in nonmetropolitan areas (where three-fifths of the nation's substandard housing units were located in 1970). In many rural areas, vital public services and facilities such as police and fire protection, a clean water supply, sewage disposal, air transportation facilities, and recreational and cultural opportunities—are unavailable, inadequate, or more expensive.

### 3.2.1.2 The Changing Role of the Central City

Shifts in population and changes in the location of economic activity have had a substantial impact on the physical, social, and economic vitality of many central cities as well.

The influx of low-income families and individuals has placed a heavy burden on municipal services and facilities. At the same time, the revenue sources available to pay for them have been shrinking as business, industry, and middle- and upper-income families move to the suburbs. These families may continue to place demands on central city facilities and services, intensifying the problems cities face in providing them.

The stagnant or declining tax bases of most large cities, together with the growing costs of the police, fire, welfare, and sanitation services, have often led to a reduction in the quality of services. This reduction falls especially hard on poor families who suffer proportionally more from the consequences of crime, vandalism, drug addiction, and neighborhood deterioration.

### 3.2.1.3 Racial and Economic Concentration

Population movements have increased racial and economic uniformity in urban areas. The percent of metropolitan families with incomes below the official poverty level living in the central city increased from 61.3 in 1960 to 63.1 in 1970. Between 1960 and 1970, the percent of blacks living inside central cities increased from 51.5 to 55.2, and the percent of whites living outside central cities increased from 32.6 to 38.6. A large number of poor,

black, and other minority families are concentrated in particular inner city neighborhoods.

The intense concentration of commerce, industry, and population along the southern shores of the Great Lakes has created problems of great magnitude. Congestion and pollution, urban sprawl and blight, and racial and economic discrimination are all problems inherent in large, overly concentrated industrial complexes. Another problem is the disposal of municipal and industrial waste, whose sheer volume often exceeds the natural assimilative capacity of certain portions of the Great Lakes Region. Urban waste management is a tremendous problem requiring huge economic investments. While the benefits of increasing economies of scale initially encourage accelerated concentration of population, urban growth seems in many cases to have reached the point of diminishing returns.

The problems of waste disposal and racial and economic concentration are just a few of the serious implications of excessive urban growth. Metropolitan complexes are greatly dependent on adequate supplies of materials and energy, and are very susceptible to fluctuations in these essential elements. While the economy of the Region is very diversified, a shortage of a key production factor, such as fuel, may have a cascading effect that influences the transport of raw materials, production output and distribution, or consumer demands. An example of this dependence on adequate energy supplies was the temporary decline in recreational facilities usage in the northern part of the Basin as a result of the recent fuel shortage. With the concentrations of the people in the southern portions of the Basin and high quality recreational resources in the northern part, a great geographical disparity between supply and demand exists. If the transportation linkage is severed, both regions suffer greatly. The environmental and economic implications of this disparity are extremely important.

The metropolitan complexes in the southern end of the Region have also greatly accelerated the competition for land resource development. The southern portion of the Region contains the best agricultural land, and due to increased urbanization, thousands of acres of prime agricultural land are converted each year. In addition to this agricultural land conversion, the paving of prime aquifer recharge areas, the filling of prime wetland areas, the development along flood plain areas, and the development on slopes of a steep gradient, all have detrimental environmental impacts.

The large metropolitan industrial complexes discharge significant quantities of nutrients as well as toxic materials to the Great Lakes. Land use activities such as intensive agriculture and forestry operations also frequently contribute significant quantities of both sediment and nutrients as a result of soil removal and precipitation runoff. The Basin's extensive agricultural areas devoted to row crops which require intensive fertilizer, herbicide, and pesticide application also add substantial chemical pollution to the southern portion of the Lakes. Water quality may also be degraded by the removal of foreign matter from the air through precipitation. The degradation of water quality, disruption of ecological relationships, and a deterioration of aesthetic quality, all are significant impacts on the environment of the Great Lakes. These impacts are directly related to the concentration of people and industries and the intensive use of land and water resources.

### 3.2.1.4 Environmental and Transportation Effects

Increasing population in large metropolitan areas has intensified problems of air, water, and noise pollution and other forms of environmental degradation. Forests, streams, swamps, shorelines, wetlands, open space, and scenic areas have been consumed by metropolitan development.

Few cities have found ways to control traffic congestion. Many urban dwellers spend a substantial proportion of their time contending with problems of clogged streets and highways and trying to find parking spaces at their destination. At the same time, declining densities within metropolitan areas have made it difficult to provide efficient, self-supporting public transportation service.

### 3.2.1.5 Rising Land Costs

In most areas of the United States, rapid increases in land costs have accompanied urban growth. Census Bureau surveys of the price of new homes indicate that land values increased about 6 percent annually between 1963 and 1969. The proportion of new home value accounted for by site costs arose from 11 percent in 1949 to 24 percent in 1969. Similarly, site costs of homes financed with FHA-insured loans rose from 17 percent of total value in 1960 to 20 percent in 1970. Inflation in land prices contributed to the 75 percent increase in housing costs during the 1965–1970 period.

Side by side with the problem of restoring the physical environment is the even greater problem of overcoming the ills of the human and social environment. Those ills seem to be accumulating even faster and to be as stubbornly resistant to reversal as environmental ills. As we have seen, these two problems are inextricably related.

### 3.2.2 Impacts of Proposed Framework Programs

Framework programs which are critically important in influencing and maintaining a high quality environment during economic growth of the Basin include: water quality management; water supply, power plant facility and waste discharge management; agricultural land treatment (including erosion control and drainage); forest, recreation, shoreland, flood plain, visual and aesthetic resource management. An environmental rating of plus or minus for these and other Proposed (PRO) Framework solutions is found in Annex 1. The ratings do not attempt to assign relative ranking, but simply indicate a beneficial or adverse impact. The narrative which follows describes major adverse and desirable impacts indicated by the ratings in the Annex 1 display sheet.

The PRO Framework encourages recirculation practices which could reduce municipal and industrial wastewater needing treatment, while at the same time implementing the goals of P.L. 92–500, the Federal Water Pollution Control Act Amendments of 1972. The trend toward regionalized waste treatment portends large plants with large quantities of treated effluent reaching Basin lakes, streams, and/or the Great Lakes. However, by 2020 it is expected that implementation of progressive Federal and State legislation coupled with pollution control management systems will be effective so that there will be minimal effect on the environment in the Great Lakes Basin from municipal and industrial wastewater treatment facilities, except in the event of plant breakdown. The potential adverse effect of plant failure could affect both U.S. and Canadian water quality.

Due to the lack of knowledge regarding kinetics and reaction rates involved in the breakdown of organic and inorganic pollutants, no one can say how long it will actually take to clean up, or flush, the Lakes. It has been demonstrated that complex interactions of sediment, biota, and water occur in the Great Lakes, the net result of which is the storage of vast quantities of undesirable chemical constituents in the sediment and food chain. A reduction in loading rates of these constituents will likely lead to release of the stored material from the Lakes themselves and further delay the achievement of a higher quality of water.

PRO Framework programs to supply industrial, rural, irrigation (cropland and golf courses), and mineral processing water requirements project a major dependence on inland lakes, streams, and ground-water sources. Throughout plan formulation, it was felt that such dependence would not significantly affect base flow or ground-water yield in the Basin. However, increased consumptive losses from these uses may alter stream regimen, affect fish and wildlife resources, decrease water quality, and degrade the aesthetic and recreational values of stream valleys. More detailed assessment of individual withdrawal effects is necessary to be confident of environmental effects. The location of self-supplied industries along the Great Lakes shorelines may have significant environmental effects upon the shorelands. The construction of industrial water supply facilities should endeavor to minimize environmental disruption and encourage environmental repair needed as a result of facility construction and use of water.

In the PRO Framework the Great Lakes are assumed to provide all the water required for cooling condensers in the production of energy. The withdrawals themselves are not judged to have a significant effect upon the quantity or quality of the Lakes. However, the location of power plants along or near the shorelands implies a significant increase in the amount of shoreland allocated to power plant construction with elimination of valuable waterfowl and fish habitat. The dissipation of heated water discharge from thermal power plants will be accomplished in different ways at different sites, but recirculation techniques using cooling towers or other methods may create local fog and even increase precipitation. Heated water discharge into the Great Lakes could have serious localized effects upon wildlife and fishery habitat by increasing the water temperature to unacceptable limits. Other fishery habitat effects include impingement of aquatic animals on the cooling water intake screens, the entrainment of organisms through condensers, and the discharge of chemical cleaning agents into receiving waters. Design improvements may reduce the potentially harmful effects of power plants, and research in this area should be encouraged. By 2020, a major portion of the total energy produced in the Great Lakes Basin may be from nuclear power plants. A potential threat of nuclear accident and radiological contamination of the Lakes requires stringent public health and environmental safeguards to be recommended in the PRO Framework.

The large increase in electrical power demands expected in the Great Lakes Basin will require adequate land for power plant sites and transmission line rights-of-way. The land requirement for thermal plants varies from about 0.09 acres/MW to 0.17 acres/MW, depending on the size and type of plant. For the steam generating capacity projected to be installed in the Great Lakes by 2020, and using the larger land requirement figure, the amount of land required for thermal plants (fossil fuel and nuclear) by 2020 would be about 69,000 acres. Assuming the number of plant sites required is about 150 to 200 and that they are all situated on

the lakeshore, a maximum of about 200 miles of shoreline would be required out of about 4,000 miles of existing mainland shores.

Rights-of-way for single-circuit transmission lines planned by 1980 will require an additional 74,000 acres of land, and those contemplated between 1981–1990 will require another 34,000 acres.

Problems of aesthetics and land loss and disruption result from distribution and transmission lines. However, manufacturers and utilities have developed many new designs and materials which can improve the appearance of these power facilities. Natural, historic, scenic, and recreational values will be adversely affected by the upground location of transmission facilities and related rights-of-way. On the other hand, the "exclusion areas," which comprise a part of the land requirements for nuclear plants, can be utilized for hunting, fishing, and picnicking under existing Federal regulations, and some utilities are building visitor centers at nuclear plant sites, thus encouraging tourism.

With the exceptions of petroleum, natural gas, and a few other resources, mineral reserves within the Great Lakes Basin are adequate to meet projected PRO Framework demands. Historically the Basin has relied on other areas to provide those minerals not accessible within the Great Lakes area, and no future problem is foreseen in continuing this relationship. Mineral-bearing land requirements are projected to grow about nine times by 2020. In addition to the requirements for mineral-bearing lands, certain mineral producers have need of large acreages of land for processing plant sites, ore storage areas, overburden and waste rock dumps, and tailings ponds. Within the Basin, this type of surface land use accounts for much of the land requirements projected for iron ore and all of the requirements projected for copper and zinc-lead.

The field of solid waste management and resource recovery has undergone tremendous technological change in recent years. Not only can many materials such as paper, glass, and ferrous and nonferrous metals be reclaimed and recycled from municipal refuse, but many communities are now looking to garbage or organic materials as possible energy supplies. The use of recycled materials increases energy efficiency in the production of new materials, and it has been demonstrated to reduce air pollution and water resource requirements as well. Obviously, increasing the use of recycled materials reduces the pressure for virgin resource exploitation and the inherent environmental impacts of those activities. Resource recovery programs also reduce the amount of land resources devoted to land filling activities, which in turn reduces the possible contamination of surface-water and ground-water resources. Even in the best-designed sanitary land fill, the potential for leachate contamination of ground-water supplies is still real. Resource recovery programs and waste utilization significantly reduce many of the environmental impacts inherent in materials productions and residual disposal. There is a definite trend towards increasing utilization of waste resources, both within the Great Lakes Region and in other areas of the country.

Although a vast quantity of mineral-bearing land is required to support the projected mineral production, this land will not only yield its mineral wealth, but can also serve useful purposes either before or after mineral extraction. Mineral land would be preserved for use, but prior to the removal of the mineral material, many nondestructive land uses like forestation, recreation, and wildlife habitation can take place on the land surface. The time required for actual mineral production is, in most cases, short, and once the mineral is removed the land can be put to sequential use through modern reclamation and revegetation practices.

The Proposed Framework recommends that a qualitative and quantitative survey of mineral resources be undertaken on any land area before it is devoted to intensive urban development or other irreversible surface uses. The PRO Framework also provides that as a part of planning programs, particularly in urbanizing areas, due consideration be given to the setting aside of land for possible future utilization of nonmineral deposits.

Mining activities (i.e., oil and gas drilling) in the beds of the Great Lakes are determined by State policy for each individual State. This issue was not specifically addressed during the formulation of the Proposed Framework. However, the developments since then (i.e., changes in energy supplies and improved technology for treating oil spills) have prompted more concern. Offshore drilling in the Great Lakes presents possible environmental damages due to unforeseen accidents. Decisions will have to be made on the feasibility of lakebed mining, weighing the environmental consequences and the economic need of oil and gas reserves. First, however, an appraisal of what is available is necessary. The location, extent, and value of mineral deposits in beds of the Great Lakes should be identified in those States where approval has been granted.

Shoreland management programs in the PRO Framework, which are designed to protect and use the shorelands for multiple uses, include a combination of structural and nonstructural measures based upon sound economic analysis and careful environmental evaluations. The design and location of structures to prevent erosion will alter the natural features of Lake shorelines by creating artificial barriers which could disrupt natural sand move-

ment patterns along them. Proper design would be necessary to minimize ecological damage to areas downcurrent from protective works. However, the decision to install structural measures must weigh the adverse environmental impact against economic impacts of allowing erosion to proceed naturally toward a more stable shoreline configuration.

Projected flood damages in the Basin (excluding flooding on the Great Lakes) will be alleviated through a two-pronged approach to flood plain management which includes nonstructural and structural measures.

By 2020 approximately 54 percent of the urban flood damages that could occur and 39 percent of the rural flood damages that could occur in the Basin will be alleviated through structural measures. These measures include reservoir storage, channel modification, levees, flood walls, and other protective works which will significantly disrupt fish and wildlife habitat both in the areas of construction and in flood plain wetlands, oxbow lakes, and other areas that depend on periodic flooding to maintain their productivity. The protection afforded through structural measures could cause an accelerated rate of growth in the flood plain areas, and this must be controlled. Nonstructural measures such as flood plain management and zoning regulations were included in development of the PRO Framework. However, as discussed in Section 3.1.2.2, there may be significant changes that give these measures a more important role than originally projected.

The environmental effects of channel maintenance and selected segmented deepening provided for in the Proposed Framework would be felt in:

(1) the extent of polluted or unpolluted dredged material removed

(2) the negative short-term effect of dredging on water quality and benthic population

(3) the land required for disposal of dredged material (often including valuable fish and wildlife habitat)

(4) the land required for harbor area development stimulated by channel and harbor deepening.

In the PRO Framework programs, millions of cubic yards of sediment material, most of which was classified as polluted in 1969, would be removed from the harbors and safely disposed of in diked areas. Dredged material would also need to be removed from the interlake connections. Each harbor and channel situation is unique, but, generally speaking, the removal of dredged material will probably do no significant harm in the long run to water quality in harbors where navigation takes place. However, deposition of dredged material does degrade waterfowl and wildlife habitat, and care will be taken to locate disposal sites where these habitats will be least affected.

The effects of dredging on aquatic flora and fauna are variable, and site-by-site analysis of impacts will be required to judge their severity. Waterfowl and waterfowl habitat, while important economically, are more important due to their scarcity. The Basin's principal waterfowl areas are: shore and inland marshes of western Lake Erie; Lake St. Clair; Saginaw Bay, Michigan; Green Bay, Wisconsin; inland southern Wisconsin marshes including Horicon; Lake Ontario and St. Lawrence River marshes; St. Marys River; eastern inland Michigan Upper Peninsula marshes; and southwestern Michigan marshes. These areas would need to be protected from on-land disposal practices. Potential adverse environmental effects of the PRO Framework could also lead to disturbance of valuable fish spawning and/or nursery areas, increased temperatures in side channels and associated wetland areas, extended periods of turbulence, and increased gouging of shoreland.

In some places, removal of dredged material may be beneficial to the sedimentary environment. In general, disturbing the sediments does not allow stabilization at bottomland areas, having much the same effect as continual passages of large vessels. Dredging may have adverse effects on fish spawning activity and may disrupt the life cycle of a variety of aquatic flora and fauna. On the other hand, the removal of wastes and pollutants may be beneficial to the harbor environment, if the reintroduction of toxic pollutants to the water column is prevented and particularly if the influx of more pollutants can be reduced through water quality management measures in the PRO Framework.

The U.S. Army Corps of Engineers, in the navigation season extension demonstration program, has studied the environmental effects of ice formation control, hydroelectric power production, protection of structures, shore erosion, waste heat utilization to prevent ice formation, and disruption of island transportation systems in the channels to be kept open.

It is generally felt that more efficient transportation will result from extension of the season through reducing the number of ships carrying ore, investment in the fleet and shore plant, and investment in over-winter inventories. Moderate, early fall season extension, such as that contained in the Proposed Framework, will have a minimal effect upon ice cover and the environment. Ice booms may be moved for transit without great power loss. Shore erosion and structures may be protected by ice anchoring. The problem of island access is solvable.

Although recreational diversity and opportunity is a desirable goal for the Basin, the construction of recreational boating harbors, ramps, and berths

will adversely affect the quality of area waters through gasoline leaks, oil spills, and noxious fumes. More intensive use of existing lakes and streams will burden some already overused resources. The construction of harbor facilities such as piling roads and parking lots and the attendant influx of users will also have significant impact on the environment.

Recreational needs including fishing, hunting, driving for pleasure, and camping will grow dramatically in the Basin. A significant share of the increase in demand will be from nonresidents seeking recreation in the Region. Aesthetic, cultural, and natural resource values could be degraded as a result of inevitable economic pressure to provide accommodations for these visitors. Construction of recreational facilities such as roads and camping areas invites intensive use of the Basin's resources, while increasing the potential for pollution, litter, and wildlife disruption.

Prescribed burning, fire trails and breaks, and dozing and shearing of low yield timber for improved wildlife habitat will temporarily degrade the natural setting in areas throughout the Basin.

The problem for wildlife now and in the future is the number of people. Indications are that the problem will become more complicated and more serious in geometric proportion as population increases. An accelerated rate of attrition of habitat is occurring over most of the Basin. Wetlands, the highest-value habitat, are most affected. Destruction of shore wetlands is proceeding at an alarming rate. In nearly all of the Great Lakes plan areas, the demands for consumptive and nonconsumptive wildlife uses are projected to be at least double the current demand. Considering the fact that the total Basin wildlife demand already exceeds the supply and that the supply in terms of acres of wildlife habitat may be steadily diminished in the future, accommodation of any major increase in the current demand is not at all likely.

### 3.3 Lake Superior Basin

Some 37,500 square miles of land and water surface area constitute the United States portion of the Lake Superior hydrologic area. Some 16,900 square miles of land area, rivers, inland lakes and embayments drain into Lake Superior from the northeastern portion of the Upper Peninsula of Michigan. An additional 20,600 square miles of Lake Superior water surface area are included in the hydrologic areas under study. Figure 3 illustrates the study area, which includes 17 counties, four each in Minnesota and Wisconsin and nine in Michigan.

The Lake Superior study area is divided into two planning subareas numbered 1.1 and 1.2 for reference purposes. The boundaries of these are shown in Figure 3. Isle Royale is considered part of 1.2.

The Proposed (PRO) Framework represents a baseline condition which provides for people's water and related land needs and addresses present and future problems in the Lake Superior basin. The PRO Framework recommends that environmental quality and regional development be given equal emphasis in the Lake Superior basin. This mix will enable growing recreational, aesthetic, and employment needs to be met with a minimum of conflict. The forest-wildland character of the area can be preserved through a continuation of multiple-purpose forest management practices. The high quality of water resources can be assured through progressive water quality management programs and effective enforcement of legislative measures. Moderate industrial and urban growth and economic development should help raise the per capita income of area residents with few potential dangers to the environment, assuming the implementation of effective land use planning.

The PRO Framework's greatest challenge is to improve the Lake Superior basin's lagging economic condition relative to the rest of the Great Lakes Basin and the nation, while insuring wise use and management of its valuable natural resources. A few of the basin problems which the Framework addresses include

(1) economically distressed areas (compared to the rest of the Great Lakes Region)

(2) heavy dependence upon unreliable income sources such as resource extraction industries and seasonal tourist trade

(3) inadequately defined comprehensive land use policies and plans for the future

(4) significant environmental impacts of mining operations

(5) inadequate treatment of municipal and industrial wastewater discharges

(6) inadequate protection and preservation of aesthetic and cultural resources

(7) erosion of red clay—especially in northwest Wisconsin.

Over the past decade, the Lake Superior region has experienced high unemployment and low income. There has been a significant migration of workers out of the region. Total personal income reached over $1,482,000,000 in 1969, with per capita income at $2,660, lagging far behind the Great Lakes average of $3,690. The major economic problems relate to marginal agricultural activity and decline in markets for forestry and mineral products.

The three Lake Superior States, Michigan, Minnesota, and Wisconsin, have only recently established programs requiring counties to adopt shore-

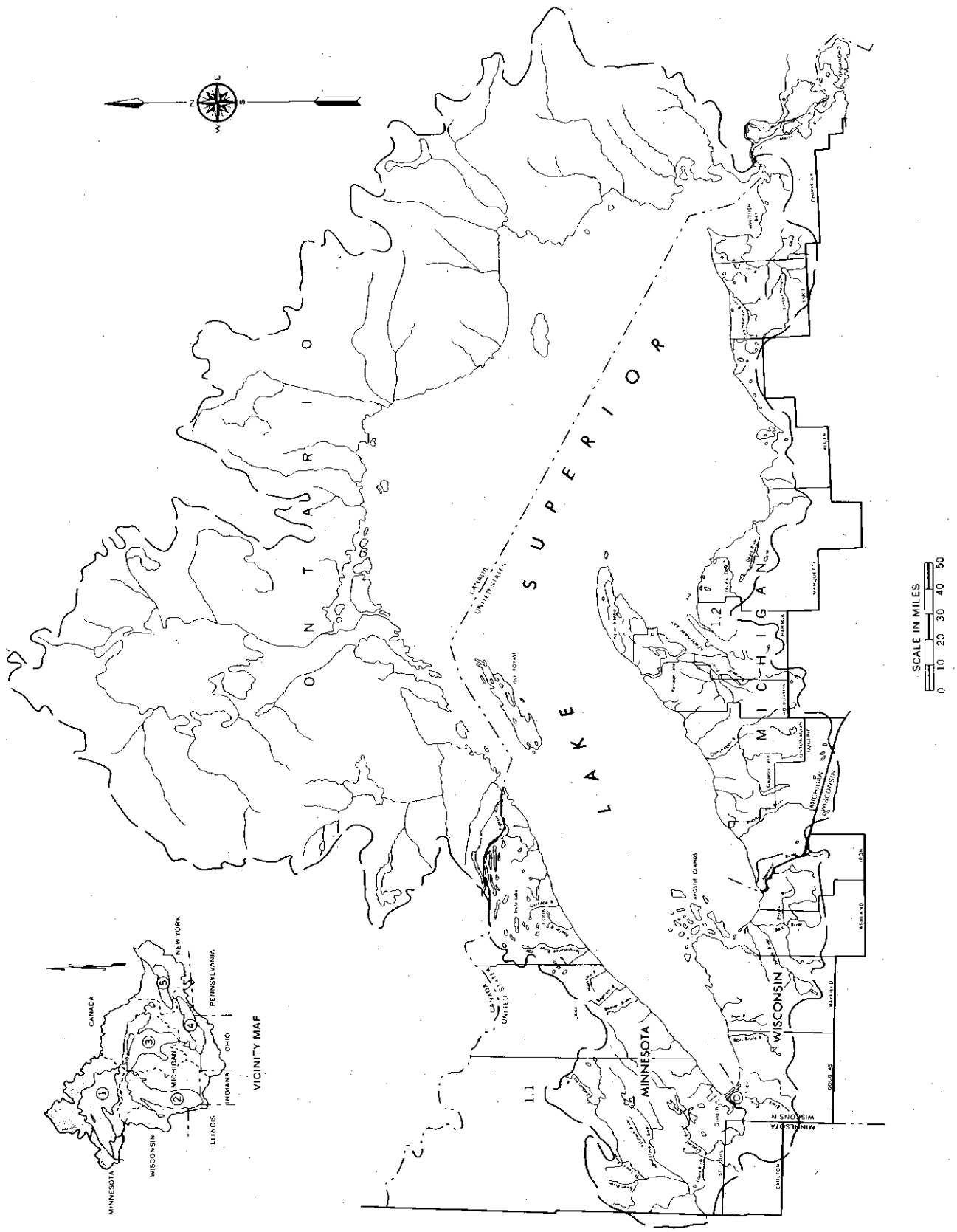



**FIGURE 3 Lake Superior Drainage and Planning Subarea Boundaries**

**TABLE 3 Lake Superior Basin Proposed Framework Programs: Estimated Cost Summary**

| Resource Use Categories | PRO Framework Cost[2] ($ millions) 1970 to 1980 | 1970 to 2000 | 1970 to 2020 |
|---|---|---|---|
| Water Supply[1] | 1.9 | 16.8 | 54.5 |
| Irrigation | 0.3 | 0.9 | 1.6 |
| Mining | 4.9 | 23.9 | 59.8 |
| Thermal Power Cooling | 0 | 58.0 | 193.5 |
| Municipal Wastewater Discharge | 147.6 | 393.7 | 688.5 |
| Sport Fishing | 3.1 | 11.3 | 26.9 |
| Recreational Boating | 35.3 | 103.2 | 197.9 |
| Commercial Navigation | 54.0 | 100.1 | 132.2 |
| Agricultural Land--Treatment | 1.2 | 4.2 | 6.1 |
| --Cropland Drainage | 0 | 0 | 0 |
| Forest Land--Treatment | 72.8 | 231.7 | 399.4 |
| Shoreland Erosion | 4.2 | 14.7 | 28.4 |
| Streambank Erosion | 3.4 | 15.7 | 39.1 |
| Flood Damage Prevention | 4.8 | 8.3 | 10.4 |
| Wildlife Management | 8.7 | 27.9 | 51.9 |
| Outdoor Recreation | 60.8 | 140.2 | 257.6 |

[1]Municipally supplied, self-supplied industrial, and rural domestic and livestock.

[2]Preliminary estimates of capital plus operation, maintenance and replacement costs

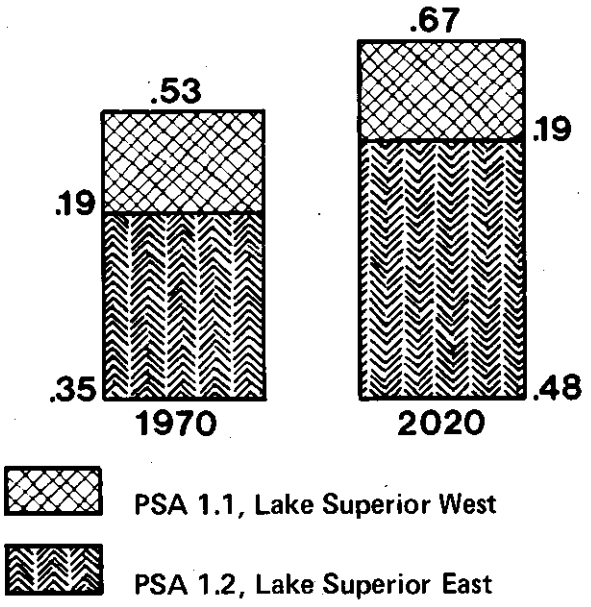
line and flood plain zoning ordinances. There is a need for aggressive implementation of this new legislation at the local level in the Lake Superior basin portions of Michigan, Wisconsin, and Minnesota.

Recreation-oriented weekend traffic reaches considerable proportions in some areas. Imagination and financial investment will be needed to meet the transportation problems. Yet the solution to land transportation problems is not necessarily to build more highways. New management problems have also been created by unequal recreational pressures on the natural resources, particularly on ecologically sensitive areas such as the portions of the Boundary Waters Canoe Area, and by the introduction of new off-the-road vehicles with increased resource impact.

In areas of national recreational significance, such as the Apostle Islands National Lakeshore, Voyageurs National Park, Grand Portage National Monument, Pictured Rocks National Recreation Area, Big-Sea-Water Recreation Area, and others, acquisition and development have been slow because of lack of funding.

A major problem is maintenance of a viable economy with a high level of environmental quality. The numerous financial constraints on public funds available for water and related land resources development have made this problem even greater. Established national priorities have necessarily had considerable influence on planning for these resources.

The Proposed Framework evaluated more than 90 structural and nonstructural programs to meet future needs and solve basin problems. Projected year 2020 costs of program accomplishments in the Proposed Framework are found in Table 3. A few major programs include




**NOTE: Figures may not add due to rounding.**

**FIGURE 4 Population Growth in the Lake Superior Region (millions)**

(1) water quality management that includes a high level of municipal wastewater treatment for over 67 million gallons every day at an estimated cost of $690 million

(2) provision for an additional 15 million recreation days at a cost of $257.6 million above the 1970 level for the year 2020

(3) provision of land treatment and management on over 5.4 million acres of forest lands at a cost of $400 million.

### 3.3.1 Environmental Impacts

Planning for a slight increase in resident population over the next 50 years in the Lake Superior basin will require the commitment of land and water resources to accommodate their spatial, recreational, economic, and other requirements. However, seasonal influx of nonresidents is estimated to more than double basin population during parts of the year (Figure 4).

States in the Superior basin have no specific policy for directly limiting population growth or distribution in the basin. Projected resource uses are assumed to be consistent with future management programs and no maximum limits have been placed on water or land resources. A summary of significant environmental changes due to growth and Proposed Framework programs is found in Table 4. A display sheet of environmental impacts is found in Annex 1.

The Lake Superior basin could be characterized as having the most "natural" environment of any of the five Great Lakes basins. The basin is over 90 percent forested, has a low population density, has limited industrial, agricultural, and electric power development, and has an abundance of high quality water in inland lakes, streams, and in Lake Superior. Adverse environmental impacts in the Lake Superior basin will, consequently, be more pronounced (and favorable impacts less pronounced) than in the other four Great Lakes basins.

PRO Framework programs which are critically important in influencing and maintaining high quality environment during controlled expansion of the area include: water quality management; mineral and power plant facility management; and forest, recreation, visual and aesthetic resources management.

Water quality programs in the Proposed Framework are based on compliance with the Federal Water Pollution Control Act Amendments of 1972, P.L. 92–500. Implementation of progressive Federal and State legislation coupled with pollution control management systems will be effective to minimize impact on the environment in the Lake Superior basin from municipal and industrial wastewater treatment facilities, except in the event of plant breakdown.

Although no significant increase in the amount of water required for municipal use is projected, over three-quarters of the water needed for that use will be withdrawn from Lake Superior. The only major environmental impact might be associated with the location of the water supply facilities and the construction of a distribution system in major metropolitan centers. Use of Lake Superior shoreline to accommodate water supply plants should be avoided and restoration of land disturbed by the construction of water supply facilities should be required.

PRO Framework programs will supply industrial water through a major dependence upon Lake Superior plus an assumption of major advances in recirculation processes to decrease the amount of water required. Increased recirculation implies increasing consumptive loss of water, but this is considered to have minimal effects on the environment. The location of self-supplied industries along the Lake Superior shoreline should be avoided to minimize the environmental effects upon the shorelands. Environmental disruption resulting from industrial water supply facility construction should be minimized, and environmental repair encouraged.

Use of water for mineral processing over the next fifty years may have a major environmental

**TABLE 4 Significant Environmental Changes Due to Growth and Proposed Framework Programs: Lake Superior Basin**

| Resource Use Category | Units | Base Year (1970) Condition | Projected (2020) Condition | Future Change--Ratio of 2020 to 1970 Condition |
|---|---|---|---|---|
| Water Supply | MGD | 186.5 | 289.2 | 1.5 |
| Irrigation | MGD--Consumption | 10.7 | 38.1 | 3.6 |
| Mining | 1000 Acres Disturbed | 58.7 | 303.2 | 5.2 |
| Thermal Power Cooling | MGD--Cooling Consumption | 4 | 67 | 17 |
| | 1000 Acres of Plants[1] | 0.1 | 2.1 | 21 |
| Municipal Wastewater Discharge | MGD--Effluent Requiring Treatment | 44.7 | 67.3 | 1.5 |
| Sport Fishing | 1000 Angler Days | 7,090 | 10,310 | 1.5 |
| Recreational Boating | 1000 Boat Days | 2,270 | 3,025 | 1.3 |
| Commercial Navigation | Million Tons/Year Accommodated | 79[2] | 179 | 2.3 |
| Agr. Land--Treatment | 1000 Acres | 473[4] | 356 | .75 |
| --Cropland Drainage | 1000 Acres | 117[4] | 0 | 0 |
| Forest Land--Treatment | 1000 Acres | 10,000[4] | 20,000 | 1.0 |
| Shoreland Erosion | Miles Protected by Structures | 5.4 | 34.1 | 6.3 |
| Streambank Erosion | Miles Protected | 13.6 | 485 | 35.7 |
| Flood Damage Prevention | Thousand $ AAD | 978 | 2,816 | 2.9 |
| Wildlife Management | 1000 Acres | 15,506[3] | 16,800 | 1.1 |
| Outdoor Recreation | 1000 Recreation Days | 14,554 | 34,347 | 2.4 |

[1]Assumes maximum land required for plants at .17 acres per megawatt of installed capacity
[2]Estimated from 1970 Great Lakes Basin total
[3]1960 Data
[4]Land requiring treatment-ratio of 2020 to 1970 indicates portion of these needs met

effect on the water and land resources of the basin. Processing of the major mineral resources scattered throughout the western half of the Lake Superior basin will depend upon the Great Lakes and inland lakes and streams for most of the needed water. Construction of water supply intake facilities on Lake Superior for transmission to mineral operations is considered to have a potential serious effect on the natural and aesthetic qualities of the region. Further, the projected dependence upon inland lakes and streams as a source of water for mineral processing has a potential for decreasing flows, or may result in the construction of on-stream impoundments in the basin, which could seriously threaten existing wildlife habitat and fishing resources and decrease the aesthetic qualities of these aquatic resources.

Despite requirements for mineral land reclamation, serious losses of land, natural forest landscape, and visual beauty will result from mineral operations in the basin. Surface mining will destroy natural wildlife habitat which will require many years for reestablishment.

Lake Superior will provide all the water required for cooling condensers in the production of energy in the Lake Superior basin. Although the withdrawals are not judged to have a significant effect upon the quantity or quality of Lake Superior water, the location of power plants along or near the Lake Superior shoreline will significantly increase the amount of shoreland taken up in power plant construction. Heated water discharge from thermal power plants will be dissipated in a variety of ways. Recirculation by use of cooling towers or other methods may create local fog and increase precipitation. Heated water discharge into Lake Superior could have serious effects upon the local wildlife and fishery habitat by increasing the water temperature

to unacceptable limits. Also, by 2020 a major portion of the total energy produced in the Lake Superior basin will be from nuclear power plants. The potential threat of nuclear accident and radiological contamination of Lake Superior, which is a water supply source, requires the implementation of stringent public health and environmental safeguards in the PRO Framework programs.

By 2020 approximately 40 percent of the urban flood damages and 12 percent of the rural flood damages that could occur in the basin will be alleviated through structural measures.

Demands for transportation of freight and bulk commodities during the period to 2020 will require maintenance of channels and harbors for commercial navigation. Dredging, excavation, and intensive harbor use contribute to temporary deterioration of water in localized areas. Regulation plans for Great Lakes water levels, including Lake Superior plans, in effect will require testing over critical water supply sequences to determine adequacy. Studies of prior regulation have concluded that dredging can be delayed or postponed in high water periods when lake levels can be used as a means of maintaining navigation channel depths within the system.

The effects of dredging on aquatic flora and fauna are variable, and site-by-site analysis of impacts will be required to judge their severity. Waterfowl and waterfowl habitat, while important economically, are more important due to their scarcity. The Lake Superior basin's waterfowl area affected is in the St. Marys River. This area would need to be protected from on-land disposal practices. Potential adverse environmental effects of the Proposed Framework could also include changes in lake current and flow patterns that could lead to disturbance of valuable fish spawning and/or nursery areas, and increased gouging of shoreland resources. Sections 3.1 and 3.2 of this statement contain further general discussion of these impacts.

### 3.4 Lake Michigan Basin

The Lake Michigan basin, shown in Figure 5, is the only one of the five Great Lakes basins entirely within the United States. Some 45,560 square miles of land area, rivers, inland lakes, and embayments drain into Lake Michigan from eastern Wisconsin and Illinois, from northwestern Indiana, and from the southern and western regions of Michigan's upper and lower peninsulas, respectively. An additional 22,300 square miles of Lake Michigan itself are included in the hydrologic area under study. The geographical area from which planning data is accumulated covers 50,425 square miles (32,272,400 acres) and includes 86 counties: 43 in Michigan, 6 in Illinois, 10 in Indiana, and 27 in Wisconsin. Despite overlap in the data bases, planning conclusions for the Lake Michigan basin have been reached with appropriate adjustments to reflect the recently completed comprehensive study of the adjacent Upper Mississippi River Basin.

The Proposed Framework recommends that environmental quality and regional development be given equal emphasis in the northern half of the Lake Michigan basin, while development in the southern half be planned with a primary emphasis upon environmental quality. The basinwide framework will aim to rectify degraded environmental conditions while providing for improved employment opportunity with a minimum of conflict. The forest wildland character of the northernmost area can be preserved through a continuation of multiple-purpose forest management practices. High quality water resources can be attained and assured through progressive water quality management programs and effective enforcement of legislative measures. Moderate industrial and urban growth and economic development should help raise the per capita income of northern area residents with few potential dangers to the environment, assuming the implementation of effective land use planning.

Proposed Framework programs to meet needs and solve basin problems are highly diversified and reflect the variations in present resource development and the severity of environmental degradation. Basinwide, the most serious problems include

(1) municipal wastewater discharge
(2) industrial wastewater discharge
(3) land use
(4) shoreland erosion.

Lake Michigan has a number of water quality problems, both local and general. On the general level, nutrients and total dissolved solids build up primarily from sewage, industrial waste, and water runoff from farm, urban, and natural lands. This is accelerating the aging process of the Lake. The growth of algae from these nutrients has caused nuisance conditions in locations on the southern end of Lake Michigan. This problem as well as erosion, sedimentation, thermal inputs, watercraft discharge, and oil spills all tend to degrade the water quality.

Additional waste treatment facilities are needed in Green Bay to reduce waste discharge. Acid mine drainage affects the water quality in the Iron River area. In areas of rapid urban development, such as the Lower Fox River, improved wastewater treatment facilities are needed to meet suitable water quality standards. The Pike and Root River basins are also experiencing water quality impairment due to rapid industrialization.

Except during extreme flood conditions, the City

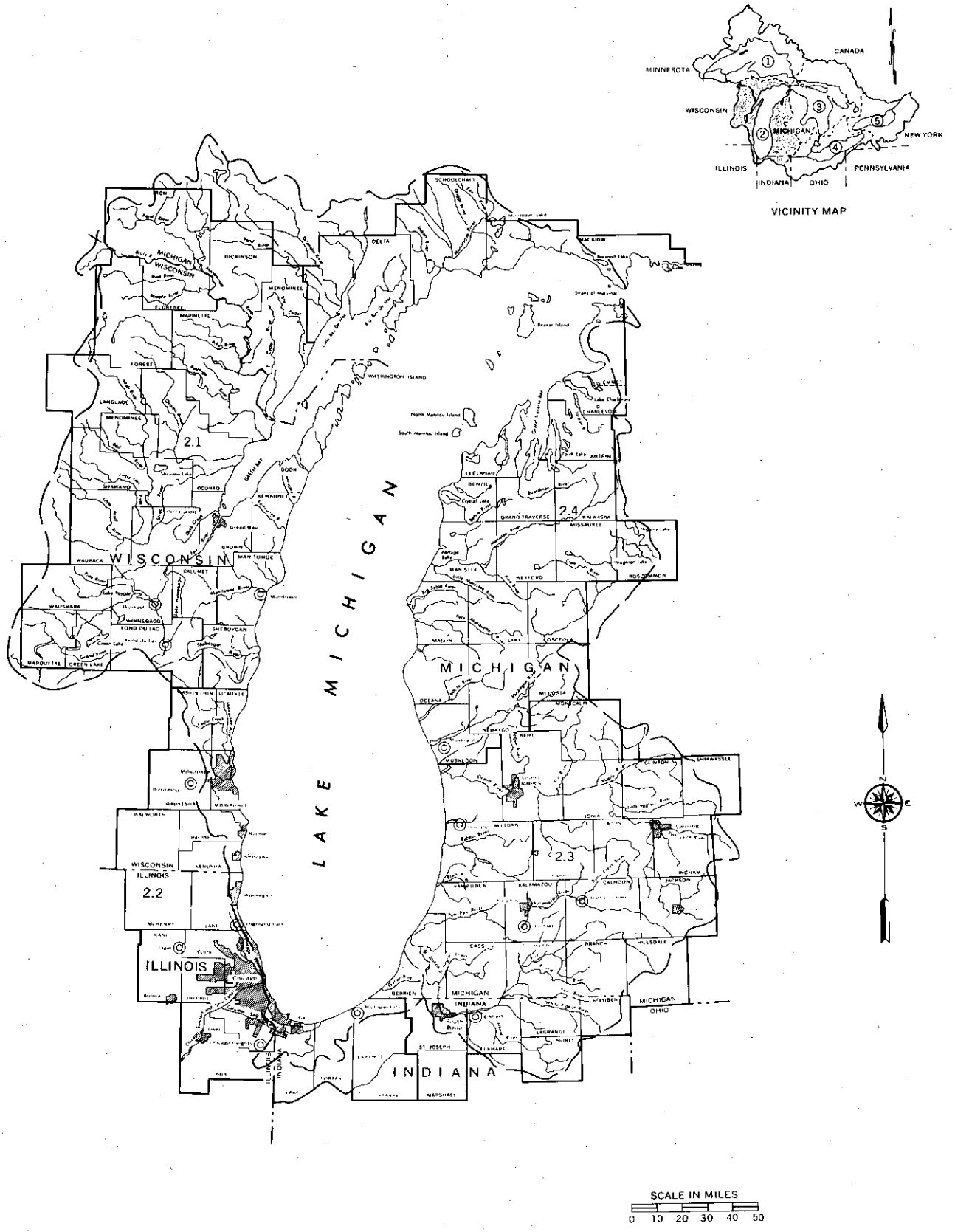



**FIGURE 5 . Lake Michigan Drainage and Planning Subarea Boundaries**

of Chicago and State of Illinois are diverting the natural drainage from about 810 square miles of the Lake Michigan basin into the Illinois River to keep from burdening the Lake with the waste contents of those waters. Under the limitations set up by the U.S. Supreme Court for water diversion from the Lake Michigan watershed by the State of Illinois, total withdrawal is limited to an average of 3,200 cubic feet per second, or 2,068 million gallons per day over a five year accounting period. This includes pumpage for municipal and industrial water supply and diversion for navigation and waste assimilation purposes. Wastewater from the City of Hammond, Indiana, and the area it serves is also occasionally diverted from the Lake Michigan drainage area to the Upper Mississippi River Basin. Milwaukee, Wisconsin, serves areas outside the Great Lakes Basin with Lake Michigan water, but discharges the treated wastewater effluents back into Lake Michigan.

Installation of chlorination facilities in the Elkhart-South Bend area of the St. Joseph River in Indiana has corrected previous bacteriological pollution. The drainage from various rivers into the Grand Traverse Bay has had an adverse effect on the water quality of that area, and several municipalities are installing facilities to improve this condition.

Lake Michigan is the principal source of self-supplied industrial water for large water-using manufacturing establishments along the lakefront. The water use table in Annex 1 reflects the tremendous amount of water used by Indiana and Illinois in Planning Subarea 2.2 for industrial use and the significantly large quantity that Illinois also requires for municipal use. Much of the industrial water is withdrawn for cooling purposes. Heated water discharged into Lake Michigan is an important issue to many groups concerned with the well-being of the Lake ecosystem. Stringent control of temperature differentials can be accomplished through installation of facilities to cool the waters before they are discharged.

Shorelands are classified into 10 shore types, of which Lake Michigan has many. Lake Michigan shorelands provide the greatest number of recreation shoreland miles of any U.S. portion of the Great Lakes, with approximately one-half of the total number so designated.

The 1362-mile shoreline of Lake Michigan lends itself to recreation. Use by local and transient recreationists, in addition to use by agricultural and industrial interests, places a large demand on the resources of the basin. Shore erosion is a major detriment to the quality of use of the shorelands.

Three hundred fifty miles or 26 percent of Lake Michigan shoreline are forested or in woodland use, characteristically in the northern portion of the basin. Although these beautiful forested lands have great aesthetic value, access to them is less developed than access to recreational areas in the southern section of the basin.

Sandy beaches and dunes, especially on the eastern shores of the Lake, present excellent recreation opportunities. With the exception of a certain few areas, good water quality enhances the water-based recreation.

Two hundred forty-five miles or 18 percent of the shoreland are publicly owned, 156 miles of which are Federal, State, and local parks. Most of the shoreline of Chicago is open to public recreation. Specific areas of interest include Indiana Dunes National Lakeshore, various State parks, and Sleeping Bear Dunes National Lakeshore.

Improper land use and management can result in unnecessary and costly flood damages to homes, property, services, and industrial and agricultural production. Flooding may occur at any time, generally as a result of rain and/or snow melt, with the most damaging floods in late winter or early spring.

The Lake Michigan basin suffers average annual flood damages of $3.6 million and $14.1 million in rural and urban areas respectively. Relatively little reduction in total losses has occurred as a result of past flood prevention measures. Flood prevention projects reduce some specific losses, but continued development in flood plains increases total losses. It is startling to note that many small dams built on a local or private basis do little to alleviate flood damages and in some areas actually contribute to flood stages. Some flood plain legislation has been developed to regulate development of flood plains, but it is apparent that more effective management and construction is warranted.

The Proposed Framework evaluated more than 90 structural and nonstructural alternatives to address these severe problems and meet people's basic resource needs. Proposed Framework programs and their costs over the next 50 years are found in Table 5. Some major programs include

(1) water quality management that includes a high level of municipal wastewater treatment for nearly 2.2 billion gallons per day

(2) shoreland erosion protection on 130 miles of severely eroding Lake Michigan shorelines

(3) provision for an additional 60 million recreation day opportunities beyond the 1970 level for the year 2020

(4) provision for increased channel and selected harbor depths from 27 to 31 feet to support future waterborne commerce

(5) provision for accelerated agricultural and forest land treatment on about 18 million acres.

**TABLE 5 Lake Michigan Basin Proposed Framework Programs: Estimated Cost Summary**

| Resource Use Categories | PRO Framework Cost[2] ($ millions) 1970 to 1980 | 1970 to 2000 | 1970 to 2020 |
|---|---|---|---|
| Water Supply[1] | 243.8 | 1,400.2 | 3,942.5 |
| Irrigation | 11.5 | 29.9 | 54.3 |
| Mining | 1.4 | 10.4 | 33.8 |
| Thermal Power Cooling | 138.9 | 989.4 | 2,946.1 |
| Municipal Wastewater Discharge | 2,024.7 | 5,750.4 | 11,151.2 |
| Sport Fishing | 22.8 | 51.2 | 92.6 |
| Recreational Boating | 119.0 | 450.4 | 875.7 |
| Commercial Navigation | 50.6 | 261.7 | 348.1 |
| Agricultural Land--Treatment | 60.5 | 183.6 | 270.9 |
| --Cropland Drainage | 43.3 | 118.0 | 172.4 |
| Forest Land--Treatment | 56.3 | 180.8 | 313.0 |
| Shoreland Erosion | 14.6 | 51.8 | 99.7 |
| Streambank Erosion | 7.4 | 34.0 | 85.3 |
| Flood Damage Prevention | 161.9 | 194.0 | 227.4 |
| Wildlife Management | 34.9 | 93.1 | 144.7 |
| Outdoor Recreation | 264.7 | 836.5 | 1,593.7 |

[1]Municipally supplied, self-supplied industrial, and rural domestic and livestock.

[2]Preliminary estimates of capital plus operation, maintenance and replacement costs.

### 3.4.1 Environmental Impacts

The Lake Michigan region had the highest population in the five individual Lake regions in 1970, with about 46 percent of the Great Lakes total. The Proposed Framework aims to meet future resource needs of a resident population projected to grow from 13.5 million to 24.8 million by 2020 (Figure 6).

A key factor for future environmental planning in the Lake Michigan basin is the distinct north-south contrast in the environment and population distribution. The southern half of the basin (River Basin Groups 2.2 and 2.3) is highly urbanized and also highly diversified in agricultural activities. The northern half of the basin (River Basin Groups 2.1 and 2.4) is more suited to recreation. Nonresidents and part-time residents significantly increase the population of the northern portion during the hunting and vacation seasons. Better means of transportation and rising incomes have increased resort and second-home seasonal land use. It is projected that urban built-up areas will gain primarily at the expense of cropland in the south. The environmental effects resulting from land use changes are many and complex. Unfortunately, data on current land use and management activities in the region are not uniformly reliable. As urban areas expand, as new seasonal facilities in the northern portion of the basin develop, and as pressures on the additional developments along the shoreline intensify in the future, more governmental units will be faced with a need for land use plans or revision of existing plans to prevent environmental degradation. A summary of significant environmental changes due to future growth projections and Framework programs is given in Table 6.

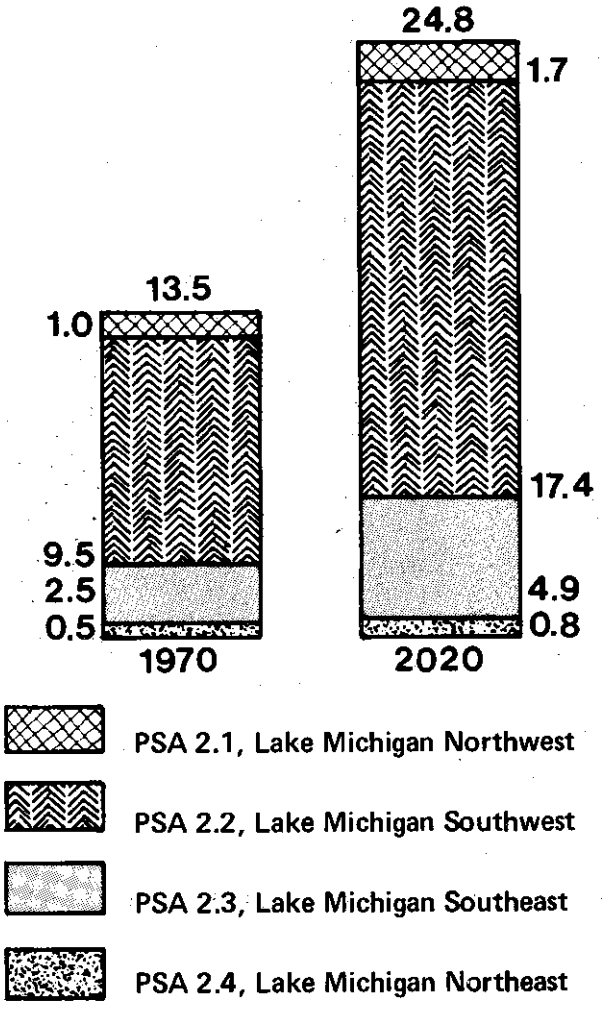



**FIGURE 6 Population Growth in the Lake Michigan Region (millions)**

Framework programs which are critically important in influencing and maintaining high quality environment during controlled expansion of the area include: water quality management; water supply, power plant facility, and waste discharge management; and forest, recreation, visual and aesthetic resource management. An environmental rating of these and other Proposed Framework solutions is found in Annex 1.

The narrative that follows describes major adverse and desirable impacts indicated by the ratings in the Lake Michigan display sheet in Annex 1.

Water quality programs in the Proposed Framework are based on compliance with the Federal Water Pollution Control Act Amendments of 1972, P. L. 92–500.

Implementation of progressive Federal and State legislation coupled with pollution control management systems will effectively minimize impact on the environment in the Lake Michigan basin from municipal and industrial wastewater treatment facilities, except in the event of plant breakdown.

Framework programs to supply rural, irrigation (cropland and golf courses), and mineral water requirements project a major dependence on inland lakes, streams, and ground-water sources. Throughout plan formulation, it was felt that such dependence would not significantly affect base flow or ground-water yield in the basin. However, increased consumptive losses from these uses may alter stream regimen and affect fish and wildlife resources, decrease water quality, and degrade aesthetic and recreational values of stream valleys. More detailed assessment of individual withdrawal effects is necessary to be confident of environmental effects. The location of self-supplied industries along the Lake Michigan shoreline should be avoided to minimize the environmental effects upon the shorelands. Environmental disruption resulting from industrial water supply facility construction should be minimized, and environmental repair encouraged.

In the Proposed Framework, Lake Michigan will provide all the basin's water requirements for cooling condensers in the production of energy. The withdrawals themselves are not judged to have a significant effect upon the quantity or quality of Lake Michigan. However, the location of power plants along or near the Lake Michigan shoreline implies a significant increase in the amount of shoreland allocated to power plant construction, with potential for elimination of valuable waterfowl and fish habitat. Further, the dissipation of heated water discharge from thermal power plants will be accomplished in a variety of ways. Recirculation techniques using cooling towers or other methods may create local fog and increase precipitation. The effects of heated water discharge into Lake Michigan could have serious localized effects upon wildlife and fishery habitat by increasing the water temperature to unacceptable limits. Further, by 2020 a major portion of the total energy produced in the Lake Michigan basin will be from nuclear power plants. Since Lake Michigan is a water supply source, the potential threat of nuclear accident and radiological contamination of the Lake requires stringent public health and environmental safeguards to be recommended in the PRO Framework programs. A pumped storage hydroelectric power plant, recently constructed at Ludington, Michigan, in River Basin Group 2.4, is the largest in the world. The plant is designed to generate power by gravity flow of water from a large upper reservoir (1.3 square miles surface area with 27 billion gallon

**TABLE 6 Significant Environmental Changes Due to Growth and Proposed Framework Programs: Lake Michigan Basin**

| Resource Use Category | Units | Base Year (1970) Condition | Projected (2020) Condition | Future Change--Ratio of 2020 to 1970 Condition |
|---|---|---|---|---|
| Water Supply | MGD | 7,954.2 | 15,452 | 1.9 |
| Irrigation | MGD--Consumption | 363 | 1,340 | 3.7 |
| Mining | 1000 Acres Disturbed | 2.6 | 124.3 | 47.8 |
| Thermal Power Cooling | MGD--Cooling Consumption | 44 | 953 | 22 |
| | 1000 Acres of Plants[1] | 1.8 | 28.9 | 16.1 |
| Municipal Wastewater Discharge | MGD--Effluent Requiring Treatment | 686 | 2,170 | 3.2 |
| Sport Fishing | 1000 Angler Days | 27,700 | 56,200 | 2.0 |
| Recreational Boating | 1000 Boat Days | 12,800 | 17,540 | 1.4 |
| Commercial Navigation | Million Tons/Year Accommodated | 88[2] | 197 | 2.2 |
| Agr. Land--Treatment | 1000 Acres | 8,950[4] | 6,140 | .69 |
| --Cropland Drainage | 1000 Acres | 1,520[4] | 958 | .63 |
| Forest Land--Treatment | 1000 Acres | 9,050[4] | 6,530 | .72 |
| Shoreland Erosion | Miles Protected by Structures | 162 | 292 | 1.8 |
| Streambank Erosion | Miles Protected | 130.6 | 1,151 | 8.8 |
| Flood Damage Prevention | Thousand $ AAD | 17,670 | 97,220 | 5.5 |
| Wildlife Management | 1000 Acres | 28,520[3] | 31,080 | 1.1 |
| Outdoor Recreation | 1000 Recreation Days | 298,237 | 874,384 | 2.9 |

[1]Assumes maximum land required for plants at .17 acres per megawatt of installed capacity
[2]Estimated from 1970 Great Lakes Basin total
[3]1960 data
[4]Land requiring treatment-ratio of 2020 to 1970 indicates portion of these needs met

capacity) through a power station on the Lake Michigan shore to the Lake. Water is withdrawn from and returned to the Lake through six steel tubes (penstocks). Loss of natural land area at the plant site, potential fish kills at plant intakes, and some loss of aesthetic and recreational values of the shoreland area are issues of concern. However, some recreational and other environmental mitigation has been undertaken at the project.

Further problems of aesthetics, land loss, and disruption come from overhead transmission and distribution lines. Manufacturers and utilities have developed many new designs and materials which can improve the appearance of these power facilities. However, natural, historic, scenic, and recreational values will be adversely affected by the upground location of transmission facilities and related rights-of-way.

By 2020, approximately 43 percent of the urban flood damages that could occur and 19 percent of the rural flood damages that could occur in the basin will be alleviated through structural measures.

Navigation improvements, which will be required in anticipation of increased area productivity and transportation, will include deepening from 27 to 31 feet in channels and in Escanaba, Chicago, Milwaukee, and Indiana harbors and six-week navigation season extension. Dredging, excavation, and intensive harbor use will contribute to a deterioration of the water quality in local segments of Lake Michigan for short periods of time. In the long term, however, dredging will remove polluted bottom materials from the aquatic medium and may improve water quality if reintroduction of toxic pollutants to the water column is prevented.

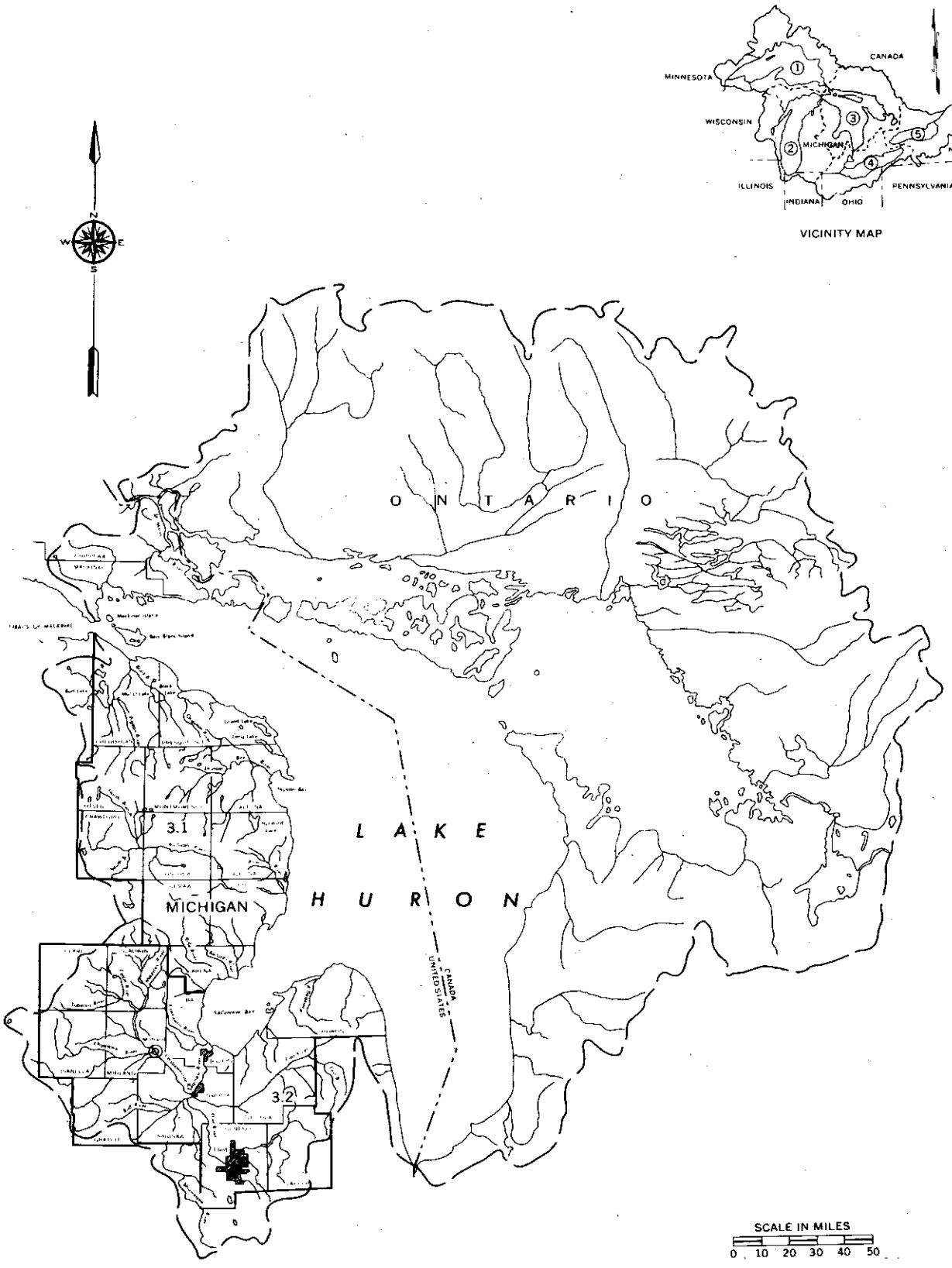



**FIGURE 7 Lake Huron Drainage and Planning Subarea Boundaries**

Larger ships will require fewer trips, and tonnages and facilities will increase. However, potential threats of major oil spills and other vessel discharges will be intensified. Sections 3.1 and 3.2 of this statement contain further general discussion of these impacts.

### 3.5 Lake Huron Basin

Some 25,300 square miles (16,192,000 acres) of land and water surface area constitute the United States portion of the Lake Huron hydrologic area. Some 16,200 square miles (10,368,000 acres) of Michigan land area, rivers, inland lakes, and embayments drain into Lake Huron. An additional 9,100 square miles (5,824,000 acres) of Lake Huron itself are included in the hydrologic area under study. The geographical area which the Proposed Framework addresses includes 22 Michigan counties (Figure 7). Chippewa and Mackinac Counties, which border the northern edge of Lake Huron, and Sanilac and part of St. Clair Counties, which border the southwestern edge of the Lake, are included for planning purposes in other Lake basins.

The Proposed Framework recommends that environmental quality and regional development objectives be given equal emphasis in the Lake Huron basin. This mix will enable growing recreational, aesthetic, and employment needs to be met with a minimum of conflict. The forest-wildland character of the northernmost area can be preserved through a continuation of multiple-purpose forest management practices. High quality water resources can be assured through progressive water quality management programs and effective enforcement of legislative measures. Moderate industrial and urban growth and economic development should help raise the per capita income of area residents with few potential dangers to the environment, assuming the implementation of effective land use planning.

The Proposed Framework provides for present and future resource needs and offers solutions to resource problems facing residents of the Lake Huron basin. Some of the most serious problems are

(1) pollution from cities
(2) pollution from industries
(3) inadequate land use planning
(4) sedimentation.

Further areas of major concern include flooding problems, economic growth, recreational opportunities, and other water-related resource uses.

Planning Subarea 3.1, which incorporates the more northerly of the two river basin groups draining into Lake Huron, faces a number of major problems in adjusting to the economic change which has taken place there over the last 30 years. Agriculture has declined to the point where it no longer dominates the economy, while the extractive industries have failed to provide a significant number of new jobs. This deficiency, however, has been offset to some degree by increased employment in wholesale and retail trade, public administration, business and services, and miscellaneous industries. These increases are partly attributable to increased manufacturing, but growth in the tourist trade has probably been an equally important factor.

Population growth in the Lake Huron plan area has likewise fallen below State and national trends. Population growth and economic growth are, in fact, highly interdependent processes. Among certain segments of the area's population, unemployment and underemployment are high and educational level is low. Immigration of retirees into the area is high, while vocational education facilities are inadequate.

Problems in land use, particularly in the shoreline areas, are increasing because of the influx of seasonal residents, speculative land development, and mining activities. Some of these land use problems are acute at the present time, and indications are that they will grow to be of major concern in the future.

Water quality problems, although localized, are present throughout the Lake Huron basin. A number of localized reaches in Planning Subarea 3.1 are subject to pollution from discharge of effluent from primary treatment plants, discharge of industrial waste, and discharge of untreated and partially treated sewage. Such conditions are found in portions of the Pine, Rifle, Au Sable, Thunder Bay, and Cheboygan Rivers.

Water quality in the Au Gres and Tawas Rivers is generally good with the exception of localized bacteriological problems due to the discharge of untreated and partially treated sewage and effluent from primary sewage plants. Algal blooms are common occurrences in these areas.

Water in the Saginaw River (Planning Subarea 3.2) is of substandard quality throughout its entire length. Tributary inflows contribute sizeable waste loads, especially chlorides and nutrients. The Flint River waters are degraded by eight municipal and institutional wastewater treatment facilities and nine industrial establishments. Above the City of Flint's wastewater treatment plant, the river is degraded by storm water overflows, tributary waste loads, and untreated or partially treated sewage discharges from outlying townships. The other rivers in the basin all have reaches of substandard quality due to quantities of dissolved

**TABLE 7 Lake Huron Basin Proposed Framework Programs: Estimated Cost Summary**

| Resource Use Categories | PRO Framework Cost[2] ($ millions) 1970 to 1980 | 1970 to 2000 | 1970 to 2020 |
|---|---|---|---|
| Water Supply[1] | 40.1 | 314.4 | 985.5 |
| Irrigation | 2.6 | 5.5 | 10.0 |
| Mining | 1.3 | 8.8 | 25.2 |
| Thermal Power Cooling | 49.7 | 418.6 | 1,289.4 |
| Municipal Wastewater Discharge | 406.3 | 1,131.0 | 2,136.9 |
| Sport Fishing | 3.8 | 14.2 | 35.7 |
| Recreational Boating | 37.9 | 122.3 | 269.3 |
| Commercial Navigation | 85.0 | 575.0 | 793.0 |
| Agricultural Land--Treatment | 17.3 | 52.3 | 77.3 |
| --Cropland Drainage | 14.6 | 41.0 | 60.4 |
| Forest Land--Treatment | 16.4 | 54.0 | 94.8 |
| Shoreland Erosion | 1.3 | 4.9 | 9.6 |
| Streambank Erosion | 4.6 | 21.0 | 52.2 |
| Flood Damage Prevention | 27.7 | 49.5 | 86.1 |
| Wildlife Management | 29.2 | 82.2 | 115.4 |
| Outdoor Recreation | 49.6 | 172.6 | 368.3 |

[1]Municipally supplied, self-supplied industrial, and rural domestic and livestock.

