

Coastal Zone  
Information  
Center

COASTAL ZONE  
INFORMATION CENTER

# APPENDIX 17

## Wildlife

GB  
705  
.G73  
G74  
1976  
appendix  
v.17

GREAT LAKES BASIN FRAMEWORK STUDY

0 4331

# Great Lakes Basin Framework Study

## APPENDIX 17

### WILDLIFE

U. S. DEPARTMENT OF COMMERCE NOAA  
COASTAL SERVICES CENTER  
2234 SOUTH HOBSON AVENUE  
CHARLESTON, SC 29405-2413

**COASTAL ZONE  
INFORMATION CENTER**

Property of CSC Library

GREAT LAKES BASIN COMMISSION

---

Prepared by Wildlife Work Group

Sponsored by Bureau of Sport Fisheries and Wildlife

U.S. Department of the Interior

GB705 . G73 .54 1976 appendix. v. 17  
JUL 24 1997

Published by the Public Information Office, Great Lakes Basin Commission, 3475  
Plymouth Road, P.O. Box 999, Ann Arbor, Michigan 48106. Printed in 1975.

*Cover photo by Kristine Moore Meves.*

---

This appendix to the *Report of the Great Lakes Basin Framework Study* was prepared at field level under the auspices of the Great Lakes Basin Commission to provide data for use in the conduct of the Study and preparation of the *Report*. The conclusions and recommendations herein are those of the group preparing the appendix and not necessarily those of the Basin Commission. The recommendations of the Great Lakes Basin Commission are included in the *Report*.

The copyright material reproduced in this volume of the *Great Lakes Basin Framework Study* was printed with the kind consent of the copyright holders. Section 8, title 17, United States Code, provides:

The publication or republication by the Government, either separately or in a public document, of any material in which copyright is subsisting shall not be taken to cause any abridgement or annulment of the copyright or to authorize any use or appropriation of such copyright material without the consent of the copyright proprietor.

The Great Lakes Basin Commission requests that no copyrighted material in this volume be republished or reprinted without the permission of the author.

## 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

JUN 13 1975

## SYNOPSIS

Nearly all of the Great Lakes Basin is wildlife habitat. In the U.S. portion of the land area there are 75 million acres of habitat or resource base, out of a total of 84 million acres. The shoal waters in the U.S. portion of the Great Lakes total 610,000 acres, of which 491,000 acres are important to wildlife. All of the open waters are used from time to time by migrating waterfowl. The value of this habitat varies greatly, but the important consideration is that all nonurbanized land, some urban land, and all waters have some value to wildlife.

The eight kinds of Basin wildlife habitat include northern wilderness forests; farmland woodlots; blocks of eastern hardwood forests; river bottom woodlands; scrub and brush lands; open fields and meadows; cropland; and freshwater wetlands.

The supply of wildlife habitat other than cropland is generally good in the northern and far eastern areas of the Basin and only fair south of these areas. The country north of the Milwaukee-Buffalo line is forested and sparsely settled, while the Basin country south of this line is heavily settled and is primarily industrial and agricultural. The wide spectrum of wildlife that occupies this habitat can be grouped into the following major categories: big game, waterfowl, shorebirds, wading birds, songbirds, small game and furbearers. Some of these animals and birds are rare, some endangered, and some common.

The single most important factor affecting Basin wildlife and habitat is human population growth and the resultant increase in

land-use intensity. The current Basin population, 30 million people, is expected to increase to 53 million during the 50-year study period. Most of these people live in a belt through the southern tier of Basin States where the greatest increase will occur.

People cause two problems of greatest concern to wildlife managers—habitat degradation and loss. The population increase will cause a loss of a projected five million acres of wildlife habitat over the study period. Degradation is difficult to quantify. It is estimated that significant portions of the Basin wildlife habitat will be degraded by 2020.

Ironically, increased human populations also mean an increased demand for wildlife resources. The present demand for use of wildlife resources is 15 million man-days, and it is projected to increase to 33 million man-days in 2020. Hunter participation is growing more slowly than population so the demand figure projected for 2020 actually consists of more non-hunters than hunters.

Game and furbearer population trends and the environmental factors influencing them are felt to be generally indicative of those for nongame species associated with similar habitats. The use of game and furbearer data throughout the report reflects availability rather than an emphasis on this relatively small group of wildlife species.