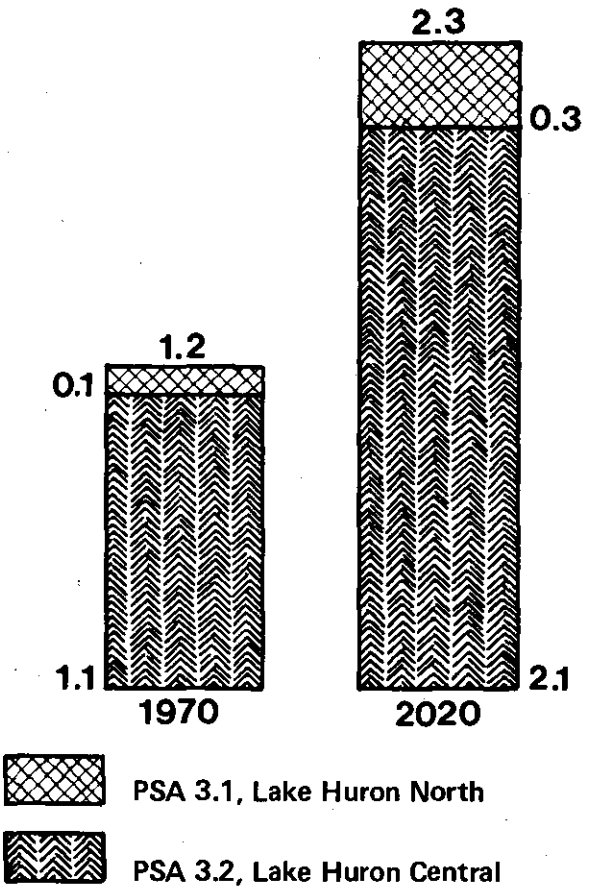
[2]Preliminary estimates of capital plus operation, maintenance and replacement costs.

solids, septic tank discharges, or industrial and agricultural waste discharges.

Streambank erosion and the resulting sediment are moderately severe in this Lake basin. There are over 1700 miles of streambank that are subject to some erosion.

Flood problems occur in the Lake Huron basin, even though many of its rivers and drainage basins are small. In the upper portion of the Lake basin, flood problems are relatively minor, occurring chiefly on farm lands, power facilities, and secondary roads and their drainage structures. The lower part of the Lake basin experiences more severe flooding by comparison, mainly in the Kawkawlin River basin, where it occurs in residential areas along both banks from Saginaw Bay to about 2.5 miles upstream and on the crop areas located along the upper reach of the main stem and the lower reaches of the two branches of the Kawkawlin River. A steady demand in land development for residential purposes has taken place near the mouth of the Kawkawlin River. The growth trend shows no sign of abating.

Wildlife habitat in the Lake Huron basin is diverse. It includes the northern forests, active and fallow cropland, and some of the most valuable waterfowl marsh in the State of Michigan. Urban areas comprise a significant portion of the area in the lower portion of the basin and they have seriously degraded some of the wildlife habitat. Changes in forest succession are occurring to some extent, and loss and degradation of wetland habitat around Saginaw Bay are among the most critical wildlife resource problems. The Saginaw Bay and its extensive marsh complex is a nationally known waterfowl concentration area which is endangered




**NOTE: Figures may not add due to rounding.**

**FIGURE 8 Population Growth in the Lake Huron Region (millions)**

by the construction of a small boat channel, docks, and other marine facilities in the marsh area. The Proposed Framework evaluated more than 90 structural and nonstructural programs and types of solutions to meet future needs and solve basin problems. Projected year 2020 costs of program accomplishments in the Proposed Framework are found in Table 7. A few major programs include

(1) water quality management that includes a high level of municipal wastewater treatment for over 263 million gallons per day at an estimated cost of $694 million

(2) provision for an additional 17 million recreation days at a cost of $368 million beyond the 1970 level for the year 2020.

(3) provision of land treatment and management on nearly 1.3 million acres of forest and agricultural lands at a cost of $428 million

(4) provision for wildlife management measures at a cost of $115 million

(5) shoreland erosion protection on eight miles of severely eroding areas at a cost of $9.6 million.

### 3.5.1 Environmental Impacts

The estimated doubling of resident population in the Lake Huron basin over the next 50 years will require the planned commitment of land and water resources to accommodate their spatial, recreational, economic, and other needs (Figure 8). Seasonal influx of nonresidents, particularly in the northern half of the basin, will place a further burden on area resources.

Michigan has no specific policy for directly limiting population growth or distribution in the basin. Projected resource uses are assumed to be consistent with future management programs and no maximum limits have been placed on water or land resources. A summary of significant environmental changes due to future growth and Proposed Framework programs is found in Table 8.

The Lake Huron basin is characterized by striking contrasts between the northernmost environment (River Basin Group 3.1) and its southernmost environment (River Basin Group 3.2). The northern half of the basin is more than 72 percent forested, is sparsely populated with about five percent of the area urbanized, and supports limited manufacturing and industrial development. Historically, the area has been well suited for recreation as indicated by the approximately 20,700 seasonal vacation homes in the area. The highest concentration of these homes is in the counties adjacent to Lake Huron and in the counties with a large number of inland lakes. In addition to these seasonal vacation residents, thousands of tourists come to the area each year for recreation.

In contrast, River Basin Group 3.2 has a modern economy which is focused on intensive, heavy manufacturing around Flint and Saginaw. Most of the manufacturing activity is concentrated in the urban areas of Genesee, Saginaw, and Bay Counties. Midland County is the center of one of the largest chemical industries in the United States. For the most part, the population is centered in these four counties. Economic activity in most of the other counties in the southern portion of the basin depend on the prime agricultural land in the "thumb" area and the western part of the planning subarea. Fifty-four percent of the land in RBG 3.2 is cropland, and 27 percent is forested.

Proposed Framework programs that are critically important in influencing and maintaining high quality environment during controlled expansion of the area include: water quality management; water supply, power plant facility, and waste discharge management; and forest, recreation, visual and aesthetic resource management. An environmental rating of these and other PRO Framework solutions is found in Annex 1.

The narrative which follows describes major ad-

**TABLE 8 Significant Environmental Changes Due to Growth and Proposed Framework Programs: Lake Huron Basin**

| Resource Use Category | Units | Base Year (1970) Condition | Projected (2020) Condition | Future Change--Ratio of 2020 to 1970 Condition |
|---|---|---|---|---|
| Water Supply | MGD | 711.9 | 1,850.4 | 2.6 |
| Irrigation | MGD--Consumption | 23.3 | 233.3 | 10.0 |
| Mining | 1000 Acres Disturbed | 1.1 | 33.1 | 30.1 |
| Thermal Power Cooling | MGD--Cooling Consumption | 6 | 385 | 64 |
| | 1000 Acres of Plants[1] | .2 | 11.5 | 57.5 |
| Municipal Wastewater Discharge | MGD--Effluent Requiring Treatment | 85 | 263 | 3.1 |
| Sport Fishing | 1000 Angler Days | 6,140 | 13,650 | 2.2 |
| Recreational Boating | 1000 Boat Days | 3,800 | 5,538 | 1.5 |
| Commercial Navigation | Million Tons/Year Accommodated | 22[2] | 58.2 | 2.6 |
| Agr. Land--Treatment | 1000 Acres | 2,050[4] | 1,750 | .85 |
| --Cropland Drainage | 1000 Acres | 572[4] | 305 | .53 |
| Forest Land--Treatment | 1000 Acres | 2,810[4] | 1,720 | .61 |
| Shoreland Erosion | Miles Protected by Structures | 0 | 8 | |
| Streambank Erosion | Miles Protected | 49.9 | 676 | 13.5 |
| Flood Damage Prevention | Thousand $ AAD | 1,732 | 5,022 | 2.9 |
| Wildlife Management | 1000 Acres | 7,690[3] | 7,886 | 1.0 |
| Outdoor Recreation | 1000 Recreation Days | 38,897 | 116,034 | 3.0 |

[1]Assumes maximum land required for plants at .17 acres per megawatt of installed capacity
[2]Estimated from 1970 Great Lakes Basin total
[3]1960 Data
[4]Land requiring treatment-ratio of 2020 to 1970 indicates portion of needs met

verse and desirable impacts indicated by the Lake Huron display summary in Annex 1.

Water quality programs in the PRO Framework are based on compliance with the Federal Water Pollution Control Act Amendments of 1972, P.L. 92-500.

Implementation of progressive Federal and State legislation coupled with pollution control management systems will be effective to minimize impact on the environment in the Lake Huron basin from municipal and industrial wastewater treatment facilities, except in the event of plant breakdown.

PRO Framework programs to supply industrial, irrigation (cropland and golf courses), and mineral water requirements assumed a major dependence on inland lakes, streams, and ground-water sources. Throughout plan formulation, it was felt that such dependence would not significantly affect base flow or ground-water yield in the basin. However, increased consumptive losses from these uses may alter stream regimen and affect fish and wildlife resources, decrease water quality, and degrade aesthetic and recreational values of stream valleys. More detailed assessment of individual withdrawal effects is necessary to be confident of environmental effects. The location of self-supplied industries along the Lake Huron shoreline should be avoided to minimize the environmental effects upon shorelands. Environmental disruption as a result of water supply facility construction and water use should be minimized, and environmental repair should be encouraged.

Lake Huron will provide all the water required for cooling condensers in the production of energy in the Lake Huron basin. The withdrawals them-

selves are not judged to have a significant effect upon the quantity or quality of Lake Huron. However, power plant development along or near the Lake Huron shoreline will increase the amount of shoreland allocated to power plant construction, with resultant wildlife habitat losses, which could be especially important in Saginaw Bay. It is anticipated that the dissipation of heated water discharge from thermal power plants will be accomplished in a variety of ways on a site-by-site basis. Recirculation techniques using cooling towers or other methods may create local fog and even increase precipitation. The effects of heated water discharge into Lake Huron could have serious localized effects upon wildlife and fishery habitat by increasing the water temperature to unacceptable limits. Further, by 2020 a major portion of the total energy produced in the Lake Huron basin will be from nuclear power plants. A potential threat of nuclear accident and radiological contamination of Lake Huron, a water supply source, requires stringent public health and environmental safeguards to be recommended in the PRO Framework programs.

By 2020, approximately 37 percent of the urban flood damages that could occur and 65 percent of the rural flood damages that could occur in the basin will be alleviated through structural measures.

Navigation programs required to maintain waterborne commerce resulting from increased area productivity include maintenance dredging to a 27-foot depth in channels and selected harbors in the basin and six-week navigation season extension. Dredging, excavation, and intensive harbor use will contribute to a deterioration of the water quality in local areas, particularly in segments of Saginaw Bay and the Saginaw River, for short periods of time. In the long term, however, dredging will remove polluted bottom materials from the aquatic medium and can improve water quality. Larger ships will require fewer trips, and tonnages and facilities will increase. However, threats of major oil spills and other vessel discharges will be intensified.

Sections 3.1 and 3.2 contain additional general discussion of these impacts.

Recreational needs including fishing, hunting, driving for pleasure, and camping will grow dramatically in the basin. A major share of the increase in demand will occur in RBG 3.1 and will be due to nonresidents seeking recreation in the region. Visual diversity and cultural and natural resources values could be degraded as a result of inevitable economic pressure to provide accommodations for these visitors. Construction of recreational facilities invites intensive use of the basin's resource, while increasing the potential for pollution, litter, and wildlife disruption.

### 3.6 Lake Erie Basin

The United States portion of the Lake Erie basin covers some 25,000 square miles of land and water surface area, including Lake Erie itself. The geographical area which the Proposed (PRO) Framework addresses encompasses 45 counties in Michigan, Indiana, Ohio, Pennsylvania, and New York (Figure 9).

The PRO Framework for the Lake Erie basin meets a mixture of planning objectives by recommending programs which give primary emphasis to environmental quality and resource conservation while maintaining national economic efficiency through governmental investment and guidance to private investment. The PRO Framework aims to rectify and prevent degraded water and land conditions while improving employment opportunities with minimum conflict.

The PRO Framework provides for people's water and related land needs, develops resource opportunities, and solves present and future problems in the Lake Erie basin. The Framework's greatest challenge is to provide for the basic needs of a rapidly urbanizing area while, conserving and planning for wise use of the basin's unique natural resources. Among the most significant problems in the Lake Erie basin which the PRO Framework addresses are inadequacies in

(1) land-based recreation
(2) water-based recreation
(3) flood protection
(4) water quality protection
(5) aesthetic and cultural opportunities.

Lakes Huron and Erie furnish this basin's residents with drinking water, and Lake Erie receives their wastes. More than 5.4 billion gallons of municipal and industrial wastewater reach Lake Erie each day. Other less concentrated wastes also reach Lake Erie in large volumes each day. Treatment of this waste is not adequate at the present time. The tremendous task of treating present waste loads remains to be accomplished, and further increased waste loads for the Lake Erie aquatic system are expected in the future.

Present land use patterns are associated with many of the water and related land resources problems. If present land use trends continue, these problems will become even more severe in the future.

Tributary streams annually contribute nearly 2.5 million tons of sediment to Lake Erie. Sheet erosion, primarily from agricultural and urban lands, accounts for over 98 percent of the problem. The

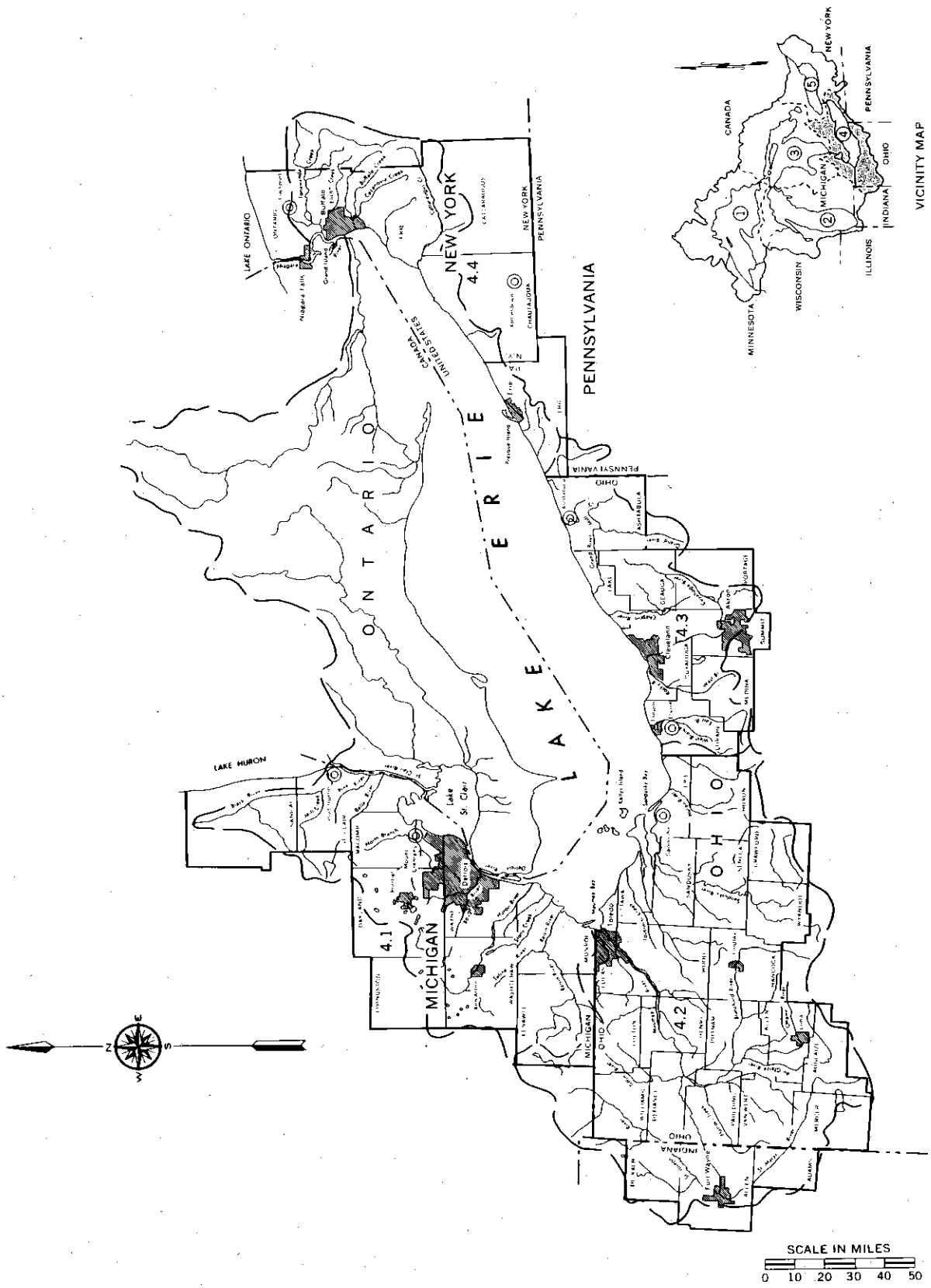



**FIGURE 9 Lake Erie Drainage and Planning Subarea Boundaries**

**TABLE 9 Lake Erie Basin Proposed Framework Programs: Estimated Cost Summary**

| Resource Use Categories | PRO Framework Cost[2] ($ millions) 1970 to 1980 | 1970 to 2000 | 1970 to 2020 |
|---|---|---|---|
| Water Supply[1] | 415.3 | 1,691.8 | 4,195.4 |
| Irrigation | 7.3 | 16.1 | 30.7 |
| Mining | 5.1 | 36.6 | 106.2 |
| Thermal Power Cooling | 0 | 478.1 | 1,712.4 |
| Municipal Wastewater Discharge | 4,575.7 | 11,411.9 | 21,653.3 |
| Sport Fishing | 40.3 | 63.9 | 96.9 |
| Recreational Boating | 99.7 | 363.2 | 684.6 |
| Commercial Navigation | 60.0 | 758.5 | 1,042.5 |
| Agricultural Land--Treatment | 56.3 | 172.2 | 254.3 |
| --Cropland Drainage | 59.1 | 172.3 | 257.6 |
| Forest Land--Treatment | 22.6 | 71.4 | 122.0 |
| Shoreland Erosion | 1.2 | 7.2 | 20.1 |
| Streambank Erosion | 4.1 | 18.4 | 47.4 |
| Flood Damage Prevention | 327.9 | 537.3 | 588.4 |
| Wildlife Management | 39.6 | 107.0 | 196.8 |
| Outdoor Recreation | 374.8 | 1,192.1 | 2,258.9 |

[1]Municipally supplied, self-supplied industrial, and rural domestic and livestock.

[2]Preliminary estimates of capital plus operation, maintenance and replacement costs.

Maumee River alone contributes approximately 1.2 million tons of sediment (almost half the total) every year to Maumee Bay and the western basin of Lake Erie.

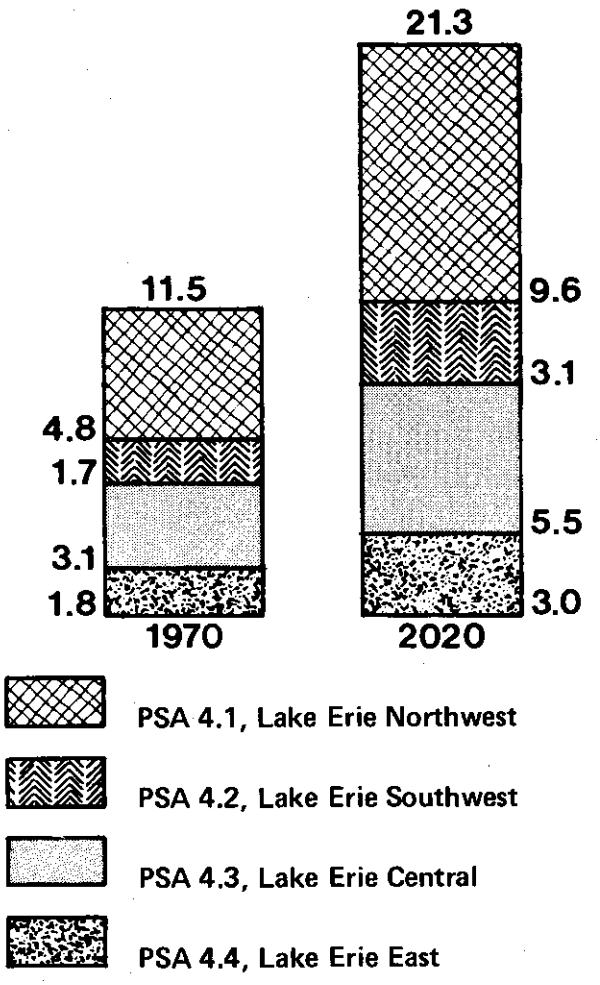
Drainage is also a problem. The Lake Erie basin has nearly 50 percent of the Great Lakes Basin's agricultural drainage problems. Northwest Ohio and northeast Indiana have the most serious drainage problem, with 2.5 million acres needing improved drainage systems. Impaired drainage adversely affects both agricultural production and urban growth potential in the basin.

At one time, the western Lake Erie marshes were the largest and most productive wetland habitats in the Great Lakes Basin. Wildlife habitat is being seriously threatened along the lakeshore by commercial, industrial, and residential development and to a lesser degree by clean tillage or other incompatible agricultural practices. The Lake Erie basin is generally regarded as suffering from the most serious environmental problems of the Great Lakes Basin.

The most persistent problem in the Lake Erie basin has been poor water quality and eutrophication of the Lake itself. The phosphorus content has been high, and the dissolved oxygen content has been less than one part per million in bottom waters of central Lake Erie at certain periods. Total dissolved solids increased markedly in the years prior to 1970. High algal concentrations are another main problem in the open waters of the Lake.

More than 90 structural and nonstructural alternatives are evaluated in the PRO Framework to meet future needs and solve basin problems. Table 9 estimates the 50-year cost of PRO Framework accomplishments. PRO Framework solutions to some major problems include the following:

(1) water quality management that includes a




NOTE: Figures may not add due to rounding.

**FIGURE 10 Population Growth in the Lake Erie Region (millions)**

high level of municipal wastewater treatment for over 3.4 billion gallons every day

(2) provision for an additional 65 million recreation day opportunities beyond the 1970 level for the year 2020

(3) provision for comprehensive land treatment on 2.6 million acres of agricultural land

(4) provision for structural measures to control erosion on 582 miles of streambanks

(5) provisions for accelerated agricultural and forest land treatment on 5 million acres.

### 3.6.1 Environmental Impacts

The Lake Erie plan area had the second highest resident population in the Great Lakes in 1970, with about 39 percent of the regional total. The Proposed Framework aims to meet future resource needs of a resident population projected to grow from 11.5 million in 1970 to 21.3 million by 2020 (Figure 10).

Some key growth and development factors which bear upon environmental impacts of the Proposed Framework are:

(1) The Lake Erie region is the most urbanized area in the Great Lakes with 88 percent of its population residing in 10 metropolitan areas: Detroit and Ann Arbor, Michigan; Fort Wayne, Indiana; Lima, Toledo, Akron, Cleveland, and Loraine-Elyria, Ohio; Erie, Pennsylvania; and Buffalo, New York.

(2) Despite large urban development, some of the most productive agricultural land in the nation is found along the lakeshore and within the drainage basin.

(3) The more than 475 miles of U.S. Lake Erie shore has been developed principally for residential, industrial, commercial, and agricultural uses. Approximately 90 miles of the total shoreline, or less than 20 percent, is presently used for parks, wildlife, game lands, and forests. More than 80 percent of the Lake Erie shoreline is privately owned.

(4) It is estimated that nearly 28 percent of the region's population is supported in jobs and income by bulk and general cargo waterborne commerce.

(5) It is projected that urban built-up areas will gain primarily at the expense of cropland.

A highlight summary of significant environmental changes due to future growth projections and PRO Framework programs is found in Table 10.

Framework programs which are critically important in influencing and maintaining high quality environment during controlled expansion of the area include: water quality management; agricultural land treatment; water supply, power plant facility, and waste discharge management; and forest, recreation, visual and aesthetic resource, and shoreland management. An environmental rating of these and other PRO Framework solutions is found in Annex 1.

The narrative which follows describes major adverse and desirable environmental impacts indicated for Lake Erie by the Annex 1 display sheet.

Water quality programs in the Proposed Framework are based on compliance with the Federal Water Pollution Control Act Amendments of 1972, P. L. 92–500.

The trend toward regionalized waste treatment portends large plants with large quantities of treated effluent reaching basin lakes, streams, and/or Lake Erie. Implementation of progressive Federal and State legislation coupled with pollution control management systems will be effective to minimize effects on the environment in the Lake

**TABLE 10 Significant Environmental Changes Due to Growth and Proposed Framework Programs: Lake Erie Basin**

| Resource Use Categories | Units | Base Year (1970) Condition | Projected (2020) Condition | Future Change--Ratio of 2020 to 1970 Condition |
|---|---|---|---|---|
| Water Supply | MGD | 5,773.1 | 11,989.0 | 2.1 |
| Irrigation | MGD--Consumption | 237 | 890 | 3.8 |
| Mining | 1000 Acres Disturbed | 1.6 | 80.8 | 50.5 |
| Thermal Power Cooling | MGD--Cooling Consumption | 89 | 682 | 7.7 |
| | 1000 Acres of Plants[1] | 2.1 | 21.1 | 10 |
| Municipal Wastewater Discharge | MGD--Effluent Requiring Treatment | 1,880 | 3,450 | 1.8 |
| Sport Fishing | 1000 Angler Days | 27,900 | 47,700 | 1.7 |
| Recreational Boating | 1000 Boat Days | 6,110 | 7,904 | 1.3 |
| Commercial Navigation | Million Tons/Year Accommodated | 153[2] | 318.0 | 2.1 |
| Agr. Land--Treatment | 1000 Acres | 6,380[4] | 5,340 | .84 |
| --Cropland Drainage | 1000 Acres | 3,400[4] | 1,180 | .35 |
| Forest Land--Treatment | 1000 Acres | 2,230[4] | 1,560 | .70 |
| Shoreland Erosion | Miles Protected by Structures | 124.7 | 145.3 | 1.2 |
| Streambank Erosion | Miles Protected | 102 | 684 | 6.7 |
| Flood Damage Prevention | Thousand $ AAD | 38,340 | 144,964 | 3.8 |
| Wildlife Management | 1000 Acres | 12,855[3] | 13,312 | 1.0 |
| Outdoor Recreation | 1000 Recreation Days | 217,982 | 648,834 | 3.0 |

[1]Assumes maximum land required for plants at .17 acres per megawatt of installed capacity
[2]Estimated from 1970 Great Lakes Basin total
[3]1960 Data
[4]Land requiring treatment-ratio of 2020 to 1970 indicates portion of these needs met

Erie basin from municipal and industrial wastewater treatment facilities, except in the event of plant breakdown.

PRO Framework programs to supply rural, irrigation (cropland and golf courses), and mineral water requirements project a major dependence on inland lakes, streams, and ground-water sources. Throughout plan formulation, it was felt that such dependence would not significantly affect base flow or ground-water yield in the basin. However, increased consumptive losses from these uses may alter stream regimen and affect fish and wildlife resources, decrease water quality, and degrade aesthetic and recreational values of stream valleys. More detailed assessment of individual withdrawal effects is necessary to be certain of environmental effects. The location of self-supplied industries along the Lake Erie shoreline should be avoided to minimize the environmental effects upon the shorelands. Environmental disruption resulting from water supply facility construction and use of water should be minimized, and environmental repair should be encouraged.

In the Proposed Framework Lake Erie will provide all the basin's water requirements for cooling condensers in the production of energy. The withdrawals themselves are not judged to have a significant effect upon the quantity or quality of Lake Erie. However, the location of power plants along or near the Lake Erie shoreline implies up to a ten-fold increase in the amount of shoreland allocated to power plant construction with potential for elimination of valuable waterfowl and fish habitat. The dissipation of heated water discharge from thermal power plants will be accomplished in a variety of ways on a site-by-site basis. Recircula-

tion by use of cooling towers or other methods may create local fog and increase precipitation. The effects of heated water discharge into Lake Erie could have serious localized effects upon wildlife and fishery habitat by increasing the water temperature to unacceptable limits. Further, by 2020 a major portion of the total energy produced in the Lake Erie basin will be from nuclear power plants. Because Lake Erie is a water supply source, the potential threat of nuclear accident and radiological contamination of the Lake requires stringent public health and environmental safeguards to be recommended in the PRO Framework programs.

Further problems of aesthetics, land loss, and disruption come from overhead power distribution and transmission lines. Despite manufacturers' and utilities' successes in developing many new designs and materials which can improve the appearance of these power facilities, natural, historic, scenic, and recreational values will be adversely affected by the upground location of transmission facilities and related rights-of-way.

By 2020 approximately 64 percent of the urban flood damages that could occur and 45 percent of the rural flood damages that could occur in the basin will be alleviated through structural measures. On-stream reservoirs, which are recommended in the Proposed Framework, will inundate agricultural land. The creation of water storage areas in the Lake Erie basin could potentially stabilize streamflows. This would enhance fish habitat, improve water quality, and minimize flood hazard. With the exception of southeastern Michigan, there are few inland lakes in the basin. Impoundments could enhance ecological diversity. However, valuable stream valley resources and extensive agricultural land would be sacrificed.

Navigation system changes will be required to accommodate the greater transportation needs brought about by increased area productivity. Additional channel depths from 27 to 31 feet would be provided in the St. Clair and Detroit Rivers, Lake St. Clair, and the western basin of Lake Erie, to accommodate the additional drafts. The PRO Framework would also provide for a 34-foot depth in a new lock and dam in the St. Clair River, provide 31-foot depths in harbors at Detroit, Toledo, Lorain, Cleveland, Conneaut, and Erie, and extend the commercial navigation season for six weeks.

Dredging, excavation, and intensive harbor use will contribute to a deterioration of the water quality in local segments of Lake Erie and its connecting waterways for short periods of time. In the long term, however, dredging will remove polluted bottom materials from the aquatic medium and can improve water quality. Larger ships will require fewer trips, and tonnages and facilities will increase. However, potential threats of major oil spills and other vessel discharges will be intensified. Sections 3.1 and 3.2 of this statement contain further general discussion of these impacts.

### 3.7 Lake Ontario Basin

The U.S. portion of the Lake Ontario basin encompasses 18,774 square miles of land and water surface area. Some 15,314 square miles of land area, rivers, inland lakes, and embayments drain into Lake Ontario from the northern portion of the State of New York and from a small area of the Commonwealth of Pennsylvania. An additional 3,460 square miles of Lake Ontario water surface area is included in the hydrologic area under study. The total surface area of Lake Ontario is 7,340 square miles, which is divided almost equally between the United States and Canada.

The geographical area for which planning data is accumulated includes the 21 counties shown in Figure 11. For purposes of easy reference, the Lake Ontario basin has been numbered Plan Area 5.0, and has been further divided into planning subareas which are numbered 5.1, 5.2 and 5.3.

The Proposed (PRO) Framework is designed to provide for people's basic needs such as protection of life, health, food, and water and also provide for secondary needs such as outdoor recreation, aesthetic appreciation, and cultural advancement. The PRO Framework also recommends programs to solve pressing problems in the basin.

The most significant problems which the PRO Framework addresses in the Lake Ontario basin are

(1) water quality management
(2) flood damage
(3) prompt, adequate financing and implementation of water and related land resources conservation, use, and development.

Land use planning is necessary to maintain and preserve the many aesthetic, cultural, scenic, and recreational values in the basin. Land conservation is needed to reduce streambank and shore erosion. The eastern shore of Lake Ontario contains rare natural areas that are in danger of destruction. The eastern shore area contains the only remaining sand dunes on Lake Ontario, unique shore areas with shorebirds and wildlife value, and large wetland areas that are essential to both nesting and migratory waterfowl. These natural areas are in jeopardy from accelerated erosion caused by above-average Lake levels and unwise land development.

In Lake Ontario proper, major problems are the growth of algae, largely from nutrient inputs coming into Lake Ontario through the Niagara River,

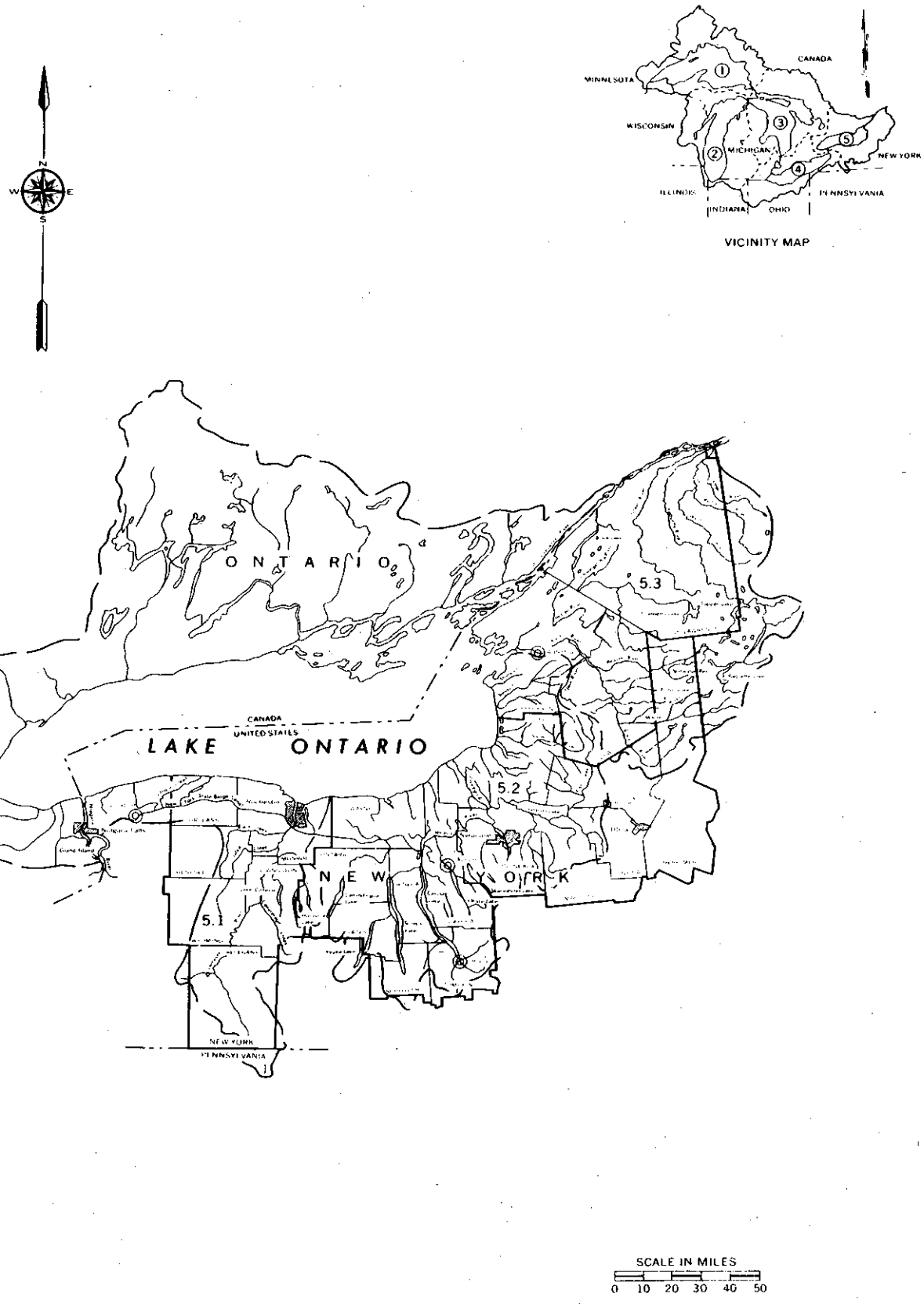



**FIGURE 11 Lake Ontario Drainage and Planning Subarea Boundaries**

and the build-up of sulfates, chloride ions, and total dissolved solids.

Lake Ontario is generally considered to be susceptible to eutrophication, although not eutrophied at the present time. It is hoped that research and stepped-up pollution control efforts within the last decade will prevent Lake Ontario from reaching a state of degradation such as that which has occurred in Lake Erie. However, this will be difficult to avoid unless Lake Erie water quality improves, because Lake Erie is a major contributor, via the Niagara River, to the water quality problems in Lake Ontario.

Most of the flood damage and acreage subject to flooding in the Lake Ontario basin is in rural areas. There are only limited opportunities for installation of structural measures, such as reservoirs, to reduce flood damages. The topography is such that it is desirable to use the flood plains for a number of purposes, including both transportation routes and agricultural development, but consideration must be given to flood hazards and steps taken to minimize flood damages.

The accessibility of transportation and utilities brings about many prime opportunities for commercial and industrial site development adjacent to streams in urban areas. Such development intensifies the likelihood and magnitude of urban flood damages. Generally speaking, there are sites other than flood plains for commercial and residential use in the Lake Ontario basin. The problem is one of regulation and persuasion to restrict highly damageable uses of flood plains.

Much of the shoreland within a half mile of Lake Ontario is of considerable value for vineyard purposes. One of the major land use questions facing Lake Ontario basin residents is whether to preserve these lands as vineyards or to let them be used for future transportation and recreational purposes.

Another shoreline problem of considerable importance is erosion. In this area about 17 miles of shoreline are subject to critical erosion and 169 miles are subject to noncritical erosion. Critical erosion areas are defined as those economic and recreational shorelands that have presently high values and histories of rapid loss of land and major damage. All other areas recording significant erosion and minor damage are classified as noncritical erosion areas. This 186 miles is about 65 percent of the entire shoreline of Lake Ontario in the United States. About 90 percent of the Lake Ontario shoreline is privately owned.

Another problem is streambank erosion. At the present time, there are about 1,285 bank miles subject to moderate streambank erosion damage and 211 bank miles subject to severe streambank erosion. Altogether, land loss, sedimentation, and other erosion damages cost about $99,000 annually in the area. The major part of the damages and erosion occurs in Planning Subarea 5.2. Sedimentation also increases water supply filtration costs.

The Proposed Framework programs for the Lake Ontario basin serve a mixture of planning objectives by giving primary emphasis to environmental quality and resource conservation while maintaining a commitment to national economic efficiency through governmental investment and guidance to private investment. The PRO Framework aims to rectify and prevent degraded water and land conditions while improving employment opportunities with minimum conflict.

More than 90 structural and nonstructural alternatives for meeting Lake Ontario basin needs and solving future problems are evaluated in the PRO Framework. Table 11 estimates the 50-year cost of accomplishing PRO Framework programs. PRO Framework solutions to some major problems include

(1) water quality management that includes a high level of municipal wastewater treatment for 773 million gallons per day

(2) provision for an additional 32 million recreation day opportunities beyond the 1970 level for the year 2020

(3) provision of land treatment and management on 2.4 million acres of forest and agricultural lands

(4) shoreland erosion protection on 17 miles of severely eroding areas.

### 3.7.1 Environmental Impacts

Planning for a near-doubling in resident population over the next fifty years in the Lake Ontario basin will require the commitment of land and water resources to accommodate their spatial, recreational, economic, and other requirements (Figure 12). Seasonal influx of nonresidents from major population centers south and west of the basin places an increased burden on area resources.

In 1970 the Lake Ontario basin had the third largest population of the five basins of the Great Lakes, or nine percent of the total Great Lakes Basin population. Some 2.5 million persons reside in the U.S. portion of the Lake Ontario basin. The Canadian population of the Lake Ontario basin reached 3.7 million persons in 1971.

Most of the people in the Lake Ontario basin reside in the major urban areas of Rochester, Syracuse, and Utica, New York. Outside of those areas, the Ontario basin is sparsely populated, with density decreasing from west to east. In 1970 the overall Ontario basin population density averaged 164 persons per square mile, one of the lowest

**TABLE 11 Lake Ontario Basin Proposed Framework Programs: Estimated Cost Summary**

| Resource Use Categories | PRO Framework Cost[2] ($ millions) 1970 to 1980 | 1970 to 2000 | 1970 to 2020 |
|---|---|---|---|
| Water Supply[1] | 31.4 | 212.5 | 602.1 |
| Irrigation | 1.3 | 3.9 | 7.7 |
| Mining | 1.3 | 7.3 | 21.9 |
| Thermal Power Cooling | 172.3 | 345.8 | 602.4 |
| Municipal Wastewater Discharge | 1,738.4 | 3,075.7 | 4,983.7 |
| Sport Fishing | 19.0 | 43.7 | 70.9 |
| Recreational Boating | 43.0 | 135.8 | 268.3 |
| Commercial Navigation | 82.0 | 461.2 | 573.2 |
| Agricultural Land--Treatment | 14.3 | 43.7 | 64.8 |
| --Cropland Drainage | 6.7 | 20.3 | 29.9 |
| Forest Land--Treatment | 24.7 | 74.9 | 129.0 |
| Shoreland Erosion | 3.5 | 12.4 | 23.7 |
| Streambank Erosion | 1.5 | 7.4 | 18.5 |
| Flood Damage Prevention | 26.3 | 165.0 | 167.2 |
| Wildlife Management | 14.7 | 52.7 | 77.2 |
| Outdoor Recreation | 119.7 | 393.1 | 768.4 |

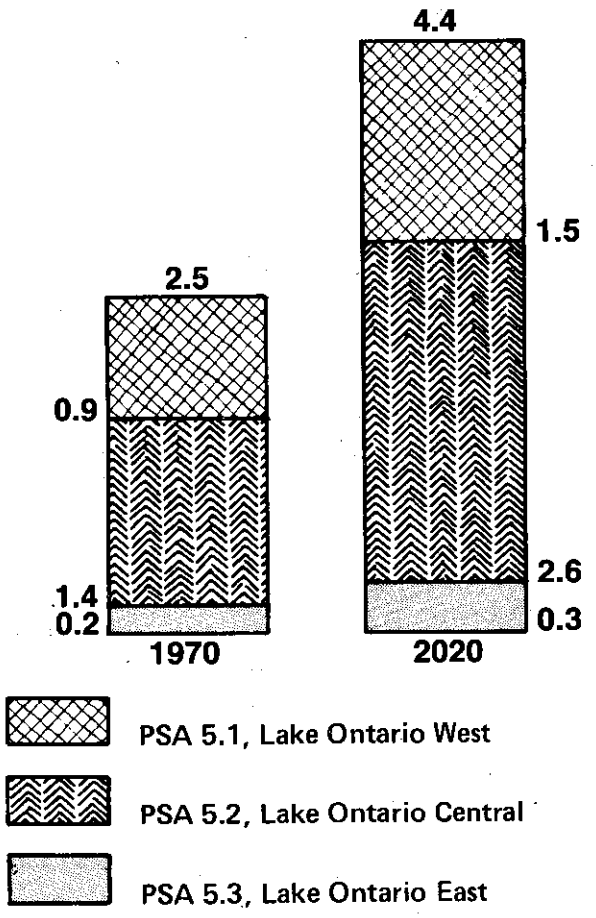
[1]Municipally supplied, self-supplied industrial, and rural domestic and livestock.

[2]Preliminary estimates of capital plus operation, maintenance and replacement costs.

densities of any region in the Great Lakes Basin.

As might be expected, the economy of the Lake Ontario basin varies with population. Total personal income in 1970 for the Lake Ontario region was estimated at 8.9 billion dollars. Earnings for workers reached nearly 7.1 billion dollars in 1970. Generally speaking, the economy of Planning Subarea 5.1 is highly diversified and provides income and earnings at a rate above the average U.S. level in the 1970 period. In contrast, Planning Subareas 5.2 and 5.3 have not historically maintained per capita income and per worker earnings at a level commensurate with the U.S. average. In the Lake Ontario region as an aggregate, some 964,000 persons were employed during 1970 in agriculture, forestry, fisheries, mining, manufacturing, trades and services and other occupations. Manufacturing, trades and services were the region's major employers.

Generally speaking, the Lake Ontario region is predominantly rural. Fruit, vegetable, and dairy production are of major importance, in addition to localized areas of diversified manufacturing and industry. In Planning Subarea 5.1, fruit orchards and dairy farms dominate the landscape along the Lake Ontario shore, while livestock production is prevalent in the more rugged inland plateaus. Industrialization in the Rochester area is characterized by production of paper, chemicals, and specialized photographic equipment. Industrial activity is highly diversified in Planning Subarea 5.2. Syracuse is the principal industrial center, producing machinery, food, paper, and chemicals such as caustic soda. Dominant agricultural activity in this area includes dairy, fruit, vegetable, and grape production. In Planning Subarea 5.3, poor climate, soils, and topography discourage agriculture other than dairying; however, mineral, forest,




NOTE: Figures may not add due to rounding.

**FIGURE 12 Population Growth in the Lake Ontario Region (millions)**

and recreational resources strengthen the area's economy. The major trade and service centers for the area residents include Rochester, Syracuse, Rome-Utica, and Watertown.

An abundance of generally high quality land and water resources form the basis for the important tourism and recreational enterprises in the Lake Ontario basin. It has been estimated that approximately $273 million is spent annually by recreationists in the Lake Ontario basin. The Finger Lakes and the Thousand Island areas are recreational resources of national prominence. A highlight summary of significant environmental changes due to growth and PRO Framework programs in the Lake Ontario basin is found in Table 12.

PRO Framework programs which are critically important in influencing and maintaining high quality environment during controlled expansion of the area include: water quality management; water supply, power plant facility, and waste discharge management; and forest, recreation, visual and aesthetic resource, and shoreland management. An environmental rating of these and other Proposed Framework solutions is found in Annex 1.

The narrative which follows describes major adverse and desirable impacts indicated by the Lake Ontario display summary in Annex 1.

Water quality programs in the Proposed Framework are based on compliance with the Federal Water Pollution Control Act Amendments of 1972, P.L. 92-500.

The trend toward regionalized waste treatment portends large plants with large quantities of treated effluent reaching basin lakes, streams, and/or Lake Ontario. However, by 2020, it is expected that implementation of progressive Federal and State legislation coupled with pollution control management systems will be effective in minimizing impacts on the environment in the Lake Ontario basin from municipal and industrial wastewater treatment facilities, except in the event of plant breakdown.

PRO Framework programs to supply industrial, irrigation (cropland and golf courses), and mineral water requirements project a major dependence on inland lakes, streams, and ground-water sources. Throughout plan formulation, it was felt that such dependence would not significantly affect base flow or ground-water yield in the basin. However, increased consumptive losses from these uses may alter stream regimen and affect fish and wildlife resources, decrease water quality, and degrade aesthetic and recreational values of stream valleys. Furthermore, moderate to poor quality groundwater could force even greater dependence upon surface sources. More detailed assessment of individual withdrawal effects is necessary to be confident of environmental effects. The location of self-supplied industries along the Lake Ontario shoreline should be avoided to minimize the environmental effects upon the shorelands. Environmental disruption resulting from construction of industrial water supply facilities and use of water should be minimized, and environmental repair should be encouraged.

Lake Ontario will provide all the water required for cooling condensers in the production of thermal power in the Lake Ontario basin. The withdrawals themselves are not judged to have a significant effect upon the quantity or quality of Lake Ontario water. However, the location of power plants along or near the Lake Ontario shoreline implies up to a thirteen-fold increase in the amount of shoreland that might be allocated to power plant construction. This creates a potential for elimination of valuable waterfowl and fish habitat, particularly in and near Sodus Bay. The dissipation of heated water discharge from thermal power plants will be accomplished in various ways on a site-by-site basis.

**TABLE 12 Significant Environmental Changes Due to Growth and Proposed Framework Programs: Lake Ontario Basin**

| Resource Use Categories | Units | Base Year (1970) Condition | Projected (2020) Condition | Future Change--Ratio of 2020 to 1970 Condition |
|---|---|---|---|---|
| Water Supply | MGD | 802.2 | 1,771.1 | 2.2 |
| Irrigation | MGD--Consumption | 48.1 | 262.1 | 5.4 |
| Mining | 1000 Acres Disturbed | 1.4 | 30.5 | 21.8 |
| Thermal Power Cooling | MGD--Cooling Consumption | 22 | 132 | 6.0 |
| | 1000 Acres of Plants[1] | 0.4 | 5.3 | 13.2 |
| Municipal Wastewater Discharge | MGD--Effluent Requiring Treatment | 368 | 773 | 2.1 |
| Sport Fishing | 1000 Angler Days | 11,800 | 25,600 | 2.2 |
| Recreational Boating | 1000 Boat Days | 4,030 | 5,843 | 1.5 |
| Commercial Navigation | Million Tons/Year Accommodated | 1[2] | 2.1 | 2.1 |
| Agr. Land--Treatment | 1000 Acres | 2,600[4] | 1,940 | .75 |
| --Cropland Drainage | 1000 Acres | 604[4] | 166 | .27 |
| Forest Land--Treatment | 1000 Acres | 3,840[4] | 1,960 | .51 |
| Shoreland Erosion | Miles Protected by Structures | 25.6 | 42.4 | 1.7 |
| Streambank Erosion | Miles Protected | 50.4 | 281 | 5.6 |
| Flood Damage Prevention | Thousand $ AAD | 1,859 | 6,269 | 3.4 |
| Wildlife Management | 1000 Acres | 10,247[3] | 10,661 | 1.0 |
| Outdoor Recreation | 1000 Recreation Days | 67,497 | 190,188 | 2.8 |

[1]Assumes maximum land required for plants at .17 acres per megawatt of installed capacity
[2]Estimated from 1970 Great Lakes Basin total
[3]1960 Data
[4]Land requiring treatment-ratio of 2020 to 1970 indicates portion of these needs met

Recirculation techniques using cooling towers or other methods may create local fog and increase precipitation. The effects of heated water discharge into Lake Ontario could have serious localized effects upon wildlife and fishery habitat by increasing the water temperature to unacceptable limits. By 2020 a major portion of the total energy produced in the Lake Ontario basin will be from nuclear power plants. A potential threat of nuclear accident and radiological contamination of Lake Ontario, a water supply source, requires stringent public health and environmental safeguards to be recommended in the PRO Framework programs.

The PRO Framework proposes meeting the remaining energy needs through pumped storage hydroelectric facilities. Both programs will adversely affect natural habitat and water courses in the immediate construction area.

Further problems of aesthetics, land loss, and disruption come from power distribution and transmission lines. Despite manufacturers' and utilities' successes in developing many new designs and materials which can improve the appearance of these power facilities, natural, historic, scenic, and recreational values will be adversely affected by the upground location of transmission facilities and related rights-of-way.

By 2020, approximately 21 percent of the urban flood damages that could occur and 18 percent of the rural flood damages that could occur in the basin will be alleviated through structural measures. The creation of water storage areas in the Lake Ontario basin have the potential to stabilize streamflows. This could enhance fish habitat, improve water quality, and minimize flood hazard. Impoundments could enhance ecological diversity. However, valuable stream valley resources and extensive agricultural land would be sacrificed.

Navigation programs to maintain waterborne commerce needed for increased area productivity include maintenance of dredging to a 27-foot depth in channels and selected harbors in the basin and six-week navigation season extension. Dredging, excavation, and intensive harbor use will contribute to a deterioration of the water quality in local areas for short periods of time. In the long term, however, dredging will remove polluted bottom materials from the aquatic medium and may improve water quality if the reintroduction of toxic pollutants to the water column is prevented. Larger ships will require fewer trips, and tonnages and facilities will increase. Potential threats of major oil spills and other vessel discharges will be intensified. Sections 3.1 and 3.2 of this statement contain further general discussion of those impacts.

# Section 4

# ALTERNATIVES AND THEIR ENVIRONMENTAL IMPACTS

In order to comply as fully as possible with the National Environmental Policy Act of 1969 (P.L. 91–190), this section of this environmental impact statement will use a broader definition of "alternatives" to the proposed action than has normally been used in the Great Lakes Basin Framework Study. As described in the Framework Study *Report*, the term "Alternative Frameworks" refers to a set of two specified frameworks, the Normal (NOR) Framework and the Proposed (PRO) Framework. Appendix 1, *Alternative Frameworks*, makes clear that a "framework" is not, in the strictest sense, a proposed action. Rather it is a range of alternative actions and interdependent programs to solve problems and meet needs projected from a coherent set of assumptions, constraints, and objectives.

An essential part of the analytical procedure used in this Framework Study was the development of three sets of economic and demographic projections based on three alternative assumptions about future national and regional growth rates: limited, normal and accelerated growth. These three assumptions about growth are closely tied in this study to the three objectives of environmental quality, national economic development, and regional development, respectively. The Great Lakes Basin Commission does not consider these objectives mutually exclusive "alternatives," but rather as objectives to be striven for simultaneously in integrated planning approaches and program solutions. Nonetheless, the objectives of economic growth and resource conservation appear to be inversely related. What varies in each of the alternative growth projections is the objective which receives primary emphasis. Each set of projections envisions the achievement of each objective at a certain minimum limit consistent with social well-being—the fourth, and overriding objective.

The limited and accelerated growth assumptions were not developed as realistic or feasible alternative actions in this Framework Study. Rather they were developed as a way of defining the limits within which realistic planning could proceed. In consequence, statistical projections and program options were not fully developed for these two "alternatives." Projections were fully developed only for the Normal (NOR) Framework, and the program options selected for the NOR and PRO Frameworks were often identical. The truncated and rudimentary projections for the accelerated and limited growth alternatives were not considered full-fledged "frameworks," but for the sake of convenience in this section they will be referred to as such. Because of the incomplete nature of these growth alternatives, however, discussion on a Lake basin basis (as done with the PRO Framework) is not possible. Only a brief description will be given. One further option, "no framework implementation," is also outlined in this section.

The Great Lakes Basin Framework Study has evaluated the following multiple planning variables:

(1) population and economic projections
(2) resource demands (through assumptions about unit resource demands)
(3) solution types (nature of structural and nonstructural programs)
(4) level of investment (governmental spending to solve future problems)
(5) timing of future programs (investment by 1980, 2000, and 2020).

The above variables were considered concurrently in relation to the four defined planning objectives of national economic efficiency, environmental quality, regional development, and social well-being. What follows is a presentation of brief frameworks for each of the three growth alternatives, normal (NOR), accelerated (ACC), and limited (LIM), from which the Proposed (PRO) Framework actions were developed. The environmental impacts of each "alternative" can apply to any or all of the five planning variables considered in this study.

## 4.1 Comparative Environmental Impacts of Growth Alternatives

The environmental impacts of the limited (LIM), normal (NOR), and accelerated (ACC) growth alternatives differ from those identified in the Proposed (PRO) Framework primarily in timing (when the impact occurs), extent (the magnitude of the impact), and location (where the resource management measure is applied), rather than in the basic

nature of their physical resources effects. Further studies for smaller geographical areas will be needed to establish with more detail and certainty the environmental impacts of the multiple alternatives treated in this Framework Study.

### 4.1.1 Population

More than 29 million people resided in the Great Lakes Region in 1970. Over 80 percent of the basin residents live in urban areas occupying about eight percent of the land in the Region. More than 85 percent of the total live within 50 miles of the shores of Lakes Erie and Michigan. Historically, the Great Lakes Region has accounted for a steady 14 to 15 percent of the total U.S. population in the census decades from 1940 to 1970. Normal growth projections pose a gradual decline in the regional share of the national population levels to just over 13 percent, amounting to over 53 million people by 2020. If national and regional growth rates both accelerate, a population shift from other regions to the Great Lakes Region can be projected. The accelerated growth rate projects regional population to be more than 17 percent of the national total, or 85 million persons, by 2020. Given implicit or explicit policies to limit national population growth rates toward zero levels, and to curtail population pressures on Great Lakes resources, the limited growth level reaches 37 million persons, with the Region accounting for less than 11 percent of the national population in 2020 (Figure 13). Under limited growth projections, all areas within the Great Lakes except the Lake Superior region are projected to gain in population through the next 50 years. The future growth rates being considered are not the result of optimum density determinations for the Great Lakes Basin. Basic assumptions behind the numbers are highlighted in Sections 4.2 through 4.5. Generally speaking, even under the extremely high growth and resource demand assumptions of the ACC framework, it is felt that water and land resources are available in sufficient quantity and quality to provide for people's needs through year 2020. Environmental protection and management measures will be needed to assure high quality of life and adequate economic and social opportunities for Basin residents under all growth alternatives.

Gross determinations of the projected change in land use and consumptive water use for ACC, NOR, and LIM frameworks are found in Table 13. It should be recognized that considerable variation in land use exists within the 15 planning subareas in the Basin.

The Report of the President's Commission on Population Growth and the American Future pro-

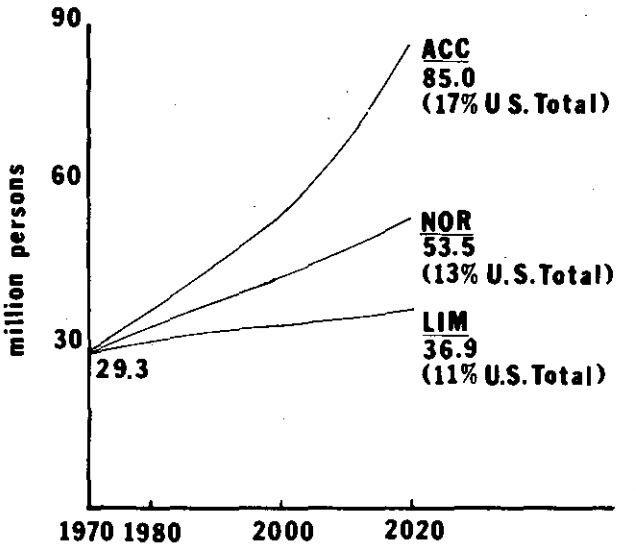



**FIGURE 13 Population Growth in the Great Lakes Region**

vides some useful insights into alternative population and economic growth patterns and their environmental effects. The following review of growth trends and implications for the nation can apply to the Great Lakes Region.

Regardless of what happens to the birthrate from now on, our past growth commits us to substantial additional growth in the future. At a minimum, we will probably add 50 million more Americans by the end of the century, and the figure could easily be much higher than that.

The baby boom of the 1950s is not over. The babies have merely grown older. It has become a boom in the teens and twenties. In a few decades, it will be turning into a retirement boom. During the second decade of the next century, 30 million people will turn 65, compared with 15 million who had their 65th birthday in the past 10 years. Census Bureau reports disclose that 25 percent of today's aged live in poverty, compared with eight percent of people in the working-age range from 22 to 45.

The Presidential Commission formed a definite judgment about the choice the nation (and by inference each component region like the Great Lakes) should make about future growth. They state:

> We have examined the effects that future growth alternatives are likely to have on our economy, society, government, resources, and environment, and we have found no convincing argument for continued national population growth. On the contrary, the plusses seem to be on the side of slowing growth and eventually stopping it altogether. Indeed, there might be no reason to fear a decline in population once we are past the period of growth that is in store.
>
> Neither the health of our economy nor the welfare of individual businesses depends on continued population

**TABLE 13 Comparative Environmental Effects: Great Lakes Basin (U.S. only)**

| Environmental Factors | Base Year 1970 Condition | Projected 2020 Conditions for Alternative Frameworks NOR | ACC | LIM |
|---|---|---|---|---|
| | Percent of Great Lakes Basin | | | |
| Land Use | | | | |
| Urbanization | 8.4 | 14.5 | 29.1[1] | 12.5[1] |
| Cropland[2] | 34.3 | 30.5 | 25.3 | 31.2 |
| Pasture & Range[2] | 4.1 | 3.8 | 3.2 | 3.9 |
| Forest Land[2] | 47.4 | 46.0 | 38.1 | 47.1 |
| Other Land[2] | 5.8 | 5.2 | 4.3 | 5.3 |
| | Billion Gallons | | | |
| Total Consumptive Water Use[3] | 2.1 | 12.2 | 35.5[4] | 5.8[4] |
| Approx. multiple per day change from 1970 | --- | 6 | 17 | 2.8 |

[1]Assumes urban density of 3.4 persons per acre = $\frac{\text{urban population (1970)}}{\text{urban built-up area (1967)}}$

[2]Methods for computing percentages of non-urban land for accelerated and limited are consistent with method of computation for normal framework

[3]Includes municipal, self-supplied industrial, rural, mining, irrigation, (crop and golf), and thermal power

[4]Assumes consumptive use ratios to projected requirements based on NOR (except power assumptions)

growth. In fact, the average person will be markedly better off in terms of traditional economic values if population growth slows down than if it resumes the pace of growth experienced in the recent past.

With regard to both resources and the environment, the evidence we have assembled shows that slower growth would conserve energy and mineral resources and would be a significant aid in averting problems in the areas of water supply, agricultural land supply, outdoor recreation resources, and environmental pollution.

Slower population growth can contribute to the nation's ability to solve its problems in these areas by providing an opportunity to devote resources to the quality of life rather than its quantity, and by buying time—that is, slowing the pace at which problems accumulate so as to provide opportunity for the development of orderly and democratic solutions.

For government, slower population growth offers potential benefits in the form of reduced pressures on educational and other services; and, for the people, it enhances the potential for improved levels of service in these areas. We find no threat to national security from slower growth. While population growth is not by any means the sole cause of governmental problems, it magnifies them and makes their solution more difficult. Slower growth would lessen the increasing rate of strain on our federal system. To that extent, it would enhance the likelihood of achieving true justice and more ample well-being for all citizens even as it would preserve more individual freedom.

Each one of the impacts of population growth—on the economy, resources, the environment, government, or society at large—indicates the desirability, in the short run, for a slower rate of growth. And, when we consider these together, contemplate the ever-increasing problems involved in the long run, and recognize the long lead time required to arrest growth, we must conclude that continued population growth—beyond that to which we are already committed by the legacy of the baby boom—is definitely not in the interest of promoting the quality of life in the nation.

Choice of an alternative for growth will also affect the availability of physical resources. Under the extreme assumption of complete loss (no recharge) to the Great Lakes system of consumptive water volumes in 2020, and assuming no change in existing lake level regulation schemes, it is es-

timated that average flow in the St. Lawrence River would be decreased six percent in the Normal Framework, by about 22 percent in the accelerated framework, and decreased about four percent in the limited framework. Since Lakes Superior and Ontario are regulated and only a minor fraction of total water use occurs within these basins, the major effect of decreased average streamflow and lake levels would be felt in Lakes Michigan, Huron and Erie. Power production facilities in Niagara River could be forced to decrease output, assuming no change in requirements for aesthetic values associated with Niagara Falls. Wetlands may be adversely affected by reduced average lake levels, while slight benefits might result from the consequent reduction in shoreline erosion and property damages.

Some generalized but significant environmental changes under the Alternative Frameworks and growth assumptions are shown in Table 14.

## 4.2 The Normal Growth Alternative

The Normal (NOR) Framework alternative represents a level of resource conservation, preservation, and development associated with a mixture of objectives with emphasis upon national economic efficiency and based primarily on projections of the historical trends of population and resource use demands. This framework represents a middle-ground approach to growth, but one which is slightly higher than the projections of anticipated population growth envisioned for the Proposed (PRO) Framework.

A comparison of PRO and NOR Framework programs of 2020 indicates the major program alternatives included under the NOR Framework assumptions that were used to derive the PRO Framework. Examples of normal or trend programs are shown in Table 15.

### 4.2.1 Water Quality Programs

The Normal Framework estimates basic treatment requirements for all effluent from municipalities and industries. It is projected that treatment cost efficiencies will be gained by the use of proposed regional and subregional treatment facilities, rather than independent systems for municipal and industrial wastewater treatment. In addition to basic treatment provided in the Normal Framework, advanced waste treatment will be required

**TABLE 14 Significant Environmental Changes Due to Growth and Alternative Programs**

| Resource Use Category | Units | Base Year (1970) Condition | Ratio of 2020 Condition to 1970 Condition | | | |
|---|---|---|---|---|---|---|
| | | | PRO | NOR | ACC | LIM |
| Self-Supplied Industrial Water Consumption | MGD | 823 | 7.5 | 7.5 | 27.0 | 2.0 |
| Thermal Power--Cooling Water Consumption | MGD | 165 | 13.4 | 13.4 | 16.4 | 10.8 |
| Municipal Wastewater Effluent Requiring Treatment | MGD | 3,060 | 2.2 | 2.2 | 11.0 | 1.1 |
| Commercial Navigation | Million Tons/Year Accommodated | 343 | 2.2 | 2.2 | 3.7 | 1.4 |
| Municipally Supplied Water | MGD | 4,300 | 2.1 | 2.1 | 8.0 | .8 |
| Irrigation | MGD | 682 | 4.1 | 4.1 | 10.8 | 1.5 |
| Mining | MGD | 780 | 1.9 | 2.2 | 13.0 | .8 |
| Water Oriented Outdoor Recreation | 1000 Recreation Days | 100,000 | 4.3 | 4.3 | 10.6 | 3.4 |
| Sport Fishing | 1000 Angler Days | 80,700 | 1.9 | 1.9 | 3.6 | 1.1 |
| Wildlife Management | 1000 User Days | 49,600 | 1.3 | 1.3 | 1.9 | .6 |
| Recreational Boating | 1000 Boat Days | 29,010 | 1.4 | 1.4 | 5.4 | 1.3 |

**TABLE 15 Comparison of Proposed and Normal Growth Programs: 2020**

| Resource Use Category | Units | Base Year (1970) Condition | 2020 Condition PRO | 2020 Condition NOR |
|---|---|---|---|---|
| Agricultural Land Treatment | 1000 Acres | - | 15,500 | 7,570 |
| Forest Land Treatment | 1000 Acres | - | 21,800 | 14,200 |
| Commercial Navigation | Million Tons/Year Accommodations | 343 | 753 | 753 |
| Cropland Drainage | 1000 Acres | - | 2,610 | 1,470 |
| Irrigation | MGD | 681 | 2,090 | 2,100 |
| Mining | MGD | 780 | 724 | 837 |

at many areas within the Basin. The policy of no pollution discharge is not endorsed in the Normal Framework.