To meet these demands and insure protection of wildlife habitat a number of recommendations are made, including the acquisition of 14 million acres of wildlife habitat.

## FOREWORD

Appendix 17, *Wildlife*, is intended primarily for use in plan formulation. It represents the combined effort of work group members, with greatest input from State members. In 1962 Senate Document No. 97, 87th Congress, directed close cooperation in planning by key Federal agencies "to the end that regional, State, and local objectives may be accomplished to the greatest extent consistent with national objectives." With the passage of PL 89-80, the Water Resources Planning Act of 1965, it was declared to be the policy of the Congress to encourage the conservation, development, and utilization of water and related land resources of the United States on a comprehensive and coordinated basis by the Federal government, States, local governments, and private enterprise with the cooperation of all affected Federal agencies and others concerned. To this end, the Great Lakes Basin Commission was created and the Wildlife Work Group formed to provide an inventory of the existing wildlife resources and a plan for their future use. The work group was directed by the U.S. Bureau of Sport Fisheries and Wildlife.

Members of the work group and alternates are as follows: Sumner A. Dole, Jr., work group chairman, and John C. Peterson, U.S. Bureau of Sport Fisheries and Wildlife; H. Gordon Hanson, U.S. Army Corps of Engineers; Francis J. Baker, U.S. Bureau of Outdoor Recreation; Robert Radtke, U.S. Forest Service; Charles Smith, U.S. Soil Conservation Service; Richard Lutz, Illinois; Edward Hanson

and Eugene Bass (alternate), Indiana; J. Mark Hargitt, Stanley R. Quackenbush, Ed Mikula, Dr. Norman F. Sloan and Arlow Boyce (alternate), Michigan; Jerome H. Kuehn, Joseph Sizer, and John Hall (alternate), Minnesota; Ralph S. Palmer (liason), Edgar M. Reilly, Robert F. Perry, Charles Mason (replaced R.F. Perry in March 1972), John A. Finck (information); Denton Aldrow (alternate), New York; Allen Cannon, Ohio; Nicholas Vukovich, Pennsylvania; and Frank King and Edward J. Frank (alternate), Wisconsin.

The appendix was prepared by Sumner A. Dole, Jr., John C. Peterson, and Kenneth A. Multerer, staff members of the Lebanon, Ohio, field office of the U.S. Bureau of Sport Fisheries and Wildlife. A number of persons in the Bureau of Sport Fisheries and Wildlife, several State employees, and representatives of several Federal agencies assisted the authors by providing information for the appendix.

This appendix is written to favor preservation and sound management of wildlife resources. We also understand that any "trade-offs" or losses of wildlife habitat to other planning interests are the responsibility of decision-making and policy-level government officials.

Notwithstanding prior agreements with other planning elements, terminology used in this appendix is that recognized by the majority of the work group, voting members from State and Federal fish and wildlife agencies.

## TABLE OF CONTENTS

	Page
OUTLINE .....	iii
SYNOPSIS .....	v
FOREWORD .....	vi
LIST OF TABLES .....	x
LIST OF FIGURES .....	xiv
INTRODUCTION .....	xvii
<b>1 BASIN DESCRIPTION .....</b>	<b>1</b>
1.1 Biophysical Characteristics .....	1
1.1.1 Lake Superior Basin .....	1
1.1.2 Lake Michigan Basin .....	1
1.1.3 Lake Huron Basin .....	2
1.1.4 Lake Erie Basin .....	2
1.1.5 Lake Ontario Basin .....	2
1.2 Demographic Considerations .....	3
<b>2 PRESENT STATUS OF WILDLIFE .....</b>	<b>5</b>
2.1 Basin Wildlife Populations and Trends .....	5
2.1.1 Minnesota .....	5
2.1.2 Wisconsin .....	5
2.1.3 Illinois .....	6
2.1.4 Indiana .....	6
2.1.5 Michigan .....	6
2.1.6 Ohio .....	7
2.1.7 Pennsylvania .....	8
2.1.8 New York .....	8
2.2 Wildlife Habitat and Trends .....	26
2.2.1 The Wildlife Habitat Base .....	26
2.2.2 Great Lakes Wetlands and Waterfowl .....	38
2.2.2.1 Introduction .....	38
2.2.2.2 Defining Wetlands .....	38
2.2.2.3 Wildlife and Great Lakes Wetlands .....	38
2.2.2.4 Waterfowl Use Patterns .....	54
2.2.2.5 National Wildlife Refuges .....	66
2.2.2.6 Status of Wetlands .....	67
2.3 Use of Wildlife Resources and Trends .....	72
2.3.1 Species Utilization .....	72
2.4 Existing Wildlife Problems .....	73
2.4.1 Basinwide Problems .....	73
2.4.2 Wildlife Problems in Each Planning Subarea .....	77
2.4.2.1 Planning Subarea 1.1, Minnesota and Wisconsin .....	77
2.4.2.2 Planning Subarea 2.1, Wisconsin .....	78