The Normal Framework suggests that a key part of the solution to the algae problems lies in the adoption by all governmental entities of a uniform phosphorus removal policy. This policy should not only include reductions at treatment plants, but be extended to incorporate widely distributed products, such as detergents, which may never pass through a treatment plant, but reach the lakes directly. Continued research into the promotion of alternative nonphosphate detergents is supported in the Normal Framework. In addition, the problem of nonpoint sources of pollution must be investigated and controlled.

The NOR Framework programs will improve water quality in streams, inland lakes and the Great Lakes, but perhaps at a slower rate than PRO water quality programs. Site-by-site analysis of treatment facilities will be needed to determine environmental impacts with greater certainty. The move toward regionalized sewage treatment facilities will require high levels of treatment to prevent localized environmental damages, particularly along the Great Lakes shorelands.

### 4.2.2 Commercial Navigation

The Normal Framework endorses continued maintenance dredging of all existing authorized Federal harbors and connecting channels to a minimum depth of 27 feet. It further recommends increasing navigation capacity beyond authorized 27-foot depths in the Lake Superior-Michigan segment of the navigation system.

Between Lake Superior and Lake Michigan segments of the Great Lakes system the Normal Framework incorporates deeper origin and destination harbors and linking connecting channels. The Normal Framework provides greater depths at Silver Bay, Taconite and Duluth-Superior Harbors on Lake Superior; Escanaba, Chicago, Milwaukee, and Indiana Harbors on Lake Michigan; and connecting channels in the St. Marys River. The total cost would be about $186 million, of which more than $58 million would be required at Milwaukee, and $17 million at Duluth-Superior (Milwaukee and Duluth-Superior may not be economically justified). In addition, it is estimated that $340 million worth of channel dredging in the St. Marys River and Mackinac Straits will be required. The environmental effects of the maintenance and selected segmented deepening in the Normal Framework would be felt in:

(1) the extent of polluted or unpolluted dredge material removed

(2) the short term effect of dredging on water quality

(3) the land requirements for disposal of dredged material

(4) the indirect land requirements effect for harbor area development stimulated by channel and harbor deepening.

At least 15 million cubic yards of sediment material, most of which was classified as polluted in 1969, would be removed from the harbors and disposed of safely. Another estimated 200 million cubic yards of dredged material would need to be removed from the interlake connections. Although each harbor and channel situation is unique, the removal of dredged material is not, as a rule, harmful in the long run to water quality in harbors where navigation takes place. The effects on aquatic flora and fauna are variable, and site-by-site analysis of impacts will be required to assess the damages to waterfowl and wildlife habitat.

In some places, dredging may be beneficial to the sedimentary environment. In general, disturbing the sediments does not cause major changes, but only temporary ones, similar in effect to those caused by the passage of a large vessel. On the other hand, the removal of wastes and pollutants can be beneficial to the harbor environment, if the reintroduction of toxic pollutants to the water column can be prevented, and particularly if the influx of more pollutants can be reduced through water quality management measures.

Transportation needs in the Normal Framework could be met through other alternatives which also consume energy. Among available freight transport alternatives, water transport is the most energy-efficient method. Studies by the International Association of Great Lakes Ports reveal that ships get anywhere from 247 to 1,050 ton-miles per gallon depending on the type of cargo (general cargo—lowest, bulk—highest) in comparison to 193 ton-miles per gallon for railway freight, and only 54 ton-miles for trucks. Air pollution studies show

that ships produce 33 percent less pollutants than diesel trains and 373 percent less than diesel trucks per unit of cargo carried. Noise emission studies also show that ships are more environmentally desirable for freight transport because a ship produces peak noises that are 75 percent lower than those produced by trucks or diesel locomotives. Further, manpower, plant, and land requirements would likely be greater for these land-based alternatives.

The Water Quality Improvement Act is designed to bring an end to the discharge of wastes into navigable waters. Methods of meeting these requirements are currently under study. Increased use of pipelines for oil transmission further reduces the possibility of major oil spills and attendant pollution. Regulation plans of the International Joint Commission require testing over critical water supply sequences to determine adequacy. Studies of prior regulation have, however, concluded that regulation can be used as a means of restoring and maintaining navigation channel depths within the system. The economic consequences reflect the hydrologic sequence.

### 4.2.3 Drainage—Cropland

The Normal Framework represents the minimum drainage to supply efficiently the Basin's share of national food production in 2020. The program would meet about 25 percent of the needs or opportunities for cropland drainage by 2020. This will vary slightly from river basin group to river basin group, with the larger programs being included in the Lake Michigan and Lake Erie drainage areas. Drainage measures in intense agricultural areas may tend to reduce the already limited wildlife cover in these areas, thus damaging wildlife habitat.

Draining excess water would help solve localized wetness problems, increase crop yield on those acres, help to meet the food production needs of the Basin, and provide more income for the farm unit.

By restoring or maintaining soil productivity, the drainage programs have the advantage of reducing total land needed for food production. Some of the less productive and undrained land could then be dropped from crop production and made available for other uses.

The NOR Framework confines drainage to active croplands and their water problems and would thereby minimize conflict with wildlife and waterfowl habitat.

## 4.3 The Limited Growth Alternative

Generally speaking, the limited framework is built on the premise of stabilizing population and economic growth to a level consistent with a high priority for natural resources conservation in the Great Lakes Basin. Conservation implies wise use of the Basin's natural resources and maximum use of human resources to meet population demands without degrading the natural environment.

Some basic features and assumptions associated with limited growth are governmental and nongovernmental efforts to:

(1) increase the quality of human life and the Basin environment by reducing stresses on human and natural resources historically associated with exponential growth

(2) encourage development objectives that will focus growth within the Region into areas of existing urban concentration and compaction. (This assumes a high level of planned coordination and urban renewal programs for existing centers.)

(3) implement a national environmental control policy which will encourage industries to improve industrial production techniques rather than to relocate

(4) provide government subsidies to industry and cities when they are necessary to support conversion programs

(5) provide accelerated regional investment to acquire and protect natural resources

(6) develop and implement strict regional performance standards for open space, ecological systems, and water quality

(7) encourage the industry base to become more efficient, diversified, and competitive in order to maintain levels of regional income on restricted resources.

As stated in Section 4.1.1, the limited growth population base by 2020 is estimated at 37 million residents in the Great Lakes Region. The Framework Study estimated the extent of resource demands that might be generated under the limited growth conditions and projected several alternative resource management programs for those conditions. Table 16 and the discussion which follows present several examples of programs evaluated in the development of the Proposed Framework. The examples describe programs representing major deviations from the Proposed Framework solutions, and hence significant alternatives with varying environmental impacts.

### 4.3.1 Drainage—Cropland

The limited growth framework proposes fewer new drainage systems on croplands than do other

**TABLE 16 Comparison of Proposed and Limited Growth Programs: 2020**

| Resource Use Category | Units | Base Year (1970) Condition | 2020 Condition PRO | 2020 Condition LIM |
|---|---|---|---|---|
| Agricultural Land Treatment | 1000 Acres | - | 15,500 | 14,233 |
| Forest Land Treatment | 1000 Acres | - | 21,800 | 27,955 |
| Commercial Navigation | Million Tons/Year Accommodated | 343 | 753 | 483 |
| Cropland Drainage | 1000 Acres | - | 2,610 | 690 |

alternatives. No additional drainage measures would be applied to seven of the 15 planning areas in the Basin. Food production on existing well-drained soils in those seven areas might have to be intensified or more total land cultivated to supply people's needs. While limited growth implies fewer people, demands for food, both for domestic and export uses, could be the same as under normal growth conditions. In the remaining eight planning areas, drainage programs and environmental impacts are the same as for the Normal Framework.

Without additional cropland drainage, existing wet soil conditions would continue to be a part of the total agricultural environment. No additional drainage means no new channel disturbances to existing fish and wildlife habitat. Wet soils which are neither drained nor used for crop production may provide more food and cover overall for wildlife and waterfowl, although drained and properly farmed soils can provide more stable, suitable food and cover for some wildlife species. Wet spots tend to serve as sinks for sediment and nutrients such as nitrogen and phosphorus. Standing water tends to reduce runoff and encourage ground-water recharge more directly than artificial drainage measures.

On the other hand, if other factors affecting agricultural productivity remain constant, continuing present levels of cropland drainage would bring no new benefits or efficiencies in either farm income or job stability.

### 4.3.2 Flood Damage Prevention

A basic premise in the limited framework is that prevention of future flood plain damages in urban and rural areas is best accomplished by elimination and/or protection of damageable uses in the flood plain. The limited framework assumes that a significant change in public philosophy regarding use of flood plains would take place prior to 1980. Development in the flood plains would be discouraged, and flood plain legislation would reduce growth-induced, nonagricultural, urban and rural flood damages by 50 percent between the years 1970 and 1980, by 75 percent between 1980 and 2000, and by 95 percent between 2000 and 2020. Structural measures are included to the extent needed to protect existing uses in the context of a total flood plain management program.

The effect of reserving flood plain lands to serve as natural water courses enhances visual diversity in the Region's landscape, improves wildlife habitat, increases the recreational land base, and uses nature to the maximum extent possible to control floods. The assumed immediate implementation of such a program means better control of future flood problems than past programs have experienced.

Flood plain legislation to eliminate damageable uses does restrict the development that may produce more immediate dollar return on investments. A false sense of security from catastrophic floods may develop in areas surrounding the flood plain so that, when major floods do occur, damages would be substantial in those areas.

## 4.4 The Accelerated Growth Alternative

The accelerated framework represents an upper limit of projected population and economic growth and a simulated maximum use of water and land resources in the Great Lakes Basin. One purpose of defining the accelerated "extreme" is to determine which Basin resources become unavailable and/or severely degraded in quality if such growth conditions were to occur. A basic premise of the accelerated framework states that maximum benefit to residents of the Basin measured by substantially improved income and employment opportunities will be provided when natural resources are used to produce maximum economic growth. A minimum acceptable level of environmental quality is assumed in the accelerated framework.

Several other assumptions were also made in developing the accelerated framework:

(1) Government and nongovernmental interests should encourage development objectives that will expand growth on a statewide basis into outlying and newly created satellite metropolitan centers—a decentralization of regional growth.

(2) Accelerated growth may require Federal development incentives to encourage private sector expansion into new areas.

(3) Accelerated growth will require shifts in interregional trade and resource use patterns.

A framework for meeting accelerated growth needs, consistent with the basic assumptions stated above, is illustrated in Table 17 and in the discussion of the following program examples.

**TABLE 17 Comparison of Proposed and Accelerated Growth Programs: 2020**

| Resource Use Category | Units | Base Year (1970) Condition | 2020 Condition PRO | 2020 Condition ACC |
|---|---|---|---|---|
| Agricultural Land Treatment | 1000 Acres | - | 15,500 | 17,311.2 |
| Forest Land Treatment | 1000 Acres | - | 21,800 | 17,108 |
| Commercial Navigation | Million Tons/Year Accommodated | 343 | 753 | 1,258 |
| Cropland Drainage | 1000 Acres | - | 2,610 | 3,341.8 |

### 4.4.1 Drainage—Cropland

It is estimated that over 3.3 million acres of cropland can be drained for increased farm production in the accelerated framework. This contrasts with drainage opportunity on 1.5 million acres under normal growth, and on only 0.7 million acres under limited growth. The accelerated framework recommends a 60 percent increase in channel modification over that included in the Normal Framework. Twice as much tile drainage is proposed under accelerated growth conditions than under normal ones. The intensified drainage program means that less land may be needed to meet per capita food requirements because existing cropland with wet soil conditions will be altered for more efficient food production. Intensified drainage also reduces the potential of public health hazards sometimes associated with stagnant water.

Project action (channelization) can often result in major long-term disruption of fish and wildlife habitat in streams by adverse changes in sedimentation rates, turbidity, erosion, flood plain encroachment, downstream flooding, and low-flow water regime. Channelization can also disrupt archeological, anthropological, and scenic sites. Channel modification includes deepening, clearing of trees and snags, and straightening of streams.

### 4.4.2 Flood Damage Prevention

The accelerated framework defines an upper limit of potential flood damages and assumes that there would be less resistance to growth and development in the flood plain than in limited or Normal Frameworks. Development would, however, be discouraged in the flood plain through legislation which would reduce urban and rural nonagricultural flood damages resulting from growth by five percent between the years 1970 and 1980, by 20 percent between 1980 and 2000, and 40 percent between 2000 and 2020. Structural and other nonstructural programs are included in the accelerated framework.

Protection of flood plain lands through means other than restrictive legislation encourages high economic uses, especially in urban areas. Structural protection, especially through storage impoundments, is reasonably reliable. Maximum use of river valley lands for either economic or environmental purposes can be often accomplished through land use regulations.

Adverse environmental effects would occur under the accelerated program for flood damage prevention. To allow development in the flood plain to occur, valuable resources in river valleys would be lost and potential flood damages would increase. An increased dependence on structural works reduces the proportion of natural landscape and may create a false sense of security against floods of catastrophic proportions. A dependence on impoundments may unacceptably alter natural water courses and inundate valuable croplands, fish and wildlife habitat, and historic sites.

## 4.5 No Framework Implementation

The alternative of no framework implementation would probably result in a continuation of planning and program selection methods which in the past have produced some unpleasant and unforeseen results. Much of the planning in the past has been somewhat piecemeal and has not been coordinated by and with the various levels of government. The institution of a framework plan will improve governmental coordination and will be a guide for the selection and development of future programs and projects.

The alternative of no framework implementation could result in environmental degradation by leaving governments unable to predict and assess wisely the primary environmental effects which a particular program, project, or use of water and related land, and the alternatives to it, including no development, may produce.

All projects alter the natural environment. Without guidance in choosing and assessing the environmental consequences of proposed water and related land uses and programs, it is difficult to foresee the broader environmental cost and benefits which are likely to result.

It is necessary to take environmental values and processes into account in selecting among alternatives so as to accommodate those values or processes, or where a conflict of values is necessarily present, to reach an informed and balanced judgment as to what will best serve the public interest. The complexities of resource problems and the increasing developmental pressures on the re-

sources of the Basin would appear to make the no framework implementation alternative unacceptable.

Planners and developers in the past have not adequately considered ecological processes and environmental values in water and related land development and use. While a number of projects have been planned and executed with careful regard for environmental values, a significant number have not. Too many of these projects have caused unnecessary damage, leaving the Region environmentally poorer. Furthermore, in some cases the cost of modifying or abandoning a project to mitigate unacceptable environmental damage has resulted in a financial loss as well.

Careful planning frequently can accommodate important developmental and environmental values within a harmonious solution. The Framework Study, and the frameworks developed in such a study, provide an effective way to analyze and report the effects of alternative choices. They help planners strike the balance which serves the public interest most fairly and promptly, eliminating the social, economic, and environmental costs which attend delay in reaching needed decisions.

The basic purpose of the Great Lakes Basin Framework Study is to identify geographic areas and resource categories where problems may arise in meeting the needs of the people of the Basin from available supplies of water and related land. As a first step toward a Comprehensive Coordinated Joint Plan for managing the resources of the Great Lakes Basin, the study provided a rationale for formulating and evaluating the relative merits of alternative courses of actions to solve the current and potential problems, for resolving the potential conflicts, and for meeting the needs of the people at a minimum cost. The Framework Study did not involve basic data collection, detailed cost estimates, or detailed formulation of projects. It was designed not to give specific answers about what should be done, but rather to indicate possibilities that should be considered and the consequences of the choices that can be made. The Framework Study then says, in effect, here is what we have, here are the ways we can use what we have, and here is what will happen if we make these various choices. Without such guidance in choosing, it is difficult to foresee the broader environmental costs and benefits which are likely to result.

### 4.5.1 Water Supply Development

A persistent tendency of water resource planning has been the use of a single-valued projection of water use into the future under a continuation of present policies, leading to estimates of future water requirements. This often leads to unbalanced development of water supplies in many areas. Although the amount of water in the Great Lakes Region is not a constraint, it is difficult to forecast precise levels of future water use on the basis of past water use without taking into consideration the population levels and distribution, the per capita energy consumption, rate of income growth, technological development, water policies, consumer habits and lifestyles, various governmental policies, and other variables. The Framework study has addressed most of these variables and has considered various ways of arriving at the future water supply needs for the Region.

### 4.5.2 Water Quality

The development of the Great Lakes Region has exacted a high price in the deteriorating quality of its water resources. The streams and lakes have been heavily damaged by discharges of wastes, by polluted runoff from urban, agricultural, and mine development, and by accelerated siltation, erosion, and sedimentation.

As a basis for sound decisions about programs for water quality improvement, the public needs to know the facts about water pollution and to understand the costs and the benefits of alternative strategies for managing water quality.

The Federal Water Pollution Control Act Amendments of 1972 (P.L. 92–500) involve a sweeping revision of the entire governmental program for control of water pollution in the country. In addition, this legislation proclaims two general goals for the United States:

(1) to achieve, wherever possible by July, 1983, water that is clean enough for swimming and other recreational uses, and clean enough for the protection of fish, shellfish, and wildlife

(2) by 1985, to have no discharges of pollution into the nation's waterways.

The new national quality goals are to be achieved through a "permit program" based on effluent limitations as well as through water quality standards. All elements of the new program are tied together in a new mandatory planning procedure. The goals of the Act are the groundwork for a series of specific actions aimed at the prevention, reduction, and elimination of water pollution. These actions, which are described in Appendix 7, *Water Quality,* include:

(1) a review and upgrading of water quality standards in order to accomplish the first goal

(2) stringent new effluent limitations for abatement of both municipal and industrial pollution

(3) increased Federal funding for construction of municipal wastewater treatment plants.

### 4.5.3 Commercial Navigation

The availability of low-cost, waterborne transportation in conjunction with the rich natural resources of the area was the primary factor in the initial growth of the Great Lakes Basin and continues to provide a transportation base vital to the Basin's continuing economic health.

Future navigation and waterfront planning must be comprehensive in nature, including commercial, industrial, social, recreational, and aesthetic needs and values. The Basin provides high "quality of life" through its enjoyable scenery, fishing, swimming, power boating, and sailing, and through agriculture, mining, manufacturing, power supply, and transportation. These factors are all dependent upon the water resources of the Basin. Some uses are complementary, others are competitive. Prime consideration must be given to the effects of any proposed action on the environment and to restoring, preserving, and improving the Great Lakes Basin for the benefit of its users or inhabitants. Plans and programs that are not comprehensive in scope usually do not give prime consideration to the effects of any proposed action on the environment and quality of life in the Great Lakes Region.

### 4.5.4 Land Use

Land use planning and water resource planning should be integrated in order that planners may have first-hand knowledge of the needs and intentions of all concerned. Water resource planning is important, but is only one aspect of overall resource planning to satisfy human wants. Land use plans made without the involvement of the water planner may permit the extension of residential or industrial building onto the flood plain; may permit flood storage areas, such as swamps, to be drained and filled; and may approve use of flood plains for channel-constricted uses, such as filling for site improvement, or for the disposal of solid waste material.

Water planners, on the other hand, sometimes proceed without the involvement of land use planners. How lands are to be used will determine in large measure where and how much water will be demanded and for what purposes. Decisions made in preparing land use plans for industrial parks, power plant sites, irrigated agriculture, commercial developments, and other water uses and purposes, will determine whether, and how extensively, water resources must be developed to serve the intended uses. There is a pressing need for all future planning to be coordinated by all levels of government in order to improve water and related land use. There is usually no best plan. Therefore, the alternative combinations of actions that might be taken should be described, and the probable adverse and beneficial effects of each choice should be indicated and submitted to the decision-maker for determination.

The Framework Study has integrated water planning with planning for the use of land, the needs of metropolitan areas, the environmental consequences, the interest of the general public, and the long-range forecast for the development of the Region's resources.

# Section 5

# UNAVOIDABLE ADVERSE IMPACTS OF PROPOSED FRAMEWORK

## 5.1 General

The National Environmental Policy Act of 1969 (P.L. 91–190) requires the environmental impact statement accompanying a major proposal to state "any adverse environmental effects which cannot be avoided should the proposal be implemented."

The Proposed Framework serves as a guideline for more detailed and location-specific planning, design, and construction of structural and nonstructural projects or programs. The Proposed Framework thus suggests a pattern for future resource conservation and development programs which, if implemented, will have a great deal of environmental impact and place greater pressure on natural water and land resources in the Basin.

The following description of adverse environmental impacts of Framework programs is based on the long-range effects of PRO Framework implementation at the time period 2020. The specific quantities are shown to give perspective and an estimate of potential environmental change, rather than a prediction of what will occur. The changing values and policies of society, coupled with technological advances, will most certainly alter the nature and quantity of these impacts before the year 2020.

## 5.2 Water Withdrawal Programs

The Proposed Framework anticipates that water requirements for municipalities, self-supplied industries, and electrical power cooling would be supplied mainly from Great Lakes sources. Inland lakes, streams, and ground water do become an increasingly significant source for meeting municipal, industrial, rural, and irrigation demands for water withdrawals. Although it is not anticipated that impoundments will be required to satisfy water supply needs in most parts of the Great Lakes Basin, in the event that future demands upon inland lakes and streams and ground-water resources were judged to be excessive, additional impoundments have a significant potential for providing water supply for inland industries, municipalities, and other users, particularly in the basins of Lakes Erie and Ontario. Total consumptive losses in 2020 are projected at 14.8 billion gallons per day, more than six times present consumption in the U.S. portion of the Basin. Major water consumers in 2020 are projected to be industry, power, and irrigation. Adverse effects on power production, commercial navigation, and possibly wildlife, could result from an estimated six percent decrease in average flow of the St. Lawrence River by the year 2020.

Increased consumptive losses in the interior drainage areas could alter stream regimen and affect fish and wildlife resources, decrease water quality, and degrade aesthetic and recreational values of stream valleys. More detailed assessment of individual withdrawal effects is necessary to be certain of environmental effects. The location of self-supplied industries along the Great Lakes shorelines may have significant environmental effects upon the shorelands. The development of industrial water supply facilities should include efforts both to minimize environmental disruption as a result of construction and water use and to encourage environmental repair.

A significant water withdrawal impact could develop as electrical generating plants are sited near the Great Lakes to meet the increasing demand for energy. The volumes of water these generating plants require for cooling purposes make strong demands on the aquatic environment at the point of release by disrupting the existing temperature regimen. The effects of plants already in operation have not been well defined because of the relatively short history of experience with thermal discharges. This lack of information makes it difficult to establish an upper limit for either numbers or volumes of heated discharges into any of the Great Lakes before significant environmental changes result. Several alternatives do exist, but they require additional expense and could have undesirable environmental and aesthetic effects. Cooling ponds for heated effluent require more space than may be available near population centers. Cooling towers, which require less space, may produce undesirable microclimatic effects (localized fogging,

icing) and under some circumstances may be an aesthetically detracting element. Power transmission lines will also pose an adverse impact as lands are pre-empted for lines to connect new facilities to existing power transmission networks. By 2020, a major portion of the total energy produced in the Great Lakes Basin is forecast to come from nuclear power plants. A potential threat of nuclear accident and radiological contamination of the Lakes as a water source requires stringent public health and environmental safeguards to be recommended in the PRO Framework program.

### 5.3 Nonwithdrawal Programs

Nonwithdrawal programs in the Proposed Framework include proposals with varied environmental demands. Improvement of water quality through compliance with the Federal Water Pollution Control Act Amendments of 1972 will require major capital and material allocations to meet the goals set forth in this Act. The funds dedicated to the improvement of water quality will be derived largely from an aggregate of governmental funds. Development of areawide waste treatment systems will lead to localized impacts. Proper land use planning will be vital in preventing urban sprawl and ribbon development along interceptors.

The adoption of the PRO Framework affords the best means of flood damage reduction for developed flood plain areas in the short term, but could pose a major adverse impact in the long term. Once existing flood plain development is protected by channeling, levees, impoundments, or other structural measures, the economic commitment to continue in this direction is made irrevocable by the continuing effect of renewed economic investment in the protected area. Stream gradients are accelerated, channel capacities altered, and flooding problems are transferred from one reach of stream to another. The capital investment continues in both development of the flood plain and in protective works. The alternative to this is legislation prohibiting further flood plain development for noncompatible uses, coupled with adequate enforcement. These steps would avoid the anguish, public expense, and loss of property and life that result from major floods, and in the long term, make a greater contribution to the general welfare of the Basin.

The potential adverse effects of commercial and recreational navigation programs include:

(1) habitat change from dredge disposal on land or in contained areas

(2) changes in lake current and flood patterns that could lead to disturbance of valuable fish spawning or nursery areas

(3) increased temperatures in side channels and associated wetland areas

(4) extended periods of turbulence

(5) increased gouging of shorelands

(6) gasoline or oil leaks

(7) noxious fumes

(8) increased noise levels

(9) land requirements for harbor and marina construction.

More intensive use of existing lakes and streams will burden some already overused resources.

### 5.4 Related Land Use Programs

Significant adverse effects on land resources would result from Proposed Framework implementation. Improvement of economic efficiencies and resource opportunities will encourage concentration of growth in the area. Land acquisition will continue to change the nature of the environment and its capability to sustain certain uses. Land used in construction of housing, industry, transportation, and other facilities will be largely irretrievable losses.

Visual diversity, cultural value, and quality of natural resources could be degraded as a result of inevitable economic pressure to provide accomodations for recreationists. Construction of recreational facilities invites intensive use of the Basin's resources for such purposes as roads and camping areas, while increasing the potential for pollution, litter, and wildlife disruption.

Prescribed burning, fire trails and breaks, and dozing and shearing of low-yield timber for improved wildlife purposes will temporarily degrade the natural setting in areas throughout the Basin. Adverse impacts from structural flood protection measures like impoundments, levees, and floodwall construction may include:

(1) disturbance of trees

(2) noise

(3) disturbance of vegetation

(4) disturbance of soil associated with construction

(5) ponding or installation of dewatering systems on protected lands

(6) altering of stream hydraulics

(7) diminishing of riverscape aesthetics.

Land acquisition may involve displacement of people and commitment of economic resources.

The extractive industries of the Great Lakes Basin should have adequate reserves to meet needs indicated by the PRO Framework. The impact of their actions depends to a great degree on the adequacy of programs to restore mined or quarried areas for forestry, wildlife habitat, recreation, or other valuable uses once the mineral removal has been completed.

Impoundment of flowing streams will change the terrestrial habitat of the impounded area to an aquatic habitat and the moving water ecosystem to a still water ecosystem. Depending on the size of the impoundment, construction could involve such issues as physical, social, and economic impacts, noise, fire, tree removal, erosion, change of water table, surface water levels, displacement of people, and destruction of certain fish and wildlife populations. Land treatment measures such as improved drainage can adversely affect streams and flood plain wildlife habitats.

Intensive farming practices, such as larger farmland units and use of larger machines, can reduce wildlife habitat, while increased use of fertilizers and pesticides may cause water quality problems. The effects of nonpoint source pollution emanating from intensive agricultural activities will have critical effects on water quality and aquatic productivity resulting from nutrient influx and toxic material build-up in aquatic organisms and sediments.

# Section 6

# SHORT- vs. LONG-TERM IMPACTS

The Proposed Framework provides general guidelines for decision-makers in both the governmental and private sectors for use in planning and developing priorities and to assure that present and future programs and policies contribute to the preservation and enhancement of environmental quality to the degree possible. While these guidelines should contribute to a better understanding and ultimate use of existing resources within the Basin, there is, on the other hand, no assurance that they will be fully implemented by potentially affected units of government.

The Framework Study gives decision-makers the opportunity to evaluate potential trade-offs between short-term economic gains and occasional long-term losses (or vice versa) for each Alternative Framework and related program. In some parts of the Basin, these decisions will have pronounced, far-reaching effects. In others, there will be little opportunity to resolve existing or future problems.

Several elements of the proposed Framework entail risking short-term uses of the environment to the detriment of long-term productivity of the resource base of the Great Lakes Basin. The PRO Framework projects a need for several single and multipurpose reservoirs, which may be productive for their primary purposes for only a matter of decades, but which may also have significant long-term adverse effects on biotic communities, stream characteristics, recreation, fish and wildlife, and aesthetic values of the area. The PRO Framework holds that creation of additional water surface area through impoundments would generally improve the fishery. Such a generalized statement may hold true in some cases but not others, depending on the criteria used to judge the quality of a fishery. If pounds of fish produced is the predominant criterion, the Proposed Framework is generally correct. If species composition is substituted as the predominant criterion, the reverse may often be true. Maximal benefit depends on the nature of the individual project and the stream site at which it is constructed. The PRO Framework plan must deal in such generalizations because it is not site-specific.

The Proposed Framework views flood plain legislation as effective only for alleviating certain percentages of the increase in average annual flood damages and assumes that, for the immediate time period, damages to developments in the flood plain can best be reduced by structural measures. Structural measures on flood plains are vulnerable to the charge of being products of short-term planning which does not adequately recognize the long-term benefits of removing developments from the flood plain and allowing it to continue performing its flood storage function.

Structural measures are also espoused for protection of certain Great Lakes shorelands against erosive effects of wave action, currents, and high lake levels, which may be accelerated by existing structures. Such structural measures are situated along the fragile water/land interface, either just onshore or in the littoral zone of the lake. The adverse environmental impacts of structural measures must be judged against the economic impacts of allowing erosion to proceed naturally toward a more stable shoreline configuration.

The PRO Framework advocates the provision of incremental "improvements" to the Great Lakes navigation system, meaning such things as greater depths in harbors and connecting channels and a longer navigation season. The economic benefits of each such project will have to be weighed against its effects on the biotic productivity of the area's aquatic environment, and some will have significant deleterious effects.

The Framework further advocates studies to give policy makers more and better information about the suitability of land uses and to help them plan water uses complementary with land uses. Such studies would include the conversion of prime agricultural land to urban uses as well as the loss of aquifer recharge areas, flood plains, and valuable ecological systems such as wetlands. The exploitation of these resources for short-term gains may be extremely critical when weighed against increased future demands for food and fiber, natural resources, and recreational facilities.

The examples above illustrate the difficulties involved in balancing the benefits—the short-term gains from altering a natural system to serve economic or other particular needs—against the long-term impact on the biological productivity of the land and water resources. As public awareness of these impacts grows, individual projects may un-

dergo more stringent scrutiny of their effects. For example, nonstructural methods of reducing shore erosion and damages on flood plains have been given more emphasis since the development of the Framework Study. At the same time, greater populations and increasing economic pressures will also continue to balance environmental concerns. The Proposed Framework acknowledges this reality in advocating a middleground approach to growth, so that the ability of the land and water resources of the Great Lakes Basin would not be committed beyond their capacity to support a reasonable quality of life through the year 2020.

# Section 7

# IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS

The following resource commitments are required to implement the program components of the Proposed Framework:

(1) Land Requirements. Essentially, the entire Basin area, 179,000 square miles, is affected by the PRO Framework. PRO Framework programs address water supply sources and water-related resources such as flood plains and recreation areas. As much as 37,300,000 acres of agricultural and forest land would undergo conservation measures. Continued urbanization will take a projected 3.4 million additional acres, increasing from about 8 percent to about 14 percent of the Basin area by 2020.

(2) Construction Materials.

(3) Labor and Money. The cost of implementing the program components of the PRO Framework over the next 50 years is estimated to be $25.6 billion capital cost, and $46.9 billion operation, maintenance, and replacement (OM&R) cost.

Some of the actions (i.e. outdoor recreation, commercial navigation) in the PRO Framework will have limited or indirect effects on land and water resources. Other actions (i.e. municipal waste water treatment, thermal power) will have a significant environmental effect. Some of the proposed activities may limit or alter present uses of natural resources. However, this preclusion is not entirely irreversible because future legislative bodies can reverse program decisions if they perceive the public interest differently.

In some instances, the extent of development in specific areas may influence land use patterns in the surrounding areas. Thus, land and water resources may be committed to other short- and long-term uses. Care will be essential in monitoring major program activities within the Basin to insure compatible uses of the environment. This activity will require a continuing coordinated effort by the Great Lakes Basin Commission in conjunction with all affected governmental units.

Alteration of the environment for various proposed activities (i.e. mining, public utilities, industry, urbanization) may contribute to the loss of renewable resources such as timber, wildlife, and agricultural crops. Increased use of free-flowing streams could create an irreversible change in the aquatic ecosystem and result in irreversible losses of wildlife habitat. Highly developed urban or industrial areas could also cause irreversible damage to existing natural features and drastically change the physical characteristics of the environment, thus resulting in possible loss of irreplaceable sociological and cultural values. It is also possible that unforeseen secondary effects of proposed actions could have an irreversible environmental effect.

We must accept the fact that the environment is an interacting process with its own inherent laws which present intrinsic opportunities for and constraints to human use. It is all too clear that man cannot continue to manipulate natural systems in disregard of these laws without suffering dire consequences. One approach to this environmental planning involves analyzing the land to ascertain opportunities and constraints to economic development. The physiographic features that are examined include:

(1) topography and subsurface geology
(2) surface and ground water
(3) climatic and hydrologic relationships
(4) flood plains
(5) soils and vegetation
(6) flora and fauna.

A set of physiographic principles are then formulated which indicate the categories of development and the densities that are environmentally acceptable.

Examples of these principles are: the prime agricultural land should be preserved; development should be prohibited over prime aquifer recharge areas; one hundred year flood plains should be exempted from all development, save agriculture and recreation; and development of slopes of 25 percent or greater should be prohibited. A natural systems approach to planning facilitates rational and intelligent guidance of development. Development in consonance with physiographic opportunities and liabilities allows the preservation of valuable natural systems and the enhancement of the quality of life by accommodating required development while ensuring the highest level of amenity.

A second approach to environmental planning involves ecological systems analysis to determine regional tolerances for development. This ecological analysis includes: biological communities; ecological irreversibilities; ecological potentialities for

production and assimilation capabilities; fragile systems such as estuaries and shorelines; and energy and materials costs and flows. The goals and objectives for this ecological approach are basically the same as the physiographic method. The ecological approach provides a planning technique to enable the accommodation of economic development goals while maintaining ecological systems and processes. In both cases, however, the guiding criterion is that man must learn to live with nature and conform to certain immutable environmental laws.

Although there will be no irreversible or irretrievable commitments of resources through adoption of the PRO Framework itself, the Framework will encourage commitments which would take place as programs and projects are implemented by responsible governmental agencies. The National Environmental Policy Act requires Federal agencies to study carefully the environmental effects of proposed actions, thus giving consideration to alternatives that will assure a minimum of environmental impact. Several Great Lakes States have enacted similar legislative requirements. In this manner, future actions will hopefully provide programs compatible with other uses while maintaining a quality environment with a minimum of adverse environmental impact.

# Section 8

# CONSIDERATIONS OFFSETTING ADVERSE IMPACTS

## 8.1 Objectives

The Proposed Framework provides a broad guide to the optimum use, or combination of uses, of water and related land resources of the Great Lakes Basin to meet foreseeable immediate and long-term needs. The PRO Framework is prescriptive in the sense that it seeks the resource allocation best achieving consensus of Basin residents concerning economic development and environmental quality. It is descriptive in that it seeks to establish boundaries and strategies for resource development and economic growth in the Great Lakes Basin.

The PRO Framework considers both individual and group needs. Basin residents require economic goods to satisfy their physical and material needs. They need psychologically satisfying experiences to maintain their mental, social, and environmental well-being. It is important to remember that the PRO Framework seeks a rational balance between the competitive uses of resources: to allow economic development, to provide for general social well-being, and to provide a high-quality environment.

## 8.2 Specific Contributions

The assessment and evaluation of contributions of the PRO Framework are hindered by the difficulty of assessing quantitatively the values of many human experiences and needs. There is a notable diversity of opinion on what constitutes the proper mix of economic development and preservation or enhancement of the natural environment. Consequently, any plan for resource management is destined to meet some disagreement as to where the line should be drawn with regard to environmental quality. But looking beyond this inherent weakness, the following definite strengths associated with the PRO Framework are also worth consideration:

(1) Income Distribution. Consideration of human needs on a regional basis offers the opportunity for a more even geographical distribution of economic development. The process allows for improving the income and morale of isolated areas which might otherwise be passed by during economic growth. This more even distribution of economic growth has a spin-off environmental benefit, by curtailing population congestion in more highly developed areas.

(2) Institutional Stability. The PRO Framework establishes priorities for dealing with both developmental and environmental problems in the Great Lakes Basin. By identifying specific needs and establishing boundaries or limits on the degree to which certain needs will be met, the Framework seeks to avoid the uncertainty and economic instability caused by "resource management by reaction" in the face of critical needs. The Framework offers a program of resource management based on clear-cut rational objectives designed to promote institutional stability.

(3) Environmental Quality. American society has burdened planners with two specific goals which tend to be mutually exclusive. Planners are called upon to meet increasing demands for resources to support a higher standard of living. At the same time, they are asked to conserve those same resources in order to preserve the quality of the human environment. The PRO Framework represents a growth strategy that seeks a rational mix of economic development and maintenance of environmental quality. The ultimate goal of the Framework is to effect allocation of resources to meet human needs without causing any specific geographic area to sacrifice more than its fair share either economically or environmentally.

## 8.3 Alternative Growth Objectives

As indicated in Section 1, the Proposed Framework was developed by studying Normal, Accelerated, and Limited Growth objectives for meeting different levels of water and land resource demands. Each of the growth concepts assumes that at least the minimum requirements for social, economic, and environmental well-being will be provided. A major difference in the strategies is the extent to which economic or environmental objectives are emphasized.

(1) Accelerated Growth. The Accelerated Growth objective reflects an increased willingness

to exploit natural resources and to relegate cultural, aesthetic, and environmental factors to a position of secondary importance. A key word here is resource exploitation rather than wise use. Any statement of opportunity costs or social acceptance of the environmental quality trade-offs associated with accelerated growth would be purely speculative. However, there is at least one strong argument for viewing such a strategy with caution. It is wise to choose reversible actions whenever possible. If resources are committed to use through accelerated growth, alternatives for future programs are thereby constrained. It is true that the effects of many uses of land and water resources are not irreversible. However, from the practical standpoint, the time needed for reversing an impact may effectively eliminate alternative uses of the resource by one or more human generations.

The Accelerated Growth objective, as described in the analysis of alternatives, would tend to infringe upon environmental quality objectives set forth in both the National Environmental Policy Act (P.L. 91-190) and the Federal Water Pollution Control Act (P.L. 92-500) as amended in 1972.

(2) Limited Growth. The Limited Growth objective is based on the concept that preservation, conservation, and restoration of the natural environment are of primary importance. A heavy emphasis on the natural, cultural, and aesthetic aspects of resource management is implied. The concept assumes near-zero population growth.

At first viewing, the limited growth alternative would seem to be the panacea for all environmental quality problems. Use of resources conserved would accrue over a long period of time and would include successive generations of people among the beneficiaries. Obviously, the opportunity costs of not using resources must be considered. It is likely, even with reduced population growth, that there would be some sacrifice in regional income and employment to achieve the Limited Growth objective. In this regard, it is necessary once again to emphasize that the Proposed Framework seeks to maximize economic and social well-being as well as environmental well-being.

### 8.4 Summary

Of the alternatives considered, the Proposed Framework best represents the consensus values of the Great Lakes Basin Commission with regard to economic development and environmental quality. The Proposed Framework is in consonance with the requirements of the Water Resources Planning Act of 1965, the Federal Water Pollution Control Act Amendments of 1972, and the National Environmental Policy Act of 1969.

# Section 9

# ENVIRONMENTAL IMPACT INFORMATION NEEDS

It is the opinion of the Great Lakes Basin Commission that the effectiveness of long-range planning can be significantly augmented by further data collection, analysis, and research, particularly in the following resource information areas:

(1) evaluation of long-term, cumulative water quality changes in large lake systems, particularly as shown by chemical and biological parameters

(2) regional effects of land and water use decisions on fish and wildlife habitat conditions

(3) inventory data on shoreland resources adequate for sound economic, social, and environmental planning programs

(4) effect of land treatment programs on water quality

(5) interaction between air pollution and Great Lakes water quality

(6) cumulative effects of power plant location and heat discharges on Great Lakes waters near population centers.

As additional environmental assessments are conducted, more information gaps will likely be uncovered, while many areas of information are substantially advanced.

The Commission encourages comprehensive consideration of environmental impacts in all planning programs. Federal agencies and several Great Lakes States prepare environmental statements for major actions significantly affecting the environment. These statements must continue to advance the level of environmental knowledge, and improve the planning judgments needed to make environmental progress possible. Several statements and other reports of particular interest are listed in Annex 2. The Commission will continue to keep apprised of Canadian studies and environmental programs which provide environmental impact information that can complement analyses conducted in the United States. Joint consideration of environmental impacts on Great Lakes waters, particularly those of an international character, should be useful to both countries in their future planning and management activities.

# Section 10

# REVIEW COMMENTS AND RESPONSES

Upon completion of the Draft *Environmental Impact Statement*, the Great Lakes Basin Commission referred it to appropriate Federal, State, and local agencies for comment and consultation. Specific comments by these agencies and responses by the Commission are set forth in this section to document the consultation process and present the widest possible range of views on the environmental impacts of the Framework Study.

Full copies of all EIS review correspondence from responding agencies are presented as Annex 3 of this statement. For ease of reference, however, agency comments are digested in standardized form in this section. Since page numbers in the Draft EIS do not correspond to page numbers in this Final EIS, references to specific draft pages have been converted to paragraph numbers within the numbered subsections of this final statement. Readers of the draft statement may notice that subsections within Section 3 have been renumbered. Specific comments dealing with typographic errors and other nonsubstantive comments are not included here. Spelling and punctuation in some comments have been regularized here for clarity of reference. The comments reproduced in this section include some received from Basin Commission member agencies after the formal review period and prior to final approval of the EIS.

## 10.1 Federal Agencies

### Department of Agriculture

**Comment:** The tone of the statement could be more objective. It appears the statement advocates a proposed plan more than it describes impacts relating to resource development.

**Response:** There may appear to be a degree of advocacy in the *Environmental Impact Statement* since the document describes the framework; however, any such appearance is unintended. Upon rereading the statement, we believe that it does deal objectively with the issues involved.

The displays in Annex 1 are an objective analysis of impact, and should also compensate for any impression of advocacy in the text. Certain changes made in response to other EIS comments also address this concern.

**Comment:** The agricultural aspects of the plan are adequately covered.

**Response:** Noted.

**Comment:** The discussion of impacts of power production in Section 3.1.1 should be deleted since they are covered in Section 3.2, Environmental Impacts. The discussion on impacts appears to overemphasize power in relation to water quality.

**Response:** The discussion in Section 3.1.1 is not duplicated to a significant degree in Section 3.2, and we feel that deleting part of it would leave an incomplete picture.

The power discussion is a vital component of the impacts section, due to the amount of water to be consumed. On the basis of growth patterns in land use, industry, power generation, and population, it is projected that rates of consumptive use will increase from about 2,300 cfs in 1970 to about 13,000 cfs in 2020. Regardless of the power generation technology used, a significant amount of this consumption will be cooling water for power plants.

**Comment:** The entire description of population and population factors, found in Section 3.2.1 under Environmental Impacts, should be deleted. This Section should describe the impacts of the Proposed Framework program and does not need general population discussion. The material which should be discussed in this section is included in Section 3.2.2.

**Response:** We believe that the perspective provided in Section 3.2.1 (especially in Table 2) is valuable in helping the reader view impacts in the context of how they have developed, and to understand the factors that may determine the nature and degree of future impacts.

**Comment:** Section 3.2.2, ¶1. The statement "An envionmental rating . . . is found in Annex 1" is misleading. The ratings found in the annex are simply a plus or minus with no relative ranking. The "rating" could be discussed in some detail here to clarify the condition. The same statement is

included in the description of each Lake basin and could be deleted if it is described in Section 3.2.2, ¶1.

**Response:** The ratings have been briefly explained in Section 3.2.2, ¶1. Mention of the ratings will be retained in all of the Lake basin discussions, so that each can be understood without referencing this section.

**Comment:** Section 3.4, ¶15. The agriculture and forest land and management programs should be included in the list of programs for the Lake Michigan Basin.

**Response:** They have been included.

**Comment:** Section 3.6, ¶9. The forest land treatment and management program should be included in the list of programs for the Lake Erie Basin.

**Response:** They have been included.

**Department of Army, Corps of Engineers, North Central Division**

**Comment:** Section 3.1.2.4(6). Neither the Main *Report* nor the *Alternative Frameworks* Appendix refer to the Proposed Framework as including an item specifically related to the St. Lawrence Seaway as indicated in this subparagraph. It is suggested that this subparagraph be deleted.

**Response:** It should be noted that the cost tables in both the *Report* and Appendix 1 include necessary dredging and structure modification in the Seaway. The text reference "and other channels" permits the inference that the Seaway is included, but this is not believed adequate. Therefore, it is proposed to leave the discussion in the EIS and modify the *Report*, paragraph 11 under "Nonwithdrawal Water Uses" in Section 4, by changing the period to a semi-colon at the end of the last full paragraph and adding "and channel dredging and structure modification in the St. Lawrence Seaway." A similar change will be made in Appendix 1 (Section 5.6.2) so that the text in the documents will conform to the costs shown.

**Comment:** Section 3.6, ¶8. The eutrophic nature of Lake Erie should be mentioned (refer to page 167 of Appendix 7, *Water Quality*).

**Response:** Concur. Additional wording has been incorporated into the text.

**Comment:** Section 3.6.1, ¶7. The statement on potential adverse effect on Canadian water quality in the event of breakdown in wastewater management plant operation would also be true for U.S. shoreline and for all lakes. This statement was not included for Lake Superior. It is suggested that the statement either be deleted or expanded.

**Response:** The statement regarding Canadian and U.S. water quality and possible wastewater plant breakdowns has been removed from individual Lake basin discussions and added to the Basin summary section.

**Comment:** Section 10.1, Assistant Secretary of Defense. Your response that structural measures do not redefine a flood plain is not true. For any given flood occurrence up to that of the design flood, the flood plain is reduced for the protected area; the degree of flood plain reduction is variable in the case of impoundments dependent upon distance. It is suggested that the first three sentences be deleted.

**Response:** Concur. Changes have been made to incorporate the suggestion.

**Assistant Secretary of Defense (Health and Environment)**

**Comment:** Section 1.2.3.4. A description is given of the agricultural capabilities of the land in the Great Lakes Region. One important statistic is omitted. That is, of the land suitable for agriculture, how much of it is presently under cultivation? This is important for planning purposes. Especially, how much land is idle?

**Response:** Has been included in paragraph 2.

**Comment:** Section 1.2.3.2, ¶4. Mean lake level elevations do not agree with those presented by International Great Lakes Levels Board in *Regulation of Great Lakes Water Levels*. This discrepancy should be checked.

**Response:** Has been changed. EIS figures were simply accurate to ±0.01 ft. Accuracy has been changed to ±0.1 ft.

**Comment:** Section 3.2.2, ¶18. Waterfowl habitat is again noted here as being important due to its scarcity. However, in paragraph 17, diked disposal areas are not indicated as frequently taking waterfowl habitat out of production. Same problem in Section 4.2.2, ¶3.

**Response:** Sections 3.2.2 and 4.2.2 have been amended.

**Comment:** Section 3.1.2.3, ¶1. It would seem that harbor improvements could encourage exploitation of fishery stocks, but it is not apparent how production could be encouraged, as implied here.

**Response:** The sentence in question has been deleted, and other explanatory material added.

**Comment:** On several pages it is projected that 90 percent of the energy demands of the Great Lakes Basin in the year 2020 will be met by nuclear power plants, many on the Great Lakes shorelines. Does this projection take into account possible technological advances which would make a shoreline location relatively less advantageous, thereby allowing the utilities to avoid the environmentally sensitive shore zones? This should be addressed in the Final EIS.

**Response:** The EIS is based on figures in the Framework Study itself, which did indicate that by 2020, 90 percent of power needs would be met by nuclear plants. However, we acknowledge the hazard in promulgating any percentage figure, since the state of the art changes. Recent events would indicate that the figure may be less than 90 percent. Level B and other more detailed followup studies will be the most recent information available.

**Comment:** Section 3.2.2, ¶15, last two sentences. The sentences suggest that structural measures induce growth in the intermediate regional flood plain (the standard for flood plain management programs), while in fact structural measures redefine and constrict the regional flood plain. Flood plain management is designed to control nonconforming growth in the regional flood plain. Since some benefits claimable under structural flood control plans depend upon a great freedom of use or more intensive use of the former flood plain lands, the paragraph should be made more clear as to which flood plain is meant.

**Response:** In all cases, we are referring to the natural flood plain.

### Department of Commerce

**Comment:** Footnotes and bibliographic references. Sources of data used to identify, quantify, or evaluate any and all of the environmental consequences should be made known to the reader.

**Response:** The EIS material is derived from the Framework Study *Report* and the twenty-five appendixes. The bibliographies and references in the *Report* and appendixes should be useful. In response to this comment, however, we will expand Annex 2 of the EIS to include pertinent sources of Basin environmental information.

**Comment:** Explanation of estimated cost summaries. A brief description of the methodology for deriving Framework program costs and an identification of the discount rate would be useful.

**Response:** Capital costs refer to first-time costs, including installation cost and such related nonstructural program costs as technical and financial assistance. They were developed to include all appropriate subitems. The capital costs associated with each of the different program components differ according to resource use, and uniformity among the river basin groups was achieved by providing cost data for use by all the task forces.

Similarly, annual OM&R (Operation, Maintenance, and Replacement) costs were provided for use by the task forces, differing among the resource uses as appropriate. No allowance for interest or amortization has been included.

**Comment:** Charts and tables comparing the environmental impacts of the Proposed and the alternative Framework programs. In line with the objective of conveying information succinctly in a form easily understood, both by members of the public and by decision makers, it is suggested that charts and tables which compare the impacts of the Proposed and alternative Frameworks be prepared for the Final *Environmental Impact Statement.* The tables provided in the Draft EIS describing the impacts of the Proposed Framework program and the various alternative framework programs do not maintain consistent resource categories and/or units for comparison. The suggested charts and tables should be designed to reduce the present need for undue cross-referencing. Further, they should allow for a consistent and thorough comparison of the significant environmental impacts of the Proposed and the alternative Framework programs.

**Response:** Concur. Tables 2, 4, 6, 8, 10, 12, and 14 have been enlarged to be consistent and to provide the fullest treatment of resource use categories.

**Comment:** The development of a fourth alternative. Most of the future impacts of the resource uses in the Proposed alternative are based on the assumption that the Water Pollution Control Act Amendments of 1972 will be fully implemented and complied with. Recent events have indicated that compliance with this program and the air quality program may be delayed. An alternative should be developed to discuss the impacts of the Proposed Framework in the instance of the delayed implementation of these programs.

**Response:** Inasmuch as there are only five resource use categories in which the Proposed Framework will differ from the Normal Framework, and because we are dealing with impacts

through the year 2020, we do not believe that a slight delay in implementation of air and water quality programs will produce a condition sufficiently changed to warrant consideration as a fourth alternative.

**Comment:** We most strongly concur with the Great Lakes Basin Commission that effective long-range planning is highly dependent on quantitative measurements of the parameters involved and that further data collection is required.

**Response:** Noted. However, we should reiterate that further data collection will be done within formats other than the Framework Study (i.e., narrower-scope studies, site-specific project proposals, etc.).

**Comment:** We recommend a permanent program to coordinate and centralize all water dynamics data for the Great Lakes system. This would include data obtained by NOAA and those conducting one-time surveys for specific projects and programs. Consideration should be given to increasing the number of measurement stations, the frequency of measurements, and coordination of present data acquisition programs.

**Response:** We concur, and steps have already been taken to coordinate data acquisition, storage, and retrieval.

**Comment:** The plan, with the status and prestige of the Great Lakes Basin Commission behind it, would significantly impact future water resources development in the Great Lakes area. The impacts would extend to fish and wildlife resources. In our opinion, the present Draft *Environmental Impact Statement* inadequately addresses the potential effects of the plan on aquatic resources, particularly the commercial fisheries. We recommend that the potential impact on the commercial fishery be discussed in the Final EIS in a depth appropriate to the scope of the study.

In particular, we feel that the Commission has not met its principal charge, as outlined in the third paragraph of Section 1.1 of the Draft EIS, in that commercial fishing has not been included as an active factor in the long-range plan. In our opinion, optimum management of the fishery resources requires a balanced mix of sport and commercial fishing—a concept that gets little or no recognition in the Draft EIS in spite of its central importance.

The lack of balance in the treatment of recreational and commercial fisheries is further illustrated in the section on historical development of the Great Lakes Basin, as discussed in Section 1.2.2.1, where the contribution of the fishing industry is greatly understated. The following quotation from "Fish and Wildlife as Related to Water Quality of the Lake Superior Basin" (Fish and Wildlife Service, U.S. Department of Agriculture, 1970) serves to illustrate this point: "The abundant supply of fish in the Great Lakes played an important part in the development of bordering land areas from the beginning of human settlements." Commercial fishing also played an important and active part in the development of the Basin's other natural resources, including the copper, iron, and lumber industries in the Upper Great Lakes Region. In addition, the following quotation illustrates the sport-commercial fishery relationship: "The historical importance of the Great Lakes for commercial fishing has declined, while the value of recreational fishing has increased. This does not diminish the value of commercial fishing but demonstrates the ever-increasing importance of sport fishing, hunting, and other related forms of recreation which have been drawn to the Great Lakes area."

**Response:** Appendix 8, *Fish*, and the Framework Study *Report* discuss "limited entry" and other methods of regulating commercial fishing on the Great Lakes, as well as relationships with sport fishing activity. In all instances, consideration has been within a context that maintains that commercial fishing will not be a significant industry on the Great Lakes through the year 2020. Annual commercial catches now run about 71 million pounds, worth $5.9 million, and the trend is downward. Conflict with sport fishing activity and programs is likely to continue dampening commercial fishing activities.

An institutional entity, the Great Lakes Fishery Commission, was established in 1956 to deal with, among other things, research and rehabilitation programs. Such programs hold out hope for restoration of a significant commercial fishery, but not within the time frame of this study; and the alternative Frameworks should not have greatly varying impacts upon it within the period 1970–2020.

The Comprehensive Coordinated Joint Plan will be prepared in stages, with the Framework Study being simply the first stage (Level A portion). More detailed, specific studies will develop management information indicating the degree to which commercial fishing will be a viable objective on the Lakes.

The value of commercial fishing in a historical perspective of the Basin is not denied, nor do we wish to convey the impression that it has no future. It is likely to attain greater importance on the Lakes, but not in the near future, and not until further research is done.

**Comment:** In our opinion, the value of the *Environmental Impact Statement* as a decision-mak-

ing document could be enhanced by including a detailed discussion of specific examples for each impact mentioned.

**Response:** Examples were not included for every potential impact, in the hope of maintaining a document of readable length. Our attempt in the discussion of impacts basinwide and in the various plan areas, was to highlight those resource use categories which were critical in each area. We also note in the early pages of Section 4 how impacts of the various frameworks differ, which is basically in degree and timing, rather than in nature.

**Comment:** The statement should accentuate more the need to improve the quality of activities in the Basin which at the present time are either inefficient and energy-consuming or damaging to the environment. Specifically, improvements are needed in the present methods to dispose of dredge spoil generated by maintenance of harbors. Although the statement recognizes adverse environmental effects of diked disposal, it supports the continuation of dredge spoil disposal in diked areas of millions of cubic yards of sediment material classified as polluted. Several measures could be listed to improve the situation. Regional planning should evaluate harbors based on the ratio of dredge spoil versus shipping tonnage. Inefficient harbors should be gradually reduced in importance by reducing maintenance dredging. Sandusky Harbor, listed to be deepened to 31 foot depth, is one of the harbors requiring excessive maintenance. In addition, research should be directed towards better utilization of nutrient-rich spoil than burial in diked areas.

**Response:** The Framework Study does discuss specific potential actions, such as lock enlargement, greater harbor depths, etc., but only in the sense of advocating activities that are incrementally economically beneficial. The Study does not address project-specific environmental impacts, which will be treated in more specific follow-up studies. The Commission's advocacy of programs such as dredge spoil disposal is premised on the assumption that they involve environmental impacts that either are not significantly detrimental or are capable of being mitigated properly. Any finding to the contrary would require a reconsideration of the program by the Commission.

Ongoing research programs will provide more specific information for consideration in regard to individual project proposals.

**Comment:** Research and development is essential and very profitable in the ways to dispose of surplus heat generated by thermal power plants. The Statement estimates that generation of heat will expand more than thirteen times within the next fifty years. At the present time, the most economical way to dispose of surplus heat is in the Great Lakes. Extensive research in Canada and scattered research in the United States failed to discover significant adverse effects, and Canada uses Great Lakes water for that purpose without restrictions. Estimate was made that about 200 miles of shoreline would be required by 2020 for thermal power plants. However, for small additional cost, it would be possible to place power plants a short distance inland. The shoreline could then be diverted for public use.

**Response:** The Framework Study is not site-specific regarding power plant location, but rather the amount of waste heat that will accrue to the Lakes. Power plant siting research and evaluations are now beginning as another element of the Comprehensive Coordinated Joint Plan.

**Comment:** The Framework assumes that for the immediate time period, damages to existing development in the flood plain can best be reduced by structural measures. It is believed that immediate steps could be taken to convert certain areas subject to flooding for utilization as public parks, or where appropriate, for wildlife and fishery. Public parks near metropolitan areas are extremely high in demand and occasional flooding would not seriously disrupt their use.

**Response:** Noted. The Framework Study recognizes recreation demand, and provides for changes in institutional arrangements to help satisfy the demand. Such changes require time to be developed and implemented.

**Comment:** The shoreline measures presented in Sections 1.2.1 and 1.2.3.4, ¶5, are not the same. Further, they are not the figures used by the National Ocean Survey.

**Response:** Concur. Section 1.2.1 has been changed to 3,715 miles, which includes both mainland shores and connecting waterways. Section 1.2.3.4 is correct as written.

**Comment:** It would be helpful to know the date(s) of the origin and destination studies referred to in Section 1.2.2.1, ¶9, and to know the definition for the term "urban communities" used in Section 1.2.2.

**Response:** All Framework Study base figures are for 1970. "Urban community" means communities of 2,500 or more.

**Comment:** Section 1.2.2.3, ¶4. A chart showing some statistics on the water supply, water quality,

and income yield aspects might be added to clarify the meaning of paragraph four.

**Response:** Such aids are usually helpful. However, in a general discussion of this length, they did not seem practical.

**Comment:** The mean annual precipitation figure (31 inches) provided in Section 1.2.3.2, ¶2, appears to be in conflict with the annual precipitation figure implied, i.e., 36 inches, by the phrase, "about one-third of the water, or about 12 inches (63.2 bgd) which falls annually as precipitation over the Basin, . . ." in Section 1.2.3.3, ¶1.

**Response:** Section 1.2.3.3 has been changed.

**Comment:** The numbers describing the area of the Great Lakes Basin provided in Sections 1.2.1, ¶1, and 1.2.3.7, ¶1, are not the same.

**Response:** The numbers are correct. The 61,000-square mile figure refers to only U.S. waters; the 95,000-square mile figure is total (U.S. and Canada) water area. The 299,000-square mile figure in Section 1.2.1 includes the land area below the Lake Ontario outlet.

**Comment:** Section 1.2.3.8, ¶1. The list of "Prime Commercial and Sport Fishes of the Great Lakes" is incorrect. The lake sturgeon is no longer caught commercially; in fact, this fish along with the blue pike, deepwater cisco, and blackfin cisco, are all listed in the 1973 edition of "Threatened Wildlife of the United States" (Bureau of Sport Fisheries and Wildlife, U.S. Department of the Interior, Resource Publication 114, revised Resource Publication 34). Both the deepwater cisco and blackfin cisco are considered extinct; none has been caught since the early 1950's, although these species figure predominantly in the early fishery as the target species of the chub fishermen. The kiyi, also a member of the chub group, never contributed significantly to the commercial fishery.

**Response:** List has been changed.

**Comment:** Section 1.2.3.8, ¶3. The statement dealing with the introduction of the sea lamprey and alewife is incorrect. The sea lamprey and the alewife, now abundant in most of the lakes, were unknown in the Great Lakes prior to the opening of the Welland and Erie Canals (Smith, Stanford H., personal communication). The statement regarding the marketability of alewife is also incorrect. Although the alewife is a low value species, there is a ready market for this fish in both pet food and fishmeal industries.

**Response:** Paragraph has been changed.

**Comment:** Section 2, Relation of Proposed Act to Land Use Plans, Policies and Controls for the Affected Area, should include some discussion on the Clean Air Act, as amended, and the Flood Disaster Protection Act of 1973. These discussions should reflect the possibility of delays in the actual implementation of these programs.

**Response:** The Framework Study does assume compliance with all applicable legislation. At this point, it does not appear that the delays in implementation of these programs will be of such duration as to affect significantly a planning program that reaches through the year 2020.

**Comment:** Section 3.1.1, ¶4. With regard to impacts on aquatic organisms, the discussion of the potential problems associated with cooling water usage, particularly those problems related to the electric power generation industry, is presented in insufficient detail. For example, in addition to entrainment of plankton, this section should discuss the probable impacts of impingement of fish on power plant intake screens.

**Response:** Paragraph has been modified.

**Comment:** Section 3.1.2.2. An explanation is needed of the assumptions leading to the proposed flood damage prevention program.

**Response:** It was assumed that increasing use of nonstructural measures will occur as time passes. However, as was indicated earlier, flood damage cannot be alleviated through flood plain legislation until the legislation can actually be implemented (i.e., until it is in effect, with regulations published and funding accomplished).

**Comment:** Information is needed demonstrating the need for the proposed commercial navigation program.

**Response:** Such information is provided in the Framework Study *Report.*

**Comment:** Section 3.1.2.4, ¶1(3). Instead of "a new lock and dam in the St. Clair River," a more proper term should be "a control structure" since there are ways to control water levels without a lock.

**Response:** Wording has been changed.

**Comment:** Section 3.2. With regard to the aquatic environment, this entire section lacks sufficient detail to allow a comprehensive evaluation of the Proposed Framework's impacts. The same deficiencies are particularly noticeable in Sections 3.3 through 3.7, dealing with the individual Lake basins, particularly in the discussions on electric

power generation and its potential adverse effects and on the various proposed navigational improvements and their associated dredging and spoil disposal impacts. For example, in Section 3.4.1, ¶11, it is stated that "In the long term, however, dredging will remove polluted bottom materials from the aquatic medium and can improve water quality." However, the problem of finding suitable disposal sites for polluted dredged materials is not addressed in this section. The adverse impacts of diked disposal of spoil on aquatic habitat should be considered vis-a-vis the fact—recognized in Section 3.1.1, ¶2–3—that the littoral zone of all the Great Lakes is the most biologically productive portion of the basin.

**Response:** The Commission fully acknowledges the critical value of the littoral and shoreline zones along the Lakes, and that further studies will be necessary to minimize environmental damage of such activities as dredged spoil disposal. Mitigation of specific project effects is not within the purview of the Framework Study; however, we do assume that no significant adverse impact will accrue, and that impacts can be satisfactorily mitigated. The Commission remains flexible, open, and willing to reconsider any Proposed Framework policy which proves deleterious to environmental values.

**Comment:** Table 2. Information demonstrating the need for the thermal power use in 2020. If, as stated earlier in Section 3.2.1, the resident population is expected to double, the need for a 15-fold increase is questionable.

**Response:** The Framework Study (Appendix 10, *Power*) determined the 15–fold increase, based on per capita consumption changes as well as population growth. This particular assumption has, however, been discussed by the Commission, and is now under review.

**Comment:** Section 3.2.2, ¶5. Cooling towers, when located near marshy areas, will increase mortality of waterfowl. This should be listed as an adverse effect.

**Response:** The comment is noted, and will be a factor in addressing waterfowl impacts in subsequent Level B and project implementation studies.

**Comment:** Section 3.2.2, ¶13–15. The descriptions of the impacts of shoreland management programs and flood prevention programs are not clear. They should incorporate the concise statements of impacts provided in Section 5 and Section 6 of the Draft *Environmental Impact Statement.*

**Response:** Some additions have been made to paragraph 13.

**Comment:** Section 3.2.2, ¶16–19. The explanation of the effects of dredging should be clarified and expanded.

**Response:** See additions made to paragraphs 17 and 19.

**Comment:** Sections 3.3 through 3.7. As a general comment on the discussion of the individual Lake basins, it does not seem necessary to repeat the paragraph on water required for cooling condensers in the production of energy in each of the separate basin discussions. Perhaps this one aspect of the individual basin descriptions could be covered generally in the discussion of impacts for the entire Great Lakes Basin.

**Response:** Although eliminating repetitious statements is desirable in one respect, we have purposely allowed some repetition among Lake basin discussions so that each is "self-contained" or self-explanatory to a degree.