	Page
2.4.2.3 Planning Subarea 2.2, Wisconsin, Illinois, and Indiana .	79
2.4.2.4 Planning Subarea 2.3, Indiana and Michigan .....	80
2.4.2.5 Planning Subareas 1.2, 2.4, and 3.1, Michigan .....	82
2.4.2.6 Planning Subarea 3.2, Michigan .....	83
2.4.2.7 Planning Subarea 4.1, Michigan .....	84
2.4.2.8 Planning Subarea 4.2, Indiana and Ohio .....	85
2.4.2.9 Planning Subarea 4.3, Ohio .....	86
2.4.2.10 Planning Subarea 4.4, Pennsylvania and New York ....	90
2.4.2.11 Planning Subarea 5.1, New York .....	91
2.4.2.12 Planning Subarea 5.2, New York .....	92
2.4.2.13 Planning Subarea 5.3, New York .....	93
<b>3 FUTURE USE OF WILDLIFE RESOURCES .....</b>	<b>95</b>
3.1 Projected Human Populations .....	95
3.2 Projected Hunter Use .....	95
3.2.1 Projected Participants .....	95
3.2.1.1 Licensed Resident Use .....	95
3.2.1.2 Licensed Non-Resident Use .....	96
3.2.1.3 Unlicensed Use .....	96
3.2.1.4 Latent Demand .....	96
3.2.2 Projected Annual Use Rates Per Participant .....	97
3.2.3 Projected Gross Demand .....	97
3.2.4 Projected Net Demand .....	97
3.2.5 Planning Subareas: Hunters and Needs .....	97
3.2.6 Estimated Non-Hunter Use .....	100
<b>4 ALTERNATIVES FOR SATISFYING FUTURE REQUIREMENTS .....</b>	<b>101</b>
4.1 Capabilities of Wildlife Resources to Sustain Future Demands .....	101
4.2 Known Future Management Programs and Recommendations .....	101
4.2.1 Minnesota .....	101
4.2.1.1 Future Management Programs .....	101
4.2.1.2 Management Recommendations (Planning Subarea 1.1)	101
4.2.2 Wisconsin .....	102
4.2.2.1 Future Programs .....	102
4.2.2.2 Management Recommendations for Northern Forest Re-	
gion (Planning Subarea 1.1 and Northern Half of Plan-	102
ning Subarea 2.1) .....	
4.2.2.3 Management Recommendations for Farm and Urban	
Region (Planning Subarea 2.2 and Southern Half of Plan-	104
ning Subarea 2.1) .....	
4.2.3 Illinois .....	104
4.2.3.1 Known Future Management Programs .....	104
4.2.3.2 Management Recommendations (Planning Subarea 2.2)	104
4.2.4 Indiana .....	105
4.2.4.1 Future Management Programs .....	105
4.2.4.2 Management Recommendations (Planning Subareas 2.2,	
2.3, and 4.2) .....	105
4.2.5 Michigan .....	105
4.2.5.1 Future Programs .....	105
4.2.5.2 Management Recommendations for Southern Part of the	
State .....	106
4.2.5.3 Management Recommendations for Northern Part of the	
State .....	106