**Comment:** Section 3.3.1, ¶12. In the sentence "Dredging can be eliminated in high water period," a more exact wording should be either "delayed" or "postponed." As known, periods of high runoff from land and high Lake levels produce more harbor deposits that must be removed when Lake levels go down.

**Response:** Concur. Paragraph has been changed.

**Comment:** Sections 3.3 through 3.7. It is suggested that the Final EIS address the impact that large increases in thermal power use will have in specific basins. For example, Table 8 shows that the thermal power requirements for Lake Huron land and water resources in 2020 will increase 57.5 and 64 times respectively over the base year figure. The Draft EIS fails to take into account the impact that this increase will have on what is currently a major use of the Lake and shoreline, namely, recreation. The Final EIS should address many questions of this nature.

**Response:** We believe that the Framework Study and EIS have pointed out the nature and degree of impact as well as can be done at this point (the Framework Study context). The nature of the specific site planning done, management of power plant lands, and the direction in which power generation technology evolves, will determine the degree of impact which will accrue from this increase in generation facilities. Please note also that the thermal power figures above have been modified in this Final EIS.

**Energy Research and Development Administration**

**Comment:** Summary. Reference to AEC should now be to ERDA.

**Response:** Concur. Change has been made.

**Comment:** Summary (4). Reference to 70,000 acres for power plants in 2020 does not check with Table 2 (362,000 acres) or Section 3.2.2, ¶6 (76,300 acres). Table 2 may include transmission line right of way but this cannot be verified from the values in Section 3.2.2, ¶7.

**Response:** Correct figure is 68,900 acres. Changes have been made to Table 2 and Section 3.2.2, ¶6.

**Comment:** Summary. In general, it does not appear adequate to describe "environmental impacts" only in terms of resources affected (even as some multiple of 1970 values). The question would be will these uses significantly degrade environmental quality or harm human health, animal populations, ecosystem stability, etc. Note, for example, references to potentially significant impacts in Section 3.1.1, ¶6 (meteorological impacts due to waste heat), Section 3.2.1.3, ¶4 (effects of land use changes), Section 3.2.2, ¶4 (affects of consumptive loss on stream regimes), Section 3.2.2, ¶10 (leachate contamination from land fill), etc. All of these produce environmental impacts related to future growth which need to be further quantified (approximately), summarized, and explicitly assessed in terms of environmental quality.

**Response:** Concur. The environmental impacts of Framework programs are likely to include qualitative effects as well as quantifiable resource costs. We believe, however, that the EIS addresses these qualitative impacts as specifically as is feasible in a Level A study. The impacts highlighted in the Summary do appear to be among the most significant in quantitative terms. Additional wording will be added to the Summary to clarify this: "It should be noted that the EIS is on a conceptual study, not an authorized plan for construction. Therefore, unlike project-oriented impact statements, this EIS is by necessity very general, with little description of detailed effects. It is believed that the EIS adequately highlights the most significant impacts that can be covered in a Level A study."

**Comment:** In relation to the comment above, Section 4.1.1, ¶1 says that even in the accelerated (ACC) future, water and land resources will be available in quality and quantity to meet needs. Does this imply no significant or unmanageable (at acceptable cost) environmental impact problems? A conclusion of either type should probably be given prominence in the Summary section, since it describes the acceptability of even limit assumptions of growth.

**Response:** See discussion of "limited" and "accelerated" in Section 4, ¶3. It is believed this should be an adequate explanation of the use of these alternatives.

**Comment:** Section 1.3.3. It would be helpful to show the PRO trend in Figure 2. Note the PRO is described as being slightly lower than NOR but Section 3.1, ¶1 says PRO population growth is slightly higher than projections based on recent data. Are these consistent?

**Response:** The statements are consistent. The NOR population projections were based on the data available in 1970, when the growth rate was higher than that shown in more recent projections. The reference to a slightly lower level of growth in PRO than in NOR refers to growth in a more generalized sense which includes economic growth. In reference to Figure 2, PRO is not shown because it is the same as NOR for demographic data.

**Comment:** Section 3.1.1, ¶1 states that PRO surface and subsurface management provides for all needs through 2020 except for irrigation and mining. Clarification of these important exceptions appears needed. Note also references in Section 3.2.1, ¶2 to declining employment in these sectors and indications in Table 2 of increased agricultural acreage; is there any connection?

**Response:** Concur. Clarification was made. (Add after first sentence in Section 3.1.1, "In particular areas, other uses of the land are given higher priority, and water is not always supplied for uses such as irrigation and mining.") No direct connection is known between the declining employment and increasing agricultural acreage.

**Comment:** In Table 2, it would appear that other categories of potentially significant environmental impact might be included, such as growth of urbanized land, transportation requirements, or land-oriented waste disposal (see Section 3.2.1.3).

**Response:** The resource use categories employed in Table 2 (and Tables 4, 6, 8, 10, 12) are categories which are standardized for the entire Framework Study. Those shown were felt to be the categories of primary significance for purposes of a Framework Study EIS addressing the use of *water* and water-related land resources. The general qualitative impacts of the growth of urbanized land and of land-oriented (solid) waste disposal were discussed in the Framework Study and EIS, but were not felt

to be related directly enough to water issues to justify the creation of separate categories. The growth of urbanized land, for example, was taken into account in projections of available agricultural land. Some water-related transportation issues were addressed in Appendix C9, *Commercial Navigation*; a still broader approach to transportation issues is being encouraged by the Basin Commission's Standing Committee on Transportation. Section 3.2.1, ¶3 does state that the listing is a "highlight summary." An explanatory note will, however, be added to the text at that point: "It is recognized that additional impacts may take place, however, due to the general nature of this EIS. Those changes listed provide sufficient coverage for a Level A study."

**Comment:** In Section 3.2.2, ¶5, it would appear desirable to indicate the capability of design to reduce any thermal or impingement effect to acceptable levels and to clarify whether any localized impacts are indeed significant or transient and recuperable.

**Response:** Additional wording has been supplied. After the sentence, "Other fishery . . . into receiving waters," insert "Design improvements may reduce the potentially harmful effects of power plants and research in this area should be encouraged."

**Comment:** In Section 4, ¶5, it is not clear how "environmental impacts" can be adequately assessed in terms of the five planning variables indicated (see our third comment above).

**Response:** Wording has been changed to help clarify. A detailed discussion of how the impacts apply to the variables would be too extensive. (Rewording reads, "The environmental impacts of each alternative can apply to any or all of the five planning variables considered in this study.")

**Comment:** In general, the separate discussions of PRO impacts on the several subbasins, seems to indicate that different regions will experience impacts differently (depending on rate, type of development, etc.). This same approach may be desirable for discussion of the "alternative" frameworks, particularly ACC (see Section 4.1).

**Response:** It is true that various regions are likely to experience differently the impacts of resource use and development. The bases for these differences in impact are set forth in general terms in Section 3 of the EIS, and more specifically, in Sections 6–10 of Appendix 1, *Alternative Frameworks*. The ACC and LIM growth alternatives were not developed fully enough to provide for separate discussion of their impacts for each plan area or planning subarea. Additional wording will be supplied to the text of Section 4, ¶3 to clarify this.

**Comment:** Section 8.3(1). It appears unnecessarily pejorative to use the term "exploitation" in connection with ACC. Certainly an increased thrust toward greater growth does not preclude "wise planning" (of Section 4.1.1, ¶1, which indicates that ACC can be accommodated in terms of quality and quantity of resources).

**Response:** A pejorative connotation was not intended. It is believed that the use of the term "exploitation" is appropriate to denote uses of natural resources where economic objectives are foremost, as they would be in the ACC growth alternative. Also, if a change is made, it might be argued that the analogous use of the term "conservation" to describe the LIM growth alternative would also have to be changed.

**Comment:** We should like to point out that Section 9 of the document briefly describes six key research areas that are needed to provide for a more effective long-range planning in the Great Lakes Basin. Two of these: (a) the interaction between air pollution and Great Lakes Water Quality and (b) cumulative effects of power plant location and heat discharge in the Great Lakes near population centers are key aspects of the ERDA aquatic program at Argonne National Laboratory. We suggest that the Great Lakes Basin Commission increase their coordination with these programs.

**Response:** The Basin Commission recognizes the effects of air pollution on water quality and that basic research in this field falls more appropriately within the jurisdictions of other agencies. The Commission's cooperation and coordination with other agencies in regard to both issues is being increased. For example, Commission staff was involved with the Interagency Committee for Marine Science and Engineering (ICMSE), Second Federal Conference on the Great Lakes (Argonne National Laboratory, March 1975) and will publish the proceedings of this conference, which focused on the effects of energy production (including air pollution) on the Great Lakes.

**Comment:** We note in the Summary that one of the stated purposes of the Framework Study is to obtain a consensus among State and Federal agencies on which types of development should be encouraged or discouraged and which geographical areas would receive special attention. We could not find a clear description in the Statement that supported this objective. An appropriate note should be included in the Summary, and it should be

explicitly described in an appropriate section in the Statement. This would help one to judge to what degree the Framework Study's objective was met.

**Response:** The PRO Framework was to accomplish this purpose. The Framework Study *Report* gives an overview of the PRO Framework, and Appendix 1, *Alternative Frameworks*, describes the Framework in detail. Council on Environmental Quality guidelines for the preparation of Environmental Impact Statements specify the format of EIS summary sheets. A more elaborate statement was not felt to be appropriate within this prescribed format.

**Comment:** We note that the Draft does not present significant cost-benefit analyses and would suggest that the Statement should attempt to provide some additional specific balances for various suggested alternatives even if specific cost-benefit studies are not offered.

**Response:** The guidelines for framework studies do not provide for benefit analyses and the budget would not permit them. Specific or elaborate cost-benefit analyses were therefore not part of the Framework Study, but quantitative estimates of costs of Framework programs are presented in an extensive series of tables in Appendix 1, *Alternative Frameworks.* This data is now digested in the tables presented in this EIS.

**Comment:** The Statement only generally describes impacts projected for the year 2020 without indicating whether any particular period in this span is any more or less important than any other. However, Table 1 provides cost estimates for 1980, 2000, and 2020 which would tend to indicate that some activities in the plan may involve more intense action and consequent impacts at different times. We suggest that the Statement should look at the impacts associated with the maximum rates or periods of development, as well as the total integrated overall impact.

**Response:** Noted. Differentiation of impacts according to the time frame in which they occur may have been a desirable refinement of the impact assessment process. Such refinement, however, is beyond the scope of a Level A Framework Study such as this one.

**Comment:** In relation to the comment above, the Draft does not really discuss the priorities for developing (or protecting) the various framework categories (water supply, pollution control, etc.). Some of these must be more critical and require earlier development than others. The Draft should attempt to establish a more specific ranking of importance.

**Response:** It is not the function of this Environmental Impact Statement to assign specific priorities to the various Framework Study resource development or conservation programs. Many implicit priorities, however, for resource development and conservation are expressed in the Framework Study *Report* and Appendix 1, *Alternative Frameworks.* For example, it was decided that water supply needs would be met for all time periods while other resource use categories such as irrigation and mining needs are not always met.

**Comment:** Acknowledging the fact that the Draft Statement and the Framework Study are not site-specific, and that it is impractical at this stage to develop specific site and land use definition, we feel that there should be an attempt to outline, wherever possible *major* land use categories, their locations, and their interrelation or the possible degree of impact as one use is supplanted by another. For example, the Draft contains only brief references concerning the possible impacts upon ecological balances due to land use changes; those references which are provided do no more than point to the general possible impacts. It would be helpful if the Statement would attempt to quantify such impacts, wherever possible e.g., as farmland is cleared, drained, or developed, what ecosystem balances are changed? This practice would assist in making future decisions related to the degree or course of overall development. For example, in considering the impacts on wildlife and other ecosystem balances, should existing fallow prime farmland be developed first in any future expansion of the Great Lakes Basin agriculture plan rather than draining and developing the lower classes of land? Also, we feel it might be desirable to attempt identification of major blocks of lands which could be developed and to discuss how they relate to desirable objectives such as the preservation of such balances.

**Response:** The discussion of impacts stemming from land use changes was intended to be brief and general in scope. Discussion of these impacts in more detailed or quantitative terms was not considered feasible in a Level A Framework Study EIS.

**Comment:** The Draft does not provide a significant discussion of the total projected environmental impacts on fish, wildlife, plant life, etc., but only indicates that there will be an acceptable level of environmental quality and control achieved as appropriate for various alternatives (e.g., "minimum acceptable quality" for the case of accelerated

growth, see Section 4.4, ¶1, and "high level quality" for limited growth, see Section 4.3, ¶1). The meaning of such terms is not clear. In addition, it does not necessarily associate a particular quality level with a particular development level since a high quality environment can probably be achieved even in the accelerated case, if society chooses to expend the requisite amount of resources. If there are clear reasons for any such association, then these should be detailed in the document. Furthermore, the EIS appears to imply that acceleration necessarily leads to exploitation [Section 8.3(1)]. This appears to be an unnecessary implication which could lend a biased low-growth tone to the environmental assessments and lead to less than optimum utilization of regional resources.

We feel that the Statement could be strengthened by discussing more fully the potential environmental effects upon the environment, health and society and how these may influence policy choices instead of narrowing the discussions just to those associated with the amounts of resources involved. In addition, the various tables presented generally indicate impacts in various categories for the limited, normal, accelerated, and proposed alternatives and list only the amounts of resources involved. These tables should provide some indication of the significance of the amounts of resources committed versus available totals or carrying capacities, etc.

**Response:** Wording has been changed to eliminate unclear terms. Also, additional tables concerning the Normal and Proposed Frameworks can be found in the Framework Study *Report* and Appendix 1, *Alternative Frameworks*. These are not believed to be appropriate in the EIS and are not included. Much of the "limited" and "accelerated" information is not completely developed and is not readily available in tabular form.

**Comment:** The Draft does not clearly discuss Great Lakes Basin (GLB) development in relation to surrounding areas, the parallel development of which may inherently place demands upon the GLB resources or contribute assistance to GLB development which diminishes such demands. Similarly the Draft does not significantly discuss international relationships which could affect the development of the GLB, although Section 1.2.1, ¶2 does indicate the GLB boundary with Canada and Section 3.1.4(3) indicates that the Proposed Framework plan will provide full support of the U.S./Canada Water Quality Agreement. However, it is not clear to what extent this agreement or others might foreshadow restrictions upon major increases in future use of Great Lakes water, etc. The Draft should discuss more specifically such potential constraints.

**Response:** Extraregional constraints are taken into account in the Framework Study. For example, water transfers between the Upper Mississippi River Basin and the GLB are included in the projected water budget for the Lake Michigan basin. While the primary responsibility for international coordination between the United States and Canada lies with the International Joint Commission, the Great Lakes Basin Commission and its staff have maintained constant working contact with Canadian federal and provincial government representatives.

**Comment:** The Draft refers to meeting national (as well as regional) goals, (Section 1.1, ¶6) and "defined national economic efficiency, environmental quality, regional development, and social well-being objectives" (Section 4, ¶5). However, these goals do not appear to be clearly defined in the Draft and should be specifically listed if available. For example, there are various references throughout the Draft to the national goals of zero pollutant discharge by 1985 (as well as those of PL 92-500) and to the report of the Presidential Commission concerning arguments against continued national population growth, and the apparent intention to reflect these in GLB goals. We feel that the Draft should be more specific concerning the full list of any national goals and how they are specifically going to be taken into account in the Study.

**Response:** Adequate discussion pertaining to the definition of these goals is contained in Sections 1.3.1, 1.3.2, and 1.3.3 of this EIS, and the objectives are explained at greater length in Section 2 of Appendix 1, *Alternative Frameworks* (specifically Sections 2.1 and 2.2). Ultimately, the definition of these objectives is mandated by the Water Resources Council in its "Principles and Standards for Planning Water and Related Land Resources" (*Federal Register*, September 10, 1973).

**Comment:** In relation to the above comment, the Draft and its underlying Framework Study do not appear to discuss sufficiently initiatives which might be outside the Proposed Framework. The Draft discusses increased agriculture as a reflection of the GLB's continuing share in a totally growing nation rather than as a deliberate increase in this share (Section 4.2.3, ¶1). The Statement could discuss alternative opportunities which may be available by increased use of GLB land and water in assisting reaching potential national goals such as developing major coal resources in water-limited areas of the West or for major agriculture increases not limited just to the GLB's future, but extended to the nation or world. We feel that a

fuller examination of available alternatives would be desirable in this respect.

**Response:** Detailed consideration of such initiatives or alternatives is felt to be beyond the scope of the Framework Study EIS as it was originally conceived. The accelerated and limited growth alternatives are not meant to be viable planning options but rather to help define the practical limits of resource development or conservation.

**Comment:** Commercial fishing in the Great Lakes Basin is a substantial effort at the time, and this does not seem to be discussed in the Statement.

**Response:** The Framework Study *Report* and Appendix 8, *Fish*, discuss the regulation of commercial fishing on the Great Lakes and its relationship to sport fishing. In all instances, consideration has been within a context that maintains that commercial fishing will not be a significant industry on the Great Lakes through the year 2020. Annual commercial catches now run about 71 million pounds, worth $5.9 million, and the trend is downward. Conflict with sport fishing activity and programs is likely to continue dampening commercial fishing activities.

However, some minor changes have been incorporated into the language of Section 3.1.2.3 of the EIS to reduce what appeared to be a strong bias. See also the language in the Framework Study recommendations which appear in the *Report*.

**Comment:** The Draft does not discuss meteorological baselines for the GLB or how air quality may act as a constraint on development alternatives.

**Response:** While the Basin Commission recognizes the effects of air pollution on water quality, basic research in this field falls more appropriately within the jurisdictions of other agencies.

**Comment:** Section 1.1, ¶7(3). Related land uses do not discuss requirements for expanding cities or location of new cities to meet expanding population needs, etc.

**Response:** Discussion of these requirements, beyond the level of detail in Section 3.2.1 of the EIS, is considered beyond the scope of this document.

**Comment:** Section 3.1.1, ¶5 might better read "Thermal shock also may represent an intermittent loss of fish population whenever thermal outfalls are rapidly shut off. The significance of all these effects cumulated over time requires further definition in order to assess the total environmental costs of power plants." In the next paragraph, the first line might better read, "discharges via once-through-cooling or closed-cycle cooling systems, such as cooling towers or cooling ponds, on various hydrologic. . . ."

**Response:** Concur. Wording has been changed, incorporating language similar to that suggested.

**Comment:** Section 3.1.1, ¶7. It should be remembered, in discussing the beneficial uses of waste heat from power plants that it is very difficult to find uses for significant portions of the waste heat and that it may require major regional initiatives to properly utilize major amounts of this energy. Any such major initiatives should be explored more fully.

**Response:** Concur. The discussion of waste heat utilization has been modified.

**Comment:** In Table 2 (and related tables for individual Lake basins), the 0.17 acres per megawatt of installed capacity does not appear to allow for transmission line right-of-way, cooling lakes, or for disposal areas for products of stack gas cleaning. For example, the indicated value appears to cover only the immediate exclusion areas of nuclear power plants noting that Section 3.2.2, ¶5–7 states that the GLB electric capacity by 2020 will be 90 percent [nuclear]. The Statement in ¶8 which refers to exclusion areas as being a considerable portion of the land requirement for nuclear power plants and that such areas can be used for other activities appears in error. The exclusion area is a small portion of the total power plant related land use; however, there are possibilities for selected uses of power plant lands, but such uses would have to be fully evaluated by the Nuclear Regulatory Commission.

**Response:** The word "considerable" has been removed from discussion of exclusion areas of nuclear plant land requirements.

**Comment:** Section 3.2.2, ¶9 states that except for petroleum and natural gas, the GLB mineral resources are adequate for GLB needs. These are major exclusions (implying clear economic interrelationships with other areas besides GLB) and must act as some constraint on GLB futures. More discussion would be desirable.

**Response:** Some general comments will be added to the text of Section 3.2.2, ¶9 to clarify: "Historically the Basin has relied on other areas to provide those minerals not accessible within the Great Lakes area, and no future problem is foreseen in continuing this relationship."

**Comment:** It is not clear that the potential for

energy conservation measures in reducing the growth for power has been adequately treated (Table 2 and other similar tables for the individual Lakes). Conservation would also tend to reduce resource requirements and further reduce the impact of future GLB growth. An attempt might be made to discuss whether major energy conservation would have any effect on the alternatives for the Framework Study for future GLB development.

**Response:** Concur. Additional discussion has been supplied to Section 3.1.1.

**Comment:** We suggest that the development principles listed (Section 7, ¶6) as well as other principles used in the Framework Study and the Draft should be given more prominence and placed in the beginning of the EIS.

**Response:** The summary sheet is prepared in accordance with Council on Environmental Quality format guidelines and those expressed in the National Environmental Policy Act. Changes to these guidelines are not suggested.

**Environmental Protection Agency**

**Comment:** While we realize the Proposed Framework programs are general in nature and do not represent approved projects, the Framework Study itself will be used as a reference in establishing priorities for specific resource development plans. For this reason, we believe certain generalizations within the report should be changed or eliminated to reduce the possibility of misinterpretation. Specifically, this applies to the following statements: that withdrawals (for power plant cooling systems) "are not judged to have a significant effect upon the quantity or quality of the Lakes" (Section 3.2.2, ¶5); that "removal of dredged material is not significantly harmful in the long run to water quality in harbors where navigation takes place" (Section 3.2.2, ¶17); that "creation of additional water surface area through impoundments would generally improve the fishery" (Section 6, ¶3); and that "for the immediate time period, damages to existing development in the flood plain can best be reduced by structural measures" (Section 3.1.2.2). Although the Framework Study has indicated such statements are indeed generalizations, we believe their presence in the document may serve to encourage more specific water resource programs that do not adequately consider environmental objectives. Therefore, we suggest that such generalizations be eliminated or that the adverse environmental effects associated with such programs be accentuated in the report.

**Response:** We recognize the validity of this comment. The passages in Sections 3.1.2.2 and 3.2.2, ¶17, have been qualified. We believe that the other two passages take on a qualified meaning when read in the context of the sections in which they appear. Further study of such project-related impacts will be carried out in connection with implementation studies.

**Comment:** Section 3.3, ¶4. The discussion on the Lake Superior basin should list shore erosion (red clay) as a major problem in the basin. The level of shore protection proposed by the Framework for the year 2020 represents only a quarter of the total shoreline in need of protection; this is inadequate and additional protection should be encouraged. Reference should be made to IJC Plan SO-901 regarding regulation of lake levels in the EIS. This plan will have a significant effect upon the Great Lakes ecosystem which should be addressed in the Draft EIS.

**Response:** The red clay problem has been cited. The Framework Study advocates protection of all shoreline classified as critical (about 3 percent of Lake Superior shoreline). At this writing, neither IJC Plan SO–901 nor any other lake level regulation plan had been adopted by the IJC. However, the environmental impacts of the plan are addressed in the EIS for SO–901.

**Comment:** Section 3.1.1, ¶3. There appears to be some confusion in the use of the term "blow down" in this paragraph. Blow down refers only to that portion of recycled cooling waters which is discharged to reduce solids build-up in the cooling system. It should be noted in the same paragraph that entrainment of planktonic organisms in cooling systems may through thermal shock or mechanical means induce lethal or sublethal effects on organisms; however, whether or not this represents a significant reduction of fish food depends on the proportion of cooling waters to the total volume of the receiving body. In addition, it should be explained in this section that thermal shock also occurs as a result of stopping or reducing thermal discharges during cold weather periods; the suddenness of temperature change may be lethal to fish which were attracted to the warmer water.

**Response:** The blow down discussion has been clarified, and the thermal shock discussion added.

**Comment:** Section 2 of the EIS regarding compliance with currently applicable legislation should include P.L. 93-523, the Safety of Public Water Systems.

**Response:** Has been included in Section 2.

**Comment:** Since the Framework Study will be used in water resource program decision-making, we believe the structural and non-structural programs listed in the report should be presented in a context which equally points out both beneficial and adverse environmental effects. Our remaining comments concern several areas within the Study which we believe could be improved in this regard. For example, the discussion on channelization (Section 3.1.3.1) tends to place undue emphasis on beneficial effects. Subsequent environmental impact statements on individual projects frequently make reference to the Framework Study in justifying the project; since EPA policy is generally opposed to channelization as a flood control measure, we do not believe it should be encouraged in the Study. In like manner, the discussion on flood damage prevention programs tends to encourage use of structural measures (Section 3.1.2.2). The discussion should be expanded to include effects generic to existing flood control programs such as the increase in flood damages that have resulted in spite of structural measures. Also, we believe it is appropriate for the Framework Study to encourage evaluation of individual harbor dredging projects with regard to the amount of use they receive and the environmental and economic costs of maintaining navigation depths and with respect to alternate modes of materials transport. Adverse effects associated with transmission lines should mention potential problems (e.g., ozone effects, electrical discharge into the atmosphere) that could be encountered in the proposed use of ultrahigh-voltage transmission lines (i.e., greater than 700,000 volts).

**Response:** The Commission does not wish to appear to disregard or "gloss over" adverse effects of channelization, structural flood prevention measures, harbors, powerlines, etc. However, it should be recognized that the Framework Study addresses these issues in the broadest context, identifying measures generally desirable to maintain the economic viability of the Region, and attempting, where possible, to gauge demand or quantify what is "needed."

It is pertinent to acknowledge that the EIS does reflect Commission Framework Study policy regarding use of channelization, other structural flood control measures, etc., and within that context simply evaluates on a broad scale the probable impacts of such actions, rather than taking issue with them. We acknowledge that since preparation of the Framework Study there has evolved a greater awareness of the true impacts of such measures, and that individual Federal agency guidelines are emerging to give greater consideration to wetlands, flood plains, etc. The Commission also has endorsed greater use of nonstructural water resources projects for other than near-term time frames.

The environmental impact of special implementing actions will vary with such factors as the sensitivity of planners and legal constraints and requirements. Such impacts will be evaluated in greater detail in environmental impact statements for implementing project proposals.

**Comment:** In line with the purpose of the Framework report, we believe it would be useful to present contrasting opinions regarding existing Federal water resource policies. Reference to independent studies such as the National Water Commission Report which criticize existing resource programs would help create an objective document useful in resource policy decision-making.

**Response:** Most of the work for the Framework Study was completed prior to the publication of the National Water Commission Report. However, we agree with the principle advocated, and believe it should be internalized in all future implementation studies.

On a practical basis there has been expression of contrasting opinion as the Framework Study progressed and the Commission worked toward a consensus document, the Framework Study. Such contrasting opinion will continue to be an important part of future studies.

**Comment:** While the EIS indicates that the location of self-supplied industries and water supply facilities should be selected to minimize environmental effects upon the shoreland, we believe passage of Land Use Planning Legislation should also be encouraged as a means of resolving such development issues.

**Response:** Noted.

**Comment:** We believe the alternatives section of the EIS should be expanded to encompass recent energy and resource development programs that are being projected for the nation. The priorities of the Region will be highly dependent upon the changing values of the nation; therefore, the environmental effects of these alternatives for the Great Lakes area should be addressed.

**Response:** Although the recent energy and resource development programs mentioned were not in existence when the Framework Study was formulated and are not considered in the various Framework alternatives, the Commission remains flexible and open with respect to reconsidering policies as new information emerges.

**Comment:** We suggest that any future EIS specifically address the expected public information program for the study and the agencies' and public's opportunity to comment on the study and Draft EIS during the series of public meetings. As agreed by the Commission, the Final EIS should not be prepared until this public participation program is completed.

**Response:** To encourage public participation in the Framework Study planning process, the Commission held a series of 15 open meetings during 1972 in locations across the Basin. More than 10,000 background information booklets were mailed to interested citizens before these meetings. The Commission also held six public meetings in cities throughout the Basin during 1976, to insure the incorporation of public response into its Framework Study recommendations.

The Draft EIS was reviewed by citizen groups and has been available to the public at a nominal charge since December 1974. The Commission's Public Information Office has filled more than 100 requests for copies. The *Communicator*, a Commission newsletter published monthly and distributed without charge, grew in circulation from 3,800 in late 1971 to 9,000 during the 1972 meetings. Circulation is now more than 14,000. Public comment is now a regularly scheduled part of the Commission's quarterly meetings. The Commission will maintain an active public information program and will encourage public participation in future planning activities.

**Comment:** It is our understanding that a second Draft EIS will be prepared and we look forward to reviewing that document when it is filed with the Council on Environmental Quality.

**Response:** Properly speaking, there is to be no second Draft EIS filed with the Council on Environmental Quality for formal review under CEQ guidelines. The guidelines require filing of only the Draft and Final Statements. Before the Great Lakes Basin Commission approves the Final EIS for publication, however, the Commission member agencies (including EPA) are to have the opportunity to review Basin Commission responses to the review comments, textual changes made in response to the comments, and other changes.

**Comment:** Section 10. We take exception to the earlier response which stated that "the Commission has agreed that there will be no further public meetings regarding the Framework Study." Six public meetings on the Framework Study recommendations were held in January and February of 1976, satisfying our recommendation and invalidating the response as written. The displays at these meetings consisted of samples of or references to material published by the Commission, presumably including the Draft EIS. The Staff summaries indicate that the EIS was discussed during at least three of the meetings.

**Response:** Changes have been made above to correct the reference to public meetings.

**Federal Power Commission, Chicago Regional Office**

**Comment:** Summary. The 70,000 acres of land required in 2020 for power plants and the increased need for cooling water are on the list of the more significant environmental impacts envisioned for the year 2020. We believe that the environmental impact of the land required for power plants is relatively minor compared with that required by other developments, such as 12,000,000 acres required for urbanized areas. Pertaining to the amount of cooling water required, paragraph 5 in Section 3.2.2 says "the withdrawals themselves (for cooling condensers) are not judged to have a significant effect upon the quantity or quality of the Lakes." Inasmuch as the environmental impacts for power plants, as stated, are of lesser concern than for the other items listed, we suggest that it be placed at the end of the list rather than heading it.

**Response:** The citation from Section 3.2.2 deals with only withdrawals, and not thermal discharge, and is thus taken somewhat out of context. However, the suggested change in the Summary has been made.

**Comment:** In Section 3, the Proposed (PRO) Framework and Probable Impacts, essentially all the material under Section 3.1.1, Water Withdrawal Programs, pertains to water withdrawals for power plants. The discussion pertaining to power plants should be limited to one or two paragraphs, and that relating to other withdrawals, such as municipal waste treatment and self-supplied industrial use should be expanded, since their environmental impacts are at least equal to power plants, if not greater.

**Response:** We recognize that the water withdrawal program discussion emphasizes power plant aspects. However, we believe that the discussion should remain intact, since power generation is one of the most controversial uses in the Basin and less well understood than most.

**Comment:** Sections 3.2.2, ¶8; 3.4.1, ¶9; and 3.7.1, ¶14. Natural, historic, scenic and recreational values will be adversely affected by the upground location of transmission facilities—add: *in such*

*areas*, since transmission lines through farmland, for instance, would have no such adverse effect.

**Response:** The intent of the discussion cited is to include all such effects, including those aesthetic and other impacts which would impinge on natural values of farmland and virtually all other land uses. For example, construction of transmission lines can adversely affect an area's streams through erosion and sedimentation, as well as loss of vegetation and wildlife cover. It also reduces the amount of land in agricultural production, in some cases.

**Comment:** Section 3.4. Hydroelectric power is listed as a potential future problem in the Muskegon River Basin, but no future hydro plants in that basin have been included in the study.

**Response:** Has been deleted.

**Comment:** Table 18, Annex 1. The hydroelectric power needs should be 105,209 (or 105,200 rounded) rather than 118,000.

**Response:** Has been changed.

**Comment:** The comments attributed to the Federal Power Commission in Section 10 are those of the Chicago Regional Office of FPC (submitted in our letter dated January 15, 1975) and not those of our Washington office. Since it is stated in the Summary that comments were requested from the Federal Power Commission (Washington, D.C.), the comments in Section 10 should be noted as those of the Federal Power Commission, Chicago Regional Office.

**Response:** Concur. Changes have been made to incorporate suggestion.

**Comment:** The data shown for Thermal Power Cooling Comsumption and number of acres are incorrect in Tables, 2, 4, 6, 8, 10, and 12. Apparently, diversion data were used instead of consumption. The data in the previous draft for these items were correct and should be used in the Final EIS.

**Response:** Concur. Changes had been made but were not indicated in the draft given to you to review.

**Comment:** We suggest changing "waste" heat to "heated water discharges" the six times this term occurs in Section 3.

**Response:** Concur. Changes have been made.

**Comment:** In Table 1, the 1970 to 2000 PRO Framework Cost is given as 2289.9 million dollars in the *Report* rather than the 2216.1 shown for Thermal Power Cooling.

**Response:** Correct figure is 2289.9, and the table has been changed to show this.

**Comment:** Section 3.2.2, ¶6. The 76,300 acres required for thermal plants in 2020 include the noncondensing plants (I. C. and combustion turbines) for which land requirements are insignificant. The land requirements for steam-electric thermal plants are 69,000 acres in 2020, of which the additional land required from 1970 is 65,000 acres.

**Response:** Correct figure is 69,000, and changes have been made to show this.

**Comment:** Section 3.4.1, ¶8. In the third sentence, add "surface area" after "square miles."

**Response:** Concur. Change made.

**Comment:** In Table 23, change the Hydroelectric Power needs from 70,500 to 57,900.

**Response:** Concur. Change made.

**Department of Health, Education and Welfare**

No comment.

**Department of the Interior**

**Comment:** The highlight summary (Section 3.4) for the Lake Michigan basin is excellent and similar summaries in both form and content, should be provided for the other basins.

**Response:** Similar summaries were not prepared for other basins as part of the Framework Study, which presented such material in text form. In the interest of uniform treatment of individual Lake basins, and at the suggestion of the Department of Agriculture, the Lake Michigan summary has been deleted.

**Comment:** The statement's discussion of each basin usually ends by noting some of the major programs included among the Proposed Framework alternatives prescribed for that particular basin. The section which follows discusses the environmental impacts of those programs. It is not possible to evaluate how adequately the statement discusses the probable impacts of the whole study if only the major programs have been listed. The impact statement appears to rely too heavily on the judgment of the Basin Commission. The Final EIS should discuss all programs proposed in each Lake

basin and the probable impacts. Only by so doing can the statement allow reviewers an opportunity to assess the Proposed Framework and its impacts.

**Response:** Concur. Tables 2, 4, 6, 8, 10, and 12 have been expanded to include information for all resource use categories in the Basin and all plan areas.

**Comment:** As stated in Section 3.1, ¶2, "The quantification of structural and nonstructural solutions to resource needs is not always possible in a framework study analysis." Some quantification has been attempted in the EIS which at this time does not appear to have been updated. An example is the frequently repeated statement that, by 2020, over 90 percent of the energy produced in specific sub-areas will be supplied by nuclear power plants. Recent reports prepared by power companies indicate that the 90 percent energy supply figure is substantially higher than their present anticipations. Consequently, the above figure should probably be deleted or the statement should be qualified or updated because of the energy crisis.

**Response:** The figures in the Framework Study are based upon materials used in the Framework Study itself. Some time has passed since the Study was substantially completed, and we acknowledge that there are a number of areas where more recent information has been developed. However, the Study has gone to print, and the EIS evaluates it as it exists. The Commission will utilize updated information in implementation studies and other subsequent studies.

**Comment:** Consideration should be given to including a discussion of Indian cultural and natural resources of the Great Lakes Basin as they relate to the Framework Study.

**Response:** Has been discussed in Section 1.2.2.1.

**Comment:** Section 1.2.3.7, ¶3. The paragraph should end with the following sentences: "Many non-game wildlife species also inhabit the Basin. Some of these species, such as songbirds, are valuable by keeping insects and other pests in check and others by keeping the habitat free of carrion. Others, such as rodents, are considered pests because they destroy farm crops. Rodent populations are dampened by other non-game species, such as hawks and owls."

**Response:** Has been inserted.

**Comment:** Section 1.2.3.7 ¶4. The paragraph should state that whereas the whitetailed deer is the Basin's most important big game species, squirrels and rabbits are the most important small game animals.

**Response:** Has been added.

**Comment:** Section 1.2.3.8, ¶1. The word "adequate" should be deleted and replaced by the word "enjoyed." The following species should be added to both the Commercial and Sport Fish listings: channel catfish, carp, fresh-water drum, and American smelt. Bullheads and other panfish also should be added to the Sport Fish list.

**Response:** Have been added.

**Comment:** Section 3.1.2.2, ¶2. This section indicates that wildlife can benefit from effective flood plain management programs. In other sections, the statement describes these programs as including impoundments, flood control channeling, and land development for recreation. All of these measures have varying degrees of both adverse and beneficial effects on wildlife. The statement also should recognize the adverse effects.

**Response:** The passage has been altered.

**Comment:** In addition, apparent oversights occur in several tables in Chapter 3 of the statement. Table 2 includes, under Resource Use Category, estimates for total acres disturbed because of "Mining" in the Great Lakes Basin. However, in the tables for the individual basins, only the table for Lake Superior basin (Table 4) includes estimates for "Mining," whereas Tables 6, 8, 10, and 12 do not.

**Response:** Tables 2, 4, 6, 8, 10, and 12 are being revised to include information for all resource use categories.

**Comment:** Section 3.1.2.3, ¶2. The section on sport fishery programs erroneously states that proposed harbor improvements in the recreational navigation portion of the PRO Framework may or may not encourage high value fish species production in upstream areas. This may be true, but the proposed harbor improvements themselves usually seriously degrade the sport fishery. To elaborate, harbor improvements usually are located at river mouths and include dredging, filling, and spoiling in shallow water areas and wetlands, and their operation degrades water quality, all of which adversely affect fish and wildlife habitats. Increased sport fishing and pleasure craft use also can adversely affect sport fishing. Excessive fishing pressure reduces the quality of the fishing experience and can adversely affect most high value fisheries by locally depleting fish stocks. This discussion should replace the last sentence of the section.

**Response:** The discussion has been added.

**Comment:** Section 3.2.2, ¶16. Item (2) is not necessarily true in regard to effects of dredging on water quality. It is known that dredging polluted harbor sediments, for example, reintroduces harmful pollutants into the water column thus making them available to food chain organisms. Because some aquatic organisms absorb and concentrate pollutants in their tissues, there could be serious long-term impacts from these dredging activities. The discussion, however, should not be limited to water quality impacts. Another adverse impact is benthic community disruption and displacement.

Item (3) should note that valuable shoal waters and productive wetlands are often selected for dredged spoil disposal sites, seriously degrading these valuable fish and wildlife habitats.

**Response:** The entries have been changed.

**Comment:** Section 3.2.2, ¶17. This paragraph should discuss the adverse impacts associated with indiscriminate choice of disposal sites. Often, valuable habitat is used for such facilities. The statement should include assurances that care will be taken to locate these areas so as to involve as few of these habitats as possible.

**Response:** Has been included.

**Comment:** A statement should be added in Section 3.2.2 to emphasize that thorough minerals investigations be conducted for the specific projects and programs following the comprehensive framework study.

**Response:** Has been added in paragraph 12.

**Comment:** Sections 3.2.2, ¶19; 3.4.1, ¶11; 3.7.1, ¶16; 4.2.2, ¶3–4; etc. These sections are not necessarily on sound ground with the statement that "the removal of wastes and pollutants can be beneficial to the harbor environment . . . " As noted in a previous comment, the reintroduction of toxic pollutants to the water column through dredging activities may pose a serious adverse impact.

**Response:** Have been changed.

**Comment:** Section 3.2.2, ¶22. This paragraph should discuss the actual physical alteration of the environment from construction. The word "subtly" should be deleted as these impacts are not necessarily subtle.

**Response:** Discussion of physical alterations has been added. "Subtly" has been deleted.

**Comment:** Section 3.6, ¶8. The paragraph should include modern agricultural practices and drainage as serious threats to wildlife habitat.

**Response:** Has been included.

**Comment:** Section 3.7. The eastern shore of Lake Ontario contains rare natural areas which are in danger of destruction. The eastern shore area contains the only remaining sand dunes on Lake Ontario, unique shore areas with shorebirds and wildlife of high value, and large wetland areas that are essential to both nesting and migratory waterfowl. These natural areas are in jeopardy from accelerated erosion caused by above average lake level and unwise land development. This section should include this description.

**Response:** Has been included in paragraph 5.

**Comment:** Section 4.2.3, ¶4. This paragraph states: "There is no wetland area or wildlife habitat included," referring to active cropland. Active farmland is used by wildlife for feeding and therefore is classed as habitat. An apparent discrepancy exists between this statement and Section 1.2.3.7, ¶3–4. The statement in Section 4.2.3 should be deleted.

**Response:** Has been deleted.

**National Aeronautics and Space Administration**

**Comment:** The environmental implications of the plan with regard to water and land resources appear to have been adequately addressed in the Draft EIS, however, the equally significant issue of air quality in the Basin and how it is impacted by the various growth options should also be considered. For example, industrial development and growth of urbanization in the Basin may significantly impact air quality, and growth could be inhibited by the regulations for preventing significant deterioration of air quality recently promulgated by the EPA (Federal Register, Vol. 39, No. 235, December 5, 1974, pp. 42510–42517).

**Response:** We agree that industrial development and growth of urbanization in the Basin may significantly impact air quality. However, meaningful consideration of this topic lies beyond the scope of a Framework Study. Air quality impacts will be considered in subsequent, more detailed studies.

**Comment:** The assumption that 90 percent of the energy production in the Basin by the year 2020 will be nuclear-based is certainly questionable in view of the recent history of bringing nuclear plants into operation. Consideration should be given to the likelihood that heavy reliance will be placed on coal burning steam plants for some time

to come. This could represent a lesser burden on cooling water requirements for a given energy output, but would present at least three pollution issues:

(a) Increased air pollution emissions will require better emission controls and/or more restrictive siting to comply with the significant deterioration regulations cited above.

(b) Shoreline location of plants chosen for ease of cooling is questionable because of periodically undesirable meteorological conditions peculiar to shorelines or large bodies of water (Lake Breeze) which can inhibit good dispersion of air pollutants.

(c) Increased air pollutants are likely to impact water quality when intermittent control strategies utilizing high stacks rather than positive emission controls are used.

**Response:** The text has been changed to project that a "major portion" of the total energy produced in the Great Lakes Basin may be from nuclear power plants. If coal-fired plants are used, less water would be required, as is pointed out in the statement. The Framework Study indicates that there would be sufficient water for the bulk of energy production from nuclear plants.

With regard to the specific mix of nuclear and fossil-fuel plants to be used, the Commission acknowledges that newly developed information may affect future policy, and it remains open and flexible.

**Comment:** Development in the Great Lakes Basin will require special observing systems for monitoring and validating the resulting impacts. The geographic extent of the Basin and the types of measurements needed to establish baseline conditions and trends in water quality and land use suggest that remote sensing of environmental parameters from aircraft and spacecraft could play an important role. Some of the data acquired by Landsat–1 (previously called ERTS–1) has already been successfully used in experimental water quality investigations of the Great Lakes. The same spacecraft has yielded data on land use in the Region and land use maps are being produced by Purdue University as part of the experimental program. We would especially appreciate reports on the use of those data. Other experimental observing systems will be available in the future.

**Response:** The comment is noted, and several agencies participating in Commission activities are using remote sensing data.

### Department of Transportation

No comment.

## 10.2 States and State Agencies

### Indiana Department of Natural Resources

**Comment:** Section 1.2.3.3, ¶3. It is stated, "In some Michigan and Indiana areas the water is too saline for use." We believe that this sentence is misleading and should be omitted from the report. Our investigation of this matter indicated that there is plenty of shallow ground water available of good quality and that saline water only becomes a problem with extremely deep wells in the State of Indiana.

**Response:** This is noted and the statement has been deleted.

**Comment:** In the report, when the problem areas are discussed, we noticed that neither the Little Calumet River nor the Grand Calumet River are mentioned by name. Are these included as part of the Chicago, Milwaukee Complex in the discussion of problems? These rivers are a major concern in Indiana and we want to ensure that they were given consideration in the report.

**Response:** These rivers were considered in the report. The listing of the problems under each of the river basin groups has been deleted, and a statement to compare the Lake basins has been developed instead of the more detailed listing of the problems.

### New York Department of Environmental Conservation

**Comment:** The Statement does not provide a comprehensive discussion of the negative effects of structural measures on fish and wildlife.

**Response:** No attempt was made in the EIS of the Framework Study to set out all possible environmental impacts, adverse or beneficial, which may be associated with specific structures, or with what impacts a particular project will have, because the effects are site-specific and the Framework Study does not identify specific sites. However, many text changes have been made as a result of other comments received—see comments of several Federal agencies. We believe these changes improve the general treatment of fish and wildlife aspects.

**Comment:** The statement does not contain sufficient analysis of the effects of a fall navigation

extension or the effects of bottom dredging on fish and aquatic plant life.

**Response:** Such effects are admittedly treated in a very general way in this EIS, as they are in the Framework Study. There is a series of studies and reports presently underway which will advance our knowledge regarding navigation season extensions, diked disposal, and dredging impacts in general. As these studies are completed, they will either be adopted as part of the Commission's Comprehensive Coordinated Joint Plan, or otherwise serve as input for Commission decision processes.

**Comment:** The development of a salmonid fishery in Lakes Ontario and Erie should be mentioned in the fishery section.

**Response:** Lake Erie, being shallow in nature, has supported a fish ecosystem that has fluctuated considerably over the past three-quarters of a century. Because of harvest and habitat stress factors, walleyes, yellow perch, white bass, and channel catfish have been depressed and fluctuating, and consequently the carp, freshwater drum, and smelt dominate the Lake Erie fish ecosystem. Lake Erie has little potential for the development of a salmonid fishery because the fish distribution and composition in Lake Erie differs from the other Great Lakes due primarily to environmental factors.

A complete fish stock inventory of Lake Ontario has never been undertaken. Until such an inventory has been completed and several years of fish stock monitoring recorded, there will be many gaps in fish species composition data for Lake Ontario. However, approximately 10 percent of the Lake (the shallow areas) supports nearly 100 percent of the sport and commercial fisheries. The remaining 90 percent of the Lake supports an unknown amount of fish life that can only be speculated on at this time. There should be a tremendous potential for salmonid production in Lake Ontario in the future. It is the primary objective of present management.

**Comment:** The report does not discuss wildlife aspects, particularly furbearer habitats and air routes for migratory birds, in enough detail.

**Response:** This has been noted and the text has been revised to discuss wildlife and important waterfowl habitats.

**Comment:** Section 1.2.3.8, ¶1. The blue walleye (blue pike) is listed as a commercial species. Since it is on the Federal and State endangered species list, it may not be taken legally by either sport or commercial fishermen. Furthermore, recent investigation suggests the species may be extinct. Also, bass is listed as a panfish. We suggest inserting the word "rock" before bass.

**Response:** This has been noted and the text revised.

**Comment:** Section 1.3.1. Projections representing historical trends of population and resource demand can no longer by characterized as "normal growth." Such trends constitute what today must be considered very high future growth rates.

**Response:** Recent population data suggest that future growth may be less than was anticipated at the beginning of the study. However, the three growth concepts mean meeting different theoretical levels of water and land resource demands. The extent to which each of the economic or environmental parameters are emphasized varies for the three growth alternatives. The Proposed Framework appears to be in substantial accord with presently expected growth rates.

**Comment:** Section 3.7.1, ¶6. This paragraph should be amended to include the Thousand Islands area of the St. Lawrence River as a recreational resource of national prominence.

**Response:** This is noted and the text has been revised to include the Thousand Islands area of the St. Lawrence River.

**Comment:** Section 1.3. The Normal growth rate represents historical trends of population and resource demands. The EIS notes that this rate is "slightly" higher than present projections. Actually the projected annual rate of population growth of 1.2 percent per year is higher than the probable national rate of future increase. During the period 1970 to 1975, the civilian population of the United States increased by 5.1 percent or about 1.0 percent per year. During the same period the Great Lakes Basin States increased by about 0.4 percent per year.

More analysts today believe that the nation's population will continue to grow at about one percent per year for the next two decades and then decline to near zero by the year 2020. However, the majority of increase in population is expected to occur in the South, Southwest and Far West. Under those assumptions the Framework's "Normal Growth" should be considered as an absolute maximum. The Limited Growth scenario is much more probable based on current State population projections, while the Accelerated Growth rate is totally inconceivable.

**Response:** It is recognized that demographic projections have changed since the development of

the Framework Study. However, at that time the OBERS "C" Series were the projections in use, and there is no assurance that the currently lower birth rate will continue to 2020. Also, the discussion in Section 4, ¶2–3 does explain the use of the Limited and Accelerated growth rates.

**Comment:** Table 2. The number of recreation days in 1970 is listed as 637,167,000 for a population of 29,300,000; or 21.7 days per year, per capita. This is projected to increase to 34.8 days per year per capita in 2020. The base figure is high and the projected expansion is much greater than we would expect in New York. A similar conclusion is applicable to the other recreation categories, for example, sport fishing.

**Response:** The recreation figures used in the EIS were taken directly from Appendix 21, *Outdoor Recreation.* As with our response to the above comment, projections have changed since development of the Framework Study, and it is recognized that current studies may determine that different numbers are more accurate. This type of update will be incorporated into the CCJP process.

**Comment:** Section 3.7, ¶7. Delete the second sentence and substitute the following: "There are only limited opportunities for installation of structural measures, such as reservoirs, to reduce the flood damages." Change the third sentence to read as follows: "The topography is such that it is desirable to use the flood plains for a number of purposes, including both transportation routes and agricultural development, but consideration must be given to flood hazards and steps taken to minimize flood damages."

**Response:** Changes have been incorporated to include the suggested rewording.

**Comment:** Section 3.7.1, ¶12. The environmental effects of water required for cooling condensers for the production of thermal power is discussed. The discussion notes a potential thirteen-fold increase in shoreland requirements. Considering the known plans of the New York State electric utilities and the potential sites available along Lake Ontario, such an increase is quite likely. However, Table 12 shows only a 4.5 ratio of increase for cooling consumption and a 7.1 ratio of increase for acreage from 1970 to 2020. We are almost certain that the increase from 1970 to the present in the cooling water requirements and in acreage is greater than that projected to the year 2020.

**Response:** Figures in the draft you reviewed were incorrect, and revised figures indicate that your concerns were correct. The Final EIS will be published with the correct figures.

**Ohio Environmental Protection Agency**

**Comment:** The Great Lakes Basin Commission advocates the continuing pursuit of economic growth and of environmental protection or enhancement goals that may become mutually exclusive in the next 50 years. In general, these points of potential conflict will be due to the increases in population and industrialization, the consequent increased needs for recreation areas, and the inevitable pressures on wilderness and other natural areas. It will require massive research into technological innovation and refinement to create a technology that can function without additional detriment to the few remnants of the natural environment that will have been set aside. The mere fact of the increase in population means that there will be increased pressures on the recreational and wild areas from people who live in the industrialized portion of the Basin. Therefore, the Framework Study rightly devoted much effort to identifying points of conflict. It should increase its emphasis on these points of potential conflict if it intends to fulfill its stated goals.

**Response:** Noted. By definition of its function, the Commission's work will continue to focus on those points of conflict.

**Comment:** There is very little reference to Canadian policies and goals in the Framework Study. It seems that there are many places that must take Canadian intentions into account.

**Response:** The Chairman of the Commission is authorized and directed by Executive Order 11345 establishing the Great Lakes Basin Commission to refer to the Water Resources Council any matters under consideration by the Commission which relate to the areas of interest or jurisdiction of the International Joint Commission. This constraint did not limit the acquisition or exchange of technical data and information with similar interests in Canada when this information was necessary for the investigation of international lakes, streams, and fisheries. However, the constraint did prohibit any indication that this was a joint study with Canada by citing Canadian policies and goals which could be interpreted as being direct input by Canada to the Framework Study.

**Comment:** One very important aspect in the development of a comprehensive plan (one that is treated relatively lightly in the Draft EIS) is the distribution and abundance of various natural resources within the Great Lakes Basin. To properly develop and manage our natural resources it will first be necessary to know what types of resources will be dealt with, where they are found or how

they are distributed, and their abundance. (This type of information usually can be presented best on maps.)

**Response:** The distribution, nature, and extent of Basin resources are discussed in the various appendixes, and much of this information has been displayed on maps. The EIS is to set forth the impact that would result from the use, development, and management of the various resources, and we felt that the inclusion of detailed information would be repetitive and create an EIS of excessive length.

**Comment:** The Ohio Environmental Protection Agency and the (Defiance) Resource Conservation and Development District should be added to the list of agencies from which comments have been requested.

**Response:** We have added the Ohio EPA; all RC&D District inputs would be through the Soil Conservation Service.

**Comment:** Section 3.1.1, ¶7. The last two sentences of the paragraph should be deleted because they add nothing to the Draft EIS and they reflect unfavorably on its professional quality.

**Response:** These sentences deal with the desirability of evaluating both positive and negative impacts under NEPA, and appear to be in order. The entire paragraph, however, was revised for concision.

**Comment:** The Proposed Framework described in the last sentence in Section 8.4 is not in consonance with the Principles and Standards. It considers other than national economic development and environmental objectives, and alternatives are not displayed as required. At a Great Lakes Basin Commission quarterly meeting on February 27, 1974, it was clearly established that the Framework Study would not be rewritten to comply with the Principles and Standards, and that the Water Resources Council was aware of the problem and concurred.

**Response:** The point is noted and is well taken. The reference to Principles and Standards has been deleted from the text.

**Comment:** Section 1.2.3.10, ¶2. We fail to see the significance of the categorization of the cultural resources into the six environmental categories. The categories become so general that their significance is lost.

**Response:** These are the six categories that were used in Appendix 22, *Aesthetic and Cultural Resources.* Extensive thought preceded their use, and it was generally agreed that they provide a logical categorization.

**Comment:** Throughout the Draft EIS there is a need for documentation of data (e.g., by footnotes in the text).

**Response:** The EIS material is derived from the Framework Study *Report* and the twenty-three appendixes. The bibliographies and footnotes in the *Report* and appendixes should be useful. In response to this comment, however, we will expand Annex 2 of the EIS to include pertinent sources of Basin environmental information.

**Comment:** Section 3. More detail should be provided on the assumptions and criteria that were used to formulate the "Proposed Framework" alternative.

**Response:** The assumptions and criteria are discussed in depth in Appendix 1, *Alternative Frameworks*, and therefore are not repeated in the EIS. It is intended that the EIS discuss the impacts of future growth assumptions and resource requirements. It would seem excessively repetitive to repeat the details used to formulate the "Proposed Framework" alternatives.

**Comment:** Section 3.2.2, ¶6. It is stated that some 200 miles of shoreline will be required for power plants by the year 2020. How many miles of vacant land exist today? How much vacant land is projected to be available for power plants through 2020? What procedures will be used for determining where plants will be sited?

**Response:** The paragraph states that 200 miles would be required if all the 150–200 indicated plants were located on the shoreline. This is a maximum number of shoreline miles—the actual number may be much less due to the potential for fewer required power plants resulting from energy conservation or technological innovations such as solar energy. Also, increasingly stringent environmental requirements such as those in P. L. 92–500, in combination with intense competition for shoreline resources, may result in more power plants being located inland from the coastal zone. The figures for shoreland ownership and use are in Appendix 12, *Shore Use and Erosion.*

The Great Lakes States are currently developing coastal zone management programs under the Coastal Zone Management Act of 1972 (P.L. 92–538). These CZM programs must consider energy facilities siting issues and policies and permissible uses of the coastal resources. Additionally, several Great Lakes States including New York, Ohio, and Minnesota have power plant siting commissions which regulate the location of energy facilities.

Several State public service commissions also have the authority to regulate the location of power plants and transmission facilities.

**Comment:** Section 3.6, ¶6. The sediment-budget data in this paragraph should be documented. On the basis of U.S. Geological Survey data, the 2.5 million tons of sediment estimated as coming from tributary streams seems to be in the ballpark. However, sediment from shore erosion is by far the major problem in Lake Erie (Dr. Charles Carter, Ohio Division of Geological Survey, personal communications). According to Carter, some 60 millions tons/year of sediment are due specifically to shore erosion. The tremendous water-quality problems due to this large volume of sediment were overlooked.

**Response:** The effects of high water and shore erosion along the Great Lakes range from nuisance conditions to major destruction of property. Sedimentation damages are most significant in areas where shore materials are not sandy (in other words, clays, heavier textured soils, and organic soils). Lake Erie is particularly vulnerable, as is Saginaw Bay, lower Lake Huron, lower Lake Michigan, and Lake St. Clair.

The critical erosion reaches are set forth in Appendix 12, *Shore Use and Erosion*, which shows that Lake Erie ranks third in shoreland erosion and flooding miles with 20.6 miles of shoreland subject to critical erosion. This water quality problem has been recognized.

**Comment:** Structural measures must be coordinated along flood-prone or erosion-prone reaches of the shoreline so that structural protection will be consistent and continuous.

**Response:** Concur with the comment, with regard to those shoreline areas which must be protected structurally. Separate protection for short reaches of eroding shore within a larger zone of eroding shoreline is difficult and costly. Such protection often fails at the flanks as the adjacent unprotected shores continue to recede.

Nonstructural measures, such as use restrictions, setbacks, etc., provide more logical means of dealing with most such problems in the longer term, and are espoused by the Commission.

**Comment:** Section 7, ¶5. The list of natural processes that should be included in capability analysis of the Region is not complete. Also, not all of the five physiographic factors are "processes." Consideration should also be given to geomorphology, surface geology, flora, fauna, and coastal processes. We advocate a synthesis of "physiographic" factors with "ecological" factors in any capability analysis.

**Response:** Noted and the text has been changed.

### Pennsylvania Department of Environmental Resources

No comment.

### Wisconsin Department of Natural Resources

**Comment:** Section 5.2, ¶3. The draft has not addressed the problems of disposal sites for the nuclear power plants.

**Response:** The breeder reactor will produce large amounts of radioactive material and will greatly multiply safety problems in handling, transport, and disposal of this material. Appendix 1, *Alternative Frameworks*, under Section 11 (Implementation of Framework Programs), recommends including among the Basin's data collection and research needs an "analysis of the impacts of power plants in the following areas: (a) methods of ash handling and disposal; (b) fallout of particulate emissions from stacks; (c) effects of biocides and other chemicals in blow down waters which are discharged to water bodies; (d) methods for the transfer and storage of fuels and power." These and other problems will be addressed in subsequent studies.

**Comment:** Section 5.3. The discussion on area-wide treatment systems has ignored the encouragement of urban sprawl along the interceptors.

**Response:** Paragraph 1 has been amended to reflect this potential impact.

**Comment:** The inclusion of a Foreword in the Final EIS stating the Commission's policy relating to the impact statement process will give assurance to governmental agencies and the public that further environmental evaluations will be made during the project planning and implementation phases.

**Response:** Such a Foreword is included in this Final EIS.

## 10.3 Local Units of Government

### Northeastern Illinois Planning Commission

**Comment:** We find the Draft EIS to be generally consistent with the requirements of the National Environmental Policy Act of 1969. We are

supportive of the primary emphasis on restoring and protecting environmental quality in the southern half of the Lake Michigan basin. We also concur with the high priority given to the problem of municipally supplied water withdrawals in the Chicago-Milwaukee subarea. However, we would urge the Great Lakes Basin Commission to include consideration of the problem of lakeshore erosion in its Final EIS document.

**Response:** The Commission and the States are addressing the lakeshore erosion problem through the Coastal Zone Management program. This study is envisioned to be completed within about a two-year period, and should result in specific recommendations for addressing the problem. The Framework Study is intended to be broad in scope. When project-specific plans are developed, they will undergo the normal review, including review of their impact on the environment.

**Southeast Michigan Council of Governments**

No comment.

**Genesee/Finger Lakes Regional Planning Board**

**Comment:** All pertinent topics are included though due to size of report and scale of project, they are not covered in depth.

**Response:** The Framework Study is intended to be broad in scope. It will be adopted by the Commission as the Level A portion of the Comprehensive Coordinated Joint Plan and it will be revised and updated through a continuous planning process, including Level B and specific project studies (Level C) which will address impacts in depth.

**Comment:** The plan seems to have been done in a vacuum—should be a way of getting more local input. Perhaps the topic is too large for the structure.

**Response:** The Framework Study is a product of the combined efforts of the eight States and 12 Federal agencies that have membership on the Commission. The concept adopted by the Commission in the conduct of the Framework Study was to include and promote involvement of as many interested agencies and individuals as possible in staffing the Work Groups and the Plan Formulation Committees who developed the plan for the Framework Study. A total of 21 public meetings were also held throughout the Basin to obtain local input to the proposed program.

**Comment:** Proposals are extensions of trends and alterations of them. No innovative proposals are made. Commission may be missing an opportunity on this.

**Response:** We feel that innovative proposals were made. There were several sets of projections used. The Normal Framework estimated the water and related land resources programs needed to support future population levels which are generally assumed to be associated with national economic development objectives. The Proposed Framework shows water and related land programs based on population and/or economic projections for the Great Lakes Region which are generally lower than population and/or economic projections used as the base for the Normal Framework. Other projections assumed more limited or accelerated population and economic growth.

The impact of existing social and economic policies on water and related land resources in the Basin has been evaluated. The Proposed Framework documents growth preferences for each planning subarea based on public meetings and Great Lakes Basin Commission judgment, and qualitatively evaluates the effects of alternative selections using normal growth projections as a basis for comparison.

**Comment:** All topics are treated equally with no attempt to prioritize or indicate the seriousness of certain problems or the reduction and elimination of detrimental activities.

**Response:** Efforts were made to tailor the discussion under each individual Lake basin to address those issues of greatest concern. Indication of relative seriousness of problems can also be inferred by examination of the various tables showing ratios of change in water demand, percentages of water needs met, etc.

**Genesee-Lapeer-Shiawassee Region V Planning and Development Commission**

**Comment:** Changes in land uses for power-generating facilities and water quality through chemical and thermal pollution for areas along the Great Lakes shorelines are not explored in sufficient detail to determine positive or negative effects on areas (the Region V area). Temperature changes of the lake may result in hydrologic and climatic variations on a localized or more extensive area basis. The results of such changes may be of a positive or negative nature. Agricultural activities may be enhanced with a longer growing season due to the proximity of a warm body of water (positive). On

the other hand, a warmer body of water may result in increased evaporation and possible increased precipitation during winter seasons. Though these points are quite theoretical, they may be of sufficient importance to warrant additional investigation.

**Response:** Agree with the comment. Further, power generation and cooling water disposal can add to Great Lakes water resources problems. Damage to the local aquatic balance may be associated with excessive heat disposal in the immediate vicinity of power plant discharges. Power plant locations and sitings may reduce aesthetic appeal of the surrounding area. Fish spawning and habitat areas, as well as wildlife propagation areas, may be impaired or destroyed in the vicinity of pump intakes and discharges. Alternately, proper management and planning may enable excess heat from power generation to be employed for obtaining desirable increases in lake productivity and recreational and fishing opportunities.

More specific studies (Level B, Level C, and others) to follow will address these issues.

## 10.4 Private and Other Entities

### Consumers Power Company

**Comment:** Beginning at paragraph 2 of Section 3.1.1 is an extended discussion of alleged effects of cooling water discharges. Not only is the discussion slanted toward hypothetical effects of discharges, in a section presumably concerned with withdrawals, it is done so to the exclusion of discussion of withdrawals for other uses.

**Response:** The discussion was not intended to exclude the withdrawals for other uses. The Commissioners considered municipal water supply the most important need, and as a result, programs that would satisfy these needs over the time period were given first priority. About 85 to 90 percent of these needs are expected to be met by withdrawals from the Great Lakes. Ground-water sources will supply the next largest amount, followed by reservoir storage and inland lakes and streams. Cost is the major obstacle to meeting the needs at any point in time. Water for the other water withdrawal categories is in adequate supply. None of these uses are considered to impinge upon water quality so significantly as to preclude further or multiple use if the water is returned to the source with proper treatment. However, discharge of power plant cooling water may degrade water quality. While the quantities shown for the Proposed Framework are the same as those developed in the Normal Framework, it is possible that greater or lesser quantities may be required. If the trend toward secondary cooling measures continues, the withdrawals will be smaller but the consumptive use greater. However, if it is possible to locate plants where flow-through cooling can be used without adverse effects on the water body to which the effluent is returned, then larger quantities of cooling water may be required, with lower consumptive use. Studies of site location, condenser cooling transmission line location, and the entire range of electric power supply issues have a high priority in the recommendations of the Proposed Framework.

**Comment:** Section 3.1.1, ¶2. The statement that up to 100 percent of the waste heat discharge (is) circulated into the beach water zone is not subject to common interpretation, and is misleading by implying that heat in some way builds up in the beach water zone.

**Response:** The text has been changed to remove implications that up to 100 percent of waste heat discharge is circulated into the beach water zone.

**Comment:** Section 3.1.1, ¶3. The statement on blowdown inaccurately refers to chlorination of once-through cooling systems in the previous sentence. In the same paragraph, the statement that plankton mortality represents a significant mortality of fish food in the littoral zone is unfounded.

**Response:** The text has been changed to incorporate the first comment (chlorination). We believe that the text of the statement is reasonable (though admittedly generalized) with respect to the plankton mortality issue.

**Comment:** Section 3.1.1, ¶5. The statements that weather modifications potentially represent environmental consequences of great magnitude and that "accelerated thermal dissipation into the Great Lakes Basin must not be allowed to occur until the consequences of such actions are fully understood" is a policy recommendation of far-reaching consequences. The facts and the Framework Study do not warrant or justify such a statement.

**Response:** The text has been revised to incorporate this comment.

**Comment:** Section 3.1.1, ¶6. The suggestion that aquaculture of oysters and other marine organisms is "promising" for the Great Lakes Basin would seem to require some further explanation.

**Response:** Text is changed to delete oysters.

**Comment:** Section 3.1.3.1. Along with the list of

legitimate uses of land in the first paragraph, we would suggest that it would be appropriate to include energy production as a use also deserving of consideration.

**Response:** Energy production has been included in the text.

**Comment:** Section 3.1.3.5. The facts do not support the assertions in the first paragraph that "intense competition" for shoreland resources exists between thermal power generation plants and the other uses listed, or the idea that location of power plants may be in direct conflict with recreational demands and intelligent natural resource management. The facts are that power plant usage represents an almost negligible percentage of the total shoreline, and power plants can coexist with many other uses, the most compatible of which is probably general recreational use.

**Response:** The text has been changed to remove the direct conflict connotation and to indicate that, with proper planning, developments such as power plants can coexist with general recreational uses.

**Comment:** Section 3.2.2, ¶5–8. The assumptions set forth dealing with power plants, unrealistically assume worst case conditions and projected effects. This does not appear to be consistent with the other uses discussed, where a more probable outlook of projected conditions is considered. Assuming that all plants would be sited on the lakeshore, that the maximum land use figure should be considered, and that this will necessarily eliminate valuable waterfowl and fish habitat is plainly false. This same approach and assumptions are also part of the discussions for the separate Great Lakes basins.

**Response:** The Commission does not consider this to be the worst case condition, but rather the likely condition, based on information available at the time of the study. Regarding habitat destruction, it can be assumed that any power plant development will eliminate, or at least alter, wildlife habitat. The proper siting of a power plant represents an extremely complex problem and requires an extensive environmental analysis on a site-by-site basis. Environmental considerations will enter into the future siting of power plants.

**Comment:** Section 3.4.1, ¶8. It is stated that the various environmental consequences of constructing and operating the Ludington Pumped Storage facility are "irreversible." While there are some irreversible environmental consequences, the blanket statement is not true in the sense that there are long-term irreversible losses of the environmental values and components mentioned and, in fact, some recreational and other environmental enhancement has occurred in the short-term as a result of the project.

**Response:** The text has been changed to reflect mitigation which has occurred at the project.

**Comment:** Section 3.5.1, ¶10. The implication that there will be a significant increase in power plant construction, with potential for elimination of valuable waterfowl and fish habitat, in Saginaw Bay is unwarranted. The idea that new power plants would probably be built in this area is understandable, in view of Consumers Power Company's recent actions involving two sites, but it does not follow that any of this development has significant potential for eliminating valuable habitat or that future sites will be designated on the Bay shore.

**Response:** Some changes have been made to the text. However, it should still be recognized that power plant development does have the potential for damage to habitat values.

**Comment:** Section 5.2, ¶3. It is noted that there is a relatively short history of experience with thermal discharges, and that this somehow clouds the issue of what should be allowed. Thermal discharges have been made to the Great Lakes for well over 30 years and while there will always be questions, as there will be for any environmental impact of technology, the weight of the evidence clearly indicates that currently projected uses of cooling water on the Great Lakes will not have significant impacts at any level. We would be glad to direct you to the extensive literature that is available on these matters if you would like.

**Response:** Upon reexamination it is felt that the text as written is of such a general nature as to not pass judgment on effects of waste heat, but rather to simply enunciate it as a concern to be addressed.

### League of Women Voters (Lake Michigan Inter-League Group)

**Comment:** In general the Draft is verbose and repetitive, as though several different agencies had input into the various sections. If this is supposed to be a summary of 27 full reports, it still needs much synthesizing and "boiling down" to make an unmistakably clear, succinct report. The unevenness of treatment, whereby material is left out in some areas or else repeated ad nauseam in other places, "muddies the waters;" certainly this was not your intention. The result is a succession of broad, general statements made without giving adequate sources of information upon which the conclusions

are based. A college course term paper would require better organization and more supportive material.

**Response:** In addressing other comments made on the Draft EIS, it is believed that much of the criticism contained in this paragraph has been met. The EIS is not intended to summarize the 26 other volumes but to set forth what impact the Proposed Framework would have on the Region if and when the broad general projects and programs are given more detailed study on a site-by-site basis and finally implemented.

**Comment:** Section 1.2.2.1, ¶4. This section should mention that construction of locks and canals disrupted the fish chain; that exploitation of copper and iron deposits left mined-out areas and an eventually depressed economy; and that commercial fish production has also been affected by mercury and pesticide contamination.

**Response:** The text has been changed to accommodate these comments.

**Comment:** Section 1.2.2.3, ¶4. "The heavy concentration of industrial activity in the Region has played a major role in its past performance *and added significantly to the pollutant load.*"

**Response:** The text has been changed accordingly.

**Comment:** What has been the effect of mining on the forest resources?

**Response:** With approximately 50 percent of the Basin presently classified as forestland, mining has had little effect on forest resources. Much of the forest cover has been reestablished by natural regeneration and forest management practices. Urbanization and cultivation of land for agricultural purposes have had more significant impact on the forest resources than has mining. This is evident from agricultural land use in such areas as central lower Michigan, Ohio, Indiana, Pennsylvania, and New York.

**Comment:** Section 3.1, ¶2. As the impacts of non-quantifiable programs are not indicated in the annex displays, even though they have environmental effects, does not this relegate them to an "out of sight, out of mind" category? Can they really be ignored?

**Response:** As is indicated in the statement, these programs also have environmental effects, and we have recognized them to the degree possible within the Framework Study EIS.

**Comment:** Section 3.1.2.4, ¶1. Who decided that deep draft navigation and incremental improvements to the navigation system should be policy? Why should the navigation season be extended when the volume of shipping has been dropping, due in part to labor problems and to theft?

**Response:** The Commissioners adopted the policy. Our information does not indicate that the volume of shipping is or will be dropping.

**Comment:** Section 3.1.3.2. It is very vague at whose expense the enhanced recreational opportunities will be developed.

**Response:** There are funds from the Federal government that are earmarked for recreation. All of the States have appropriations for developing parks, boat ramps, etc. However, if all needs for recreation are to be met, this investment will have to be supplemented by the private sector. This will include opportunities for boating, skiing, horseback riding, golf, and other recreational activities.

**Comment:** What is the role of the Coastal Zone Management Act in the shore use and erosion programs?

**Response:** The Coastal Zone Management Act of 1972 gives the States the responsibility for providing leadership in coastal zone planning. The problem of shore damages, both from erosion and flooding, demands high quality technical studies to support structural and nonstructural shore damage reduction strategies. The task of those who are concerned with coastal zone management is to consider these problems along with other factors, in establishing programs to address the broad range of resource uses to be provided in the coastal zones.

**Comment:** Section 3.1.4(1). It is not clear how more than 113 billion gallons of safe water per day can be provided in addition to the current supply.

**Response:** This is indicated in Appendix 1, *Alternative Frameworks*, which gives the quantities and the sources for the three time frames considered in the study. The resource base is adequate to satisfy this demand.

**Comment:** Section 3.1.4.1. The estimated costs need revision in the light of the altered economic situation.

**Response:** Costs are being revised as we proceed; however, revisions are primarily in response to new legislative requirements and improved base data.

**Comment:** Section 3.2.2. This section lacks headings. Why should all the proposed new power plants

be sited on the more expensive land—the lakeshore? Diked disposal of dredgings (paragraphs 16–19) is still experimental as far as the Corps is concerned.

**Response:** Power plant site selection will be done on a site-by-site basis, which has been discussed earlier in addressing power plant siting and its impact on the environment. The text has been changed to address disposal of dredged material behind dikes.

**Comment:** It seems ironic that Lake Michigan should function both as the prime water supply source for municipalities and for cooling condensers. Who has made the policy that by 2020 more than 90 percent of the total energy produced in the lake basin will be supplied by nuclear power plants? It has yet to be proved that nuclear plants produce cheaper energy than other power plants and operate more efficiently.

**Response:** The 90 percent figure is based on materials used in the study itself. Some time has passed since the study was substantially completed, and we acknowledge that more recent information may bring certain figures into question. However, the Framework Study has gone to print, and the EIS should evaluate it as it exists. The Commission will utilize updated information in Level B and other subsequent studies.

**Lake Erie Advisory Committee**

**Comment:** Our concerns are mainly with the study approach taken toward the fragile water/land interface along the west shore of Lake Erie and the biotic productivity of that area's aquatic environment. We advocate limited growth or no growth in wetland environs to preclude the deleterious effects mentioned in Section 6 of the study, which defines the incremental "improvements" to the Great Lakes navigation system.

**Response:** The Framework Study examined limited and low growth in various regions of the Great Lakes Basin. It recognized that on the balance, continuation of Normal growth was more realistic and favored by the general community than limited growth and its concomitant restriction upon economic activity. The fragile water/land interface along the west shore of Lake Erie requires protection and insulation from development to the maximum degree practical, and the EIS notes this in Section 6, ¶5–6.

**Comment:** In Section 3.6.1, ¶7 of the EIS, the dangerous assumption that waste treatment will be regionalized is alarming and we reject it summarily. The Framework Study must address the decentralized method or CURE (Clean Urban River Environment) concept of wastewater treatment espoused by the Environmental Protection Agency in an early study. The Lake Erie Advisory Committee supports the CURE concept. Why isn't this alternative discussed in the Framework Study?

**Response:** The Framework Study deals with regional concepts and does not analyze local situations. However, examination of individual cases such as the Huron River would probably lead to the conclusion that preservation of moderate flows within the river channel are economically desirable and aesthetically pleasing. The economies of scale which would be achieved in regional wastewater treatment must be considered in light of possible adverse impacts at specific localities.

**Comment:** Section 3.6.1, ¶12 indicates increased shipping tonnages and facilities with larger ships requiring fewer trips. We believe that load limits, length restrictions, and draft limits need to be established as part of the Framework Study. We do not want VLCC class ships on the Great Lakes. The "Super" ships are destroying the oceans. The original investment in ships is amortized within the first few payloads, and after that the creaky old hulks just go on making somebody rich at the expense of the environment. The Framework Study must not become a whitewash for the shipping interests or other power groups to the detriment of other values such as private and public property rights on the shoreline.

**Response:** The dominant economic factor in the Great Lakes Basin, besides the location of raw materials there, has been the low-cost shipping available on the Great Lakes. This has stimulated the basic industries and supported the strong economy of the Region. Economic and environmental studies must be made prior to the stipulation of load limits, length restrictions, and draft limits, which will control the size of individual ships and pertinent navigation facilities. The Framework Study states that these developments must be economically and environmentally sound before being undertaken. VLCC (Very Large Cargo Carrier) ships, carrying 200,000 to 500,000 tons and drawing up to 80 feet, are four to ten times the size of the largest lake carrier.

**Professor William E. Southern, Northern Illinois University**

**Comment:** Shoreline zoning. Developmental re-

straints should be considered rather than emphasizing erosion control or measures designed to counter natural forces. It is well documented that most of the methods of erosion control only shift the lake problem to some other area.

**Response:** The Commission believes that reduction of future shoreland damages can be accomplished through use of both engineering and management techniques. Engineering techniques can reduce damages by influencing the physical interface of the land and water; management techniques can do so by influencing people in their use and development of the shorelands and coastal waters. Engineering solutions generally include structural shore protection and lake level regulation. Structural measures reduce erosion of lands and corresponding damage to buildings and similar structures. Use of such measures may be desirable along developed shorelands in high risk erosion areas. Lake regulation can reduce erosion and structural damages to some extent. However, it cannot prevent damages to the degree that shore protection can.

Effective management techniques applicable to shoreland erosion problems are generally limited to acquisition and regulatory controls. These measures generally will not reduce future losses of land due to erosion. However, they can be used to reduce or eliminate costly damages to buildings and other structures to be constructed in the future. Management programs are highly desirable where shorelands are relatively undeveloped or where land use changes are desired. The Commission favors such nonstructural approaches for longer-term shoreland protection programs.

**Comment:** Limestone quarry operations. Cement and steel companies own large tracts of land along the Great Lakes shoreline, particularly in Michigan. Presently, there is nothing to restrict the extent of devastation following these operations. Plans should be considered for the creation of boat harbors at such sites.

**Response:** The State of Michigan is aware of the need for reclamation of these kinds of areas. There is presently some control over quarries, and there is legislation being written to further control quarries, gravel pits, and sand dunes. The creation of boat harbors at such sites may be possible.

**Comment:** Islands. Any comprehensive plan for the Great Lakes must take the natural and man-made islands into consideration. Many of these are the locations for unique bird nesting colonies and their management is an important consideration.

**Response:** Concur in the comment. Such wildlife management is an ongoing concern of the U.S. Fish and Wildlife Service and other agencies; and will be considered in future Level B studies and project planning.

The wildlife management potential of islands in the Great Lakes has also been noted in the EIS, in response to this comment.

**Comment:** Non-game wildlife. The draft copy tends to stress game species as representing the important wildlife of the area. At least equal time should be given to other groups, as many marsh or wetland forms are seriously threatened by habitat destruction. In this same context, it is important that we begin showing concern for wildlife and plant species *before* they are on the endangered list. Long-range planning should consider the amount of particular habitats that are being destroyed and relate this to the requirements of the species involved. Postponing our concern until species become endangered is assuring that many will become extinct.

**Response:** Appendix 17, *Wildlife*, discusses the status of wildlife, including big game, waterfowl, small game, furbearers, non-game, rare and endangered species, and unusual or unique animals and birds. It includes recommendations for wildlife habitat protection and improvement. It does deal with the broad range of wildlife issues and needs, and subsequent studies will continue a broadening inquiry into long-range concerns regarding all plant and animal species.

**Comment:** Co-inhabitation by wildlife and man. Studies are needed to determine the impact of various types of development on wildlife populations. Very few follow-up studies have been conducted to determine the accuracy of EIS predictions.

**Response:** Concur in the comment.

**Comment:** Water cycles. The extent to which lake levels vary with time is important and consideration of same can be used to reduce impact. Development on areas exposed during lows in the water cycle should be prevented.

**Response:** Concur in the comment. The Commission has recommended nonstructural approaches as the most effective long-term means of reducing impacts.

**Comment:** Goals of local residents. Local citizens rather than non-residents should be consulted about long-range plans for their area. The predicted rate of development is unlikely in some areas

as is indicated by the recent study conducted by the University of Michigan Biological Station.

**Response:** Concur in the comment. A total of 21 public meetings were held in localities across the Basin during the plan formulation process; the views of local residents were documented and are represented in the Proposed Framework programs.

**Comment:** Oil discoveries. The rich new oil fields in Michigan may have some influence on development rates in that State, the number of oil tankers and potential spills on the Lakes, and other factors.

**Response:** Concur with the comment.

**Comment:** Sand dune associations. These unique and fragile environments should be given serious consideration.

**Response:** The States and the Federal government are moving to protect these areas with more rigid legislation. The Sleeping Bear Dunes and other areas are now under Federal protection; others are or will be protected under State laws. State land use regulation and other activities may also provide additional protection.

**Comment:** Species diversity of area. List included in draft is inadequate and suggests superficial knowledge of the fauna and flora of the area. An attempt should be made to catalog the organisms and to define or describe habitats.

**Response:** More detailed habitat descriptions and listings of flora and fauna can be found in the Framework Study (especially Appendix 17, *Wildlife*). The level of detail presented, upon reexamination, does appear to be appropriate for a Framework Study EIS.

**Dr. Rupert Cutler, Michigan State University**

Dr. Cutler's letter expressed concern over the level of detail in this EIS, with regard to both environmental impacts and economic gains. It is believed that the Final EIS accommodates such concerns to the extent possible within a Level A Framework Study EIS. Dr. Cutler's comments are acknowledged with thanks.

**Mr. Frank A. Dazey, Jr.**

Mr. Dazey's letter included several suggestions for changes to the text (grammar, spelling, format, etc.), as well as some comments on content of the EIS. Several of his comments have been accommodated, both directly and in the process of printing the final statement. His suggestions and comments are acknowledged with thanks, and it is hoped that for the most part they have been accommodated.

# Annex 1

# ENVIRONMENTAL IMPACT DISPLAYS

## Framework Programs

Over 90 structural and nonstructural programs have been evaluated in the course of plan formulation in the Framework Study. These general program types are designed to solve resource problems and meet projected water and related land needs within the Great Lakes Basin. For purposes of display and discussion, the programs have been grouped under four general categories: Water Management, Land Management, Increased Efficiency, and Collection and Dissemination of Information. Displays found in Tables 18–23 categorize as either beneficial or adverse the environmental impacts of water and land management programs only. Further explanation of the program categories follows.

(1) Water Management Programs

Water management programs include programs to supply direct water needs from the Great Lakes, inland lakes and streams, and ground-water sources. Reservoir storage and structural (including stream modification) programs are also utilized, as are nonstructural legislative and institutional means of meeting water use needs.

The environmental impacts of programs are evaluated in both the Annex 1 displays and in narrative form.

(2) Land Management Programs

Land management programs include land use changes and land treatment programs, plus legislative/institutional programs and public acquisition. Once again, environmental impacts are evaluated in both display and narrative form.

(3) Increased Efficiency Programs

Most of the resource use categories are nonquantifiable in terms of an increased efficiency program and are, therefore, difficult to assess from the environmental impact viewpoint. It can be assumed, however, that increased efficiency in resource use would bring about environmental improvement in most cases. For example, efficient irrigation practices would minimize runoff and would be beneficial in reducing runoff soil erosion and nutrient build-up in surface waters. Another example involves wastewater treatment. Increased efficiency in this respect would be greatly beneficial to the natural environment. Improving water systems to reduce leakage would also be beneficial.

However, increasing the efficiency of resource use may be, in some cases, detrimental to the natural environment. For example, increasing the efficiency of commercial navigation by providing for additional use could result in greater frequency of spills, additional construction and maintenance dredging, more "stirring action" of bottom organisms, and additional noise, air pollution, and hazard to human and other life in the short term.

(4) Programs Involving Collection and Dissemination of Information

As in the program of increased efficiency, the environmental impacts of the collection and dissemination of information regarding resource use are generally nonquantifiable. However, it can be assumed that this water and related land management action is beneficial to environmental protection. As we gain additional knowledge regarding the effects of using resources, more responsible decisions regarding their uses can be made.

## Explanation of Displays

The displays found in Annex 1 illustrate a judgment as to the environmental impact for each resource use or management program in the Proposed Framework. Appendix 1, *Alternative Frameworks*, and other information was used to develop the displays. The environmental impacts indicated are for the planning period through 2020. It is recognized that any or all management programs for resource use can result in both desirable and adverse environmental impacts. However, due to the nature of framework planning, only the broad, net environmental effects are represented in the displays. No attempt has been made to define detailed impacts of individual projects in localized areas.

The displays are quite similar to those presented in Section 12 of Appendix 1, *Alternative Frameworks*. However, instead of numbers being used in the various programs, as illustrated in Appendix 1, impact ratings of + or − are used to indicate the general type of impact a particular program may

(text concluded on page 122)

## TABLE 18 Environmental Impact of PRO Framework to 2020: Great Lakes Basin

| Resource Use Category | Units | Needs | | Source | | | |
|---|---|---|---|---|---|---|---|
| | | | | Great Lakes | | Inland Lakes and Streams | |
| | | Total | % Met | % Met | Env. Impact | % Met | Env. Impact |
| **WATER WITHDRAWALS** | | | | | | | |
| MUNICIPALLY SUPPLIED | MILLION GALLONS PER DAY | 5,400 | over | 88 | - | 3 | - |
| SELF-SUPPLIED INDUSTRIAL | MILLION GALLONS PER DAY | 10,300 | 80 | 58 | - | 15 | - |
| RURAL DOMESTIC & LIVESTOCK | MILLION GALLONS PER DAY | 267 | 92 | ... | ... | 21 | - |
| IRRIGATION | MILLION GALLONS PER DAY | 2,460 | 85 | 9 | - | 45 | - |
| MINING | MILLION GALLONS PER DAY | 965 | 75 | 10 | - | 26 | - |
| THERMAL POWER COOLING | MILLION GALLONS PER DAY | 96,500 | 100 | 100 | - | ... | ... |
| **NON-WITHDRAWAL WATER USES** | | | | | | | |
| MUNICIPAL WASTEWATER DISCHARGES | MILLION GALLONS PER DAY | 6,720 | 100 | ... | ... | ... | ... |
| INDUSTRIAL WASTEWATER DISCHARGES | MILLION GALLONS PER DAY | 9,210 | 100 | ... | ... | ... | ... |
| HYDROELECTRIC POWER | MILLION GALLONS PER DAY | 105,200 | 100 | ... | ... | ... | ... |
| WATER-ORIENTED OUTDOOR REC. | 1000 RECREATION DAYS | 329,000 | 58 | ... | ... | 1 | - |
| | 1000 ACRES WATER SURFACE | | | | | | |
| SPORT FISHING | 1000 ANGLER DAYS | 79,200 | 92 | ... | ... | ... | ... |
| | 1000 ACRES WATER SURFACE | | | | | | |
| RECREATIONAL BOATING | 1000 BOAT DAYS | 19,500 | 55 | 18 | - | 20 | - |
| | 1000 ACRES WATER SURFACE | | | | | | |
| COMMERCIAL FISHING | MILLION TONS PER YEAR | | | | | | |
| COMMERCIAL NAVIGATION | MILLION TONS PER YEAR | 754 | 100 | 98 | - | ... | ... |
| **RELATED LAND USES & PROBS.** | | | | | | | |
| AGRIC.-LAND TREATMENT | 1000 ACRES | 20,450 | 76 | ... | ... | ... | ... |
| -CROPLAND DRAINAGE | 1000 ACRES | 6,210 | 42 | ... | ... | ... | ... |
| FOREST LAND TREATMENT | 1000 ACRES | 27,900 | 78 | ... | ... | ... | ... |
| SHORELAND EROSION | MILES | 1,200 | 17 | ... | ... | ... | ... |
| STREAMBANK EROSION | MILES | 10,900 | 27 | ... | ... | ... | ... |
| | $1000 AVG. ANNUAL DAMAGES | 1,710 | 100 | ... | ... | ... | ... |
| FLOOD PLAINS-URBAN | 1000 ACRES | 251 | 79 | ... | ... | ... | ... |
| -URBAN | $1000 AVG. ANNUAL DAMAGES | 190,000 | 93 | ... | ... | ... | ... |
| -RURAL | 1000 ACRES | 2,550 | 48 | ... | ... | ... | ... |
| -RURAL | $1000 AVG. ANNUAL DAMAGES | 32,400 | 56 | ... | ... | ... | ... |
| WILDLIFE MANAGEMENT | 1000 ACRES | 14,100 | 35 | ... | ... | ... | ... |
| | 1000 USER DAYS | 33,300 | 38 | ... | ... | ... | ... |
| AESTHETIC AND CULTURAL | 1000 ACRES | | | | | | |
| OUTDOOR RECREATION-INTENSIVE | 1000 ACRES | 109 | 69 | ... | ... | ... | ... |
| -EXTENSIVE | 1000 ACRES | 600 | 76 | ... | ... | ... | ... |

[1]met by increased efficiency

KEY

\+ desireable impact
\- adverse impact
... inapplicable, not determined, or no net impact

| Water Management Programs and Impacts | | | | | | | | Land Management Programs and Impacts | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ground Water | | Reservoir Storage | | Structural (incl. stream modification) | | Non-Structural (Legislative & Institutional) | | Use Changes | | Treatment | | Legislative & Institutional | | Public Acquisition | |
| % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact |
| 7 | – | 4 | – | 1%[1] | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 7 | – | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 71 | – | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 29 | – | 2 | – | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 38 | – | 1 | – | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 100 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 100 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 100 | – | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | 5 | – | ... | ... | ... | ... | 52 | + | ... | ... | ... | ... | ... | ... |
| ... | ... | 7 | – | ... | ... | 85 | + | ... | ... | ... | ... | ... | ... | ... | ... |
| 17%[1] | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 2%[1] | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 76 | + | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 42 | + | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 78 | + | ... | ... | ... | ... |
| ... | ... | ... | ... | 17 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 27 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 100 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | 7 | – | 33 | – | ... | ... | ... | ... | ... | ... | 39 | + | ... | ... |
| ... | ... | 3 | ... | 50 | ... | ... | ... | ... | ... | ... | ... | 40 | ... | ... | ... |
| ... | ... | 4 | – | 34 | – | ... | ... | ... | ... | ... | ... | 10 | + | ... | ... |
| ... | ... | 7 | ... | 32 | ... | ... | ... | ... | ... | ... | ... | 17 | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 23 | + | 4 | + | 8 | + |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 18 | ... | 2 | ... | 18 | ... |
| ... | ... | 1 | – | ... | ... | ... | ... | 68 | – | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | 76 | – | ... | ... | ... | ... | ... | ... |

## TABLE 19 Environmental Impact of PRO Framework to 2020: Lake Superior Basin

| Resource Use Category | Units | Needs | | Source: Great Lakes | | Source: Inland Lakes and Streams | |
|---|---|---|---|---|---|---|---|
| | | Total | % Met | % Met | Env. Impact | % Met | Env. Impact |
| **WATER WITHDRAWALS** | | | | | | | |
| MUNICIPALLY SUPPLIED | MILLION GALLONS PER DAY | 25.3 | 100 | 76 | - | 1 | - |
| SELF-SUPPLIED INDUSTRIAL | MILLION GALLONS PER DAY | 72.8 | 100 | 85 | - | 12 | - |
| RURAL DOMESTIC & LIVESTOCK | MILLION GALLONS PER DAY | 4.6 | 100 | ... | ... | ... | ... |
| IRRIGATION | MILLION GALLONS PER DAY | 27.4 | 100 | ... | ... | 72 | - |
| MINING | MILLION GALLONS PER DAY | 190 | 100 | 47 | - | 47 | - |
| THERMAL POWER COOLING | MILLION GALLONS PER DAY | 2,910 | 100 | 100 | - | ... | ... |
| **NON-WITHDRAWAL WATER USES** | | | | | | | |
| MUNICIPAL WASTEWATER DISCHARGES | MILLION GALLONS PER DAY | 67.3 | 100 | ... | ... | ... | ... |
| INDUSTRIAL WASTEWATER DISCHARGES | MILLION GALLONS PER DAY | 61 | 100 | ... | ... | ... | ... |
| HYDROELECTRIC POWER | MILLION GALLONS PER DAY | 0 | ... | ... | ... | ... | ... |
| WATER-ORIENTED OUTDOOR REC | 1000 RECREATION DAYS | + | over | ... | ... | ... | ... |
| | 1000 ACRES WATER SURFACE | ... | ... | ... | ... | ... | ... |
| SPORT FISHING | 1000 ANGLER DAYS | 3,800 | 85 | ... | ... | ... | ... |
| | 1000 ACRES WATER SURFACE | ... | ... | ... | ... | ... | ... |
| RECREATIONAL BOATING | 1000 BOAT DAYS | 580 | over | 27 | - | 28 | - |
| | 1000 ACRES WATER SURFACE | | | | | | |
| COMMERCIAL FISHING | MILLION TONS PER YEAR | | | | | | |
| COMMERCIAL NAVIGATION | MILLION TONS PER YEAR | 179 | 100 | 100 | - | ... | ... |
| **RELATED LAND USES & PROBS.** | | | | | | | |
| AGRIC.-LAND TREATMENT | 1000 ACRES | 473 | 75 | ... | ... | ... | ... |
| -CROPLAND DRAINAGE | 1000 ACRES | 117 | 0 | ... | ... | ... | ... |
| FOREST LAND TREATMENT | 1000 ACRES | 10,000 | 100 | ... | ... | ... | ... |
| SHORELAND EROSION | MILES | 156 | 18 | ... | ... | ... | ... |
| STREAMBANK EROSION | MILES | 1,430 | 33 | ... | ... | ... | ... |
| | $1000 AVG ANNUAL DAMAGES | 254 | 100 | ... | ... | ... | ... |
| FLOOD PLAINS-URBAN | 1000 ACRES | 5.8 | 81 | ... | ... | ... | ... |
| -URBAN | $1000 AVG. ANNUAL DAMAGES | 2,200 | 76 | ... | ... | ... | ... |
| -RURAL | 1000 ACRES | 187 | 40 | ... | ... | ... | ... |
| -RURAL | $1000 AVG. ANNUAL DAMAGES | 638 | 25 | ... | ... | ... | ... |
| WILDLIFE MANAGEMENT | 1000 ACRES | 200 | over | ... | ... | ... | ... |
| | 1000 USER DAYS | 120 | over | ... | ... | ... | ... |
| AESTHETIC AND CULTURAL | 1000 ACRES | | | | | | |
| OUTDOOR RECREATION-INTENSIVE | 1000 ACRES | 1 | over | ... | ... | ... | ... |
| -EXTENSIVE | 1000 ACRES | 1.1 | over | ... | ... | ... | ... |

[1]met by increased efficiency

KEY

\+ desireable impact
\- adverse impact
... inapplicable, not determined, or no net impact

| Water Management Programs and Impacts | | | | | | | | Land Management Programs and Impacts | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Source | | | | | | | | | | | | | | | |
| Ground Water | | Reservoir Storage | | Structural (incl. stream modification) | | Non-Structural (Legislative & Institutional) | | Use Changes | | Treatment | | Legislative & Institutional | | Public Acquisition | |
| % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact |
| 23 | - | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 3 | - | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 100 | - | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 28 | - | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 6 | - | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 100 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 100 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | 85 | + | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 45%[1] | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 75 | + | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 100 | + | ... | ... | ... | ... |
| ... | ... | ... | ... | 18 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 33 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 100 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 26 | - | ... | ... | ... | ... | ... | ... | 55 | + | ... | ... |
| ... | ... | ... | ... | 38 | ... | ... | ... | ... | ... | ... | ... | 88 | + | ... | ... |
| ... | ... | ... | ... | 37 | - | ... | ... | ... | ... | ... | ... | 3 | + | ... | ... |
| ... | ... | ... | ... | 12 | ... | ... | ... | ... | ... | ... | ... | 13 | + | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 50 | + | ... | ... | 61 | + |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 1 | + | 198 | + |
| ... | ... | ... | ... | ... | ... | ... | ... | 99 | - | ... | ... | ... | ... | 22,618 | + |
| ... | ... | ... | ... | ... | ... | ... | ... | 63 | - | ... | ... | ... | ... | ... | + |

## TABLE 20 Environmental Impact of PRO Framework to 2020: Lake Michigan Basin

| Resource Use Category | Unit | Needs | | Source: Great Lakes | | Source: Inland Lakes and Streams | |
|---|---|---|---|---|---|---|---|
| | | Total | % Met | % Met | Env. Impact | % Met | Env. Impact |
| **WATER WITHDRAWALS** | | | | | | | |
| MUNICIPALLY SUPPLIED | MILLION GALLONS PER DAY | 2,600 | over | 93 | - | 2 | - |
| SELF-SUPPLIED INDUSTRIAL | MILLION GALLONS PER DAY | 4,770 | 57 | 45 | - | 8 | - |
| RURAL DOMESTIC & LIVESTOCK | MILLION GALLONS PER DAY | 128 | 83 | ... | ... | 35 | - |
| IRRIGATION | MILLION GALLONS PER DAY | 1,340 | 73 | 3 | - | 42 | - |
| MINING | MILLION GALLONS PER DAY | 246 | 48 | ... | ... | 37 | - |
| THERMAL POWER COOLING | MILLION GALLONS PER DAY | 42,400 | 100 | 100 | - | ... | ... |
| **NON-WITHDRAWAL WATER USES** | | | | | | | |
| MUNICIPAL WASTEWATER DISCHARGES | MILLION GALLONS PER DAY | 2,170 | 100 | ... | ... | ... | ... |
| INDUSTRIAL WASTEWATER DISCHARGES | MILLION GALLONS PER DAY | 5,090 | 100 | ... | ... | ... | ... |
| HYDROELECTRIC POWER | MILLION GALLONS PER DAY | 47,300 | 100 | ... | ... | ... | ... |
| WATER-ORIENTED OUTDOOR REC. | 1000 RECREATION DAYS | 154,000 | 39 | ... | ... | ... | ... |
| | 1000 ACRES WATER SURFACE | | | | | | |
| SPORT FISHING | 1000 ANGLER DAYS | 30,700 | 93 | ... | ... | ... | ... |
| | 1000 ACRES WATER SURFACE | | | | | | |
| RECREATIONAL BOATING | 1000 BOAT DAYS | 9,480 | 50 | 12 | - | 18 | - |
| | 1000 ACRES WATER SURFACE | 2,620 | ... | ... | ... | ... | ... |
| COMMERCIAL FISHING | MILLION TONS PER YEAR | ... | ... | ... | ... | ... | ... |
| COMMERCIAL NAVIGATION | MILLION TONS PER YEAR | 197 | 100 | 100 | - | ... | ... |
| **RELATED LAND USES & PROBS.** | | | | | | | |
| AGRIC.-LAND TREATMENT | 1000 ACRES | 8,950 | 69 | ... | ... | ... | ... |
| -CROPLAND DRAINAGE | 1000 ACRES | 1,520 | 63 | ... | ... | ... | ... |
| FOREST LAND TREATMENT | 1000 ACRES | 9,050 | 72 | ... | ... | ... | ... |
| SHORELAND EROSION | MILES | 587 | 22 | ... | ... | ... | ... |
| STREAMBANK EROSION | MILES | 3,800 | 27 | ... | ... | ... | ... |
| | $1000 AVG. ANNUAL DAMAGES | 410 | 100 | ... | ... | ... | ... |
| FLOOD PLAINS-URBAN | 1000 ACRES | 83.1 | 80 | ... | ... | ... | ... |
| -URBAN | $1000 AVG. ANNUAL DAMAGES | 83,500 | 92 | ... | ... | ... | ... |
| -RURAL | 1000 ACRES | 1,100 | 34 | ... | ... | ... | ... |
| -RURAL | $1000 AVG. ANNUAL DAMAGES | 6,560 | 40 | ... | ... | ... | ... |
| WILDLIFE MANAGEMENT | 1000 ACRES | 7,970 | 32 | ... | ... | ... | ... |
| | 1000 USER DAYS | 14,600 | 20 | ... | ... | ... | ... |
| AESTHETIC AND CULTURAL | 1000 ACRES | | | | | | |
| OUTDOOR RECREATION-INTENSIVE | 1000 ACRES | 56.1 | 40 | ... | ... | ... | ... |
| -EXTENSIVE | 1000 ACRES | 316 | 48 | ... | ... | ... | ... |

[1] met by increased efficiency

KEY

\+ desireable impact
\- adverse impact
... inapplicable, not determined, or no net impact

| Water Management Programs and Impacts | | | | | | | | Land Management Programs and Impacts | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Source | | | | | | | | | | | | | | | |
| Ground Water | | Reservoir Storage | | Structural (incl. stream modification) | | Non-Structural (Legislative & Institutional) | | Use Changes | | Treatment | | Legislative & Institutional | | Public Acquisition | |
| % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact |
| 11 | – | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 4 | – | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 48 | – | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 28 | – | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 11 | – | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 100 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 100 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 100 | – | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | 39 | + | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | 93 | + | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 25 | + | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 54 | + | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 69 | + | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 63 | + | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 72 | + | ... | ... | ... | ... |
| ... | ... | 2 | – | 20 | – | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | 3 | – | 24 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | 2 | – | 98 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | 1 | – | 30 | – | ... | ... | ... | ... | ... | ... | 49 | + | ... | ... |
| ... | ... | 1 | ... | 28 | ... | ... | ... | ... | ... | ... | ... | 61 | ... | ... | ... |
| ... | ... | 1 | – | 24 | – | ... | ... | ... | ... | ... | ... | 9 | + | ... | ... |
| ... | ... | 1 | – | 18 | – | ... | ... | ... | ... | 19 | + | 2 | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | 13 | + | ... | ... | 12 | + | 7 | + |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 3 | ... | 17 | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | 40 | – | ... | ... | ... | ... | 442 | + |
| ... | ... | ... | ... | ... | ... | ... | ... | 48 | – | ... | ... | ... | ... | ... | ... |

## TABLE 21 Environmental Impact of PRO Framework to 2020: Lake Huron Basin

| Resource Use Category | Unit | Needs | | Source | | | |
|---|---|---|---|---|---|---|---|
| | | | | Great Lakes | | Inland Lakes and Streams | |
| | | Total | % Met | % Met | Env. Impact | % Met | Env. Impact |
| **WATER WITHDRAWALS** | | | | | | | |
| MUNICIPALLY SUPPLIED | MILLION GALLONS PER DAY | 245 | 100 | 85 | - | ... | ... |
| SELF-SUPPLIED INDUSTRIAL | MILLION GALLONS PER DAY | 861 | 100 | 46 | - | 46 | - |
| RURAL DOMESTIC & LIVESTOCK | MILLION GALLONS PER DAY | 32.5 | 100 | ... | ... | ... | ... |
| IRRIGATION | MILLION GALLONS PER DAY | 210 | 100 | ... | ... | 67 | - |
| MINING | MILLION GALLONS PER DAY | 55.5 | 100 | ... | ... | 38 | - |
| THERMAL POWER COOLING | MILLION GALLONS PER DAY | 18,800 | 100 | 100 | - | ... | ... |
| **NON-WITHDRAWAL WATER USES** | | | | | | | |
| MUNICIPAL WASTEWATER DISCHARGES | MILLION GALLONS PER DAY | 263 | 100 | ... | ... | ... | ... |
| INDUSTRIAL WASTEWATER DISCHARGES | MILLION GALLONS PER DAY | 364 | 100 | ... | ... | ... | ... |
| HYDROELECTRIC POWER | MILLION GALLONS PER DAY | 0 | ... | ... | ... | ... | ... |
| WATER-ORIENTED OUTDOOR REC. | 1000 RECREATION DAYS | 19,900 | 85 | ... | ... | ... | ... |
| | 1000 ACRES WATER SURFACE | | | | | | |
| SPORT FISHING | 1000 ANGLER DAYS | 8,800 | 85 | ... | ... | ... | ... |
| | 1000 ACRES WATER SURFACE | | | | | | |
| RECREATIONAL BOATING | 1000 BOAT DAYS | 2,700 | 64 | ... | ... | 29 | - |
| | 1000 ACRES WATER SURFACE | 854 | ... | ... | ... | ... | ... |
| COMMERCIAL FISHING | MILLION TONS PER YEAR | | | | | | |
| COMMERCIAL NAVIGATION | MILLION TONS PER YEAR | 58.2 | 100 | 84 | - | ... | ... |
| **RELATED LAND USES & PROBS.** | | | | | | | |
| AGRIC.-LAND TREATMENT | 1000 ACRES | 2,050 | 85 | ... | ... | ... | ... |
| -CROPLAND DRAINAGE | 1000 ACRES | 572 | 53 | ... | ... | ... | ... |
| FOREST LAND TREATMENT | 1000 ACRES | 2,810 | 61 | ... | ... | ... | ... |
| SHORELAND EROSION | MILES | 163 | 5 | ... | ... | ... | ... |
| STREAMBANK EROSION | MILES | 1,710 | 37 | ... | ... | ... | ... |
| | $1000 AVG ANNUAL DAMAGES | 142 | 100 | ... | ... | ... | ... |
| FLOOD PLAINS-URBAN | 1000 ACRES | 10.9 | 5 | ... | ... | ... | ... |
| -URBAN | $1000 AVG. ANNUAL DAMAGES | 2,530 | 79 | ... | ... | ... | ... |
| -RURAL | 1000 ACRES | 291 | 69 | ... | ... | ... | ... |
| -RURAL | $1000 AVG. ANNUAL DAMAGES | 1,770 | 73 | ... | ... | ... | ... |
| WILDLIFE MANAGEMENT | 1000 ACRES | 1,400 | 14 | ... | ... | ... | ... |
| | 1000 USER DAYS | 2,670 | 64 | ... | ... | ... | ... |
| AESTHETIC AND CULTURAL | 1000 ACRES | | | | | | |
| OUTDOOR RECREATION-INTENSIVE | 1000 ACRES | 5.8 | over | ... | ... | ... | ... |
| -EXTENSIVE | 1000 ACRES | 33.1 | 70 | ... | ... | ... | ... |

[1]met by increased efficiency

KEY

\+ desireable impact
\- adverse impact
... inapplicable, not determined, or no net impact

| Water Management Problems and Impacts | | | | | | | | Land Management Programs and Impacts | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Source | | | | | | | | | | | | | | | |
| Ground Water | | Reservoir Storage | | Structural (incl. stream modification) | | Non-Structural (Legislative & Institutional) | | Use Changes | | Treatment | | Legislative & Institutional | | Public Acquisition | |
| % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact |
| 15 | - | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 8 | - | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 100 | - | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 33 | - | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 62 | - | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 100 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 100 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | 85 | + | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | 85 | + | ... | ... | ... | ... | ... | ... | ... | ... |
| 35%[1] | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 16%[1] | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 85 | + | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 53 | + | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 61 | + | ... | ... | ... | ... |
| ... | ... | ... | ... | 5 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 37 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 100 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | 1 | - | 2 | - | ... | ... | ... | ... | ... | ... | 2 | + | ... | ... |
| ... | ... | 1 | ... | 36 | ... | ... | ... | ... | ... | ... | ... | 42 | ... | ... | ... |
| ... | ... | 1 | - | 61 | - | ... | ... | ... | ... | ... | ... | 7 | + | ... | ... |
| ... | ... | I | ... | 64 | ... | ... | ... | ... | ... | ... | ... | 8 | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 9 | + | ... | ... | 5 | + |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 30 | + | 4 | + | 30 | + |
| ... | ... | ... | ... | ... | ... | ... | ... | 100 | - | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | 70 | - | ... | ... | ... | ... | ... | ... |

## TABLE 22 Environmental Impact of PRO Framework to 2020: Lake Erie Basin

| Resource Use Category | Unit | Needs | | Source | | | |
|---|---|---|---|---|---|---|---|
| | | | | Great Lakes | | Inland Lakes and Streams | |
| | | Total | % Met | % Met | Env. Impact | % Met | Env. Impact |
| **WATER WITHDRAWALS** | | | | | | | |
| MUNICIPALLY SUPPLIED | MILLION GALLONS PER DAY | 2,110 | 100 | 88 | - | 1 | - |
| SELF-SUPPLIED INDUSTRIAL | MILLION GALLONS PER DAY | 4,030 | 100 | 80 | - | 10 | - |
| RURAL DOMESTIC & LIVESTOCK | MILLION GALLONS PER DAY | 75.9 | 100 | ... | ... | 10 | ... |
| IRRIGATION | MILLION GALLONS PER DAY | 667 | 98 | 25 | - | 29 | - |
| MINING | MILLION GALLONS PER DAY | 398 | 72 | 2 | - | 9 | - |
| THERMAL POWER COOLING | MILLION GALLONS PER DAY | 26,200 | 100 | 100 | - | ... | ... |
| **NON-WITHDRAWAL WATER USES** | | | | | | | |
| MUNICIPAL WASTEWATER DISCHARGES | MILLION GALLONS PER DAY | 3,450 | 100 | ... | ... | ... | ... |
| INDUSTRIAL WASTEWATER DISCHARGES | MILLION GALLONS PER DAY | 2,690 | 100 | ... | ... | ... | ... |
| HYDROELECTRIC POWER | MILLION GALLONS PER DAY | 0 | ... | ... | ... | ... | ... |
| WATER-ORIENTED OUTDOOR REC. | 1000 RECREATION DAYS | 119,000 | 55 | ... | ... | ... | ... |
| | 1000 ACRES WATER SURFACE | | | | | | |
| SPORT FISHING | 1000 ANGLER DAYS | 20,700 | 96 | ... | ... | ... | ... |
| | 1000 ACRES WATER SURFACE | ... | ... | ... | ... | ... | ... |
| RECREATIONAL BOATING | 1000 BOAT DAYS | 4,830 | 37 | 13 | - | 12 | - |
| | 1000 ACRES WATER SURFACE | 1,240 | ... | ... | ... | ... | ... |
| COMMERCIAL FISHING | MILLION TONS PER YEAR | | | | | | |
| COMMERCIAL NAVIGATION | MILLION TONS PER YEAR | 318 | 100 | 100 | - | ... | ... |
| **RELATED LAND USES & PROBS.** | | | | | | | |
| AGRIC.-LAND TREATMENT | 1000 ACRES | 6,390 | 84 | ... | ... | ... | ... |
| -CROPLAND DRAINAGE | 1000 ACRES | 3,406 | 35 | ... | ... | ... | ... |
| FOREST LAND TREATMENT | 1000 ACRES | 2,230 | 70 | ... | ... | ... | ... |
| SHORELAND EROSION | MILES | 105 | 20 | ... | ... | ... | ... |
| STREAMBANK EROSION | MILES | 2,490 | 23 | ... | ... | ... | ... |
| | $1000 AVG ANNUAL DAMAGES | 579 | 100 | ... | ... | ... | ... |
| FLOOD PLAINS-URBAN | 1000 ACRES | 133 | 82 | ... | ... | ... | ... |
| -URBAN | $1000 AVG. ANNUAL DAMAGES | 100,000 | 95 | ... | ... | ... | ... |
| -RURAL | 1000 ACRES | 723 | 65 | ... | ... | ... | ... |
| -RURAL | $1000 AVG. ANNUAL DAMAGES | 17,600 | 61 | ... | ... | ... | ... |
| WILDLIFE MANAGEMENT | 1000 ACRES | 3,460 | 13 | ... | ... | ... | ... |
| | 1000 USER DAYS | 14,400 | 48 | ... | ... | ... | ... |
| AESTHETIC AND CULTURAL | 1000 ACRES | | | | | | |
| OUTDOOR RECREATION-INTENSIVE | 1000 ACRES | 38.2 | 53 | ... | ... | ... | ... |
| -EXTENSIVE | 1000 ACRES | 209 | 51 | ... | ... | ... | ... |

[1]met by increased efficiency

KEY

\+ desireable impact
\- adverse impact
... inapplicable, not determined, or no net impact

| Water Management Programs and Impacts | | | | | | | | Land Management Programs and Impacts | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Source | | | | | | | | | | | | | | | |
| Ground Water | | Reservoir Storage | | Structural (incl. stream modification) | | Non-Structural (Legislative & Institutional) | | Use Changes | | Treatment | | Legislative & Institutional | | Public Acquisition | |
| % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact |
| 3 | - | 6 | - | 2%[1] | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 10 | - | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 90 | - | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 44 | - | 3 | - | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 59 | - | 2 | - | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | 10 | - | 100 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 100 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | 21 | - | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | 10 | - | 45 | - | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | 21 | - | ... | ... | 75 | + | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | 9 | - | 45 | - | ... | ... | 1 | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | 12%[1] | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 84 | + | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 35 | + | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 70 | + | ... | ... | ... | ... |
| ... | ... | ... | ... | 20 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 23 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 100 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | 7 | - | 41 | - | ... | ... | ... | ... | ... | ... | 34 | + | ... | ... |
| ... | ... | 2 | ... | 61 | ... | ... | ... | ... | ... | ... | ... | 32 | ... | ... | ... |
| ... | ... | 11 | - | 42 | - | ... | ... | ... | ... | ... | ... | 12 | + | ... | ... |
| ... | ... | 8 | ... | 37 | ... | ... | ... | ... | ... | ... | ... | 16 | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 6 | + | 4 | + | 3 | + |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 24 | + | 8 | + | 16 | + |
| ... | ... | ... | ... | ... | ... | ... | ... | 53 | - | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | 51 | - | ... | ... | ... | ... | ... | ... |

## TABLE 23 Environmental Impact of PRO Framework to 2020: Lake Ontario Basin

| Resource Use Category | Unit | Needs | | Source | | | |
|---|---|---|---|---|---|---|---|
| | | | | Great Lakes | | Inland Lakes and Streams | |
| | | Total | % Met | % Met | Env. Impact | % Met | Env. Impact |
| **WATER WITHDRAWALS** | | | | | | | |
| MUNICIPALLY SUPPLIED | MILLION GALLONS PER DAY | 424 | 100 | 57 | - | 19 | - |
| SELF-SUPPLIED INDUSTRIAL | MILLION GALLONS PER DAY | 519 | 100 | 14 | - | 86 | - |
| RURAL DOMESTIC & LIVESTOCK | MILLION GALLONS PER DAY | 25.9 | 100 | ... | ... | 15 | - |
| IRRIGATION | MILLION GALLONS PER DAY | 214 | 100 | ... | ... | 82 | - |
| MINING | MILLION GALLONS PER DAY | 75.4 | 100 | ... | ... | 39 | - |
| THERMAL POWER COOLING | MILLION GALLONS PER DAY | 6,160 | 100 | 100 | - | ... | ... |
| **NON-WITHDRAWAL WATER USES** | | | | | | | |
| MUNICIPAL WASTEWATER DISCHARGES | MILLION GALLONS PER DAY | 773 | 100 | ... | ... | ... | ... |
| INDUSTRIAL WASTEWATER DISCHARGES | MILLION GALLONS PER DAY | 1,000 | 100 | ... | ... | ... | ... |
| HYDROELECTRIC POWER | MILLION GALLONS PER DAY | 57,900 | 100 | ... | ... | ... | ... |
| WATER-ORIENTED OUTDOOR REC. | 1000 RECREATION DAYS | 35,600 | 90 | ... | ... | 3 | - |
| | 1000 ACRES WATER SURFACE | | | | | | |
| SPORT FISHING | 1000 ANGLER DAYS | 15,200 | 91 | ... | ... | ... | ... |
| | 1000 ACRES WATER SURFACE | ... | ... | ... | ... | ... | ... |
| RECREATIONAL BOATING | 1000 BOAT DAYS | 1,940 | 93 | 11 | - | 10 | - |
| | 1000 ACRES WATER SURFACE | 750 | ... | ... | ... | ... | ... |
| COMMERCIAL FISHING | MILLION TONS PER YEAR | | | | | | |
| COMMERCIAL NAVIGATION | MILLION TONS PER YEAR | 2.1 | 100 | 62 | - | ... | ... |
| **RELATED LAND USES & PROBS.** | | | | | | | |
| AGRIC. LAND TREATMENT | 1000 ACRES | 2,600 | 75 | ... | ... | ... | ... |
| CROPLAND DRAINAGE | 1000 ACRES | 604 | 27 | ... | ... | ... | ... |
| FOREST LAND TREATMENT | 1000 ACRES | 3,840 | 51 | ... | ... | ... | ... |
| SHORELAND EROSION | MILES | 186 | 9 | ... | ... | ... | ... |
| STREAMBANK EROSION | MILES | 1,510 | 15 | ... | ... | ... | ... |
| | $1000 AVG ANNUAL DAMAGES | 326 | 100 | ... | ... | ... | ... |
| FLOOD PLAINS-URBAN | 1000 ACRES | 17.8 | 54 | ... | ... | ... | ... |
| URBAN | $1000 AVG. ANNUAL DAMAGES | 1,910 | 65 | ... | ... | ... | ... |
| RURAL | 1000 ACRES | 249 | 41 | ... | ... | ... | ... |
| RURAL | $1000 AVG. ANNUAL DAMAGES | 5,840 | 54 | ... | ... | ... | ... |
| WILDLIFE MANAGEMENT | 1000 ACRES | 1,050 | 39 | ... | ... | ... | ... |
| | 1000 USER DAYS | 1,510 | 51 | ... | ... | ... | ... |
| AESTHETIC AND CULTURAL | 1000 ACRES | | | | | | |
| OUTDOOR RECREATION-INTENSIVE | 1000 ACRES | 8.2 | over | ... | ... | ... | ... |
| EXTENSIVE | 1000 ACRES | 40.7 | over | ... | ... | ... | ... |

[1]met by increased efficiency

KEY

\+ desireable impact
\- adverse impact
... inapplicable, not determined, or no net impact

| Water Management Programs and Impacts | | | | | | | | Land Management Programs and Impacts | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Source | | | | Structural (incl. stream modification) | | Non-Structural (Legislative & Institutional) | | Use Changes | | Treatment | | Legislative & Institutional | | Public Acquisition | |
| Ground Water | | Reservoir Storage | | | | | | | | | | | | | |
| % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact | % Met | Env. Impact |
| 5 | – | 19 | – | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 85 | – | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 5 | – | 13 | – | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 61 | – | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 100 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 100 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 100 | – | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | 25 | – | ... | ... | ... | ... | 62 | + | ... | ... | ... | ... | ... | ... |
| ... | ... | 9 | – | ... | ... | 82 | + | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | 72% [1] | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | 38% [1] | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 75 | + | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 27 | + | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 51 | + | ... | ... | ... | ... |
| ... | ... | ... | ... | 9 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 15 | + | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | 100 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| ... | ... | 2 | – | 11 | – | ... | ... | ... | ... | ... | ... | 41 | + | ... | ... |
| ... | ... | 1 | ... | 19 | ... | ... | ... | ... | ... | ... | ... | 45 | ... | ... | ... |
| ... | ... | 2 | – | 12 | – | ... | ... | ... | ... | ... | ... | 27 | + | ... | ... |
| ... | ... | 9 | ... | 10 | ... | ... | ... | ... | ... | ... | ... | 35 | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 7 | + | 8 | + | 24 | + |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 12 | ... | 3 | ... | 36 | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | 202 | – | ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... | ... | ... | 275 | – | ... | ... | ... | ... | ... | ... |

have on the environment relative to other program choices and other factors. The percent column in the programs portion of the displays indicates the percent of the total resource use needs met by the various programs used to satisfy the needs. The needs column illustrates the total need and the proportion of need met for each resource use category. The displays are read by first selecting a specific resource use, such as "Water Withdrawals—Municipally Supplied," and reading horizontally across the display to the programs section which indicates what programs are used to satisfy the resource use need, the percent of the need satisfied by each program used, and the associated environmental impact. The environmental impact is based upon the percent of the need satisfied by a specific program, the general environmental desirability or undesirability of one program as opposed to others, geographic location, and other factors. The displays for the individual Lake basins and the Great Lakes Basin as a whole identify long range environmental impacts of meeting resource needs by one program relative to other program choices and other considerations within the Proposed Framework.

A program may be considered to have adverse or negative environmental impacts if one or more of the following representative conditions prevail in the long term:

(1) Water Withdrawals

(a) The program selected results in increases in the rate of consumptive water use over the present condition.

(b) The program significantly decreases minimum flows or average flows or minimum or average levels of lakes and streams and ground-water tables so as to cause irreversible damage to the aquatic system. (A streamflow regulation program may increase maximum or average flows or levels so as to cause damage.)

(c) The program increases the concentrations of pollutants in existing waters.

(d) The construction and location of water supply facilities precludes other uses of shore, flood plain, and otherwise unique, aesthetic, or wildlife habitat land.

(2) Nonwithdrawal Water Uses

(a) The program degrades water quality relative to existing standards.

(b) The program significantly disrupts ecological balance and destroys the species diversity in water and land ecosystems.

(c) The program exploits renewable and nonrenewable resources so as to preclude use by future generations.

(3) Related Land Uses

(a) The program significantly disrupts present ecological systems from continuing to function.

(b) The program degrades water quality relative to existing standards.

(c) The program creates an aesthetically displeasing landscape.

Factors which result in desirable impact are shown in the displays with a positive rating. A program is desirable if one or more of the following conditions prevail:

(1) Water Withdrawals

(a) The program stabilizes stream and lake levels and flows, moderating extreme highs and lows over the entire period of study.

(b) The program encourages reuse that decreases demand for withdrawals.

(2) Nonwithdrawal Water Uses

(a) The program improves and safeguards water quality relative to standards for all water uses.

(b) The program upgrades the visual and aesthetic quality of the waters.

(c) The program creates or safeguards important waterfowl habitat.

(d) The program protects natural resources and human life from damage due to uncontrolled water, fire, wind, or other natural forces.

(3) Related Land Uses

(a) The program conserves land resources (e.g. soil, forests, minerals) so as to allow replacement of those resources.

(b) The program protects unique habitat or cultural heritage and encourages ecological balance in the study area.

# Annex 2

# SELECTED BIBLIOGRAPHY

In addition to the Framework Study *Report* and 25 appendixes listed in the Outline at the beginning of this statement, the following selected listing of impact statements, general reports, and environmental assessments may be of interest to the reader.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# Annex 3

# TEXT OF REVIEW COMMENTS

Council of Environmental Quality guidelines for the preparation of environmental impact statements require that comments on the draft statement be attached to the final EIS. The guidelines apply to all substantive comments, whether or not the comment is thought to merit individual discussion in the text of the statement itself. All such comments received by the Great Lakes Basin Commission pertaining to the Draft Environmental Impact Statement for the Framework Study are reproduced on the pages that follow.

The comments and accompanying correspondences are reproduced here with no omissions of any kind. In some cases, more than one letter or set of comments was received from a particular agency, and the comments reflect a considerable time span. Many more agencies were asked to comment than actually did so (see list of agencies in the Summary at the beginning of this volume). Comments and correspondence are arranged by agency in the order they are presented in Sections 10.1 through 10.4. Thus, they are presented for Federal agencies, State agencies, local and regional agencies, and private entities, in that order. Within agency headings, comments and correspondence are arranged chronologically, with the earliest comments presented first.

For economy, photographic reproductions are reduced considerably in size in this volume. Original copies are on file with the Great Lakes Basin Commission.

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

Mr. Frederick O. Rouse
Chairman
Great Lakes Basin Commission
3475 Plymouth Road
Post Office Box 999
Ann Arbor, Michigan 48106

January 28, 1975

Dear Mr. Rouse:

This is in response to your letter of December 6, 1974, transmitting for our review and comment the draft environmental impact statement for the Great Lakes Basin Framework Study, Michigan. This draft environmental impact statement describes in a very general manner the environmental impacts of the recommended development plan for the Basin's water and related land resources, and the differential effects of alternative plans calling for accelerated and limited levels of development. The level of detail in this statement is consistent with the development program outlined in the recommended plan, and the statement is in accordance with the intent of the National Environmental Policy Act of 1969.

The following specific comments are provided for use in the preparation of the final environmental impact statement:

1. The tone of the statement could be more objective. It appears the statement advocates a proposed plan more than it describes impacts relating to resource development.

2. The agricultural aspects of the plan are adequately covered.

3. The discussion of impacts of power production on pages 3-2 to 3-4 should be deleted since they are covered in section 3.1.5, Environmental Impacts. The discussion on impacts appears to overemphasize power in relation to water quality.

4. The entire description of population and population factors, found under Environmental Impacts, pages 3-15 thru 3-22 should be deleted. This section should describe the impacts of the proposed Framework Program and does not need general population discussion. The material which should be discussed in this section is included following page 3-22.

5. The statement "An environmental rating . . . is found in Annex I" on page 3-23 is misleading. The ratings found in the Annex are simply a plus or minus with no relative ranking. The "rating" could be discussed in some detail here to clarify the

## 1. Department of Agriculture

Mr. Frederick O. Rouse 2

condition. The same statement is included in the description of each Lake Basin and could be deleted if it is described on page 3-23.

6. The problem listing on pages 3-42 and 3-43 should be deleted and put in the format used for all the other Basins.

7. The agriculture and forest land and management programs should be included in the list of programs for the Lake Michigan Basin on page 3-44.

8. The forest land treatment and management program should be included in the list of programs for the Lake Erie Basins on page 3-63.

Thank you for the opportunity to review and comment on this environmental impact statement.

Sincerely,

PAUL A. VANDER MYDE
Deputy Assistant Secretary

## 2. Department of Agriculture, p. 2

DEPARTMENT OF THE ARMY
NORTH CENTRAL DIVISION, CORPS OF ENGINEERS
536 SOUTH CLARK STREET
CHICAGO, ILLINOIS 60605

NCDPD-SS

9 DEC 1974

Mr. Frederick O. Rouse
Chairman, Great Lakes Basin Commission
P. O. Box 999
Ann Arbor, Michigan 48106

Dear Fred:

Thanks for affording me the opportunity to review the Draft Environmental Impact Statement on the Great Lakes Basin Framework Study. As you know Carl Brown, of my staff, served on the Work Group that prepared the draft EIS. I find it to be an excellent document and have no comments to be added.

Sincerely yours,

WILLIAM C. BACHUS
Brigadier General, USA
Division Engineer

## 3. Army Corps of Engineers

DEPARTMENT OF THE ARMY
NORTH CENTRAL DIVISION, CORPS OF ENGINEERS
536 SOUTH CLARK STREET
CHICAGO, ILLINOIS 60605

NCDPD-SS

9 JUN 1976

Mr. Frederick O. Rouse
Chairman, Great Lakes Basin Commission
P. O. Box 999
Ann Arbor, Michigan 48106

Dear Fred:

Comments on the Draft Final Environmental Impact Statement to the Great Lakes Basin Framework Study are as follows:

1. Page 55, subpara. (6) - Neither the Main Report nor the Alternatives Framework Appendix refer to the Proposed Framework as including an item specifically related to the St. Lawrence Seaway as indicated in this subparagraph. It is suggested that this subparagraph be deleted.

2. Page 139, para. 1 - The eutrophic nature of Lake Erie should be mentioned (refer to page 167 of Appendix 7 - Water Quality).

3. Page 144, para. 4 - The statement on potential adverse effect on Canadian water quality in event of breakdown in wastewater management plant operation would also be true to the U.S. shoreline and for all lakes. This statement was not included for Lake Superior. It is suggested that the statement either be deleted or expanded.

4. Page 10-4, para. 2 - Your response that structural measures do not redefine a floodplain is not true. For any given flood occurrence up to that of the design flood, the floodplain is reduced for the protected area; the degree of floodplain reduction is variable in the case of impoundments dependent upon distance. It is suggested that the first three sentences be deleted.

Sincerely yours,

ROBERT L. MOORE
Brigadier General, USA
Division Engineer

## 4. Army Corps of Engineers

ASSISTANT SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301

HEALTH AND ENVIRONMENT

23 JAN 1975

Mr. Frederick O. Rouse
Chairman
Great Lakes Basin Commission
3475 Plymouth Road
Box 999
Ann Arbor, Michigan 48106

Dear Mr. Rouse:

The enclosed comments are provided in response to your request of December 6, 1974 for review of the draft environmental impact statement, "Great Lakes Basin Framework Study."

H. R. Smith
Acting Deputy Asst Secretary of Defense
(Environmental Quality)

Enclosure
a/s

## 5. Department of Defense

DRAFT ENVIRONMENTAL STATEMENT;
GREAT LAKES BASIN FRAMEWORK STUDY

The Draft Environmental Impact Statement for the Great Lakes Basin Framework Study was reviewed and the following comments are provided:

1. Pages 1-13 and 1-14. A description is given of the agricultural capabilities of the land in the Great Lakes Region. One important statistic is omitted. That is, of the land suitable for agriculture, how much of it is presently under cultivation? This is important for planning purposes. Especially, how much land is idle?

2. Page 1-12. Mean lake level elevationsdo not agree with those presented by International Great Lakes Levels Board in Regulation of Great Lakes Water Levels. This discrepancy should be checked.

3. Page 1-15, paragraph 1.2.3.7. Does "shole" refer to "shoal"?

4. Page 1-21. Nevertheless is misspelled.

5. Page 3-28. In paragraph 2 Waterfowl habitat is again noted as being important due to its scarcity. However, in paragraph 1, diked disposal areas are not indicated as frequently taking waterfowl habitat out of production.

6. Page 4-10. Same problem as 5 above.

7. Page 5-2, last line. "feneral" should be "General".

8. Page 5-4, line 5. "flod" should be "flood".

9. Page 3-6, last sentence (ending on page 3-7). It would seem that harbor improvements could encourage exploitation of fishery stocks, but it is not apparent how production could be encouraged.

10. On several pages (3-24, 3-38, 3-48, 3-59, 3-68, and 5-3). It is projected that 90 percent of the energy demands of the Great Lakes Basin in the year 2020 will be met by nuclear power plants, many on the Great Lakes shorelines. Does this projection take into account possible technological advances which could make a shoreline location relatively less advantageous, thereby allowing the utilities to avoid the environmentally sensitive shore zones? This should be addressed in the final EIS.

11. Page 3-27, paragraph 3, last two sentences. The sentences suggest that structural measures induce growth in the intermediate regional floodplain (the standard for floodplain management programs), while in fact structural measures redefine and constrict the regional floodplain. Floodplain management is designed to control non-conforming growth in the regional floodplain. Since some benefits claimable under structural flood control plans depend upon a greater freedom of use or more intensive use of the former floodplian lands, the paragraph should be made more clear as to which floodplain is meant.

## 6. Department of Defense, p. 2.

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Science and Technology
Washington, D.C. 20230

February 6, 1975

Mr. Frederick O. Rouse
Chairman
Great Lakes Basin Commission
3475 Plymouth Road
Post Office Box 999
Ann Arbor, Michigan 48106

Dear Mr. Rouse:

The draft environmental impact statement for Great Lakes Basin Framework Study, which accompanied your letter of December 6, 1974, has been received by the Department of Commerce for review and comment.

The statement has been reviewed and the following comments are offered for your consideration.

BRIEF DESCRIPTION OF ACTION AND ITS PURPOSE:

The Framework Study describes the water and related land resources of the Great Lakes Basin and proposes structural and non-structural programs for the use of these resources through the year 2020. The Study is the first stage in an attempt to define the rate at which the future development of the Basin's resources should proceed, the types of development which should be encouraged and discouraged, and the geographic areas which should be developed or preserved. Rather than being project-specific, the Study is designed to serve as a guide to programs and studies needed to consider specific resource problems and smaller geographic units. Certainly the completion of this Study is timely for purposes of Coastal Zone Management. The Study should provide guidance anddata to the Great Lakes States developing Coastal Zone Management Plans.

## 7. Department of Commerce

2.

GENERAL COMMENTS:

It is suggested that the following items of information be added to the draft environmental impact statement in order to permit an assessment of potential environmental impact by commenting agencies and the public;

1. Footnotes and bibliographic references. Sources of data used to identify, quantify or evaluate any and all of the environmental consequences should be made known to the reader.

2. Explanation of estimated cost summaries. A brief description of the methodology for deriving Framework program costs and an identification of the discount rate would be useful.

3. Charts and tables comparing the environmental impacts of the proposed and the alternative Framework Programs. In line with the objective of conveying information succinctly in a form easily understood, both by members of the public and by decisionmakers, it is suggested that charts and tables which compare the impacts of the proposed and alternative Framework be prepared for the final environmental impact statement. The tables provided in the draft environmental impact statement describing the impacts of the Proposed Framework Program and the various alternative Framework Programs do not maintain consistent resource categories and/or units for comparison. The suggested charts and tables should be designed to reduce the present need for undue cross referencing. Further, they should allow for a consistent and thorough comparison of the significant environmental impacts on the proposed and the alternative Framework Programs.

4. The development of a fourth alternative. Most of the future impacts of the resources uses in the proposed alternative are based on the assumption that the Water Pollution Control Act Amendments of 1972 will be fully

## 8. Department of Commerce, p. 2

implemented and complied with. Recent events have indicated that compliance with this program, and the air quality program may be delayed. An alternative should be developed to discuss the impacts of the Proposed Framework in the instance of the delayed implementation of these programs.

We most strongly concur with the Great Lakes Basin Commission that effective long-range planning is highly dependent on quantitative measurements of the parameters involved and that further data collection is required.

We recommend a permanent program to coordinate and centralize all water dynamics data for the Great Lakes system. This would include data obtained by NOAA and those conducting one-time surveys for specific projects and programs. Consideration should be given to increasing the number of measurement stations, the frequency of measurements and coordination of present data acquisition programs.

The plan, with the status and prestige of the Great Lakes Basin Commission behind it, would significantly impact future water resources development in the Great Lakes area. The impacts would extend to fish and wildlife resources. In our opinion the present draft environmental impact statement inadequately addresses the potential effects of the plan on aquatic resources, particularly the commercial fisheries. We recommend that the potential impact on the commercial fishery be discussed in the Final environmental impact statement (FEIS) in a depth appropriate to the scope of the study.

In particular, we feel that the Commission has not met its principal charge, as outlined in the third paragraph of Page 1-1 of the draft environmental impact statement, in that commercial fishing has not be included as an active factor in the long-range plan. In our opinion, optimum management of the fishery resources requires a balanced mix of sport and commercial fishing -- a concept that gets little or no

**9. Department of Commerce, p. 3**



recognition in the draft environmental impact statement in spite of its central importance.

The lack of balance in the treatment of recreational and commercial fisheries is further illustrated in the section on historical development of the Great Lakes Basin, as discussed on pages 1-5 through 1-8, where the contribution of the fishing industry is greatly understated. The following quotation from "Fish and Wildlife as related to Water Quality of the Lake Superior Basin" 1/ serves to illustrate this point: "The abundant supply of fish in the Great Lakes played an important part in the development of bordering land areas from the beginning of human settlements." Commercial fishing also played an important and active part in the development of the basin's other natural resources, including the copper, iron, and lumber industries in the Upper Great Lakes Region. In addition, the following quotation illustrates the sport-commercial fishery relationship: "The historical importance of the Great Lakes for commercial fishing has declined, while the value of recreational fishing has increased. This does not diminish the value of commercial fishing but demonstrates the ever-increasing importance of sport fishing, hunting and other related forms of recreation which have been drawn to the Great Lakes area." 1/

In our opinion, the value of the environmental impact statement as a decision-making document could be enhanced by including a detailed discussion of specific examples for each impact mentioned.

The statement should accentuate more the need to improve the quality of activities in the basin, which at the present time are either inefficient and energy-consuming or damaging to the environment. Specifically, improvements are needed of the

**10. Department of Commerce, p. 4**



present methods to dispose of dredge spoil generated by maintenance of harbors. Although the statement recognizes adverse environmental effects of diked disposal, it supports the continuation of disposal safely in diked areas of millions of cubic yards of sediment material classified as polluted. Several measures could be listed to improve the situation. Regional planning should evaluate harbors based on ration of dredge spoil versus shipping tonnage. Inefficient harbors should be gradually reduced in importance by reducing maintenance dredging. Sandusky Harbor, listed as to be deepened to 31 foot depth, is one of the harbors requiring excessive maintenance. In addition, research should be directed towards better utilization of nutrient-rich spoil than burial in diked areas.

Research and development is essential and very profitable in the ways to dispose of surplus heat generated by thermal powerplants. The Statement estimates that generation of heat will expand more than thirteen times within the next fifty years. At the present time, the most economical way to dispose of surplus heat is in the Great Lakes. Extensive research in Canada and scattered research in the United States failed to discover significant adverse effects and Canada uses Great Lakes water for that purpose without restrictions. Estimate was made that about 200 miles of shoreline would be required by 2020 for thermal powerplants. However, for small additional cost, it would be possible to place powerplants a short distance inland. The shoreline could then be diverted for public use.

The Framework assumes that for the immediate time period, damages to existing development in the flood plain can best be reduced by structural measures. It is believed that immediate steps could be taken to convert certain areas subject to flooding for utilization as public parks, or where appropriate, for wildlife and fishery. Public parks near metropolitan areas are extremely high in demand and occasional flooding would not seriously disrupt their use.

**11. Department of Commerce, p. 5**



SPECIFIC COMMENTS

The following comments are referenced by page number in the draft environmental impact statement:

1-4 The Environmental Setting for the Framework beginning on page 1-4 and ending on page 1-21 is extremely interesting. Clarification on the following points is suggested:

1-5 The shoreline measures presented on pages 1-5 and 1-14 are not the same. Further, they are not the figures used by the National Ocean Survey.

1-8 It would be helpful to know the date(s) of the origin and destination studies referred to on page 1-8, and to know the definition for the term "urban communities" used on this same page.

1-9 A chart showing some statistics on the water supply, water quality and income yield aspects might be added to clarify the meaning of paragraph four on page 1-9.

1-11 The mean annual precipitation figure (31 inches) provided on page 1-11 appears to be in conflict with the annual precipitation figure implied, i.e. 36 inches, by the phrase, "about one-third of the water, or about 12 inches (63.2 bgd) which falls annually as precipitation over the Basin,..." on page 1-12.

1-16 The numbers describing the area of the Great Lakes Basin provided on pages 1-5 and 1-6 are not the same.

**12. Department of Commerce, p. 6**

1-18 The list of "Prime Commercial and Sport Fishes of the Great Lakes" is incorrect. The lake sturgeon is no longer caught commercially; in fact, this fish along with the blue pike, deepwater cisco, and blackfin cisco, are all listed in the 1973 edition of "Threatened Wildlife of the United States."[2/] Both the deepwater cisco and blackfin cisco are considered extinct; none has been caught since the early 1950's, although these species figured predominantly in the early fishery as the target species of the chub fishermen. The kiyi, also a member of the chub group, never contributed significantly to the commercial fishery.

1-18, last paragraph.

The statement dealing with the introduction of the sea lamprey and alewife is incorrect. The sea lamprey and the alewife, now abundant in most of the lakes, were unknown in the Great Lakes prior to the opening of the Welland and Erie Canals (Smith, Stanford H., personal communication). The statement regarding the marketability of alewife is also incorrect. Although the alewife is a low value species, there is a ready market for this fish in both the pet food and fishmeal industries.

2-1 Section 2,

Relationship of Proposed Act to Land Use Plans, Policies and Controls for the Affected Area, should include some discussion on the Clean Air Act, as amended, and the Flood Disaster Protection Act of 1973. These discussions should reflect the possibility of delays in the actual implementation of these programs.

**13. Department of Commerce, p. 7**



3-3, paragraph 2.

With regard to impacts on aquatic organisms, the discussion of the potential problems associated with cooling water usage, particularly those problems related to the electric power generation industry, is presented in insufficient detail. For example, in addition to entrainment of plankton, this section should discuss the probable impacts of impingement of fish on power plant intake screens.

3-5 An explanation is needed of the assumptions leading to the proposed flood damage prevention program.

3-7 Information is needed demonstrating the need for the proposed commercial navigation program.

3-7 Instead of "a new lock and dam in the St. Clair River", a more proper term should be "a control structure", since there are ways to control water levels without a lock.

3-15ff

With regard to the aquatic environment, this entire section lacks sufficient detail to allow a comprehensive evaluation of the framework's impacts. The deficiencies are particularly noticeable in the sections dealing with the individual lake basins, particularly in the discussions on electric power generation and its potential adverse effects and on the various proposed navigational improvements and their associated dredging and spoil disposal impacts. For example, on page 3-49 it is stated that "In

**14. Department of Commerce, p. 8**



the long term, however, dredging will remove polluted bottom materials from the aquatic medium and can improve water quality." However, the problem of finding suitable disposal sites for polluted dredged materials is not addressed in this section. The adverse impacts of diked disposal of spoil on aquatic habitat should be considered vis-a-vis the fact -- recognized on pages 3-2 and 3-3--that the littoral zone of all the Great Lakes is the most biologically productive portion of the basin.

3-17 Information demonstrating the need for the thermal power use in 2020. If, as stated earlier in page 3-15, the resident population is expected to double, the need for a 15-fold increase is questionable.

3-24 Cooling towers, when located near marshy areas, will increase mortality of waterfowl. This should be listed as an adverse effect.

3-27 The descriptions of the impacts of shoreland management programs and flood prevention programs are not clear. They should incorporate the concise statements of impacts provided in Section 5 and Section 6 of the draft environmental impact statement.

3-28 The explanation of the effects on dredging should be clarified and expanded.

3-30 The discussion of the individual Lake Basins begins on page 3-30. As a general comment, it does not seem necessary to repeat the paragraph on water required for cooling condensors in the production of energy in each of the separate Basin discussions. Perhaps this one aspect of the individual

**15. Department of Commerce, p. 9**



Basin descriptions could be covered generally in the discussion of impacts for the entire Great Lakes Basin.

3-39 In the sentence "Dredging can be eliminated in high water period", a more exact wording should be either "delayed" or postponed". As known, periods of high runoff from land and high lake levels produce more harbor deposits that must be removed when lake levels go down.

3-39 It is suggested that the final environmental impact statement address the impact that large increases in thermal power use will have in specific Basins. For example, Table 8 on page 3-57 shows that the thermal power requirements for Lake Huron land and water resources in 2020 will increase 57.5 and 64 times respectively over the base year figure. The draft environmental impact statement fails to take into account the impact that this increase will have on what is currently a major use of the Lake and shoreline, namely, recreation. The final environmental impact statement should address many questions of this nature.

4-1 Specific comments on the remaining sections are not provided as the 5-1 above General and Specific comments cover suggestions for reorganizing 6-1 the presentation of the alternatives and incorporating Section 5 and 7-1 Section 6 into the discussion of impacts provided in Section 3.

**16. Department of Commerce, p. 10**

A1-5 Unfortunately, table 18 is very difficult to read.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving a copy of the final statement.

Sincerely,

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

LITERATURE CITED

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1. U.S. Department of the Interior, Bureau of Sport Fisheries and Wildlife. 1973. Threatened wildlife of the United States. Resource Publication 114 (revised Resource Publication 34). 289p.

## 17. Department of Commerce, p. 11

ENCLOSURE

COMMENTS ON DRAFT FINAL ENVIRONMENTAL IMPACT STATEMENT
GREAT LAKES BASIN FRAMEWORK STUDY

1. Section 10 lists comments from reviewers of earlier drafts. Comments from ERDA (formerly AEC) do not seem to be included; ERDA comments were provided on the December 1, 1974, version of the EIS by a March 7, 1975, letter from Dr. Liverman to Mr. Rouse. The covering transmittal letter indicate the November 1975 version is the same as the December 1974 version except for some minor reordering of contents; therefore it appears the earlier ERDA comments still apply, and another copy of these comments are provided for your consideration. Enclosure
2. Page ii, Reference to AEC should now be to ERDA.
3. Page i(4), Reference to 70000 acres for power plants in 2020 does not check with page 69 (362000 acres) or page 81 (76300 acres). Page 69 may include transmission line right of way but this cannot be verified from the values on page 81, second paragraph.
4. Page i, In general, it does not appear adequate to describe "environmental impacts" only in terms of resources effected (even as some multiple of 1970 values). The question would be will these uses significantly degrade environmental quality or harm human health, animal populations, ecosystem stability, etc. Note, for example, references to potentially significant impacts on page 48 (meteorological impactsdue to waste heat), page 75 (effects of land use changes), page 79 (affects of consumptive loss on stream regimes), page 81 (leachate contamination from land fill), etc. All of these produce environmental impacts related to future growth which need to be further quantified (approximately), summarized, and explicitly assessed in terms of environmental quality.
5. In relation to (4) above, page 167 says that even in the accelerated (ACC) future, water and land resources will be available in quality and quantity to meet needs. Does this imply no significant or unmanageable (at acceptable cost) environmental impact problems? A conclusion of either type should probably be given prominence in the summary section, since it describes the acceptability of even limit assumptions of growth.
6. On page 35, it would be helpful to show the PRO trend in Fig. 2. Note that PRO is described as being slightly lower than NOR but page 43 says PRO population growth is slightly higher than projections based on recent data. Are these consistent.
7. Page 44, states that PRO surface and subsurface management provides for all needs through 2020 except for irrigation and mining. Clarification of these important exceptions appears needed. Note also references on page 67 to declining employment in these sectors and page 69 indications of increased agricultural acreage; is there any connection?

## 19. ERDA, p. 2

UNITED STATES
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
WASHINGTON, D.C. 20545

June 11, 1976

Mr. Frederick D. Rouse, Chairman
Great Lakes Basin Commission
P. O. Box 999
Ann Arbor, Michigan 48106

Dear Fred:

This is in response to your memorandum of May 18, 1976 to Commissioners and Alternates requesting comments on the draft Final Environmental Impact Statement (date November 1975) for the Great Lakes Basin Framework Study. Our comments are enclosed for your consideration. Thank you for the opportunity to review this document.

Sincerely,

Walter G. Belter
ERDA Representative
Great Lakes Basin Commission

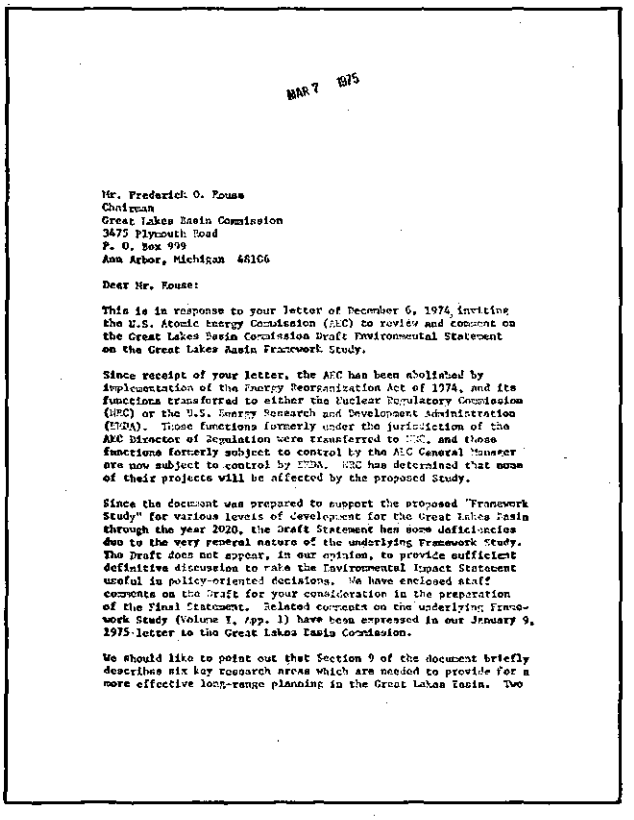
Enclosure:
As stated

## 18. Energy Research and Development Administration



8. Page 45, line 14 and 21, are there some editorial omissions in wording?
9. In Table 2, it would appear that other categories of potentially significant environmental impact might be included, such as growth of urbanized land, transportation requirements, land-oriented waste disposal (see page 74).
10. On page 80, it would appear desirable to indicate the capability of design to reduce any thermal or impingement effects to acceptable levels and to clarify whether any localized impacts are indeed significant or transient and recuperable.
11. On page 164, it is not clear how "environmental impacts" (line 18) can be adequately assessed in terms of the fine planning variables indicated (see comment 4 above).
12. In general, the separate discussions of PRO impacts on the several subbasins, seems to indicate that different regions will experience impacts differently (depending on rate, type of development, etc.). This same approach may be desirable for discussions of the "alternative" frameworks, particularly ACC (see Section 4.1).
13. Page 219, It appears unnecessarily pejorative to use the term "exploitation" in connection with ACC. Certainly an increased thrust toward greater growth does not preclude "wise planning" (of the first paragraph on page 167 which indicates that ACC can be accommodated in terms of quality and quantity of resources).

## 20. ERDA, p. 3



MAR 7 1975

Mr. Frederick O. Rouse
Chairman
Great Lakes Basin Commission
3475 Plymouth Road
P. O. Box 999
Ann Arbor, Michigan 48106

Dear Mr. Rouse:

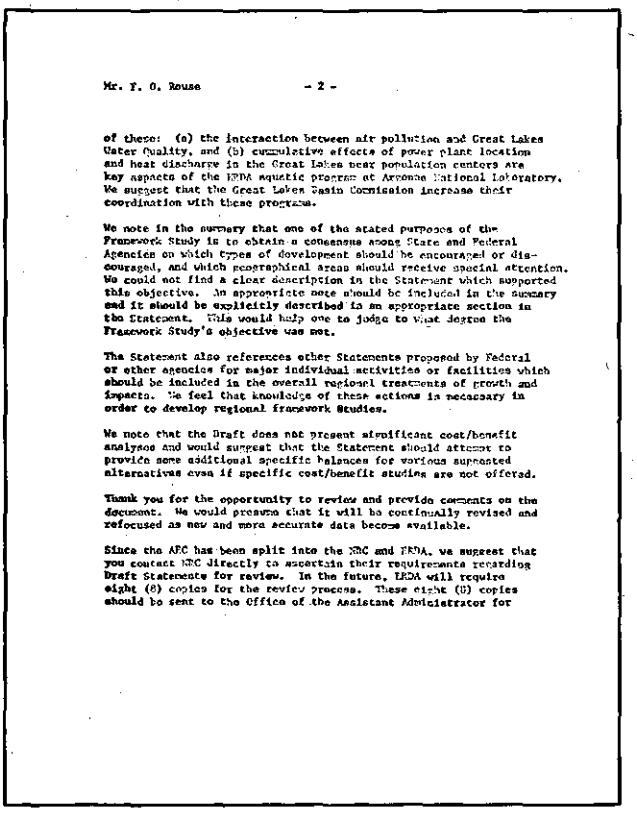
This is in response to your letter of December 6, 1974, inviting the U.S. Atomic Energy Commission (AEC) to review and comment on the Great Lakes Basin Commission Draft Environmental Statement on the Great Lakes Basin Framework Study.

Since receipt of your letter, the AEC has been abolished by implementation of the Energy Reorganization Act of 1974, and its functions transferred to either the Nuclear Regulatory Commission (NRC) or the U.S. Energy Research and Development Administration (ERDA). Those functions formerly under the jurisdiction of the AEC Director of Regulation were transferred to NRC, and those functions formerly subject to control by the AEC General Manager are now subject to control by ERDA. NRC has determined that none of their projects will be affected by the proposed Study.

Since the document was prepared to support the proposed "Framework Study" for various levels of development for the Great Lakes Basin through the year 2020, the Draft Statement has some deficiencies due to the very general nature of the underlying Framework Study. The Draft does not appear, in our opinion, to provide sufficient definitive discussion to make the Environmental Impact Statement useful in policy-oriented decisions. We have enclosed staff comments on the Draft for your consideration in the preparation of the Final Statement. Related comments on the underlying Framework Study (Volume I, App. 1) have been expressed in our January 9, 1975 letter to the Great Lakes Basin Commission.

We should like to point out that Section 9 of the document briefly describes six key research areas which are needed to provide for a more effective long-range planning in the Great Lakes Basin. Two

21. **ERDA, p. 4**



Mr. F. O. Rouse - 2 -

of these: (a) the interaction between air pollution and Great Lakes Water Quality, and (b) cumulative effects of power plant location and heat discharge in the Great Lakes near population centers are key aspects of the ERDA aquatic program at Argonne National Laboratory. We suggest that the Great Lakes Basin Commission increase their coordination with these programs.

We note in the summary that one of the stated purposes of the Framework Study is to obtain a consensus among State and Federal Agencies on which types of development should be encouraged or discouraged, and which geographical areas should receive special attention. We could not find a clear description in the Statement which supported this objective. An appropriate note should be included in the Summary and it should be explicitly described in an appropriate section in the Statement. This would help one to judge to what degree the Framework Study's objective was met.

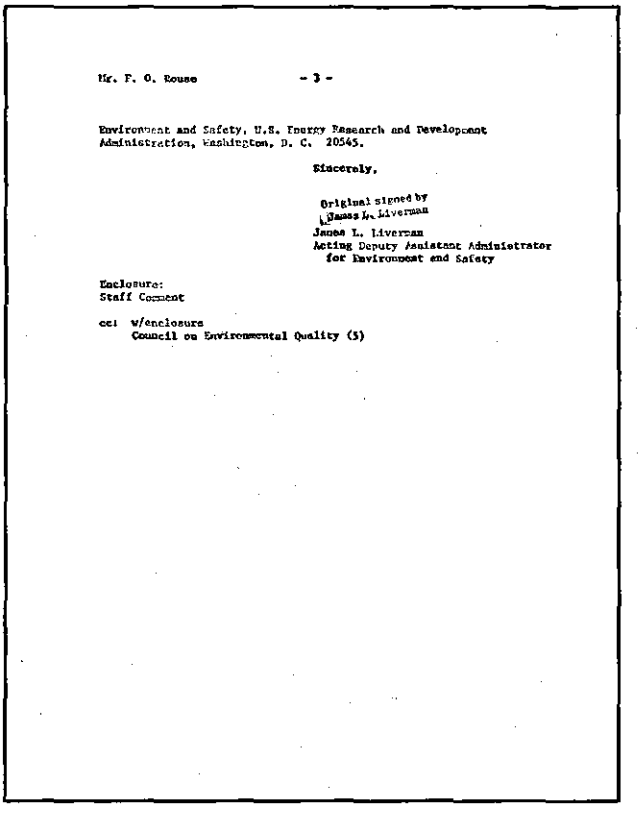
The Statement also references other Statements proposed by Federal or other agencies for major individual activities or facilities which should be included in the overall regional treatments of growth and impacts. We feel that knowledge of these actions is necessary in order to develop regional framework studies.

We note that the Draft does not present significant cost/benefit analyses and would suggest that the Statement should attempt to provide some additional specific balances for various suggested alternatives even if specific cost/benefit studies are not offered.

Thank you for the opportunity to review and provide comments on the document. We would presume that it will be continually revised and refocused as new and more accurate data become available.

Since the AEC has been split into the NRC and ERDA, we suggest that you contact NRC directly to ascertain their requirements regarding Draft Statements for review. In the future, ERDA will require eight (8) copies for the review process. These eight (8) copies should be sent to the Office of the Assistant Administrator for

22. **ERDA, p. 5**



Mr. F. O. Rouse - 3 -

Environment and Safety, U.S. Energy Research and Development Administration, Washington, D. C. 20545.

Sincerely,

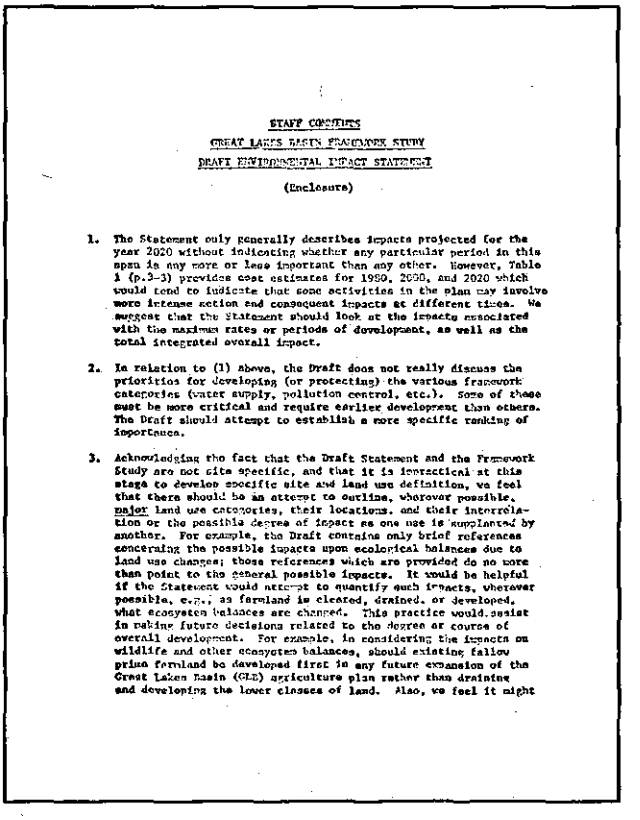
Original signed by
James L. Liverman

James L. Liverman
Acting Deputy Assistant Administrator
for Environment and Safety

Enclosure:
Staff Comment

cc: w/enclosure
Council on Environmental Quality (5)

23. **ERDA, p. 6**



STAFF COMMENTS
GREAT LAKES BASIN FRAMEWORK STUDY
DRAFT ENVIRONMENTAL IMPACT STATEMENT

(Enclosure)

1. The Statement only generally describes impacts projected for the year 2020 without indicating whether any particular period in this span is any more or less important than any other. However, Table 1 (p.3-3) provides cost estimates for 1980, 2000, and 2020 which would tend to indicate that some activities in the plan may involve more intense action and consequent impacts at different times. We suggest that the Statement should look at the impacts associated with the maximum rates or periods of development, as well as the total integrated overall impact.

2. In relation to (1) above, the Draft does not really discuss the priorities for developing (or protecting) the various framework categories (water supply, pollution control, etc.). Some of these must be more critical and require earlier development than others. The Draft should attempt to establish a more specific ranking of importance.

3. Acknowledging the fact that the Draft Statement and the Framework Study are not site specific, and that it is impractical at this stage to develop specific site and land use definition, we feel that there should be an attempt to outline, wherever possible, major land use categories, their locations, and their interrelation or the possible degree of impact as one use is supplanted by another. For example, the Draft contains only brief references concerning the possible impacts upon ecological balances due to land use changes; those references which are provided do no more than point to the general possible impacts. It would be helpful if the Statement would attempt to quantify such impacts, wherever possible, e.g., as farmland is cleared, drained, or developed, what ecosystem balances are changed. This practice would assist in making future decisions related to the degree or course of overall development. For example, in considering the impacts on wildlife and other ecosystem balances, should existing fallow prime farmland be developed first in any future expansion of the Great Lakes Basin (GLB) agriculture plan rather than draining and developing the lower classes of land. Also, we feel it might

24. **ERDA, p. 7**

Enclosure - 2 -

be desirable to attempt identification of major blocks of lands which could be developed and to discuss how they relate to desirable objectives such as the preservation of such balances.

4. The Draft does not provide a significant discussion of the total projected environmental impacts on fish, wildlife, plant life, etc., but only indicates that there will be an acceptable level of environmental quality and control achieved as appropriate for various alternatives (e.g., "minimum acceptable quality" for the case of accelerated growth, see p. 4-16, and "high level quality" for limited growth, see p. 4-13). The meaning of such terms is not clear. In addition, it does not necessarily associate a particular quality level with a particular development level since a high quality environment can probably be achieved even in the accelerated case, if society chooses to expend the requisite amount of resources. If there are clear reasons for any such association, then these should be detailed in the document. Furthermore, the report appears to imply that acceleration necessarily leads to exploitation (p. 8.2, Section 8.3, line 10). This appears to be an unnecessary implication which could lend a biased low-growth tone to the environmental assessments and lead to less than optimum utilization of regional resources.

We feel that the Statement could be strengthened by discussing more fully the potential environmental effects upon the environment, health and society and how these may influence policy choices instead of narrowing the discussions just to those associated with the amounts of resources involved. In addition, the various tables presented generally indicate impacts in various categories for the limited, normal, accelerated, and proposed alternatives and list only the amounts of resources involved. These tables should provide some indication of the significance of the amounts of resources committed versus available totals or carrying capacities, etc.

5. The Draft does not clearly discuss GLB development in relation to surrounding areas, the parallel development of which may inherently place demands upon the GLB resources or contribute assistance to GLB development which diminishes such demands. Similarly the Draft does not significantly discuss international relationships which could affect the development of GLB, although p. 1-5 does indicate the GLB boundary with Canada and p. 3-12 indicates that the proposed framework plan will provide full support of the U.S./Canada Water Quality Agreement. However, it is not clear to what extent this agreement or others might foreshadow restrictions upon major increases in future use of Great Lakes Water, etc. The Draft should discuss more specifically such potential constraints.

**25. ERDA, p. 8**

Enclosure - 3 -

6. The Draft refers to meeting national (as well as regional) goals, (p. 1-2) and "defined national economic efficiency, environmental quality, regional development and social well being objectives, (p. 4-1). However, these goals do not appear to be clearly defined in the Draft and should be specifically listed if available. For example, there are various references throughout the Draft to the national goals of zero pollutant discharge by 1985 (as well as those of PL 92-500) and to the report of the Presidential Commission concerning arguments against continued national population growth, and the apparent intention to reflect these in GLB goals. We feel that the Draft should be more specific concerning the full list of any national goals and how they are specifically going to be taken into account in the Study.

7. In relation to (6) above, the Draft and its underlying framework study do not appear to discuss sufficiently initiatives which might be outside the "proposed" framework. The Draft discusses increased agriculture as a reflection of GLB's continuing share in a totally growing nation rather than as a deliberate increase in this share (p. 4-12). The Statement could discuss alternative opportunities which may be available by increased use of GLB land and water in assisting reaching potential national goals such as developing major coal resources in water-limited areas of the West or for major agriculture increases not limited just to GLB's future, but extended to the nation or world. We feel that a fuller examination of available alternatives would be desirable in this respect.

8. Commercial fishing in the Great Lakes Basin is a substantial effort at the time, and this does not seem to be discussed in the Statement.

9. The Draft does not discuss meteorological baselines of GLB or how air quality may act as a constraint on development alternatives.

10. On p. 1-3(3), related land uses do not discuss requirements for expanding cities or location of new cities to meet expanding population needs, etc.

11. On p. 3-3, second paragraph, next to the last line, this might better read "Thermal shock also may represent an intermittent loss of fish population whenever thermal outfalls are rapidly shut off. The significance of all these effects cumulated over time requires further definition in order to assess the total environmental costs of power plant." In the next paragraph, the first line

**26. ERDA, p. 9**

Enclosure - 4 -

might better read, "discharges via once-through-cooling or closed-cycle cooling systems, such as cooling towers or cooling ponds, on various hydrologic . . . .."

12. P. 3-4 - It should be remembered, in discussing the beneficial uses of waste heat from power plants that it is very difficult to find uses for significant portions of the waste heat and that it may require major regional initiatives to properly utilize major amounts of this energy. Any such major initiatives should be explored more fully.

13. In Table 2 (and related tables for individual lake basins), the 0.17 acres per megawatt of installed capacity does not appear to allow for transmission line right-of-way, cooling lakes, or for disposal areas for products of stack gas cleaning. For example, the indicated value appears to cover only the immediate exclusion areas of nuclear power plants noting that p. 3-25 states that the GLB electric capacity by 2020 will be 90 percent. The Statement on p. 3-25 which refers to exclusion areas as being a considerable portion of the land requirement for nuclear power plants and that such areas can be used for other activities appears in error. The exclusion area is a small portion of the total power plant related land use; however, there are possibilities for selected uses of power plant lands, but such uses would have to be fully evaluated by the Nuclear Regulatory Commission.

14. P. 3-25 states that except for petroleum and natural gas, the GLB mineral resources are adequate for GLB needs. These are major exclusions (implying clear economic interrelationships with other areas besides GLB) and must act as some constraint on GLB futures. More discussion would be desirable.

15. It is not clear that the potential for energy conservation measures in reducing the growth for power has been adequately treated (Table 2, p. 3-17 and other similar tables for the individual lakes). Conservation would also tend to reduce resource requirements and further reduce the impact of future GLB growth. An attempt might be made to discuss whether major energy conservation would have any effect on the alternatives for the Framework Study for future GLB development.

16. We suggest that the development principles listed (p. 7-2, last paragraph) as well as other principles used in the Framework Study and the Draft should be given more prominence and placed in the beginning of the Draft.

**27. ERDA, p. 10**

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN STREET
CHICAGO, ILLINOIS 60604

Mr. Frederick O. Rouse
Chairman
Great Lakes Basin Commission
3475 Plymouth Road
P. O. Box 999
Ann Arbor, Michigan 48106

FEB 20 1975

Dear Mr. Rouse:

As requested in your letter dated December 6, 1974, we have completed our review of the Draft Environmental Impact Statement (EIS) for the Great Lakes Basin Framework Study. We have classified our comments as Category LO-2. Specifically, this means we have no major objections to the study as described in the Draft EIS but believe some aspects of the report require additional attention or clarity. In accordance with our responsibility under Section 309 of the Clean Air Act, the classification and date of our comments will be published in the Federal Register. The following comments are offered for your use in preparing the Final EIS.

While we realize the proposed framework programs are general in nature and do not represent approved projects, the Framework Study itself will be used as a reference in establishing priorities for specific resource development plans. For this reason, we believe certain generalizations within the report should be changed or eliminated to reduce the possibility of misinterpretation. Specifically, this applies to the following statements: that withdrawals (for power plant cooling systems) "are not judged to have a significant effect upon the quantity or quality of the lakes" (page 3-24); that "removal of dredged material is not significantly harmful in the long run to water quality in harbors where navigation takes place" (page 3-28); that "creation of additional water surface area through impoundments would generally improve the fishery" (p 6-1); and that "for the immediate time period, damages to existing development in the flood plain can best be reduced by structural measures" (page 3-5). Although the Framework Study has indicated such statements are indeed generalizations, we believe their presence in the document may serve to encourage more specific water resource programs that do not adequately consider environmental objectives. Therefore, we

**28. Environmental Protection Agency**

suggest that such generalizations be eliminated or that the adverse environmental effects associated with such programs be accentuated in the report.

The discussion on the Lake Superior Basin should list shore erosion (red clay) as a major problem in the basin. The level of shore protection proposed by the Framework for the year 2020 represents only a quarter of the total shoreline in need of protection; this is inadequate and additional protection should be encouraged. Reference should be made to IJC Plan 50-90; regarding regulation of lake levels in the EIS. This plan will have a significant effect upon the Great Lakes ecosystem which should be addressed in the Draft EIS.

There appears to be some confusion in the use of the term "blowdown" in paragraph two on page 3-3 of the EIS. Blowdown refers only to that portion of recycled cooling waters which is discharged to reduce solids build-up in the cooling system. It should be noted in the same paragraph that entrainment of planktonic organisms in cooling systems may through thermal shock or mechanical means induce lethal or subtethal effects on organisms; however, whether or not this represents a significant reduction of fish food depends on the proportion of cooling waters to the total volume of the receiving body. In addition, it should be explained in this section that thermal shock also occurs as a result of stopping or reducing thermal discharges during cold weather periods; the suddenness of temperature change may be lethal to fish which were attracted to the warmer water.

Section 2 of the EIS regarding compliance with currently applicable legislation should include PL 93-523, the Safety of Public Water Systems.

Since the Framework Study will be used in water resource program decision-making, we believe the structural and non-structural programs listed in the report should be presented in a context which equally points out both beneficial and adverse environmental effects. Our remaining comments concern several areas within the Study which we believe could be improved in regard. For example, the discussion on channelization (page 3-8) tends to place undue emphasis on beneficial effects. Subsequent environmental impact statements on individual projects frequently make reference to the Framework Study in justifying the project; since EPA policy is generally opposed to channelization as a flood control measure, we do not believe it should be encouraged in the Study. In like manner,

**29. EPA, p. 2**



the discussion on flood damage prevention programs tends to encourage use of structural measures (page 3-5). The discussion should be expanded to include effects generic to existing flood control programs such as the increase in flood damages that have resulted inspite of structural measures. Also, we believe it is appropriate for the Framework Study to encourage evaluation of individual harbor dredging projects with regard to the amount of use they receive and the environmental and economic costs of maintaining navigation depths and with respect to alternate modes of materials transport. Adverse effects associated with transmission lines should mention potential problems (e.g. ozone effects, electrical discharge into the atmosphere) that could be encountered in the proposed use of ultra high voltage-transmission lines (i.e. greater than 700,000 volts).

In line with the purpose of the Framework report, we believe it would be useful to present contrasting opinions regarding existing Federal water resource policies. Reference to independent studies such as the National Water Commission Report which criticize existing resource programs would help create an objective document useful in resource policy decision-making.

While the EIS indicates that the location of self-supplied industries and water supply facilities should be selected to minimize environmental effects upon the shoreland, we believe passage of Land Use Planning Legislation should also be encouraged as a means of resolving such development issues.

We believe the alternative section of the EIS should be expanded to encompass recent energy and resource development programs that are being projected for the nation. The priorities of the region will be highly dependent upon the changing values of the nation; therefore, the environmental effects of these alternatives for the Great Lakes area should be addressed.

**30. EPA, p. 3**



We suggest that any future EIS's specifically address the expected public information program for the study and the agencies' and public's opportunity to comment on the study and Draft EIS during the series of public meetings. As agreed by the Commission, the Final EIS should not be prepared until this public participation program is completed.

We appreciate the opportunity to review this Draft EIS. It is our understanding that a second Draft EIS will be prepared and we look forward to reviewing that document when it is filed with the Council on Environmental Quality. Please send our office six copies each of both the second Draft and the Final EIS.

Sincerely yours,

Francis T. Mayo

Francis T. Mayo
Regional Administrator

**31. EPA, p. 4**

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604

Mr. Frederick O. Rouse, Chairman
Great Lakes Basin Commission
1475 Plymouth Road
P. O. Box 999
Ann Arbor, Michigan 48106

JUN 7 1976

Dear Mr. Rouse:

We have reviewed the Draft Final Environmental Impact Statement for the Great Lakes Basin Framework Study in accordance with your memorandum of May 18, 1976. We are pleased to note that most of our previous comments have been addressed in the revised version.

We take exception, however, to the remark on page 10-16 that "the Commission has agreed that there will be no further public meetings regarding the Framework Study." Six public meetings on the Framework Study recommendations were held in January and February of this year, satisfying our recommendation and invalidating the response as written. The displays at these meetings consisted of samples of or references to material published by the Commission, presumably including the Draft EIS. The Staff summaries indicate that the EIS was discussed during at least three of the meetings.

Thank you for the opportunity to comment on this draft.

Sincerely yours,

George R. Alexander, Jr.
Regional Administrator

**32. Environmental Protection Agency**

FEDERAL POWER COMMISSION
REGIONAL OFFICE
31st Floor, Federal Building
230 South Dearborn Street
Chicago, Illinois 60604

January 15, 1975

Mr. Frederick O. Rouse
Chairman
Great Lakes Basin Commission
P. O. Box 999
3475 Plymouth Road
Ann Arbor, Michigan 48106

Dear Mr. Rouse:

We have reviewed the Draft Environmental Impact Statement on the GLBPS and have several comments as follow:

1. Page 1, Summary. The 70,000 acres of land required in 2020 for power plants and the increased need for cooling water are on the list of the more significant environmental impacts envisioned for the year 2020. We believe that the environmental impact of the land required for power plants is relatively minor compared with that required by other developments such as, 12,000,000 acres required for urbanized areas. Pertaining to the amount of cooling water required, the statement on page 3-24 says, "the withdrawals themselves (for cooling condensers) are not judged to have a significant affect upon the quantity or quality of the Lakes," inasmuch as the environmental impacts for power plants,as stated,are of lesser concern than for the other items listed, we suggest that it be placed at the end of the list rather than heading it.

2. Pages 1-3 and 1-4 were omitted from our copy of the draft.

3. In Section 3, The Proposed (PRO) Framework Alternative and Probable Impacts, essentially all the material under Part 3.1.1, Water Withdrawal Programs, pertains to water withdrawals for power plants. The discussion pertaining to power plants should be limited to one or two paragraphs, and that relating to other withdrawals such as, municipal waste treatment and self-supplied industrial use should be expanded, since their environmental impacts are at least equal to power plants, if not greater.

**33. Federal Power Commission**

- 2 -

4. Heated waste discharge should be changed to heated water discharge on pages 3-24, 3-38, 3-46, 3-46, 3-59, 3-68, and 3-79.

Other word changes are: Page 3-2, 2nd paragraph, baundance to abundance; page 3-24, 2nd paragraph , heater to heated and Othery to Other; and page 3-2, last paragraph, shore to shore.

5. Pages 3-25, 3rd paragraph; 3-49, 2nd paragraph; and 3-79, 3rd paragraph. Natural, historic, scenic and recreational values will be adversely affected by the upground location of transmission facilities - add: in such areas, since transmission lines through farm land, for instance, would have no such adverse affect.

6. Page 3-43. Hydroelectric power is listed as a potential future problem in the Muskegon River Basin, but no future hydro plants in that basin have been included in the study.

7. Table 18, page A1-5. The Hydroelectric Power needs should be 105,209 (or 105,200 rounded) rather than 118,000.

Very truly yours,

Leonard B. Young
Regional Engineer

**34. FPC, p. 2**

FEDERAL POWER COMMISSION
REGIONAL OFFICE
31st Floor, Federal Building
230 South Dearborn Street
Chicago, Illinois 60604

June 1, 1976

Mr. Frederick O. Rouse
Chairman
Great Lakes Basin Commission
P. O. Box 999
3475 Plymouth Road
Ann Arbor, Michigan 48106

Dear Mr. Rouse:

We have reviewed the Draft Final Environmental Impact Statement and have the following comments:

1. The comments attributed to the Federal Power Commission beginning on page 10-17 are those of the Chicago Regional Office of FPC (submitted in our letter dated January 15, 1975) and not those of our Washington Office. Since it is stated on page ii that comments were requested from the Federal Power Commission (Washington, D. C.), the comments on page 10-17 should be noted as that of the Federal Power Commission, Chicago Regional Office.

2. The data shown for Thermal Power Cooling Consumption and number of acres are incorrect in Tables 2, 4, 6, 8, 10, and 12. Apparently, diversion data were used instead of consumption. The data in the previous draft for these items were correct and should be used in the Final EIS.

3. We suggest changing "waste" heat to "heated water discharges" on pages 45, 48, 101, 118, 134, and 146.

4. In Table 1, the 1970 to 2000 PRO Framework Cost is given as 2389.9 million dollars in the report rather than the 2216.8 shown for Thermal Power Cooling.

5. The 76,300 acres required for thermal plants in 2020 include the noncondensing plants (I. C. and combustion turbines) which land requirements are insignificant. The land requirements for steam-electric thermal plants are 69,000 acres in 2020, of which the additional land required from 1970 is 65,000 acres.

**35. Federal Power Commission**

- 2 -

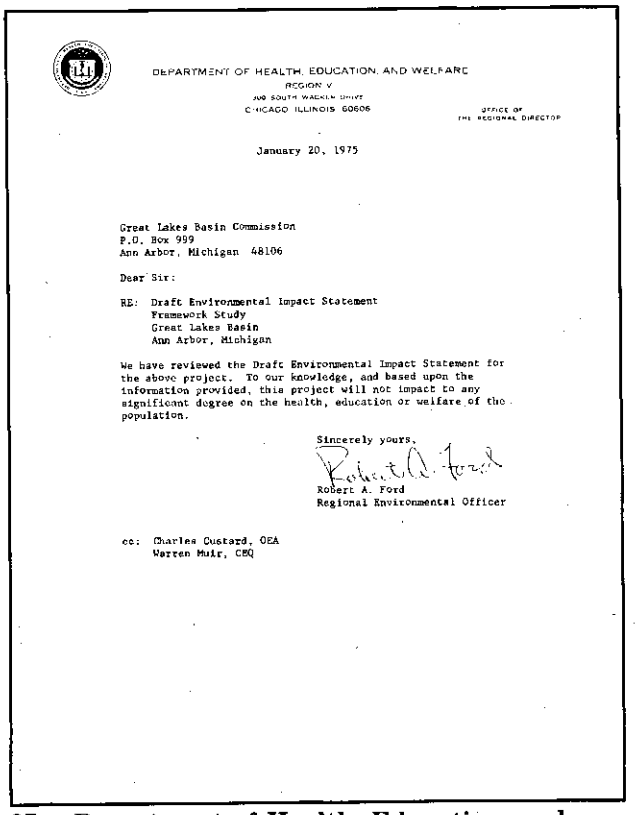
6. On page 119, third sentence, add "surface area" after "square miles."

7. In Table 23, change the Hydroelectric Power needs from 70,500 to 57,900.

Very truly yours,

Leonard B. Young
Regional Engineer

**36. FPC, p. 2**



DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGION V
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
OFFICE OF THE REGIONAL DIRECTOR

January 20, 1975

Great Lakes Basin Commission
P.O. Box 999
Ann Arbor, Michigan 48106

Dear Sir:

RE: Draft Environmental Impact Statement
Framework Study
Great Lakes Basin
Ann Arbor, Michigan

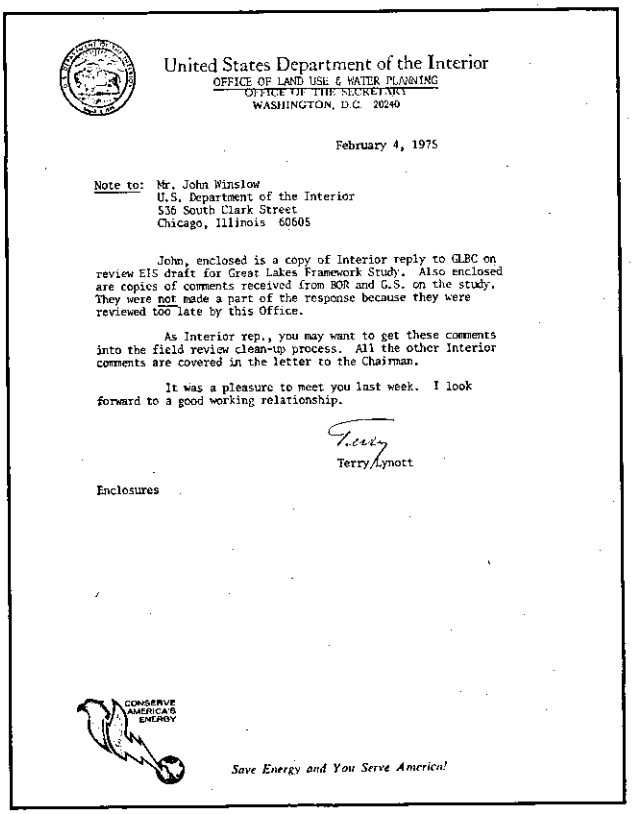
We have reviewed the Draft Environmental Impact Statement for the above project. To our knowledge, and based upon the information provided, this project will not impact to any significant degree on the health, education or welfare of the population.

Sincerely yours,

Robert A. Ford
Regional Environmental Officer

cc: Charles Custard, OEA
Warren Muir, CEQ

**37. Department of Health, Education, and Welfare**



United States Department of the Interior
OFFICE OF LAND USE & WATER PLANNING
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

February 4, 1975

Note to: Mr. John Winslow
U.S. Department of the Interior
536 South Clark Street
Chicago, Illinois 60605

John, enclosed is a copy of Interior reply to GLBC on review EIS draft for Great Lakes Framework Study. Also enclosed are copies of comments received from BOR and G.S. on the study. They were not made a part of the response because they were reviewed too late by this Office.

As Interior rep., you may want to get these comments into the field review clean-up process. All the other Interior comments are covered in the letter to the Chairman.

It was a pleasure to meet you last week. I look forward to a good working relationship.

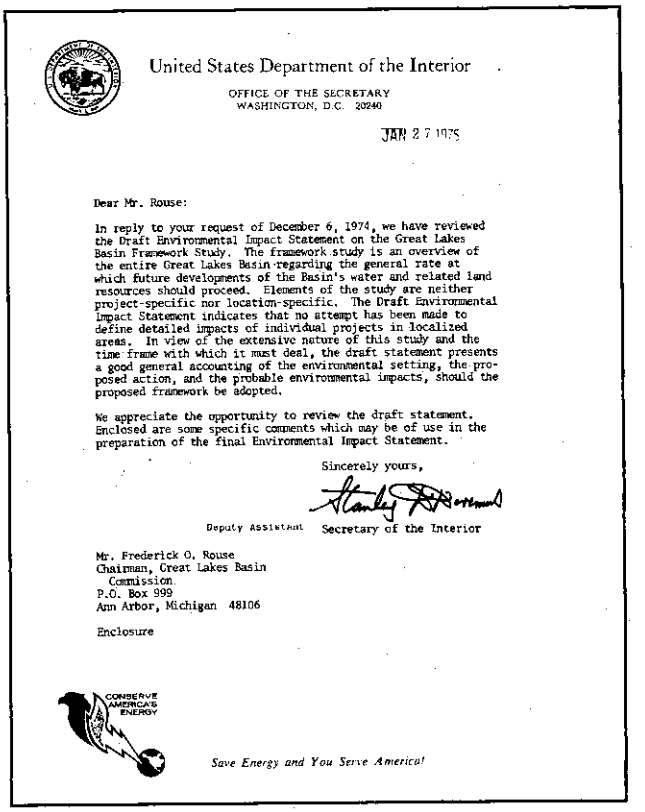
Terry Lynott

Enclosures

CONSERVE AMERICA'S ENERGY

*Save Energy and You Serve America!*

**38. Department of the Interior**



United States Department of the Interior
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

JAN 27 1975

Dear Mr. Rouse:

In reply to your request of December 6, 1974, we have reviewed the Draft Environmental Impact Statement on the Great Lakes Basin Framework Study. The framework study is an overview of the entire Great Lakes Basin regarding the general rate at which future developments of the Basin's water and related land resources should proceed. Elements of the study are neither project-specific nor location-specific. The Draft Environmental Impact Statement indicates that no attempt has been made to define detailed impacts of individual projects in localized areas. In view of the extensive nature of this study and the time frame with which it must deal, the draft statement presents a good general accounting of the environmental setting, the proposed action, and the probable environmental impacts, should the proposed framework be adopted.

We appreciate the opportunity to review the draft statement. Enclosed are some specific comments which may be of use in the preparation of the final Environmental Impact Statement.

Sincerely yours,

Deputy Assistant Secretary of the Interior

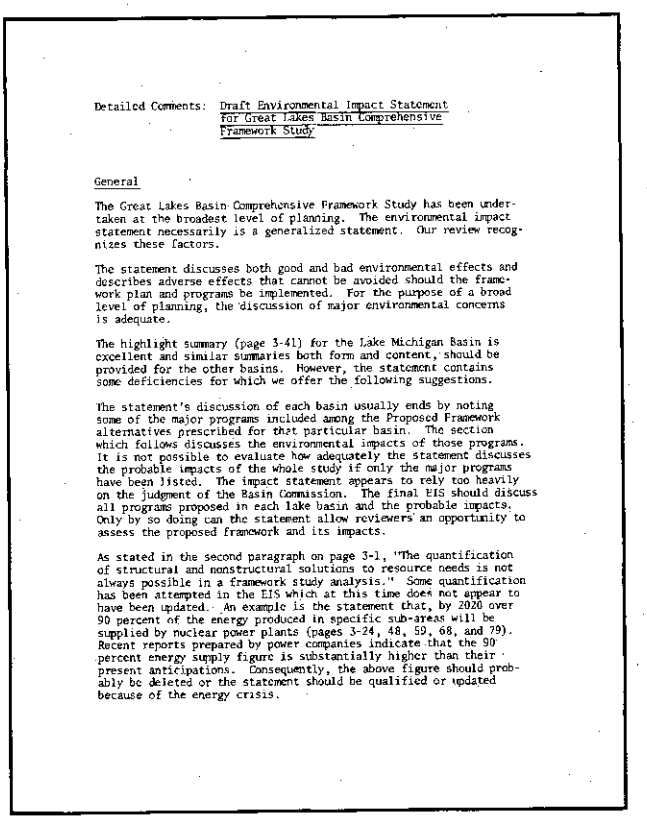
Mr. Frederick O. Rouse
Chairman, Great Lakes Basin
Commission
P.O. Box 999
Ann Arbor, Michigan 48106

Enclosure

CONSERVE AMERICA'S ENERGY

*Save Energy and You Serve America!*

**39. Department of the Interior**



Detailed Comments: Draft Environmental Impact Statement for Great Lakes Basin Comprehensive Framework Study

General

The Great Lakes Basin Comprehensive Framework Study has been undertaken at the broadest level of planning. The environmental impact statement necessarily is a generalized statement. Our review recognizes these factors.

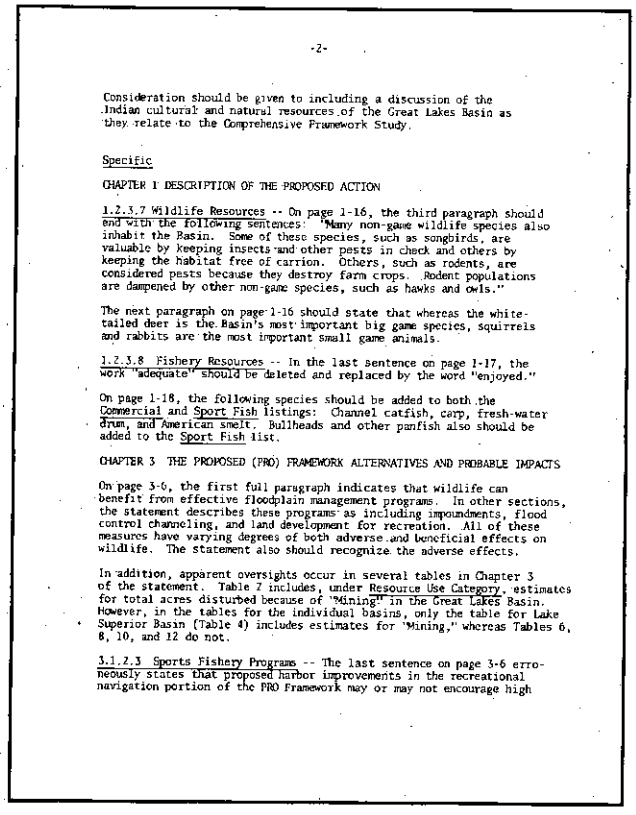
The statement discusses both good and bad environmental effects and describes adverse effects that cannot be avoided should the framework plan and programs be implemented. For the purpose of a broad level of planning, the discussion of major environmental concerns is adequate.

The highlight summary (page 3-41) for the Lake Michigan Basin is excellent and similar summaries both form and content, should be provided for the other basins. However, the statement contains some deficiencies for which we offer the following suggestions.

The statement's discussion of each basin usually ends by noting some of the major programs included among the Proposed Framework alternatives prescribed for that particular basin. The section which follows discusses the environmental impacts of those programs. It is not possible to evaluate how adequately the statement discusses the probable impacts of the whole study if only the major programs have been listed. The impact statement appears to rely too heavily on the judgment of the Basin Commission. The final EIS should discuss all programs proposed in each lake basin and the probable impacts. Only by so doing can the statement allow reviewers an opportunity to assess the proposed framework and its impacts.

As stated in the second paragraph on page 3-1, "The quantification of structural and nonstructural solutions to resource needs is not always possible in a framework study analysis." Some quantification has been attempted in the EIS which at this time does not appear to have been updated. An example is the statement that, by 2020 over 90 percent of the energy produced in specific sub-areas will be supplied by nuclear power plants (pages 3-24, 48, 59, 68, and 79). Recent reports prepared by power companies indicate that the 90 percent energy supply figure is substantially higher than their present anticipations. Consequently, the above figure should probably be deleted or the statement should be qualified or updated because of the energy crisis.

**40. Department of the Interior, p. 2**



-2-

Consideration should be given to including a discussion of the Indian cultural and natural resources of the Great Lakes Basin as they relate to the Comprehensive Framework Study.

Specific

CHAPTER 1 DESCRIPTION OF THE PROPOSED ACTION

1.2.3.7 Wildlife Resources -- On page 1-16, the third paragraph should end with the following sentences: "Many non-game wildlife species also inhabit the Basin. Some of these species, such as songbirds, are valuable by keeping insects and other pests in check and others by keeping the habitat free of carrion. Others, such as rodents, are considered pests because they destroy farm crops. Rodent populations are dampened by other non-game species, such as hawks and owls."

The next paragraph on page 1-16 should state that whereas the white-tailed deer is the Basin's most important big game species, squirrels and rabbits are the most important small game animals.

1.2.3.8 Fishery Resources -- In the last sentence on page 1-17, the work "adequate" should be deleted and replaced by the word "enjoyed."

On page 1-18, the following species should be added to both the Commercial and Sport Fish listings: Channel catfish, carp, fresh-water drum, and American smelt. Bullheads and other panfish also should be added to the Sport Fish list.

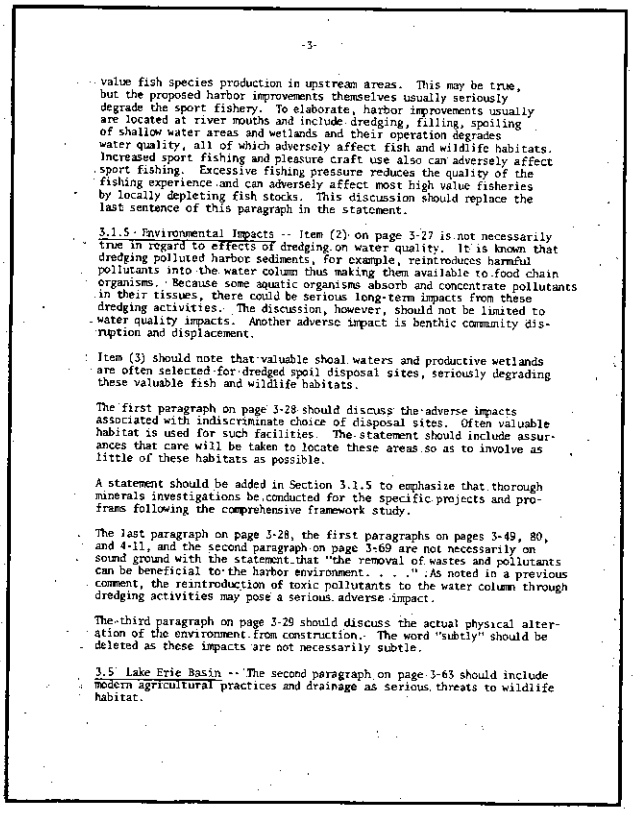
CHAPTER 3 THE PROPOSED (PRO) FRAMEWORK ALTERNATIVES AND PROBABLE IMPACTS

On page 3-6, the first full paragraph indicates that wildlife can benefit from effective floodplain management programs. In other sections, the statement describes these programs as including impoundments, flood control channeling, and land development for recreation. All of these measures have varying degrees of both adverse and beneficial effects on wildlife. The statement also should recognize the adverse effects.

In addition, apparent oversights occur in several tables in Chapter 3 of the statement. Table 7 includes, under Resource Use Category, estimates for total acres disturbed because of "Mining" in the Great Lakes Basin. However, in the tables for the individual basins, only the table for Lake Superior Basin (Table 4) includes estimates for "Mining," whereas Tables 6, 8, 10, and 12 do not.

3.1.2.3 Sports Fishery Programs -- The last sentence on page 3-6 erroneously states that proposed harbor improvements in the recreational navigation portion of the PRO Framework may or may not encourage high

**41. Department of the Interior, p. 3**



-3-

value fish species production in upstream areas. This may be true, but the proposed harbor improvements themselves usually seriously degrade the sport fishery. To elaborate, harbor improvements usually are located at river mouths and include dredging, filling, spoiling of shallow water areas and wetlands and their operation degrades water quality, all of which adversely affect fish and wildlife habitats. Increased sport fishing and pleasure craft use also can adversely affect sport fishing. Excessive fishing pressure reduces the quality of the fishing experience and can adversely affect most high value fisheries by locally depleting fish stocks. This discussion should replace the last sentence of this paragraph in the statement.

3.1.5 Environmental Impacts -- Item (2) on page 3-27 is not necessarily true in regard to effects of dredging on water quality. It is known that dredging polluted harbor sediments, for example, reintroduces harmful pollutants into the water column thus making them available to food chain organisms. Because some aquatic organisms absorb and concentrate pollutants in their tissues, there could be serious long-term impacts from these dredging activities. The discussion, however, should not be limited to water quality impacts. Another adverse impact is benthic community disruption and displacement.

Item (3) should note that valuable shoal waters and productive wetlands are often selected for dredged spoil disposal sites, seriously degrading these valuable fish and wildlife habitats.

The first paragraph on page 3-28 should discuss the adverse impacts associated with indiscriminate choice of disposal sites. Often valuable habitat is used for such facilities. The statement should include assurances that care will be taken to locate these areas so as to involve as little of these habitats as possible.

A statement should be added in Section 3.1.5 to emphasize that thorough minerals investigations be conducted for the specific projects and programs following the comprehensive framework study.

The last paragraph on page 3-28, the first paragraphs on pages 3-49, 80, and 4-11, and the second paragraph on page 3-69 are not necessarily on sound ground with the statement that "the removal of wastes and pollutants can be beneficial to the harbor environment. . . ." As noted in a previous comment, the reintroduction of toxic pollutants to the water column through dredging activities may pose a serious adverse impact.

The third paragraph on page 3-29 should discuss the actual physical alteration of the environment from construction. The word "subtly" should be deleted as these impacts are not necessarily subtle.

3.5 Lake Erie Basin -- The second paragraph on page 3-63 should include modern agricultural practices and drainage as serious threats to wildlife habitat.

**42. Department of the Interior, p. 4**



-4-

3.6 Lake Ontario Basin -- The eastern shore of Lake Ontario contains rare natural areas which are in danger of destruction. The eastern shore area contains the only remaining sand dunes on Lake Ontario, unique shore areas with shorebirds and wildlife of high value, and large wetland areas that are essential to both nesting and migratory waterfowl. These natural areas are in jeopardy from accelerated erosion caused by above average lake level and unwise land development. This section should include this description.

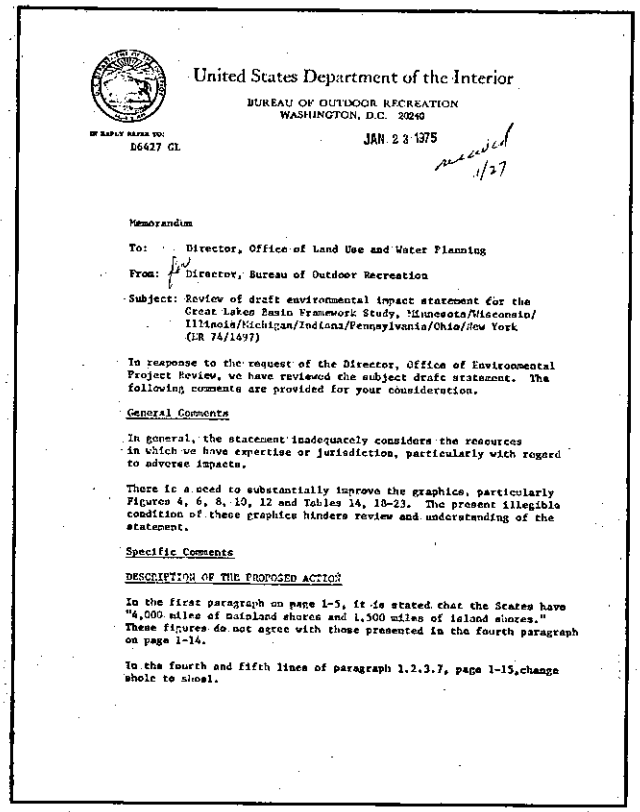
CHAPTER 4 ALTERNATIVE FRAMEWORKS AND PROGRAMS AND ENVIRONMENTAL IMPACTS

4.2.3 Drainage--Cropland -- On page 4-12 the fifth paragraph states: "There is no wetland areas or wildlife habitat included," referring to active cropland. Active farmland is used by wildlife for feeding and therefore is classed as habitat. An apparent discrepancy exists between this statement and the second sentence on page 1-16. The statement on page 4-12 should be deleted.

CHAPTER 5 PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED SHOULD THE GREAT LAKES BASIN PROPOSED FRAMEWORK BE IMPLEMENTED

On page 5-5, the second sentence of the second full paragraph should be revised. It is very confusing the way it is written. The word "involve" should replace the misspelled word "imporve."

**43. Department of the Interior, p. 5**



United States Department of the Interior

BUREAU OF OUTDOOR RECREATION
WASHINGTON, D.C. 20240

IN REPLY REFER TO:
D6427 GL

JAN 23 1975

received 1/27

Memorandum

To: Director, Office of Land Use and Water Planning

From: Director, Bureau of Outdoor Recreation

Subject: Review of draft environmental impact statement for the Great Lakes Basin Framework Study, Minnesota/Wisconsin/Illinois/Michigan/Indiana/Pennsylvania/Ohio/New York (ER 74/1497)

In response to the request of the Director, Office of Environmental Project Review, we have reviewed the subject draft statement. The following comments are provided for your consideration.

General Comments

In general, the statement inadequately considers the resources in which we have expertise or jurisdiction, particularly with regard to adverse impacts.

There is a need to substantially improve the graphics, particularly Figures 4, 6, 8, 10, 12 and Tables 14, 18-23. The present illegible condition of these graphics hinders review and understanding of the statement.

Specific Comments

DESCRIPTION OF THE PROPOSED ACTION

In the first paragraph on page 1-5, it is stated that the States have "4,000 miles of mainland shores and 1,500 miles of island shores." These figures do not agree with those presented in the fourth paragraph on page 1-14.

In the fourth and fifth lines of paragraph 1.2.3.7, page 1-15, change shole to shoal.

**44. Department of the Interior**

THE PROPOSED (FRO) FRAMEWORK ALTERNATIVES AND PROBABLE IMPACTS

This section would be improved with substantial revision. It needs to be made clear that for each alternative action considered to solve a land or water use problem there are both beneficial and adverse impacts. Too often only one aspect of the impacts is mentioned. The presentation might be aided by listing in columns the advantages and disadvantages of each potential action.

Cooling towers in rural locations have adverse impacts on the aesthetics of the area. We believe this should be noted somewhere in the second paragraph on page 3-3.

In the first paragraph on page 3-6 the adverse impacts of structural measures should be noted. The primary adverse impacts would include the irreversible conversion of land to specific uses and the loss of natural stream environments. It should also be noted that until effective flood plain zoning is a reality the secondary adverse impacts of post-project flood plain development may be more serious than the primary impacts.

Somewhere in subsection 3.1.2.4, Commercial Navigation, on pages 3-7 and 3-8 the adverse impacts of in-water and on-land spoil disposal should be noted.

In subsection 3.1.3.2, Recreation Programs, on page 3-9 the adverse impacts resulting from impoundment, such as loss of natural stream environments and conversion of agricultural land and forest land to other uses, should also be noted.

The last paragraph on page 3-27 needs to be revised. At present it is necessary to read the entire paragraph to determine that the subject is navigation.

The last paragraph on page 3-38 should include a discussion of the adverse impacts of flood prevention structural measures. This same comment is applicable to the third paragraph on page 3-49 and the last paragraph on page 3-59.

At several places on pages 3-42 through 3-44 flood plains are mistakenly listed as problems.

**45. Department of the Interior, p. 2**



In the last paragraph on page 3-49 there is no mention made of the adverse impacts of spoil disposal. This same comment is applicable to the first paragraph on page 3-60, the second paragraph on page 3-69, and the only paragraph on page 3-80.

PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED SHOULD THE GREAT LAKES PROPOSED FRAMEWORK BE IMPLEMENTED

In the last paragraph on page 5-2, the impact of increased temperatures on aquatic life should be mentioned.

In the third paragraph on page 5-5 the statement "Depending on the . . . wildlife populations" is not clear.

OTHER INTERESTS AND CONSIDERATIONS OF FEDERAL POLICY THOUGHT TO OFFSET ADVERSE ENVIRONMENTAL EFFECTS OF PROPOSED FRAMEWORK

Somewhere in the third or fourth paragraphs on page 8-3, a statement should be included showing how the limited growth alternative compares with current growth trends.

ROBERT A. RITSCH

**46. Department of the Interior, p. 3**

United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VIRGINIA 22092

OFFICE OF THE DIRECTOR

ER-74/1497

JAN 21 1975

Memorandum

To: Director, Office of Land Use and Water Planning

Through: Assistant Secretary--Energy and Minerals

From: Director, Geological Survey

JAN 29 1975

Subject: Review of draft environmental statement for the Great Lakes Basin Framework Study, Minnesota, Wisconsin, Illinois, Michigan, Indiana, Pennsylvania, Ohio, and New York

We have reviewed the subject draft environmental statement as requested in a memorandum of December 11 from the Director, Office of Environmental Project Review.

The title and Summary (p. 1) refer to a "Framework Study," while the text refers to a "Framework Plan" (p. 1-1), thereafter termed the "Framework." It is not clear whether the difference in terminology is meaningful or inadvertent.

It would be advisable to explain that the proposed action consists of implementation of the Framework Study (or Plan), how such action would be accomplished, and what real alternatives exist, if any. In view of introductory statements that a subsequent object will be to develop a Comprehensive Coordinated Joint Plan (p. 1-1, paragraph 3), it is not clear what actions would result specifically from implementation of the Framework Plan.

If the Framework now proposed is not the ultimate plan for action, then its implementation would apparently have no direct environmental impact. The most concrete action that seems to be proposed in the Description of the Proposed Action is that "flexible guidelines for specific projects and studies" be established (p. 1-2, lines 1-2), but this appears to have little or no environmental impact in itself. We believe that an environmental statement is required at the stage where a proposed action or program would result in a tangible impact

**47. Department of the Interior**





on the environment. However, the proposed plan apparently involves only the inventory of resources, delineation of areas, identification of conflicts, preparation of guidelines, and planning of resource programs (p. 1-2), none of which impose direct or tangible impacts on the environment.

One group of proposed actions that would evidently result in tangible impacts is the modification of proposed depths in specific navigation channels (p. 3-7), but the information provided is too generalized to permit evaluation of these impacts at the present stage of planning. Similarly, it is estimated that 200 miles of Great Lakes shores would require shoreline protection and management techniques (p. 3-12, #7), but the impact cannot be estimated until specific shorelines are identified and specific measures are planned.

Estimated costs that would be required for envisioned rates of development in five portions of the study area lying within the United States have been summarized on tables in Section 3 (p. 3-34, 3-45, 3-55, 3-64, and 3-74). It would be advisable to clarify what portion of total developmental costs have been included and what other costs have been excluded. An example of what appears to be incomplete accounting for costs is the allocation of about $2.4 billion to municipal wastes in the Lake Michigan Basin during the period from 1970 to 2000 (p. 3-45). A recent environmental statement for proposed new developments for the Control of Flood and Pollution Problems Due to Combined Sewer Discharges in the Greater Chicago General Service Area showed total direct expenditures of well over $2 billion and indirect expenditures of possibly $1 billion more. Since those figures covered only a small part of the basin and a period of only 10 years (versus the 30-year period on Table 5, p. 3-45), sufficient explanatory data should be provided to clarify what portion of the proposed $4 billion expenditure is excluded from the $2.4 billion figure.

In general, we feel that the fairly detailed cost estimates, given to the nearest $100,000, should be supported by one or more of the following types of supplementary data: (1) type of work included or excluded; (2) total costs of comparable items from all sources; (3) other sources of developmental funds not considered; and (4) the basis for the estimates and any important assumptions.

The alternative of No Framework Implementation (p. 4-19) does not appear to have been evaluated adequately. This possibly results from limitations mentioned above, including the apparent lack of a specific proposed action, of a proposal for its implementation, or of an evaluation of its environmental impact.

**48. Department of the Interior, p. 2**

ER-74/1497

Material now included in Section 5, on unavoidable impacts, might best be included in Section 3, on the Proposed Framework Alternatives and Probable Impacts. We feel that it is too early to attempt an evaluation of unavoidable impacts at this stage of planning. The statement that the impacts as now discussed are "an estimate of potential environmental change, rather than a prediction of what will occur" (p. 5-1, paragraph 3) raises questions as to whether such impacts can be evaluated effectively in the environmental statement.

Section 6, on short-term use versus long-term productivity, suffers from the same lack of specificity noted above, and there appears to be little or no useful purpose in attempting an evaluation of that type at this stage of planning.

We believe the statement is adequate as to the type of environmental effects to be expected on water resources of the area. Specific comments on the statement are as follows:

On page 1-12 a statement is made that the average annual flows for tributary basins are low. The statement is meaningless without additional explanation. Another statement on this page, "Surface water flow of natural water resources includes ground water flow," is difficult to interpret and should be clarified.

Channel modification (p. 3-27) is a procedure which should be considered carefully. There are cases in which such work has been environmentally damaging and of questionable value in the reduction of flood losses. This topic is alluded to in several places and structural measures contemplated should be thoroughly evaluated. This appears to be understood (p. 5-3).

Henry W. Coulter
Acting Director

**49. Department of the Interior, p. 3**



plants for some time to come. This could represent a lesser burden on cooling water requirements for a given energy output, but would present at least three pollution issues:

(a) Increased air pollutant emissions will require better emission controls and/or more restrictive siting to comply with the significant deterioration regulations cited above.

(b) Shoreline location of plants chosen for ease of cooling is questionable because of periodically undesirable meteorological conditions peculiar to shorelines of large bodies of water (Lake Breeze) which can inhibit good dispersion of air pollutants.

(c) Increased air pollutants are likely to impact water quality when intermittent control strategies utilizing high stacks rather than positive emission controls are used.

Development in the Great Lakes Basin will require special observing systems for monitoring and validating the resulting impacts. The geographic extent of the Basin and the types of measurements needed to establish baseline conditions and trends in water quality and land use suggest that remote sensing of environmental parameters from aircraft and spacecraft could play an important role. Some of the data acquired by Landsat-1 (previously called ERTS-1) has already been successfully used in experimental water quality investigations of the Great Lakes. The same spacecraft has yielded data on land use in the region and land use maps are being produced by Purdue University as part of the experimental program. We would especially appreciate reports on the use of those data. Other experimental observing systems will be available in the future.

**51. NASA, p. 2**

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

REPLY TO ATTN OF: ADA-1

January 21, 1975

Mr. Frederick O. Rouse
Chairman
Great Lakes Basin Commission
3475 Plymouth Road
P.O. Box 999
Ann Arbor, Michigan 48106

Dear Mr. Rouse:

This letter responds to yours of December 6, 1974, addressed to the NASA Comptroller. NASA personnel have examined the Draft Environmental Statement, "Great Lakes Basin Framework Study," and have the following comments:

1. The environmental implications of the plan with regard to water and land resources appear to have been adequately addressed in the draft EIS, however, the equally significant issue of air quality in the basin and how it is impacted by the various growth options should also be considered. For example, industrial development and growth of urbanization in the Basin may significantly impact air quality and growth could be inhibited by the regulations for preventing significant deterioration of air quality recently promulgated by the EPA (Federal Register, Vol. 39, No. 235, December 5, 1974, pp 42510-42517).

2. The assumption that 90% of the energy production in the Basin by the year 2020 will be nuclear-based is certainly questionable in view of the recent history of bringing nuclear plants into operation. Consideration should be given to the likelihood that heavy reliance will be placed on coal burning steam

**50. National Aeronautics and Space Administration**



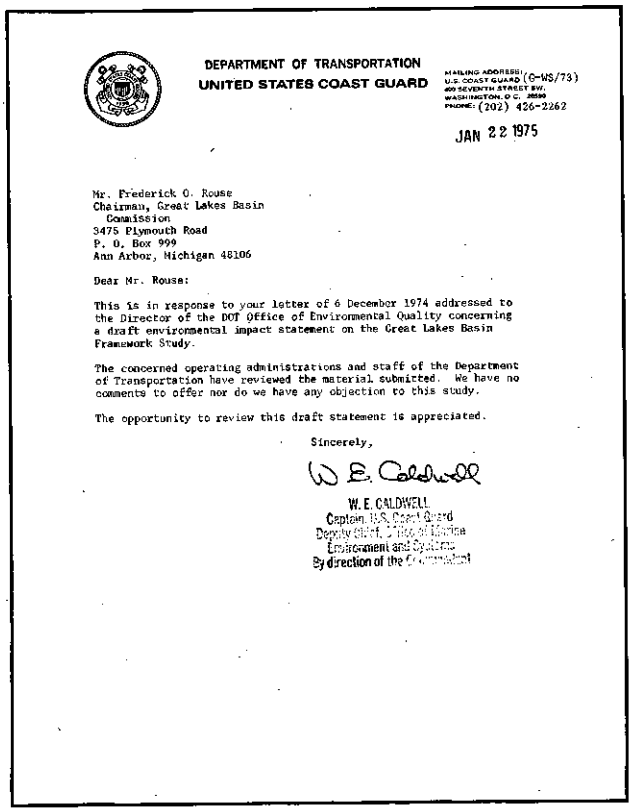
We appreciate the opportunity to comment on this environmental statement.

Sincerely yours,

Nathaniel B. Cohen

Nathaniel B. Cohen
Director, Office of Policy Analysis

**52. NASA, p. 3**



DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS: U.S. COAST GUARD (G-WS/73) 400 SEVENTH STREET SW. WASHINGTON, D.C. 20590 PHONE: (202) 426-2262

JAN 22 1975

Mr. Frederick O. Rouse
Chairman, Great Lakes Basin
Commission
3475 Plymouth Road
P. O. Box 999
Ann Arbor, Michigan 48106

Dear Mr. Rouse:

This is in response to your letter of 6 December 1974 addressed to the Director of the DOT Office of Environmental Quality concerning a draft environmental impact statement on the Great Lakes Basin Framework Study.

The concerned operating administrations and staff of the Department of Transportation have reviewed the material submitted. We have no comments to offer nor do we have any objection to this study.

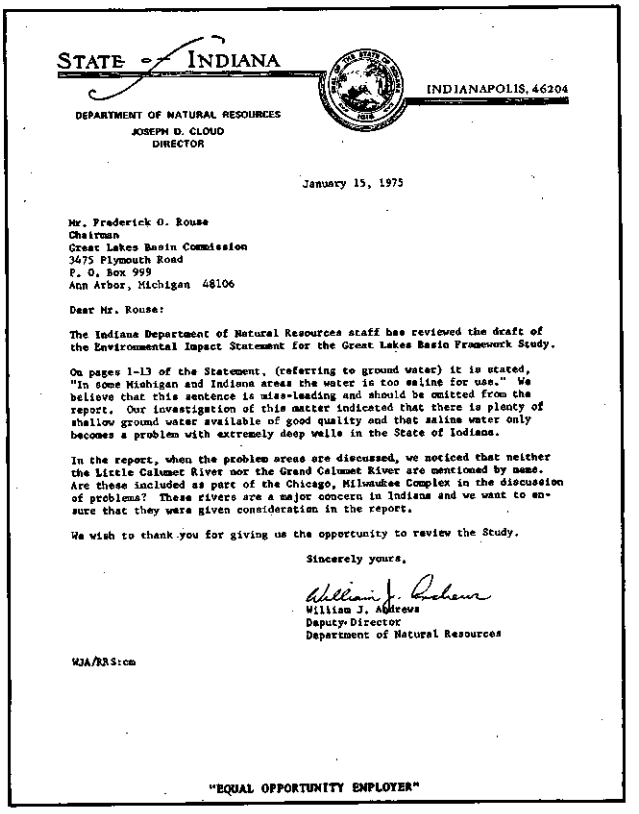
The opportunity to review this draft statement is appreciated.

Sincerely,

W. E. Caldwell

W. E. CALDWELL
Captain, U.S. Coast Guard
Deputy Chief, Office of Marine
Environment and Systems
By direction of the Commandant

## 53. U.S. Coast Guard



STATE of INDIANA

INDIANAPOLIS, 46204

DEPARTMENT OF NATURAL RESOURCES
JOSEPH D. CLOUD
DIRECTOR

January 15, 1975

Mr. Frederick O. Rouse
Chairman
Great Lakes Basin Commission
3475 Plymouth Road
P. O. Box 999
Ann Arbor, Michigan 48106

Dear Mr. Rouse:

The Indiana Department of Natural Resources staff has reviewed the draft of the Environmental Impact Statement for the Great Lakes Basin Framework Study.

On pages 1-13 of the Statement, (referring to ground water) it is stated, "In some Michigan and Indiana areas the water is too saline for use." We believe that this sentence is miss-leading and should be omitted from the report. Our investigation of this matter indicated that there is plenty of shallow ground water available of good quality and that saline water only becomes a problem with extremely deep wells in the State of Indiana.

In the report, when the problem areas are discussed, we noticed that neither the Little Calumet River nor the Grand Calumet River are mentioned by name. Are these included as part of the Chicago, Milwaukee Complex in the discussion of problems? These rivers are a major concern in Indiana and we want to ensure that they were given consideration in the report.

We wish to thank you for giving us the opportunity to review the Study.

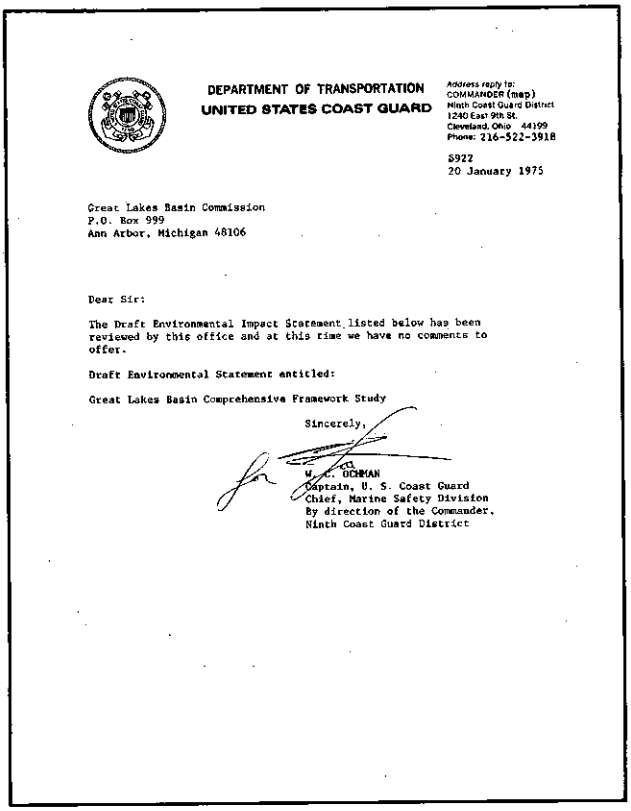
Sincerely yours,

William J. Andrews
Deputy Director
Department of Natural Resources

WJA/RRS:cm

"EQUAL OPPORTUNITY EMPLOYER"

## 55. Indiana Department of Natural Resources



DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

Address reply to: COMMANDER (map) Ninth Coast Guard District 1240 East 9th St. Cleveland, Ohio 44199 Phone: 216-522-3918

5922
20 January 1975

Great Lakes Basin Commission
P.O. Box 999
Ann Arbor, Michigan 48106

Dear Sir:

The Draft Environmental Impact Statement listed below has been reviewed by this office and at this time we have no comments to offer.

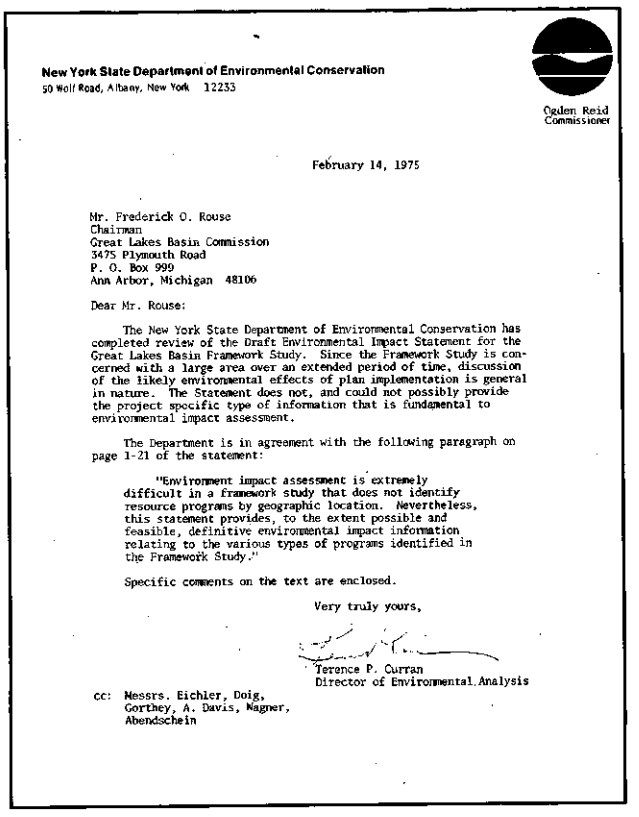
Draft Environmental Statement entitled:

Great Lakes Basin Comprehensive Framework Study

Sincerely,

for W. C. OCHMAN
Captain, U. S. Coast Guard
Chief, Marine Safety Division
By direction of the Commander,
Ninth Coast Guard District

## 54. U.S. Coast Guard



New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233

Ogden Reid
Commissioner

February 14, 1975

Mr. Frederick O. Rouse
Chairman
Great Lakes Basin Commission
3475 Plymouth Road
P. O. Box 999
Ann Arbor, Michigan 48106

Dear Mr. Rouse:

The New York State Department of Environmental Conservation has completed review of the Draft Environmental Impact Statement for the Great Lakes Basin Framework Study. Since the Framework Study is concerned with a large area over an extended period of time, discussion of the likely environmental effects of plan implementation is general in nature. The Statement does not, and could not possibly provide the project specific type of information that is fundamental to environmental impact assessment.

The Department is in agreement with the following paragraph on page 1-21 of the statement:

> "Environment impact assessment is extremely difficult in a framework study that does not identify resource programs by geographic location. Nevertheless, this statement provides, to the extent possible and feasible, definitive environmental impact information relating to the various types of programs identified in the Framework Study."

Specific comments on the text are enclosed.

Very truly yours,

Terence P. Curran
Director of Environmental Analysis

cc: Messrs. Eichler, Doig, Gorthey, A. Davis, Wagner, Abendschein

## 56. New York Department of Environmental Conservation

New York State Department of Environmental Conservation

Comments

On the Draft Environmental Impact Statement for the

Great Lakes Basin Framework Study

General

1. The statement does not provide a comprehensive discussion of the negative effects of structural measures on fish and wildlife.
2. The statement does not contain sufficient analysis of the effects of a fall navigation extension or the effects of bottom dredging on fish and aquatic plant life.
3. The development of a salmonoid fishery in Lakes Ontario and Erie should be mentioned in the fishery section.
4. The report does not discuss wildlife aspects, particularly furbearer habitats and air routes for migratory birds, in enough detail.

Specific

1. Page 1-18, the blue walleye (blue pike) is listed as a commercial species. Since it is on the federal and state endangered species list, it may not be taken legally by either sport or commercial fishermen. Furthermore, recent investigation suggests the species may be extinct.
2. Page 1-18, bass is listed as a panfish. We suggest inserting the work "rock" before bass.
3. Page 1-22 Projections representing historical trends of population and resource demand can no longer be characterized as "normal growth." Such trends constitute what today must be considered very high future growth rates.
4. Page 3-76, Paragraph 3 should be amended to include the Thousand Islands area of the St. Lawrence River as a recreational resource of national prominence.

**57. NY/DEC, p. 2**

New York State

Environmental Impact Statement Comments

1. Alternatives for Future Growth, pg. 32

Population

The Normal Growth Rate represents historical trends of population and resource demands. The E.I.S. notes that this rate is "slightly" higher than present projections. Actually the projected annual rate of population growth of 1.2% per year is higher than the probable national rate of future increase. During the period 1970 to 1975, the civilian population of the United States increased by 5.1% or about 1.0% per year. During the same period the GLB states increased by about 0.4% per year.

More analysts today believe that the nation's population will continue to grow at about one percent per year for the next two decades and then decline to near zero by the year 2020. However, the majority of increase in population is expected to occur in the South, Southwest and Far West. Under those assumption the Framework's "Normal Growth" should be considered as an absolute maximum. The Limited Growth scenario is much more probable based on current State population projections, while the Accelerated Growth Rate is totally inconceivable.

2. Table 2, pg. 69 GLB - Significant Environmental Changes

Outdoor Recreation

The number of recreation days in 1970 is listed as 637,167,000 for a population of 29,300,000; or 21.7 days per year, per capita. This is projected to increase to 34.8 days per year per capita in 2020. The base figure is high and the projected expansion is much greater than we would expect in New York. A similar conclusion is applicable to the other recreation categories, for example, sport fishing.

3. Lake Ontario Basin - 3.7

Page 151, 3rd paragraph. Delete the second sentence and substitute the following: "There are only limited opportunities for installation of structural measures, such as reservoirs, to reduce the flood damages." Change the third sentence to read as follows: "The topography is such that it is desirable to use the flood plains for a number of purposes, including both transportation routes and agricultural development, but consideration must be given to flood hazards and steps taken to minimize flood damages."

**59. NY/DEC, p. 2**

**New York State Department of Environmental Conservation**
50 Wolf Road, Albany, New York 12233

Peter A. A. Berle
Commissioner

June 15, 1976

Mr. Frederick O. Rouse, Jr.
Chairman
Great Lakes Basin Commission
P. O. Box 999
3475 Plymouth Road
Ann Arbor, Michigan 48106

Dear Fred:

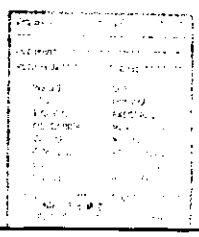
Enclosed are our comments on the Draft Final Environmental Impact Statement as requested in your memorandum of May 18, 1976.

Sincerely,

John A. Linck
New York State Alternate
Great Lakes Basin Commission

Enclosure

cc: T. Curran

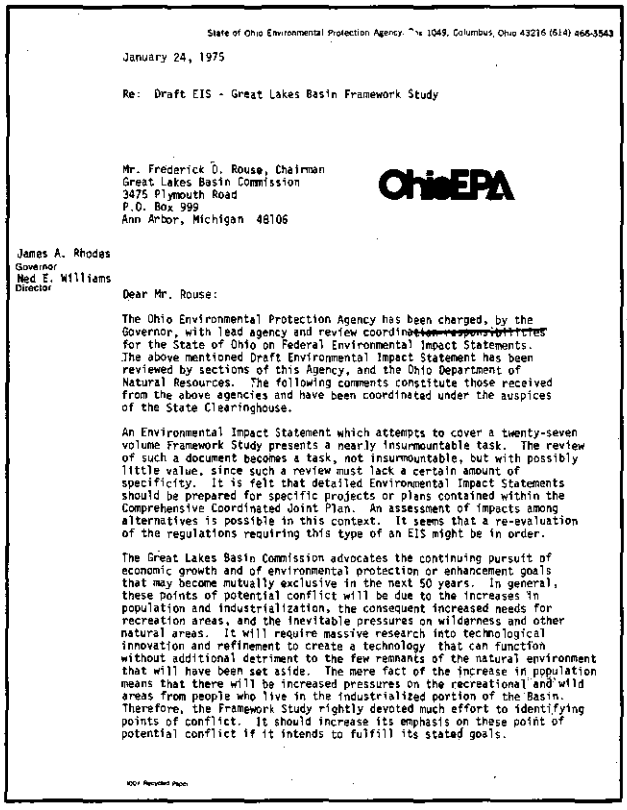


**58. New York Department of Environmental Conservation**

4. Lake Ontario Basin - 3.7.1 Environmental Impacts

On page 159, the environmental effects of water required for cooling condensers for the production of thermal power is discussed. The discussion notes a potential thirteen-fold increase in shoreland requirements. Considering the known plans of the New York State electric utilities and the potential sites available along Lake Ontario, such an increase is quite likely. However, the table on page 157b shows only a 4.5 ratio of increase for cooling consumption and a 7.1 ratio of increase for acreage from 1970 to 2020. We are almost certain that the increase from 1970 to the present in cooling water requirements and in acreage is greater than that projected to the year 2020.

**60. NY/DEC, p. 3**



State of Ohio Environmental Protection Agency. P.O. 1049, Columbus, Ohio 43216 (614) 466-3543

January 24, 1975

Re: Draft EIS - Great Lakes Basin Framework Study

Mr. Frederick O. Rouse, Chairman
Great Lakes Basin Commission
3475 Plymouth Road
P.O. Box 999
Ann Arbor, Michigan 48106

OhioEPA

James A. Rhodes
Governor
Ned E. Williams
Director

Dear Mr. Rouse:

The Ohio Environmental Protection Agency has been charged, by the Governor, with lead agency and review coordination responsibilities for the State of Ohio on Federal Environmental Impact Statements. The above mentioned Draft Environmental Impact Statement has been reviewed by sections of this Agency, and the Ohio Department of Natural Resources. The following comments constitute those received from the above agencies and have been coordinated under the auspices of the State Clearinghouse.

An Environmental Impact Statement which attempts to cover a twenty-seven volume Framework Study presents a nearly insurmountable task. The review of such a document becomes a task, not insurmountable, but with possibly little value, since such a review must lack a certain amount of specificity. It is felt that detailed Environmental Impact Statements should be prepared for specific projects or plans contained within the Comprehensive Coordinated Joint Plan. An assessment of impacts among alternatives is possible in this context. It seems that a re-evaluation of the regulations requiring this type of an EIS might be in order.

The Great Lakes Basin Commission advocates the continuing pursuit of economic growth and of environmental protection or enhancement goals that may become mutually exclusive in the next 50 years. In general, these points of potential conflict will be due to the increases in population and industrialization, the consequent increased needs for recreation areas, and the inevitable pressures on wilderness and other natural areas. It will require massive research into technological innovation and refinement to create a technology that can function without additional detriment to the few remnants of the natural environment that will have been set aside. The mere fact of the increase in population means that there will be increased pressures on the recreational and wild areas from people who live in the industrialized portion of the Basin. Therefore, the Framework Study rightly devoted much effort to identifying points of conflict. It should increase its emphasis on these point of potential conflict if it intends to fulfill its stated goals.

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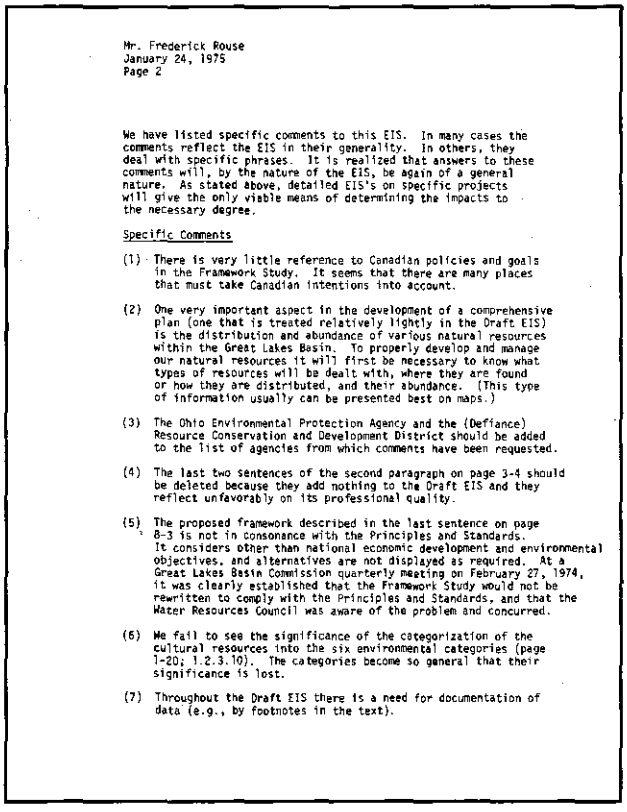
**61. Ohio Environmental Protection Agency**



Mr. Frederick Rouse
January 24, 1975
Page 2

We have listed specific comments to this EIS. In many cases the comments reflect the EIS in their generality. In others, they deal with specific phrases. It is realized that answers to these comments will, by the nature of the EIS, be again of a general nature. As stated above, detailed EIS's on specific projects will give the only viable means of determining the impacts to the necessary degree.

Specific Comments

(1) There is very little reference to Canadian policies and goals in the Framework Study. It seems that there are many places that must take Canadian intentions into account.

(2) One very important aspect in the development of a comprehensive plan (one that is treated relatively lightly in the Draft EIS) is the distribution and abundance of various natural resources within the Great Lakes Basin. To properly develop and manage our natural resources it will first be necessary to know what types of resources will be dealt with, where they are found or how they are distributed, and their abundance. (This type of information usually can be presented best on maps.)

(3) The Ohio Environmental Protection Agency and the (Defiance) Resource Conservation and Development District should be added to the list of agencies from which comments have been requested.

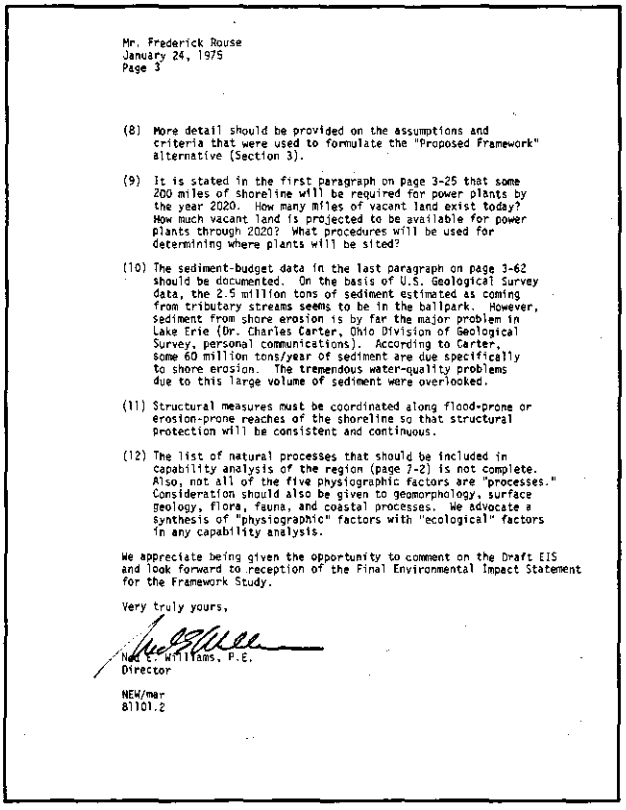
(4) The last two sentences of the second paragraph on page 3-4 should be deleted because they add nothing to the Draft EIS and they reflect unfavorably on its professional quality.

(5) The proposed framework described in the last sentence on page 8-3 is not in consonance with the Principles and Standards. It considers other than national economic development and environmental objectives, and alternatives are not displayed as required. At a Great Lakes Basin Commission quarterly meeting on February 27, 1974, it was clearly established that the Framework Study would not be rewritten to comply with the Principles and Standards, and that the Water Resources Council was aware of the problem and concurred.

(6) We fail to see the significance of the categorization of the cultural resources into the six environmental categories (page 1-20; 1.2.3.10). The categories become so general that their significance is lost.

(7) Throughout the Draft EIS there is a need for documentation of data (e.g., by footnotes in the text).

**62. Ohio EPA, p. 2**



Mr. Frederick Rouse
January 24, 1975
Page 3

(8) More detail should be provided on the assumptions and criteria that were used to formulate the "Proposed Framework" alternative (Section 3).

(9) It is stated in the first paragraph on page 3-25 that some 200 miles of shoreline will be required for power plants by the year 2020. How many miles of vacant land exist today? How much vacant land is projected to be available for power plants through 2020? What procedures will be used for determining where plants will be sited?

(10) The sediment-budget data in the last paragraph on page 3-62 should be documented. On the basis of U.S. Geological Survey data, the 2.5 million tons of sediment estimated as coming from tributary streams seems to be in the ballpark. However, sediment from shore erosion is by far the major problem in Lake Erie (Dr. Charles Carter, Ohio Division of Geological Survey, personal communications). According to Carter, some 60 million tons/year of sediment are due specifically to shore erosion. The tremendous water-quality problems due to this large volume of sediment were overlooked.

(11) Structural measures must be coordinated along flood-prone or erosion-prone reaches of the shoreline so that structural protection will be consistent and continuous.

(12) The list of natural processes that should be included in capability analysis of the region (page 7-2) is not complete. Also, not all of the five physiographic factors are "processes." Consideration should also be given to geomorphology, surface geology, flora, fauna, and coastal processes. We advocate a synthesis of "physiographic" factors with "ecological" factors in any capability analysis.

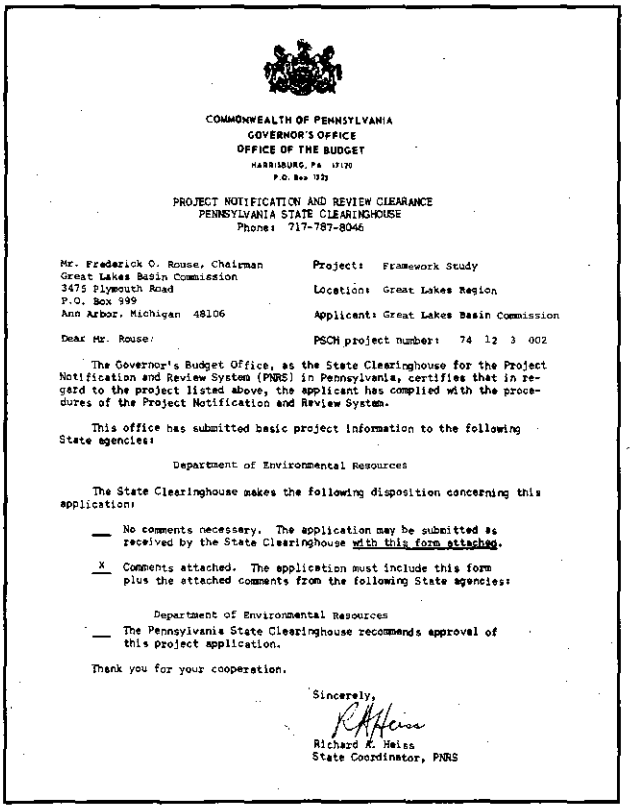
We appreciate being given the opportunity to comment on the Draft EIS and look forward to reception of the Final Environmental Impact Statement for the Framework Study.

Very truly yours,

Ned E. Williams, P.E.
Director

NEW/mar
81101.2

**63. Ohio EPA, p. 3**



COMMONWEALTH OF PENNSYLVANIA
GOVERNOR'S OFFICE
OFFICE OF THE BUDGET
HARRISBURG, PA 17120
P.O. Box 1323

PROJECT NOTIFICATION AND REVIEW CLEARANCE
PENNSYLVANIA STATE CLEARINGHOUSE
Phone: 717-787-8046

Mr. Frederick O. Rouse, Chairman
Great Lakes Basin Commission
3475 Plymouth Road
P.O. Box 999
Ann Arbor, Michigan 48106

Project: Framework Study

Location: Great Lakes Region

Applicant: Great Lakes Basin Commission

Dear Mr. Rouse:

PSCH project number: 74 12 3 002

The Governor's Budget Office, as the State Clearinghouse for the Project Notification and Review System (PNRS) in Pennsylvania, certifies that in regard to the project listed above, the applicant has complied with the procedures of the Project Notification and Review System.

This office has submitted basic project information to the following State agencies:

Department of Environmental Resources

The State Clearinghouse makes the following disposition concerning this application:

___ No comments necessary. The application may be submitted as received by the State Clearinghouse with this form attached.

X Comments attached. The application must include this form plus the attached comments from the following State agencies:

Department of Environmental Resources

___ The Pennsylvania State Clearinghouse recommends approval of this project application.

Thank you for your cooperation.

Sincerely,

Richard M. Heiss
State Coordinator, PNRS

**64. Pennsylvania Office of the Budget**

COMMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF ENVIRONMENTAL RESOURCES

The Secretary

FEB 24 1975

February 13, 1975

SUBJECT: Department of Environmental Resources
Review and Evaluation of
PSCH No.: 74-12-3-002

TITLE: Great Lakes Basin Framework
Study - DEIS

LOCATION: Great Lakes Basin

TO: Richard A. Heiss, Coordinator
Pennsylvania State Clearinghouse

FROM: MAURICE K. GODDARD
Secretary of Environmental Resources

No significant or adverse impact is anticipated by the implementation of this project. However, the Department of Environmental Resources offers these comments.

This project has been evaluated on the basis of the actions proposed in the applicant's submission. Any approval, granted or implied, does not extend to any changes made by the applicant subsequent to and not in keeping with our recommendations. Any such changes will require a new submission through the Pennsylvania State Clearinghouse.

The Draft Environmental Impact Statement for the Great Lakes Basin Framework Study, December 1, 1974, incorporates previous comments made by this Department through the Great Lakes Basin Commissioner's Office when the EIS was being developed. Since this was developed over a period of time, it is not practical or appropriate to provide a list of our comments that were previously made.

The Department of Environmental Resources retains an interest in this project and desires to be informed of any adverse environmental effects encountered or anticipated in the further development of this project.

**65. Pennsylvania Department of Environmental Resources**

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

L. P. Voigt
Secretary

BOX 450
MADISON, WISCONSIN 53701

February 3, 1975

IN REPLY REFER TO: 8250

Mr. Frederick O. Rouse, Chairman
Great Lakes Basin Commission
P. O. Box 999
Ann Arbor, Michigan 48160

Dear Mr. Rouse:

This letter is in response to your request for our comments about the draft Environmental Impact Statement on the Great Lakes Basin Framework Study.

I approve the draft as written. However, I would suggest the following additions to the document:

1. On page 5-3, the draft has not addressed the problems of disposal sites for the nuclear power plants. Also notice the typographical error on line 14 of the word "derived".

2. On pages 5-3, 5-4, the discussion on area-wide treatment system has ignored the encouragement of urban sprawl along the interceptors.

Thank you for the opportunity to review this document.

Very truly yours,

Thomas G. Frengos
Acting Assistant Secretary

THIS IS 100% RECYCLED PAPER

**66. Wisconsin Department of Natural Resources**

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Anthony S. Earl
Secretary

BOX 450
MADISON, WISCONSIN 53701

June 8, 1976

IN REPLY REFER TO: 1600

Mr. Frederick O. Rouse, Chairman
Great Lakes Basin Commission
P. O. Box 999
Ann Arbor, Michigan 48106

Dear Mr. Rouse:

We have reviewed the Draft Final Environmental Impact Statement on the Great Lakes Basin Framework Study and find that it is consistent with the earlier draft which was circulated for public review and comment. Our staff has also reviewed recently transmitted suggested revisions to the Draft FEIS. These suggestions should clarify appropriate sections of the final document.

The inclusion of a foreword in the Final EIS stating the Commission's policy relating to the impact statement process will give assurance to governmental agencies and the public that further environmental evaluations will be made during the project planning and implementation phases.

Thank you for the opportunity to examine a copy of the Draft Final Environmental Impact Statement and addendum.

Sincerely,

Anthony S. Earl
Secretary

THIS IS 100% RECYCLED PAPER

**67. Wisconsin Department of Natural Resources**

January 2, 1975

NIPC # 74-A-176

Mr. Frederick O. Rouse, Chairman
Great Lakes Basin Commission
3475 Plymouth Road
P.O. Box 999
Ann Arbor, Michigan 48106

SUBJECT: NIPC Project No. 74-A-176 Great Lakes Basin Commission - Draft EIS on the Great Lakes Basin Framework Study

Dear Sir:

Our staff has completed its review of the above referenced report and wishes to offer the following comments.

We find the draft EIS to be generally consistent with the requirements of the National Environmental Policy Act of 1969. We are supportive of the primary emphasis on restoring and protecting environmental quality in the southern half of the Lake Michigan basin. We also concur with the high priority given to the problem of municipally supplied water withdrawals in the Chicago-Milwaukee subarea. However, we would urge the Great Lakes Basin Commission to include consideration of the problem of Lakeshore erosion in its final EIS document.

We appreciate having the opportunity to comment on this draft report and hope our comments prove useful to you in the preparation of the final document. If you have any questions on this matter, please contact us.

Very truly yours,

William S. Luhman
Associate Director: Implementation

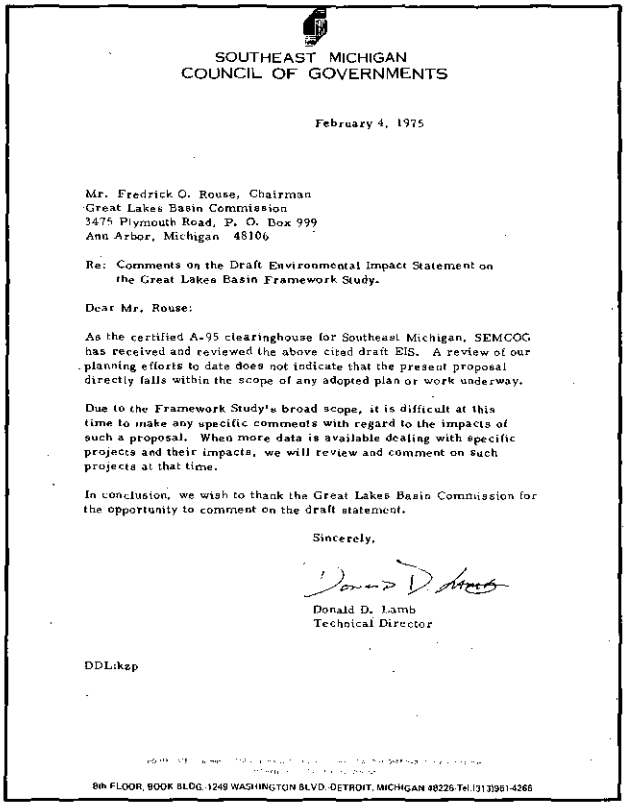
WSL:nr

NORTHEASTERN ILLINOIS PLANNING COMMISSION
10 South Riverside Plaza, Chicago, Illinois 60606 (312) 454-0400

MATTHEW L. ROCKWELL
Executive Director

IRA J. BACH
President
JACK PAHL
Vice President
LAURA K. POLAN
Secretary
WALDEMAR A. RAKOW
Treasurer

**68. Northeastern Illinois Planning Commission**



SOUTHEAST MICHIGAN
COUNCIL OF GOVERNMENTS

February 4, 1975

Mr. Fredrick O. Rouse, Chairman
Great Lakes Basin Commission
3475 Plymouth Road, P. O. Box 999
Ann Arbor, Michigan 48106

Re: Comments on the Draft Environmental Impact Statement on the Great Lakes Basin Framework Study.

Dear Mr. Rouse:

As the certified A-95 clearinghouse for Southeast Michigan, SEMCOG has received and reviewed the above cited draft EIS. A review of our planning efforts to date does not indicate that the present proposal directly falls within the scope of any adopted plan or work underway.

Due to the Framework Study's broad scope, it is difficult at this time to make any specific comments with regard to the impacts of such a proposal. When more data is available dealing with specific projects and their impacts, we will review and comment on such projects at that time.

In conclusion, we wish to thank the Great Lakes Basin Commission for the opportunity to comment on the draft statement.

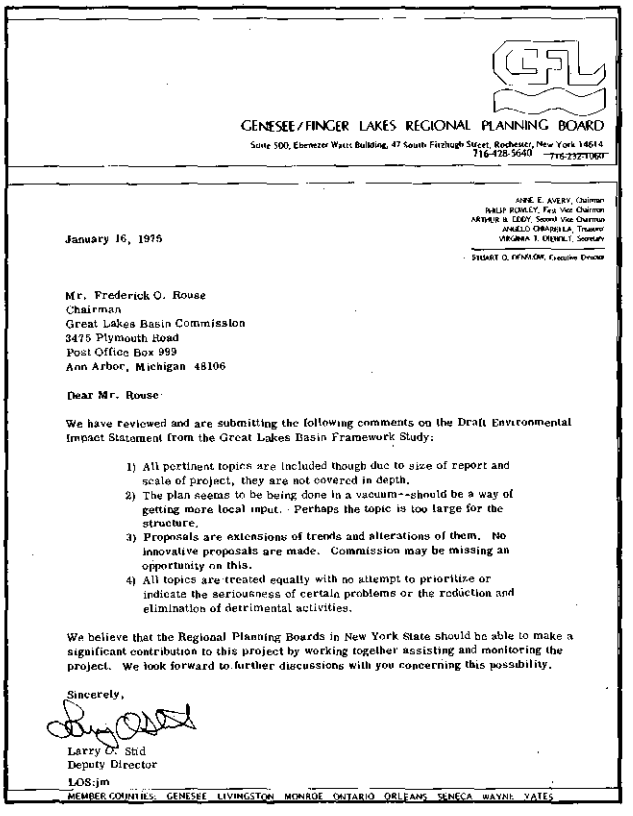
Sincerely,

Donald D. Lamb
Technical Director

DDL:kzp

8th FLOOR, BOOK BLDG.-1249 WASHINGTON BLVD.-DETROIT, MICHIGAN 48226-Tel.(313)961-4266

**69. Southeast Michigan Council of Governments**



GENESEE/FINGER LAKES REGIONAL PLANNING BOARD
Suite 500, Ebenezer Watts Building, 47 South Fitzhugh Street, Rochester, New York 14614
716-428-5640 716-232-1060

ANNE E. AVERY, Chairman
PHILIP ROWLEY, First Vice Chairman
ARTHUR H. DEBY, Second Vice Chairman
ANGELO CHIARELLA, Treasurer
VIRGINIA T. DENIKE, Secretary
STUART O. PENFOLD, Executive Director

January 16, 1975

Mr. Frederick O. Rouse
Chairman
Great Lakes Basin Commission
3475 Plymouth Road
Post Office Box 999
Ann Arbor, Michigan 48106

Dear Mr. Rouse:

We have reviewed and are submitting the following comments on the Draft Environmental Impact Statement from the Great Lakes Basin Framework Study:

1) All pertinent topics are included though due to size of report and scale of project, they are not covered in depth.
2) The plan seems to be being done in a vacuum--should be a way of getting more local input. Perhaps the topic is too large for the structure.
3) Proposals are extensions of trends and alterations of them. No innovative proposals are made. Commission may be missing an opportunity on this.
4) All topics are treated equally with no attempt to prioritize or indicate the seriousness of certain problems or the reduction and elimination of detrimental activities.

We believe that the Regional Planning Boards in New York State should be able to make a significant contribution to this project by working together assisting and monitoring the project. We look forward to further discussions with you concerning this possibility.

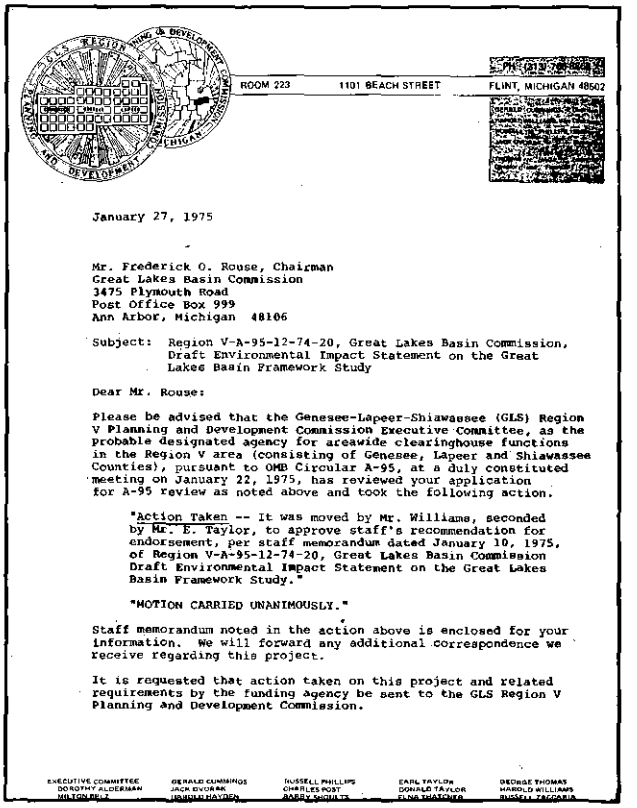
Sincerely,

Larry O. Stid
Deputy Director

LOS:jm

MEMBER COUNTIES: GENESEE LIVINGSTON MONROE ONTARIO ORLEANS SENECA WAYNE YATES

**70. Genesee/Finger Lakes Regional Planning Board**



ROOM 223 1101 BEACH STREET FLINT, MICHIGAN 48502

January 27, 1975

Mr. Frederick O. Rouse, Chairman
Great Lakes Basin Commission
3475 Plymouth Road
Post Office Box 999
Ann Arbor, Michigan 48106

Subject: Region V-A-95-12-74-20, Great Lakes Basin Commission, Draft Environmental Impact Statement on the Great Lakes Basin Framework Study

Dear Mr. Rouse:

Please be advised that the Genesee-Lapeer-Shiawassee (GLS) Region V Planning and Development Commission Executive Committee, as the probable designated agency for areawide clearinghouse functions in the Region V area (consisting of Genesee, Lapeer and Shiawassee Counties), pursuant to OMB Circular A-95, at a duly constituted meeting on January 22, 1975, has reviewed your application for A-95 review as noted above and took the following action.

"Action Taken -- It was moved by Mr. Williams, seconded by Mr. E. Taylor, to approve staff's recommendation for endorsement, per staff memorandum dated January 10, 1975, of Region V-A-95-12-74-20, Great Lakes Basin Commission Draft Environmental Impact Statement on the Great Lakes Basin Framework Study."

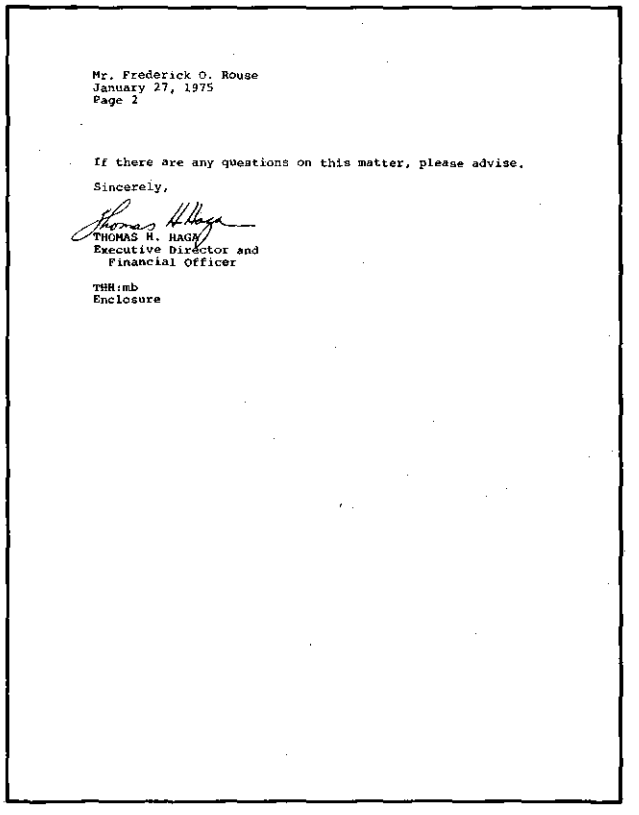
"MOTION CARRIED UNANIMOUSLY."

Staff memorandum noted in the action above is enclosed for your information. We will forward any additional correspondence we receive regarding this project.

It is requested that action taken on this project and related requirements by the funding agency be sent to the GLS Region V Planning and Development Commission.

EXECUTIVE COMMITTEE
DOROTHY ALDERMAN — MILTON BELZ
DONALD CUMMINGS — JACK DVORAK — HOWARD HAYDEN
RUSSELL PHILLIPS — CHARLES POST — BARRY SHOULTZ
EARL TAYLOR — DONALD TAYLOR — ELNA THATCHER
GEORGE THOMAS — HAROLD WILLIAMS — RUSSELL ZAGARIA

**71. Genesee-Lapeer-Shiawassee (GLS) Region V Planning and Development Commission**



Mr. Frederick O. Rouse
January 27, 1975
Page 2

If there are any questions on this matter, please advise.

Sincerely,

THOMAS H. HAGA
Executive Director and
Financial Officer

THH:mb
Enclosure

**72. GLS Region V Commission, p. 2**

PH. (313) 766-5805
ROOM 223 1101 BEACH STREET FLINT, MICHIGAN 48502

January 10, 1975

MEMORANDUM

To: Members of the Genesee-Lapeer-Shiawassee (GLS) Region V Planning and Development Commission (PDC)

From: Thomas H. Hoga, Executive Director

Subject: Region V-A-95-12-74-20, Great Lakes Basin Commission, Draft Environmental Impact Statement on the Great Lakes Basin Framework Study

I. TYPE AND PURPOSE

The subject of this review is a 130 page draft of an Environmental Impact Statement (EIS) prepared by the Great Lakes Basin Commission. The Great Lakes Basin Commission is responsible for the preparation of a long range Comprehensive Coordinated Joint Plan (CCJP) for the Great Lakes Basin area.

The draft presents a broad perusal of urban and rural activities that may influence the quality of the regional environment (defined as the drainage areas within the United States of Lake Superior, Lake Michigan, Lake Huron, Lake Erie, Lake Ontario and those streams entering the St. Lawrence River within the United States) of the Great Lakes Basin.

Several items covered in the draft EIS are applicable to the Genesee-Lapeer-Shiawassee Region V area. A copy of the Index of the draft EIS is included as Attachment #1. Of particular emphasis to Region V is a paragraph discussing the watershed of the Saginaw River, Flint River and tributaries. (Map #1 illustrates the location of the Flint River and tributaries.)

The purpose of an EIS, as outlined in Section 102 (2) (c) of the National Environmental Policy Act of 1969, is to:



**73. GLS Region V Commission, p. 3**

ATTACHMENT #1

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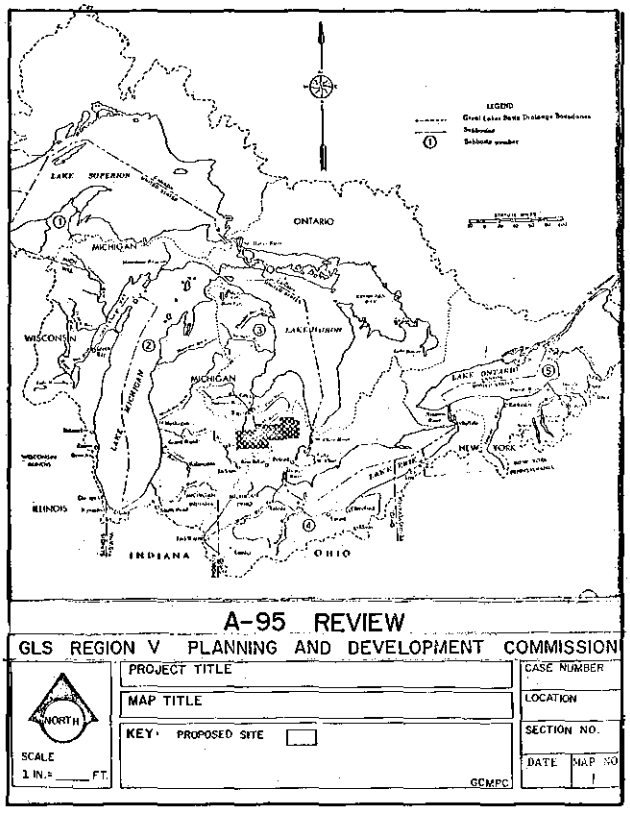
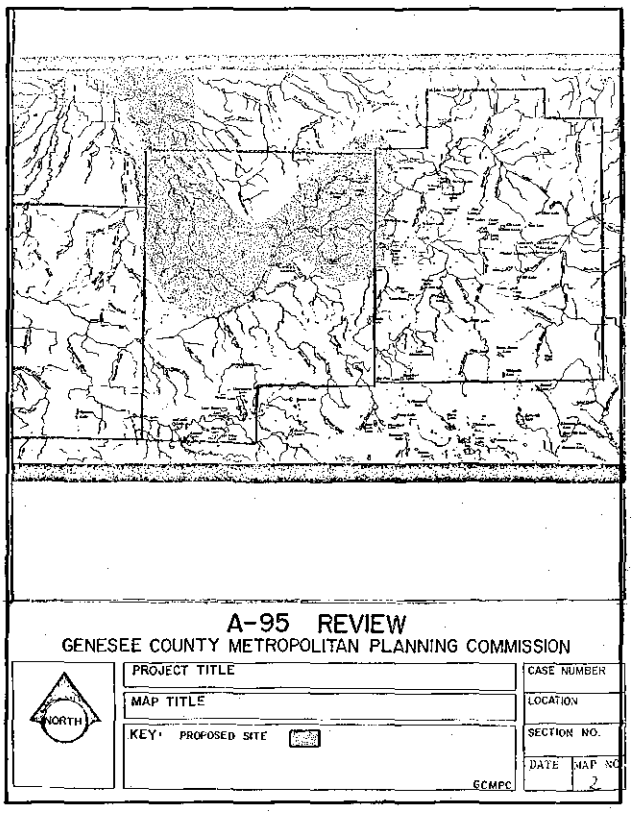
**76. GLS Region V Commission, p. 6**




**77. GLS Region V Commission, p. 7**




**79. GLS Region V Commission, p. 9**

"Include in every recommendation or report on proposals for legislation and other major federal actions significantly affecting the quality of the human environment a detailed statement by the responsible officials on:

"1. the environmental impact of the proposed action;

"2. any adverse environmental effects which cannot be avoided should the proposal be implemented;

"3. alternatives to the proposed action;

"4. the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and

"5. any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented."

The draft of the EIS prepared by the Great Lakes Basin Commission has been transmitted to the GLS Region V PDC and the Genesee County Metropolitan Planning Commission (GCMPC) for review in compliance with the Council of Environmental Quality (CEQ) Guidelines for "Statements on Proposed Federal Actions Affecting the Environment." The response of the GLS Region V PDC and GCMPC to this draft will be considered by the Great Lakes Basin Commission in the preparation of the final environmental statement.

II. LOCATION

The Great Lakes Basin is the area depicted on Map #2. This area includes a land area of 118,000 square miles and a lakes area of 61,000 square miles. The immediate area of concern to the GLS Region V PDC is the Flint River drainage basin illustrated on Map #2.

III. LAND USE CONSIDERATIONS

Public Law 89-80 provides that each river basin commission shall "prepare and keep up to date, to the extent practicable, a comprehensive, coordinated joint plan for Federal, state, interstate local and non-governmental development of water and related resources: Provided, that the plan shall include an evaluation of all reasonable alternative means of achieving optimum development of water and related land resource of the basin or basins, and it may be prepared in stages, including recommendations with respect to individual projects."



**78. GLS Region V Commission, p. 8**

The Framework Study has complied with Public Law 92-500 (Federal Water Pollution Control Acts of 1972). The Framework Study was also prepared in a manner that would facilitate the development of Coastal Zone Management (CZM) Plans by the states, under provisions of PL 92-583. In the event that Federal land use planning regulations are legislated, the Framework Study will be capable of providing some future needs in various sub-basins for commercial port facilities, water treatment plants and other elements of land use plans.

It should be noted that the Framework Study is oriented to generalized goals and not location-specific criteria. The incorporation of comprehensive plans of Federal, state, local and private projects may function to provide the location-specific criteria by which coordination of plans may be achieved. An example of a local project might be the development of sewage treatment facilities in the Flint River basin (municipal or private) that would exhibit influence upon water quality in the immediate area (site location) and areas downstream (regional - Flint River, Saginaw River and Saginaw Bay).

IV. POPULATION TO BE SERVED

The Great Lakes Basin Framework Study could theoretically serve the entire population of Genesee, Lapeer and Shiawassee counties. This statement is based on the following statement. "The Framework Study is an overview of the entire Great Lakes Basin, and will serve as a guide to programs and studies needed to consider more specific resource problems and smaller geographic areas." (Source: "Great Lakes Basin Comprehensive Framework Study," 12/74, p. 1) Though the potential area and population served would be the GLS Region V, the actual population served would be dependent upon the type of project and its site location.

V. RELATIONSHIP TO EXISTING PLANS AND POLICIES

The Framework Study as compiled by the Great Lakes Basin Commission was designed to provide a long range Comprehensive Coordinated Joint Plan (CCJP) for the conservation, preservation and development of water and related land resources in those portions of the Great Lakes Basin within the United States.

The Framework Study provides the following set of parameters by which a comprehensive plan for the Great Lakes Basin may be developed.

1. Provide a comprehensive inventory of water and related land resources in the Great Lakes Basin.

2. Indicate sub-basin areas with environmental problems requiring prompt, detailed planning efforts.



**80. GLS Region V Commission, p. 10**

3. Identify compatibilities and conflicts between present and projected resource demand and supply.

4. Present guidelines for baseline development that best meet the social, environmental, and economic goals at the national, regional, state and local levels.

5. Indicate resource programs which solve existing and projected resource problems.

(Source: "Great Lakes Basin Framework Study," 12/74)

Resource programs as broadly defined in the study include:

1. Action-oriented activities which together manage one or more resource uses. (i.e., structural flood control, levees and floodwalls, reservoirs, recreational uses of river valley parks, waste-water treatment).

2. Legal and/or institutional arrangements.

3. Research and/or data collection actions which are judged to be necessary as needed input for future resource policy decisions.

4. Special resource studies as needed.

(Source: "Great Lakes Basin Framework Study," 12/74)

This environmental impact statement discusses generally the effects which could occur throughout the 50 year planning period (1970-2020). The magnitude of the projected effects are quantified and presented primarily for the year 2020. It is also stressed that project proposals should be consistent with a regional comprehensive plan and thereby achieve the advantage of coordinated planning.

Goals of "The Genesee County 1990 Land Use-Transportation Plan" which appear relevant and complimentary are:

"Improve the Quality of Life for the People of Genesee County" (". . .the quality of the total environment must reflect human, social, cultural and economic needs. . .")

"Maximize the Optimum and Economic Use of Land" (". . . increase opportunity for the people to choose among a variety of environmental settings and potential interactions. . .")

-4-

**81. GLS Region V Commission, p. 11**

A specific recreational goal of the county plan is "enhance and direct the orderly development and redevelopment of existing and future urban patterns by integration of the open space into other land use elements."

VI. ENVIRONMENTAL CONSIDERATIONS

A. Proposed (PRO) Framework Alternatives and Probable Impacts

The primary geographic area of concern to the Region V area is the Lake Huron Basin. Urban and rural activities (industry, suburban growth, sewer treatment plants, agricultural activities, stream channelization) in the Genesee, Lapeer and Shiawassee counties area would have an impact, either positive or negative, on the Lake Huron Basin. Conversely, there may be activities (power plant facilities, shipping lanes, hydrologic alterations, waterfowl refuge, spawning areas) which when constructed along the lake shore may pose either positive or negative environmental impacts to the Region V area.

The Great Lakes Basin Commission has anticipated that the population of the Lake Huron Basin is likely to double over the next 50 years and will require a commitment of land and water resources to accommodate the spatial recreational, economic and other requirements. (Source: "Great Lakes Basin Framework Study, 12/74, p. 3-56)

Since Michigan does not have a specific policy to direct limitation of population growth and diarribution in the basin, projected resource requirements of land and water have no maximum limit of utilization. Listed below are some of the positive and negative impacts of uncontrolled growth at a regional level.

1. Positive Impacts

a. Lake Huron will provide all the water required for cooling condensers in the production of energy in the Lake Huron Basin.

b. The withdrawals of water for energy production are not judged to have a significant effect upon the quantity or quality of Lake Huron.

c. By 2020 approximately 37 percent of the urban and 65 percent of the rural flood damages that could occur in the basin could be arrested through structural measures.

-5-

**82. GLS Region V Commission, p. 12**

d. "Dredging of polluted bottom materials from the aquatic medium (water) can improve water quality over the long term." (Source: "Great Lakes Basin Framework Study," 12/74, p. 3-60)

2. Negative Impacts

a. The location of power plant facilities along or near the Lake Huron shoreline implies a significant increase in the acreage of shore-land allocated to power plant sites.

b. A reduction in waterfowl and fish habitat areas may occur as the result of construction of additional or expanded power facilities.

c. Thermal pollution could have serious localized effects upon wildlife and fishery habitat by increasing water temperature to unacceptable limits and creating localized fog conditions.

d. In excess of 90 percent of the electric energy needs by the year 2020 will be achieved through nuclear production. This situation may pose serious concern of potential threat of nuclear accident and radiological contamination of Lake Huron; therefore, requiring stringent public health and environmental safeguards to be recommended in the framework programs.

e. Dredging, excavation and intensive habor use will contribute to a deterioration of the water quality in local areas, particularly segments of Saginaw Bay and the Saginaw River for short periods of time.

f. Expansion of the shipping season and increased tonages may pose increased threats of major oil spills and other vessel discharges.

B. Alternative Frameworks and Programs and Environmental Impacts

A comprehensive definition of "alternatives" is utilized in the Great Lakes Basin Framework Study. The study evaluates the multiple planning variables of:

1. population and economic projections;

2. resource demands through assumptions related to unit resource demands;

-6-

**83. GLS Region V Commission, p. 13**

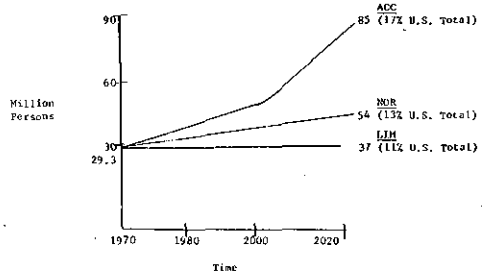
3. solution types (nature of structural and non-structural programs);

4. level of investment (governmental spending to solve future problems); and

5. timing of future programs (investment by 1980, 2000 and 2020).

The preceding variables are concurrently evaluated in the three alternative framework projections (normal, accelerated and limited). The following graph reveals the associated population increases, within the Great Lakes Basin, for each of three alternative frameworks.

POPULATION GROWTH IN GREAT LAKES REGION




-7-

**84. GLS Region V Commission, p. 14**

1. The Normal Growth Framework alternative represents a level of resource conservation, preservation and national economic efficiency based primarily on projections of historical trends. This framework approach is representative of a middle-ground growth trend. However, it should be noted that this middle-ground approach is slightly higher than the projections of anticipated population growth as foreseen for the Proposed (PRO) Framework.

   a. The Normal Growth Framework is expected to provide basic treatment to all effluent requiring treatment emanating from municipalities and industries within the planning area.

   b. Reduction of algae problems will lie in the adoption of a uniform phosphorous removal policy adhered to by all municipalities.

   c. The Normal Growth Framework will improve water quality conditions in streams, inland lakes and the Great Lakes. The Normal Framework will not improve water quality as rapidly as the PRO Framework.

2. The Accelerated Growth Framework alternative represents the upper limit of projected population and economic growth with a simulated maximum requirement of water and land resources. This growth alternative might induce increased employment and economic growth, however, it might also degrade or deplete resources of the Great Lakes Basin.

3. The Limited Growth Framework alternative is based on the premise of stabilizing population and economic growth at a level reflective of high prioritization for natural resources preservation and conservation in the Great Lakes Basin. Conservation as used in this context implies wise use of the basin's natural resources and maximum use of human resources to attain population demands without degrading the natural environment.

   Basic features and assumptions associated with the limited growth are as follows:

   a. Increase the quality of human life in the Basin by improving and maintaining a high level of environmental quality by reducing stresses on human and natural resources historically associated with expondential growth.



## 85. GLS Region V Commission, p. 15

   b. Encourage development objectives that will focus growth in existing concentration and compaction of urban growth within the region. (This assumes a high degree of planned coordination and urban renewal programs for existing centers.)

   c. Implement a national environmental control policy which will encourage industries to improve industrial production techniques rather than relocate.

   d. Provide government subsidies to industry and others which may be necessary to support conversion programs.

   e. Provide accelerated regional investment to acquire and protect natural resources.

   f. Develop and implement stricter regional performance standards for open space, ecological systems, and water quality.

   g. Encourage the industry base to become more efficient, diversified, and competitive in order to maintain levels of regional income on restricted resources.

   (Source: "Great Lakes Basin Framework Study," 12/74, p. 4-13)

4. The No Growth Framework implementation would probably result in a continuation of planning and program selection which historically have produced some unpleasant and unforeseen consequences. Implementation of the No Growth Framework alternative could result in environmental degradation based on a lack of understanding and foresight of a particular program or project.

VII. RELATIONSHIP OF PROJECT TO PRIOR OR CURRENT REGION V ACTION

Considered at a March 7, 1972, meeting of the Genesee County Metropolitan Planning Commission was an "Environmental Statement Draft" from the Army Corps of Engineers for the Flood Control Project on the Swartz Creek, Thread Creek and the Flint River, located in the City of Flint. The review involved a 1,200 foot section of the Flint River from a point near the Chevrolet Plant to Atwood Stadium and 8,900 feet of Swartz Creek and Thread Creek from the Flint River upstream to the Twelfth Street bridge. Summarization of the nine point recommendation by GCMPC staff indicated: "A study should be



## 86. GLS Region V Commission, p. 16

performed to determine the effects of the project on downstream floodplains and eventual erosion to downstream banks."

Considered at the July 10, 1974, meeting of the GCMPC an environmental statement, A-05-6-74-18, U.S. Army Corps of Engineers, Flood Control - Flint River at Flint, Section C-2, was endorsed. Staff comments concerned the need for expanded study of possible flooding both upstream and downstream of the project and the design of retaining walls safety features.

VIII. STAFF ANALYSIS

The subject of this Environmental Impact Statement is the "overall" future development of the Great Lakes Basin. Preparation of the "Great Lakes Basin Framework Study" was initiated for the purpose of evaluating water and related land resources of the entire basin area.

The Framework Study considers from a very broad perspective the general rate at which future development of water and related land resources should proceed, which types of development should be encouraged or discouraged and which geographic areas should receive special consideration for development or preservation.

Staff considers the Framework Study an adequate overview of the entire Great Lakes Basin. The Framework Study mentions the water quality of the Saginaw and Flint Rivers (serving the Region V area) as exhibiting a negative effect on Saginaw Bay and Lake Huron. Staff feels that the water quality problems associated with the Saginaw and Flint Rivers are relatively easy for public and private parties concerned to understand and resolve. From this point of view it appears that the urbanized interior portions of the state can exhibit a positive control upon the quality of water flowing into Lake Huron.

Changes in land uses for power generating facilities and water quality through chemical and thermal pollution for areas along the Great Lakes shorelines are not explored in sufficient detail to determine positive or negative effects on areas (the Region V area). Temperature changes on the lake may result in hydrologic and climatic variations on a localized or more extensive area basis. The results of such changes may be of a positive or negative nature. Agricultural activities may be enhanced with a longer growing season due to the proximity of a warm body of water (positive). On the other hand, a warmer body of water may result in increased evaporation and possible increased precipitation during winter seasons. Though these points are quite theoretical, they may be of sufficient importance to warrant additional investigation.



## 87. GLS Region V Commission, p. 17

IX. STAFF RECOMMENDATION

That the Genesee-Lapeer-Shiawassee Region V Planning and Development Commission, pursuant to OMB Circular A-95, consider at its meeting of January 14, 1975, the project described as Region V-A-95-12-74-20, Great Lakes Basin Commission, Draft Environmental Impact Statement on the Great Lakes Basin Framework Study, and endorse and forward the comments contained in staff memorandum to the Great Lakes Basin Commission. These reasons are:

1. The Draft Environmental Impact Statement, Great Lakes Basin Framework Study provides a set of parameters by which to identify and evaluate future water and related land use requirements of areas on a regional as well as local basis.

2. The Draft Environmental Impact Statement, Great Lakes Basin Framework Study identifies and assesses those environmental impacts required by the National Environmental Policy Act of 1969.

3. The Draft Environmental Impact Statement, Great Lakes Basin Framework Study and The Genesee County 1990 Land Use-Transportation Plan are in agreement on the topical areas of water management, outdoor recreation and preservation of the natural environment.

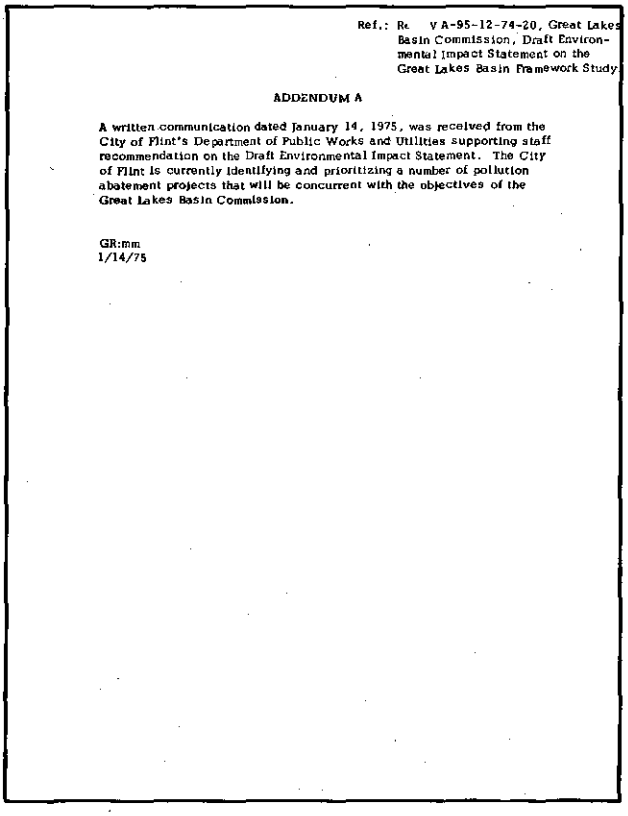
X. CITIZEN PARTICIPATION

City of Flint Department of Public Works
City of Flint Human Relations Commission
City of Flint Recreation and Park Board
City of Flint Traffic Engineering Department
Congressman Donald Riegle's Office
Congressman Elford Cedarburg
Congressman J. Robert Traxler
Genesee County Board of Commissioners
Genesee County Drain Commissioner's Office, Division of Water and Waste Services
Genesee County Road Commission
Genesee County Parks and Recreation Commission
Genesee County Soil Conservation District
Michigan Civil Rights Commission
Flint Environmental Action Team
Mayor's Flood Control Advisory Committee
Lapeer County Board of Commissioners
Lapeer County Planning Commission
Lapeer County Road Commission
Lapeer County Drain Commission
Lapeer County Soil Conservation Service
Michigan Dept. of State Highways and Transportation
Shiawassee County Board of Commissioners
Shiawassee County Planning Commission
Shiawassee County Road Commission
Shiawassee County Drain Commission
Shiawassee County Soil Conservation Service
HUD - Flint Service Office

GR:bb



## 88. GLS Region V Commission, p. 18



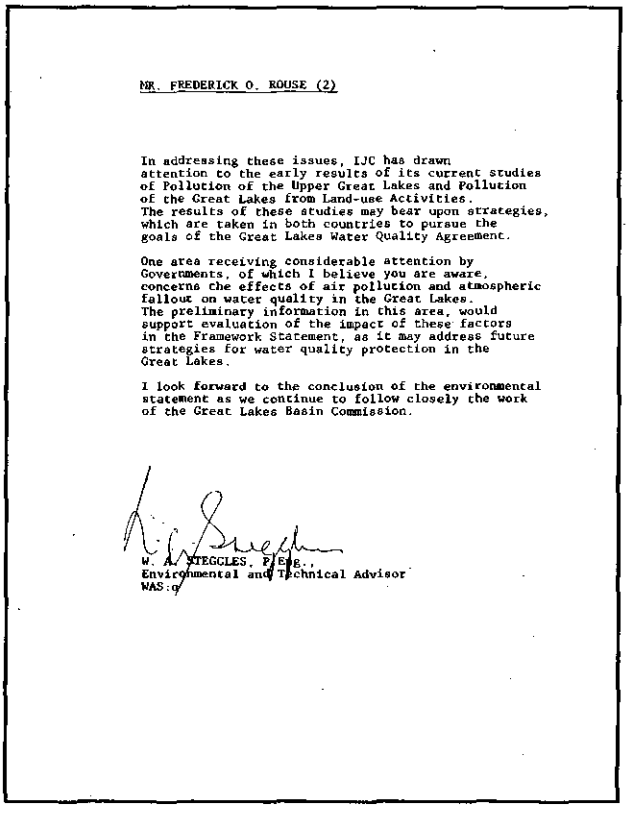
Ref.: Re V A-95-12-74-20, Great Lakes Basin Commission, Draft Environmental Impact Statement on the Great Lakes Basin Framework Study

ADDENDUM A

A written communication dated January 14, 1975, was received from the City of Flint's Department of Public Works and Utilities supporting staff recommendation on the Draft Environmental Impact Statement. The City of Flint is currently identifying and prioritizing a number of pollution abatement projects that will be concurrent with the objectives of the Great Lakes Basin Commission.

GR:mm
1/14/75

**89. GLS Region V Commission, p. 19**



MR. FREDERICK O. ROUSE (2)

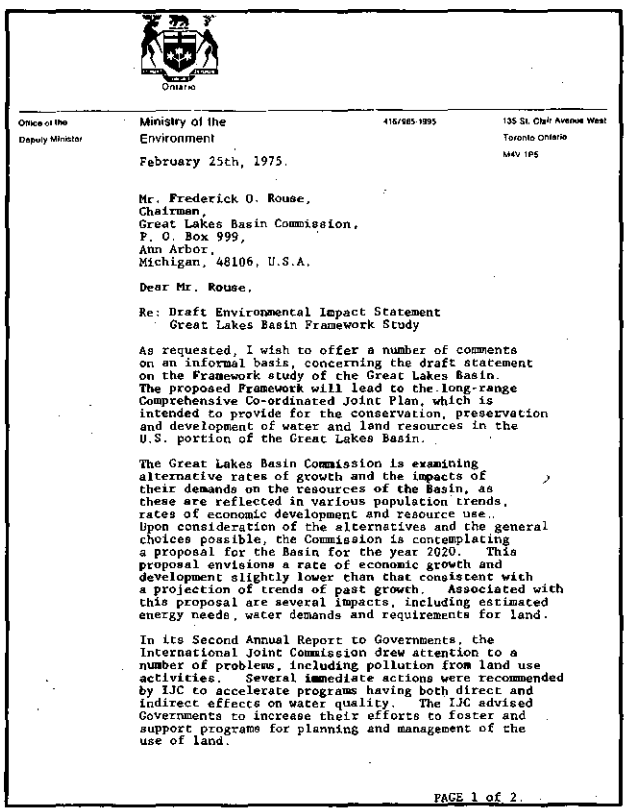
In addressing these issues, IJC has drawn attention to the early results of its current studies of Pollution of the Upper Great Lakes and Pollution of the Great Lakes from Land-use Activities. The results of these studies may bear upon strategies, which are taken in both countries to pursue the goals of the Great Lakes Water Quality Agreement.

One area receiving considerable attention by Governments, of which I believe you are aware, concerns the effects of air pollution and atmospheric fallout on water quality in the Great Lakes. The preliminary information in this area, would support evaluation of the impact of these factors in the Framework Statement, as it may address future strategies for water quality protection in the Great Lakes.

I look forward to the conclusion of the environmental statement as we continue to follow closely the work of the Great Lakes Basin Commission.

W. A. STEGGLES, P.Eng.,
Environmental and Technical Advisor
WAS:g

**91. Ontario Ministry of the Environment, p. 2.**



Ontario

Office of the Deputy Minister

Ministry of the Environment

416/965-1995

135 St. Clair Avenue West
Toronto Ontario
M4V 1P5

February 25th, 1975.

Mr. Frederick O. Rouse,
Chairman,
Great Lakes Basin Commission,
P. O. Box 999,
Ann Arbor,
Michigan, 48106, U.S.A.

Dear Mr. Rouse,

Re: Draft Environmental Impact Statement
Great Lakes Basin Framework Study

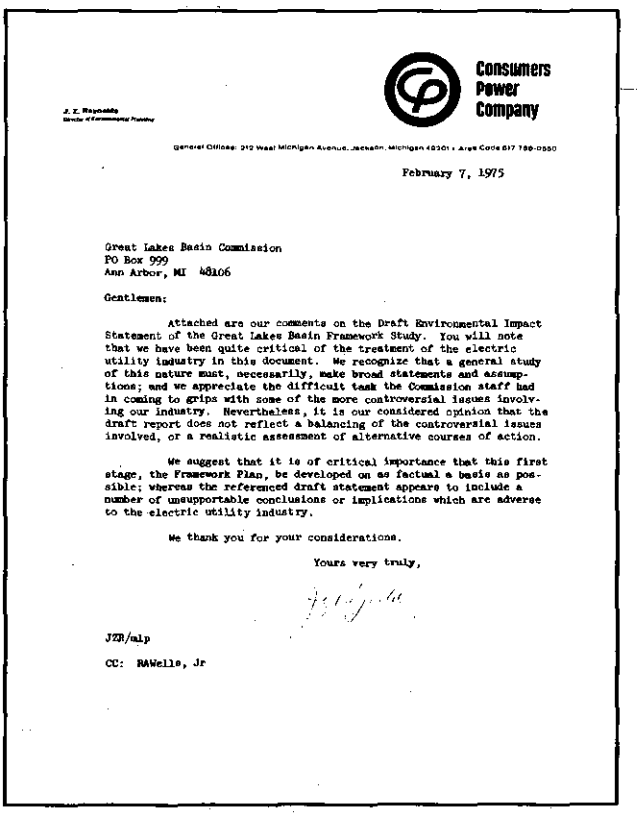
As requested, I wish to offer a number of comments on an informal basis, concerning the draft statement on the Framework study of the Great Lakes Basin. The proposed Framework will lead to the long-range Comprehensive Co-ordinated Joint Plan, which is intended to provide for the conservation, preservation and development of water and land resources in the U.S. portion of the Great Lakes Basin.

The Great Lakes Basin Commission is examining alternative rates of growth and the impacts of their demands on the resources of the Basin, as these are reflected in various population trends, rates of economic development and resource use. Upon consideration of the alternatives and the general choices possible, the Commission is contemplating a proposal for the Basin for the year 2020. This proposal envisions a rate of economic growth and development slightly lower than that consistent with a projection of trends of past growth. Associated with this proposal are several impacts, including estimated energy needs, water demands and requirements for land.

In its Second Annual Report to Governments, the International Joint Commission drew attention to a number of problems, including pollution from land use activities. Several immediate actions were recommended by IJC to accelerate programs having both direct and indirect effects on water quality. The IJC advised Governments to increase their efforts to foster and support programs for planning and management of the use of land.

PAGE 1 of 2

**90. Ontario Ministry of the Environment**



J. Z. Reynolds
Director of Environmental Planning

Consumers Power Company

General Offices: 212 West Michigan Avenue, Jackson, Michigan 49201 • Area Code 517 788-0550

February 7, 1975

Great Lakes Basin Commission
PO Box 999
Ann Arbor, MI 48106

Gentlemen:

Attached are our comments on the Draft Environmental Impact Statement of the Great Lakes Basin Framework Study. You will note that we have been quite critical of the treatment of the electric utility industry in this document. We recognize that a general study of this nature must, necessarily, make broad statements and assumptions; and we appreciate the difficult task the Commission staff had in coming to grips with some of the more controversial issues involving our industry. Nevertheless, it is our considered opinion that the draft report does not reflect a balancing of the controversial issues involved, or a realistic assessment of alternative courses of action.

We suggest that it is of critical importance that this first stage, the Framework Plan, be developed on as factual a basis as possible; whereas the referenced draft statement appears to include a number of unsupportable conclusions or implications which are adverse to the electric utility industry.

We thank you for your considerations.

Yours very truly,

JZR/alp

CC: RAWells, Jr

**92. Consumers Power Company**

COMMENTS ON GREAT LAKES BASIN FRAMEWORK STUDY
DRAFT ENVIRONMENTAL IMPACT STATEMENT (12/1/74)

The following comments relate solely to those aspects of the report that deal with the utility industry:

Section 3.1.1 - Water Withdrawal Programs

Beginning at the middle of page 3-2 is an extended discussion of alleged effects of cooling water discharges. Not only is the discussion slanted toward hypothetical effects of discharges, in a section presumably concerned with withdrawals, it is done so at the exclusion of discussion of withdrawals for other uses.

On page 3-2 (line 28), the statement that up to 100% of the waste heat discharge (is) circulated into the beach water zone is not subject to common interpretation, and is misleading by implying that heat in some way builds up in the beach water zone.

The statement on page 3-3 (line 10) on blowdown inaccurately refers to chlorination of once-through cooling systems in the previous sentence. On line 22, in the same paragraph, the statement that plankton mortality represents a significant mortality of fish food in the littoral zone is unfounded.

At the top of page 3-4, the statements that weather modifications potentially represent environmental consequences of great magnitude and that "accelerated thermal dissipation into the Great Lakes Basin must not be allowed to occur until the consequences of such actions are fully understood" is a policy recommendation of far-reaching consequences. The facts and the framework study do not warrant or justify such a statement.

On page 3-4 (line 12) the suggestion that aquaculture of oysters and other marine organisms is "promising" for the Great Lakes Basin would seem to require some further explanation.

Section 3.1.3.1 - Land Use and Management Programs

Along with the list of legitimate uses of land in the first paragraph, we would suggest that it would be appropriate to also include energy production as a use deserving of consideration.

Section 3.1.3.5 -Shore Use and Erosion Programs

The facts do not support the assertions in the first paragraph that "intense competition" for shoreland resources exists between thermal power generation plants and the other uses listed, or the idea that location of power plants may be in direct conflict with recreational demands and intelligent natural resource management. The facts are that power plant usage represents an almost negligible percentage of the total shoreline, and power plants can coexist with many other uses, the most compatible of which is probably general recreational use.

**93. Consumers Power, p. 2**

Comments on Great Lakes Basin Framework Study 2
Draft Environmental Impact Statement (12/1/74)

Section 3.1.4.1 - Estimated Costs

The assumptions set forth beginning on page 3-24, dealing with power plants, unrealistically assume worst case conditions and projected effects. This does not appear to be consistent with the other uses discussed, where a more probable outlook of projected conditions is considered. Assuming that all plants would be sited on the lakeshore, that the maximum land use figure should be considered, and that this will necessarily eliminate valuable waterfowl and fish habitat is plainly false. This same approach and assumptions are also part of the discussions for the separate Great Lakes basins.

Section 3.3 - Lake Michigan Basin

It is stated on page 3-49 (line 11) that the various environmental consequences of constructing and operating the Ludington Pumped Storage facility are "irreversible." While there are some irreversible environmental consequences, the blanket statement is not true in the sense that there are long-term irreversible losses of the environmental values and components mentioned and, in fact, some recreational and other environmental enhancement has occurred in the short-term as a result of the project.

Section 3.4 - Lake Huron Basin

The implication on page 3-59 (line 16) that there will be a significant increase in power plant construction, with potential for elimination of valuable waterfowl and fish habitat, in Saginaw Bay is unwarranted. The idea that new power plants would probably be built in this area is understandable, in view of Consumers Power Company's recent actions involving two sites, but it does not follow that any of this development has significant potential for eliminating valuable habitat or that future sites will be designated on the Bay shore.

Section 5 - Probable Adverse Environmental Effects

In the last paragraph on page 5-2, it is noted that there is a relatively short history of experience with thermal discharges, and that this somehow clouds the issue of what should be allowed. Thermal discharges have been made to the Great Lakes for well over 30 years and while there will always be questions, as there will be for any environmental impact of technology, the weight of the evidence clearly indicates that currently projected uses of cooling water on the Great Lakes will not have significant impacts at any level. We would be glad to direct you to the extensive literature that is available on these matters if you would like.

JZR/mlp
2/7/75

**94. Consumers Power, p. 3**


**League of Women Voters**
**LAKE MICHIGAN INTER-LEAGUE GROUP**

February 26, 1975

Mr. Leonard Grook
Great Lakes Basin Commission
P. O. Box 999
Ann Arbor, Michigan 48105

Dear Mr. Grook:

The Lake Michigan Inter-League Group represents 111 local Leagues of Women Voters in the four states of the Lake Michigan watershed. You may recall that you participated in our January 1969 seminar on water and land use in the Lake Michigan basin at the Milwaukee Inn in co-sponsorship with the League of Women Voters Education Fund.

Recently we received a copy of the "Draft Environmental Impact Statement" of the Great Lakes Basin Framework Study for our comments. We trust you will accept our remarks in the spirit of friendliness and cooperation in which they are offered.

In general the Draft is verbose and repetitive, as though several different agencies had input into the various sections. If this is supposed to be a summary of 27 full reports, it still needs much synthesizing and "boiling down" to make an unmistakably clear, succinct report. The unevenness of treatment, whereby material is left out in some areas or else repeated ad nauseam in other places, "muddies the waters"; certainly this was not your intention. The result is a succession of broad, general statements made without giving adequate sources of information upon which the conclusions are based. A college course term paper would require better organization and more supportive material.

Therefore, it is quite frustrating and quite impossible to do a point by point critique. In order to keep our comments within reasonable bounds I offer the following on sections one and three as a representative sample of League concerns:

Section 1.1 - quite clear and concise.

1.2.2.1. - should mention that construction of locks and canals disrupted the fish chain; that exploitation of copper and iron deposits left mined-out areas and an eventually depressed economy; and that commercial fish production has also been affected by mercury and pesticide contamination.

**95. League of Women Voters**


**League of Women Voters**
**LAKE MICHIGAN INTER-LEAGUE GROUP**

Section 1.2.2.3, p. 1-9, bottom paragraph - "The heavy concentration of industrial activity in the region has played a major role in its past performance and added significantly to the pollutant load."

1.2.3.5 - What has been the effect of mining on the forest resources?

3.1, second paragraph - As the impacts of non-quantifiable programs are not indicated in the annex displays, even although they have environmental effects, does not this relegate them to an "out of sight, out of mind" category? Can they really be ignored?

3.1.2.4, first paragraph - Who decided that deep draft navigation and incremental improvements to the navigation system should be policy?

(5) Why should the navigation season be extended when the volume of shipping has been dropping, due in part to labor problems and to theft?

3.1.3.2 - It is very vague at whose expense the enhanced recreational opportunities will be developed.

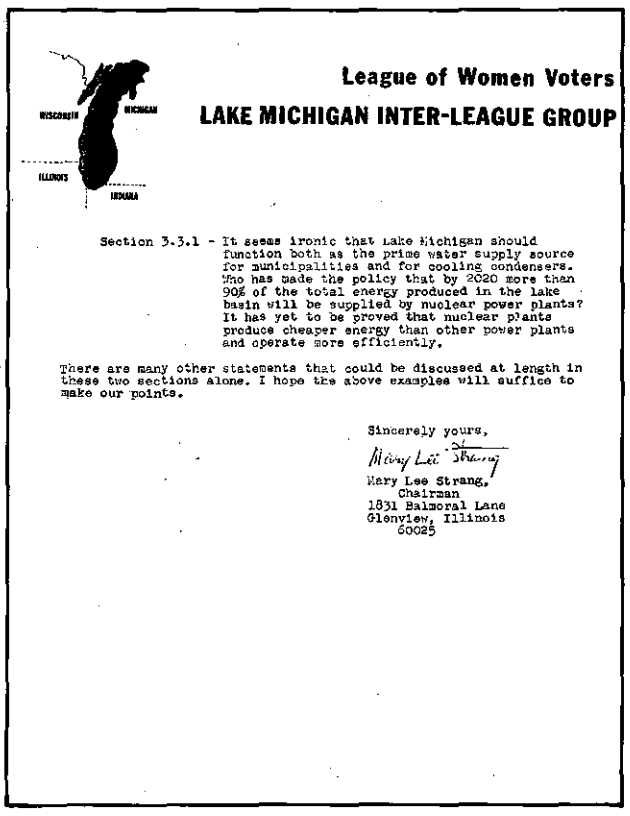
3.1.3.5 - What is the role of the Coastal Zone Management Act in the shore use and erosion programs?

3.1.4(1) - It is not clear how more than 113 billion gallons of safe water per day can be provided in addition to the current supply.

3.1.4.1 - The estimated costs need revision in the light of the altered economic situation.

3.1.5, p. 3-23 through p. 3-29 lack headings. Why should all the proposed new power plants be sited on the most expensive land -- the lakeshore? Diked disposal of dredgings (p. 3-28) is still experimental as far as the Corps is concerned.

**96. League of Women Voters, p. 2**






**League of Women Voters**

**LAKE MICHIGAN INTER-LEAGUE GROUP**

Section 3.3.1 - It seems ironic that Lake Michigan should function both as the prime water supply source for municipalities and for cooling condensers. Who has made the policy that by 2020 more than 90% of the total energy produced in the lake basin will be supplied by nuclear power plants? It has yet to be proved that nuclear plants produce cheaper energy than other power plants and operate more efficiently.

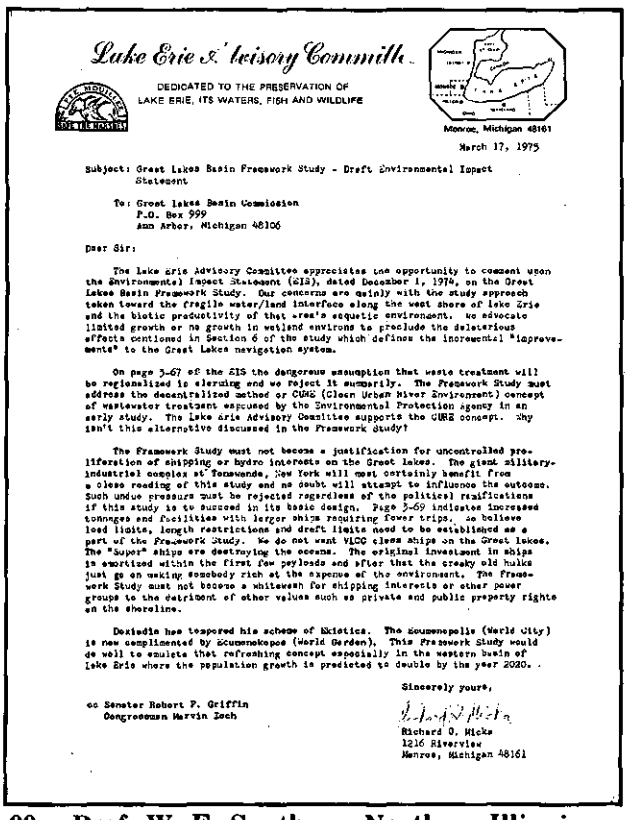
There are many other statements that could be discussed at length in these two sections alone. I hope the above examples will suffice to make our points.

Sincerely yours,

Mary Lee Strang

Mary Lee Strang,
Chairman
1831 Balmoral Lane
Glenview, Illinois
60025

**97. League of Women Voters, p. 3**



*Lake Erie Advisory Committee*

DEDICATED TO THE PRESERVATION OF
LAKE ERIE, ITS WATERS, FISH AND WILDLIFE

Monroe, Michigan 48161

March 17, 1975

Subject: Great Lakes Basin Framework Study - Draft Environmental Impact Statement

To: Great Lakes Basin Commission
P.O. Box 999
Ann Arbor, Michigan 48106

Dear Sir:

The Lake Erie Advisory Committee appreciates the opportunity to comment upon the Environmental Impact Statement (EIS), dated December 1, 1974, on the Great Lakes Basin Framework Study. Our concerns are mainly with the study approach taken toward the fragile water/land interface along the west shore of Lake Erie and the biotic productivity of that area's aquatic environment. We advocate limited growth or no growth in wetland environs to preclude the deleterious effects mentioned in Section 6 of the study which defines the incremental "improvements" to the Great Lakes navigation system.

On page 3-67 of the EIS the dangerous assumption that waste treatment will be regionalized is alarming and we reject it summarily. The Framework Study must address the decentralized method or CURE (Clean Urban River Environment) concept of wastewater treatment espoused by the Environmental Protection Agency in an early study. The Lake Erie Advisory Committee supports the CURE concept. Why isn't this alternative discussed in the Framework Study?

The Framework Study must not become a justification for uncontrolled proliferation of shipping or hydro interests on the Great Lakes. The giant military-industrial complex at Tonawanda, New York will most certainly benefit from a close reading of this study and no doubt will attempt to influence the outcome. Such undue pressure must be rejected regardless of the political ramifications if this study is to succeed in its basic design. Page 3-69 indicates increased tonnages and facilities with larger ships requiring fewer trips. We believe load limits, length restrictions and draft limits need to be established as a part of the Framework Study. We do not want VLCC class ships on the Great Lakes. The "Super" ships are destroying the oceans. The original investment in ships is amortized within the first few payloads and after that the creaky old hulks just go on making somebody rich at the expense of the environment. The Framework Study must not become a whitewash for shipping interests or other power groups to the detriment of other values such as private and public property rights on the shoreline.

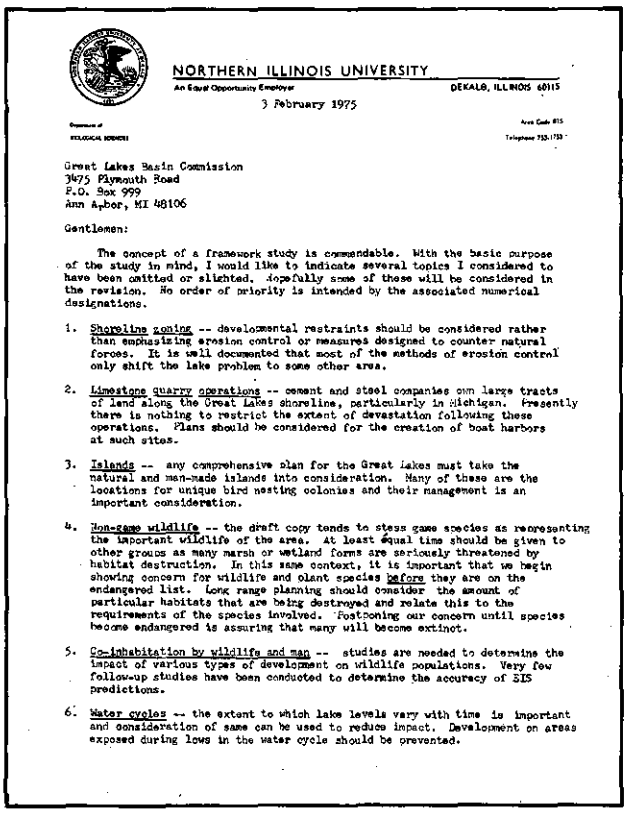
Doxiadis has tempered his scheme of Ekistics. The Ecumenopolis (World City) is now complimented by Ecumenikopes (World Garden). This Framework Study would do well to emulate that refreshing concept especially in the western basin of Lake Erie where the population growth is predicted to double by the year 2020.

Sincerely yours,

Richard O. Hicks
1216 Riverview
Monroe, Michigan 48161

cc Senator Robert P. Griffin
Congressman Marvin Esch

**99. Prof. W. E. Southern, Northern Illinois University**



NORTHERN ILLINOIS UNIVERSITY
An Equal Opportunity Employer
DEKALB, ILLINOIS 60115

3 February 1975

Department of BIOLOGICAL SCIENCES
Area Code 815
Telephone 753-1753

Great Lakes Basin Commission
3475 Plymouth Road
P.O. Box 999
Ann Arbor, MI 48106

Gentlemen:

The concept of a framework study is commendable. With the basic purpose of the study in mind, I would like to indicate several topics I considered to have been omitted or slighted. Hopefully some of these will be considered in the revision. No order of priority is intended by the associated numerical designations.

1. Shoreline zoning -- developmental restraints should be considered rather than emphasizing erosion control or measures designed to counter natural forces. It is well documented that most of the methods of erosion control only shift the lake problem to some other area.

2. Limestone quarry operations -- cement and steel companies own large tracts of land along the Great Lakes shoreline, particularly in Michigan. Presently there is nothing to restrict the extent of devastation following these operations. Plans should be considered for the creation of boat harbors at such sites.

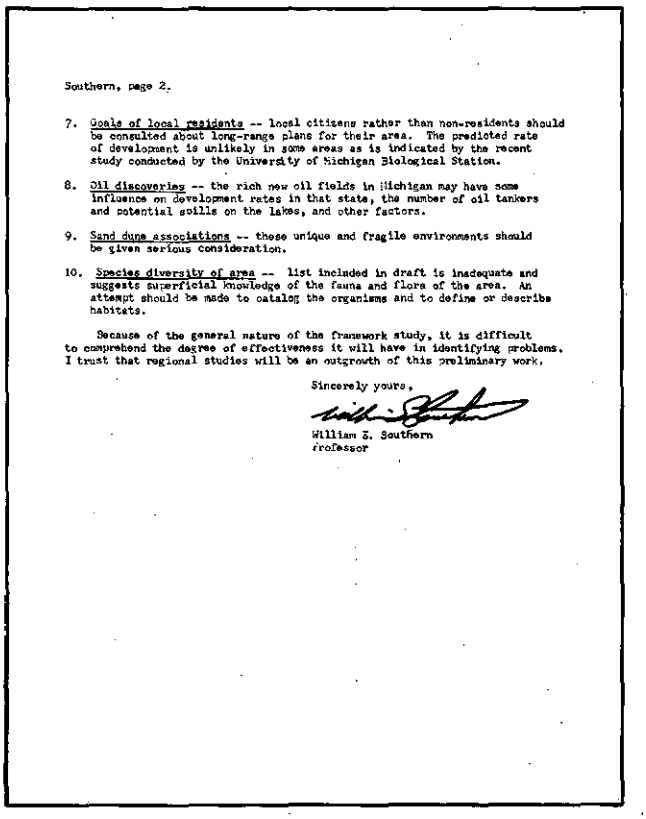
3. Islands -- any comprehensive plan for the Great Lakes must take the natural and man-made islands into consideration. Many of these are the locations for unique bird nesting colonies and their management is an important consideration.

4. Non-game wildlife -- the draft copy tends to stress game species as representing the important wildlife of the area. At least equal time should be given to other groups as many marsh or wetland forms are seriously threatened by habitat destruction. In this same context, it is important that we begin showing concern for wildlife and plant species before they are on the endangered list. Long range planning should consider the amount of particular habitats that are being destroyed and relate this to the requirements of the species involved. Postponing our concern until species become endangered is assuring that many will become extinct.

5. Co-inhabitation by wildlife and man -- studies are needed to determine the impact of various types of development on wildlife populations. Very few follow-up studies have been conducted to determine the accuracy of EIS predictions.

6. Water cycles -- the extent to which lake levels vary with time is important and consideration of same can be used to reduce impact. Development on areas exposed during lows in the water cycle should be prevented.

**98. Lake Erie Advisory Committee**



Southern, page 2.

7. Goals of local residents -- local citizens rather than non-residents should be consulted about long-range plans for their area. The predicted rate of development is unlikely in some areas as is indicated by the recent study conducted by the University of Michigan Biological Station.

8. Oil discoveries -- the rich new oil fields in Michigan may have some influence on development rates in that state, the number of oil tankers and potential spills on the lakes, and other factors.

9. Sand dune associations -- these unique and fragile environments should be given serious consideration.

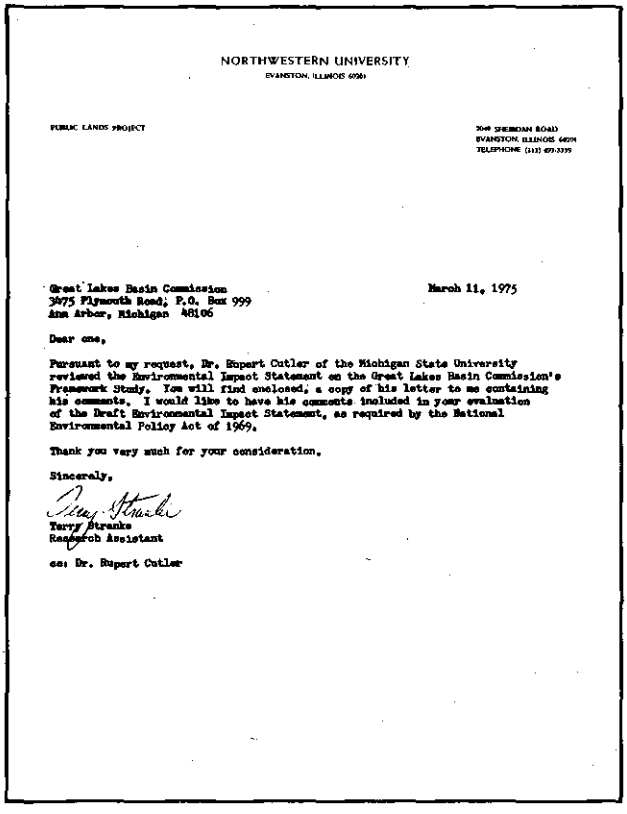
10. Species diversity of area -- list included in draft is inadequate and suggests superficial knowledge of the fauna and flora of the area. An attempt should be made to catalog the organisms and to define or describe habitats.

Because of the general nature of the framework study, it is difficult to comprehend the degree of effectiveness it will have in identifying problems. I trust that regional studies will be an outgrowth of this preliminary work.

Sincerely yours,

William E. Southern
Professor

**100. Southern, p. 2**



NORTHWESTERN UNIVERSITY
EVANSTON, ILLINOIS 60201

PUBLIC LANDS PROJECT

2040 SHERIDAN ROAD
EVANSTON, ILLINOIS 60201
TELEPHONE (312) 492-3339

March 11, 1975

Great Lakes Basin Commission
3475 Plymouth Road, P.O. Box 999
Ann Arbor, Michigan 48106

Dear one,

Pursuant to my request, Mr. Rupert Cutler of the Michigan State University reviewed the Environmental Impact Statement on the Great Lakes Basin Commission's Framework Study. You will find enclosed, a copy of his letter to me containing his comments. I would like to have his comments included in your evaluation of the Draft Environmental Impact Statement, as required by the National Environmental Policy Act of 1969.

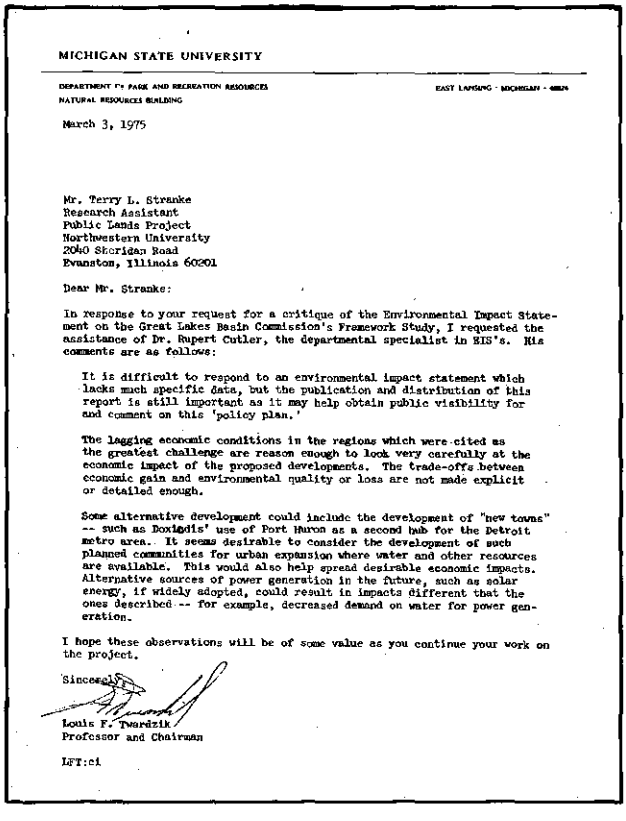
Thank you very much for your consideration.

Sincerely,

Terry Stranke
Research Assistant

cc: Dr. Rupert Cutler

**101. Terry Stranke, Northwestern University**



MICHIGAN STATE UNIVERSITY

DEPARTMENT OF PARK AND RECREATION RESOURCES
NATURAL RESOURCES BUILDING

EAST LANSING - MICHIGAN - 48824

March 3, 1975

Mr. Terry L. Stranke
Research Assistant
Public Lands Project
Northwestern University
2040 Sheridan Road
Evanston, Illinois 60201

Dear Mr. Stranke:

In response to your request for a critique of the Environmental Impact Statement on the Great Lakes Basin Commission's Framework Study, I requested the assistance of Dr. Rupert Cutler, the departmental specialist in EIS's. His comments are as follows:

It is difficult to respond to an environmental impact statement which lacks much specific data, but the publication and distribution of this report is still important as it may help obtain public visibility for and comment on this 'policy plan.'

The lagging economic conditions in the regions which were cited as the greatest challenge are reason enough to look very carefully at the economic impact of the proposed developments. The trade-offs between economic gain and environmental quality or loss are not made explicit or detailed enough.

Some alternative development could include the development of "new towns" -- such as Doxiadis' use of Port Huron as a second hub for the Detroit metro area. It seems desirable to consider the development of such planned communities for urban expansion where water and other resources are available. This would also help spread desirable economic impacts. Alternative sources of power generation in the future, such as solar energy, if widely adopted, could result in impacts different that the ones described -- for example, decreased demand on water for power generation.

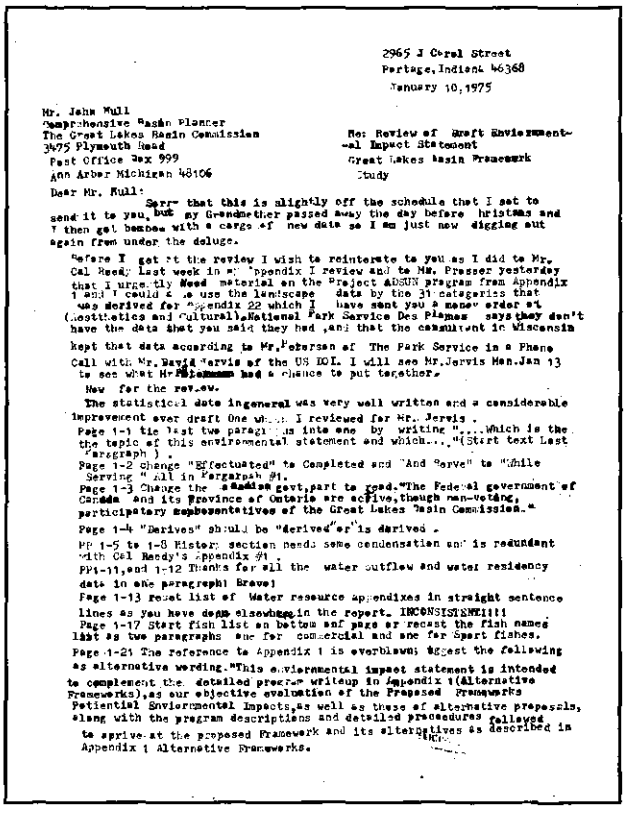
I hope these observations will be of some value as you continue your work on the project.

Sincerely,

Louis F. Twardzik
Professor and Chairman

LFT:ci

**102. Dr. R. Cutler/Prof. L. F. Twardzik, Michigan State University**



2965 J Coral Street
Portage, Indiana 46368
January 10, 1975

Mr. John Hull
Comprehensive Basin Planner
The Great Lakes Basin Commission
3475 Plymouth Road
Post Office Box 999
Ann Arbor Michigan 48106

Re: Review of Draft Environmental Impact Statement
Great Lakes Basin Framework Study

Dear Mr. Hull:

Sorry that this is slightly off the schedule that I set to send it to you, but my Grandmother passed away the day before Christmas and I then got bombed with a cargo of new data so I am just now digging out again from under the deluge.

Before I get to the review I wish to reiterate to you as I did to Mr. Cal Reedy Last week in my Appendix I review and to Mr. Presser yesterday that I urgently Need material on the Project ABSUN program from Appendix 1 and I could & use the landscape data by the 31 categories that was derived for Appendix 22 which I have sent you a money order on (Aesthetics and Cultural), National Park Service Des Plaines says they don't have the data that you said they had, and that the consultant in Wisconsin kept that data according to Mr. Petersen of The Park Service in a Phone Call with Mr. David Jervis of the US DOI. I will see Mr. Jervis Mon. Jan 13 to see what Mr. Heinemann had a chance to put together.

Now for the review.

The statistical data in general was very well written and a considerable improvement over draft One which I reviewed for Mr. Jervis.

Page 1-1 tie last two paragraphs into one by writing "...which is the the topic of this environmental statement and which..." (Start text Last Paragraph).

Page 1-2 change "Effectuated" to Completed and "And Serve" to "While Serving" All in Paragraph #1.

Page 1-3 Change the Canadian part, part to read. "The Federal government of Canada and its Province of Ontario are active, though non-voting, participatory representatives of the Great Lakes Basin Commission."

Page 1-4 "Derives" should be "derived" or "is derived."

PP 1-5 to 1-8 History section needs some condensation and is redundant with Cal Reedy's Appendix #1

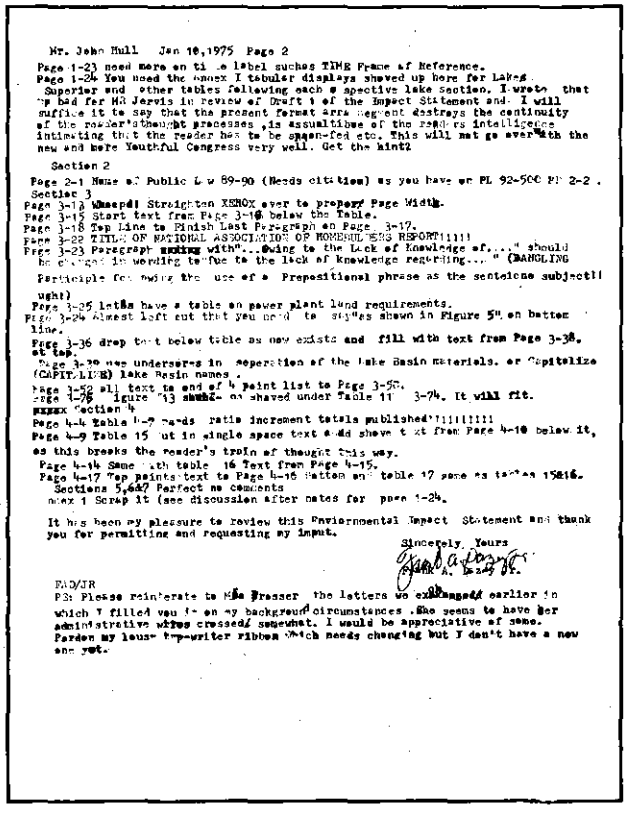
PP1-11, and 1-12 Thanks for all the water outflow and water residency data in one paragraph! Brave!

Page 1-13 resat list of Water resource appendixes in straight sentence lines as you have done elsewhere in the report. INCONSISTENCY!!!!

Page 1-17 Start fish list on bottom and place or recast the fish names list as two paragraphs one for commercial and one for Sport fishes.

Page 1-21 The reference to Appendix 1 is overblown; Suggest the following as alternative wording. "This environmental impact statement is intended to complement the detailed prose writeup in Appendix 1 (Alternative Frameworks), as our objective evaluation of the Proposed Frameworks Potential Environmental Impacts, as well as those of alternative proposals, along with the program descriptions and detailed procedures followed to arrive at the proposed Framework and its alternatives as described in Appendix 1 Alternative Frameworks.

**103. Frank A. Dazey, Jr.**



Mr. John Hull Jan 10,1975 Page 2

Page 1-23 need more on title label sucbes TIME Frame of Reference.
Page 1-24 You need the annex I tabular displays shoved up here for Lake Superior and other tables following each respective lake section. I wrote that up bad for Mr. Jervis in review of Draft 1 of the Impact Statement and I will suffice it to say that the present format arrangement destroys the continuity of the reader's thought processes, is assaultibue of the reader's intelligence intimating that the reader has to be spoon-fed etc. This will not go over with the new and more Youthful Congress very well. Get the Hint?

Section 2

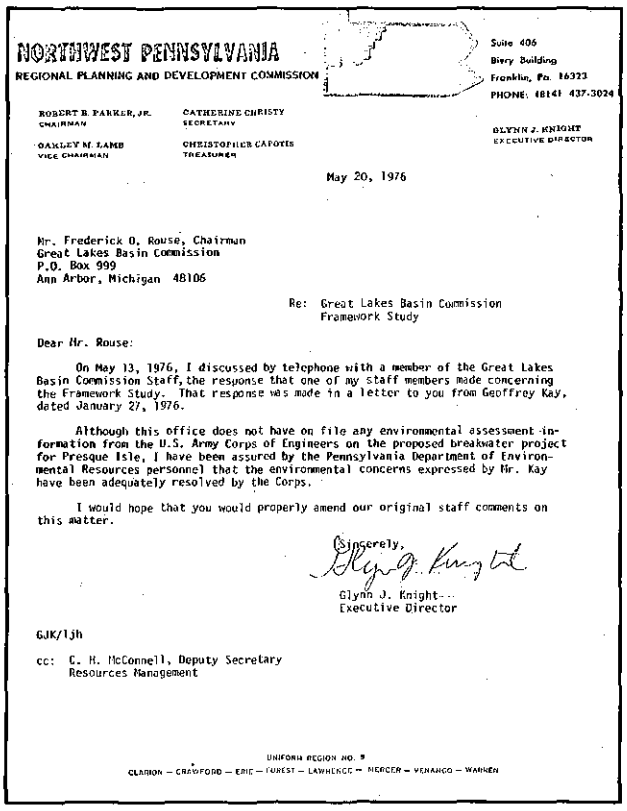
Page 2-1 Name of Public Law 89-90 (Needs citation) as you have on PL 92-500 PP 2-2.
Section 3
Page 3-13 Misspell Straighten XEROX over to proper Page Width.
Page 3-15 Start text from Page 3-16 below the Table.
Page 3-18 Top line to Finish last Paragraph on Page 3-17.
Page 3-22 TITLE OF NATIONAL ASSOCIATION OF HOMEMULDERS REPORT!!!!!
Page 3-23 Paragraph ending with "...owing to the Lack of Knowledge of..." should be changed in wording to due to the lack of knowledge regarding..." (DANGLING Participle following the use of a Prepositional phrase as the sentence subject!! ught)
Page 3-25 Tables have a table on power plant land requirements.
Page 3-26 Almost left out that you need to say "as shown in Figure 5" on bottom line.
Page 3-36 drop text below table as new exists and fill with text from Page 3-38, at top.
Page 3-38 use underscore in deperation of the Lake Basin materials. or Capitalize (CAPITALIZE) Lake Basin names.
Page 3-52 all text to end of 4 Point list to Page 3-57.
Page 3-78 Figure 13 should be shaved under Table 11 3-74. It will fit.
Section 4
Page 4-4 Table 4-9 needs ratio increment totals published!!!!!!!!!
Page 4-9 Table 15 cut in single space text & add shove text from Page 4-10 below it, as this breaks the reader's train of thought this way.
Page 4-16 Same with table 16 Text from Page 4-15.
Page 4-17 Top points text to Page 4-16 bottom and table 17 same as tables 15&16.
Sections 5,6&7 Perfect as comments
Annex 1 Scrap it (see discussion after notes for page 1-24.

It has been my pleasure to review this Environmental Impact Statement and thank you for permitting and requesting my input.

Sincerely Yours
Frank A. Dazey Jr.

FAD/JR
PS: Please reiterate to Mr. Presser the letters we exchanged earlier in which I filled you in on my background circumstances. She seems to have her administrative wires crossed somewhat. I would be appreciative of some. Pardon my loose typewriter ribbon which needs changing but I don't have a new one yet.

**104. Dazey, p. 2**



NORTHWEST PENNSYLVANIA
REGIONAL PLANNING AND DEVELOPMENT COMMISSION

Suite 406
Biery Building
Franklin, Pa. 16323
PHONE: (814) 437-3024

ROBERT B. PARKER, JR. — CHAIRMAN
OAKLEY M. LAMB — VICE CHAIRMAN
CATHERINE CHRISTY — SECRETARY
CHRISTOPHER CAPOTIS — TREASURER
GLYNN J. KNIGHT — EXECUTIVE DIRECTOR

May 20, 1976

Mr. Frederick O. Rouse, Chairman
Great Lakes Basin Commission
P.O. Box 999
Ann Arbor, Michigan 48106

Re: Great Lakes Basin Commission
Framework Study

Dear Mr. Rouse:

On May 13, 1976, I discussed by telephone with a member of the Great Lakes Basin Commission Staff, the response that one of my staff members made concerning the Framework Study. That response was made in a letter to you from Geoffrey Kay, dated January 27, 1976.

Although this office does not have on file any environmental assessment information from the U.S. Army Corps of Engineers on the proposed breakwater project for Presque Isle, I have been assured by the Pennsylvania Department of Environmental Resources personnel that the environmental concerns expressed by Mr. Kay have been adequately resolved by the Corps.

I would hope that you would properly amend our original staff comments on this matter.

Sincerely,

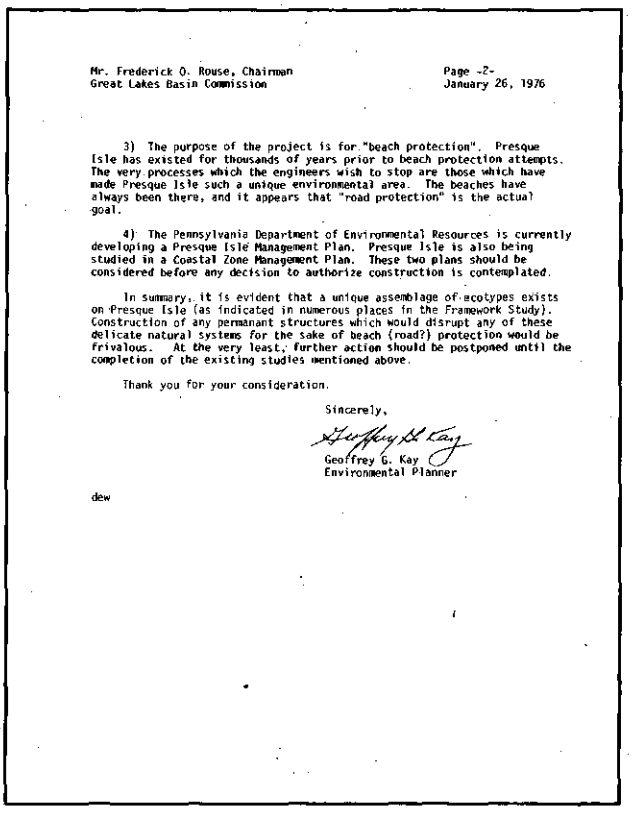
Glynn J. Knight
Executive Director

GJK/ljh

cc: C. H. McConnell, Deputy Secretary
Resources Management

UNIFORM REGION NO. 9
CLARION — CRAWFORD — ERIE — FOREST — LAWRENCE — MERCER — VENANGO — WARREN

**105. Northwest Pennsylvania Regional Planning and Development Commission**



Mr. Frederick O. Rouse, Chairman
Great Lakes Basin Commission

Page -2-
January 26, 1976

3) The purpose of the project is for "beach protection". Presque Isle has existed for thousands of years prior to beach protection attempts. The very processes which the engineers wish to stop are those which have made Presque Isle such a unique environmental area. The beaches have always been there, and it appears that "road protection" is the actual goal.

4) The Pennsylvania Department of Environmental Resources is currently developing a Presque Isle Management Plan. Presque Isle is also being studied in a Coastal Zone Management Plan. These two plans should be considered before any decision to authorize construction is contemplated.

In summary, it is evident that a unique assemblage of ecotypes exists on Presque Isle (as indicated in numerous places in the Framework Study). Construction of any permanant structures which would disrupt any of these delicate natural systems for the sake of beach (road?) protection would be frivalous. At the very least, further action should be postponed until the completion of the existing studies mentioned above.

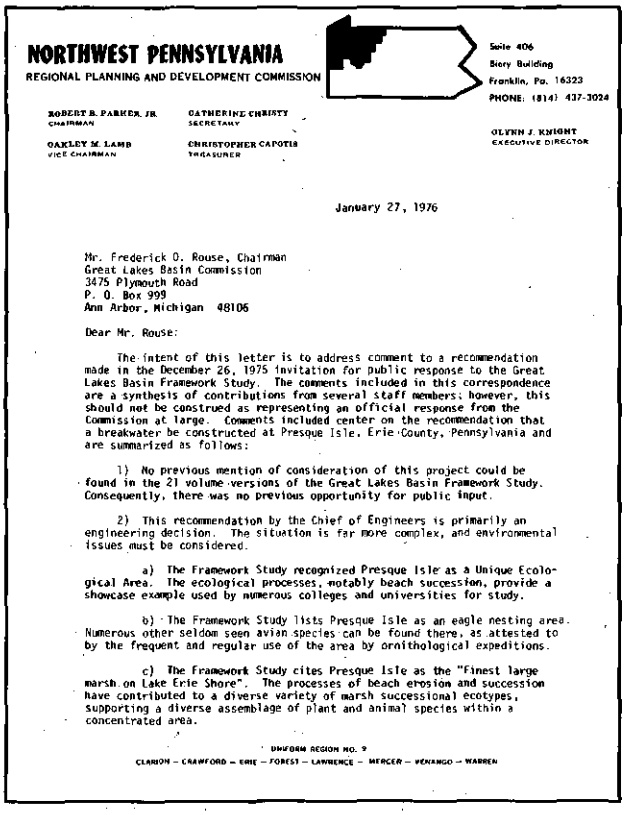
Thank you for your consideration.

Sincerely,

Geoffrey G. Kay
Environmental Planner

dew

**107. NPRPDC, p. 2**



NORTHWEST PENNSYLVANIA
REGIONAL PLANNING AND DEVELOPMENT COMMISSION

Suite 406
Biery Building
Franklin, Pa. 16323
PHONE: (814) 437-3024

ROBERT B. PARKER, JR. — CHAIRMAN
OAKLEY M. LAMB — VICE CHAIRMAN
CATHERINE CHRISTY — SECRETARY
CHRISTOPHER CAPOTIS — TREASURER
GLYNN J. KNIGHT — EXECUTIVE DIRECTOR

January 27, 1976

Mr. Frederick O. Rouse, Chairman
Great Lakes Basin Commission
3475 Plymouth Road
P. O. Box 999
Ann Arbor, Michigan 48106

Dear Mr. Rouse:

The intent of this letter is to address comment to a recommendation made in the December 26, 1975 invitation for public response to the Great Lakes Basin Framework Study. The comments included in this correspondence are a synthesis of contributions from several staff members; however, this should not be construed as representing an official response from the Commission at large. Comments included center on the recommendation that a breakwater be constructed at Presque Isle, Erie County, Pennsylvania and are summarized as follows:

1) No previous mention of consideration of this project could be found in the 21 volume versions of the Great Lakes Basin Framework Study. Consequently, there was no previous opportunity for public input.

2) This recommendation by the Chief of Engineers is primarily an engineering decision. The situation is far more complex, and environmental issues must be considered.

a) The Framework Study recognized Presque Isle as a Unique Ecological Area. The ecological processes, notably beach succession, provide a showcase example used by numerous colleges and universities for study.

b) The Framework Study lists Presque Isle as an eagle nesting area. Numerous other seldom seen avian species can be found there, as attested to by the frequent and regular use of the area by ornithological expeditions.

c) The Framework Study cites Presque Isle as the "Finest large marsh on Lake Erie Shore". The processes of beach erosion and succession have contributed to a diverse variety of marsh successional ecotypes, supporting a diverse assemblage of plant and animal species within a concentrated area.

UNIFORM REGION NO. 9
CLARION — CRAWFORD — ERIE — FOREST — LAWRENCE — MERCER — VENANGO — WARREN

**106. Northwest Pennsylvania Regional Planning and Development Commission**

Letters 105 & 106 discuss a proposed breakwater for beach protection at Presque Isle, Pennsylvania. This breakwater was among the Framework Study proposed recommendations published for public review. This specific project was not addressed within this Level A impact statement; however, these comments were reproduced in keeping with the Basin Commission's stated policy (see Foreword) of updating the EIS in light of public review and Framework Study recommendations.

TITLE GREAT LAKES BASIN FRAMEWORK STUDY: ENVIRONMENTAL IMPACT STATEMENT

| DATE DUE | BORROWER'S NAME |
|---|---|
| FEB 15 1980 | DAVIDSON 296-0656 |
| MAR 17 1980 | Renewed |
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