	Page
4.2.6 Ohio .....	107
4.2.6.1 Future Programs .....	107
4.2.6.2 Management Recommendations (Planning Subareas 4.2 and 4.3) .....	108
4.2.7 Pennsylvania .....	108
4.2.7.1 Future Management Programs (Planning Subarea 4.4) .	108
4.2.7.2 Management Recommendations (Planning Subarea 4.4)	109
4.2.8 New York .....	109
4.2.8.1 Future Programs .....	109
4.2.8.2 General Management Recommendations (Planning Sub- areas 4.4, 5.1, 5.2, and 5.3) .....	109
4.2.8.3 Waterfowl and Wetland Recommendations .....	109
4.2.8.4 Farm-Game Recommendations .....	110
4.2.8.5 Upland Game Recommendations .....	110
4.2.8.6 Big-Game Recommendations .....	110
4.2.8.7 Other Recommendations .....	110
4.2.8.8 Additional Recommendations Specific to Planning Sub- area 5.3 .....	111
4.3 Estimated State Budgets for the Study Period .....	111
SUMMARY .....	123
Status of Wildlife Resources (1970) .....	123
Future Use of Wildlife Resources (1980 to 2020) .....	124
General Basinwide Recommendations .....	124
GLOSSARY .....	127
BIBLIOGRAPHY .....	131
ADDENDUM .....	135
Methodology .....	135
Basic Data for Planning Subarea 4.2 .....	135
Computations .....	136
Determination of the Acreage Needs of the Wildlife User .....	139
Determination of Needed Acres in Planning Subarea 4.2 .....	140

## LIST OF TABLES

Table	Page
17-1 Population of Great Lakes Basin by Plan Area and Planning Subarea .	3
17-2 Status of Wildlife as of 1970, Planning Subarea 1.1, Minnesota and Wisconsin .....	11
17-3 Status of Wildlife as of 1970, Planning Subareas 2.1 and 2.2, Wisconsin	12
17-4 Status of Wildlife as of 1970, Planning Subarea 2.2, Indiana and Illinois	13
17-5 Status of Wildlife as of 1970, Planning Subarea 2.3, Indiana and Michigan	14
17-6 Status of Wildlife as of 1970, Planning Subareas 1.2 and 2.1, Michigan .	15
17-7 Status of Wildlife as of 1970, Planning Subarea 2.4 and 3.1, Michigan ..	16
17-8 Status of Wildlife as of 1970, Planning Subareas 3.2 and 4.1, Michigan .	17
17-9 Status of Wildlife as of 1970, Planning Subarea 4.2, Ohio .....	18
17-10 Status of Wildlife as of 1970, Planning Subareas 4.2, Indiana, and 4.3, Ohio	19
17-11 Status of Wildlife as of 1970, Planning Subarea 4.4, New York and Pennsylvania .....	20
17-12 Status of Wildlife as of 1970, Planning Subareas 5.1 and 5.2, New York	21
17-13 Status of Wildlife as of 1970, Planning Subarea 5.3, New York, Black River Valley and Central Tug Hill .....	22
17-14 Status of Wildlife as of 1970, Planning Subarea 5.3, New York, Tug Hill Transition and Western Adirondacks .....	23
17-15 Status of Wildlife as of 1970, Planning Subarea 5.3, New York, Adirondack Transition and Central Adirondacks .....	24
17-16 Status of Wildlife as of 1970, Planning Subarea 5.3, New York, St. Lawrence Plain and Eastern Ontario Plain .....	25
17-17 Total Acres and Percent of Farm and Forest Game Habitat by Planning Subarea in 1960 .....	26
17-18 Acres of Farm and Forest Game Habitat by State and Planning Subarea in 1960 .....	26
17-19 Acres of Public Lands Open to Hunting, Mid-1960s .....	27
17-20 State Parks and Recreation Areas, Mid-1960s .....	28
17-21 Determination of Supply Acres of Wildlife Habitat .....	29

Table	Page
17-22 Areas of Ecological Significance in Minnesota .....	31
17-23 Areas of Ecological Significance in Indiana .....	32
17-24 Areas of Ecological Significance in Wisconsin .....	33
17-25 Areas of Ecological Significance in Illinois .....	33
17-26 Areas of Ecological Significance in Michigan .....	34
17-27 Areas of Ecological Significance in Ohio .....	34
17-28 Areas of Ecological Significance in Pennsylvania .....	36
17-29 Areas of Ecological Significance in New York .....	36
17-30 Great Lakes and Connecting Waterways Shoal Acreages .....	54
17-31 Great Lakes Basin National Wildlife Refuges .....	67
17-32 National Wildlife Refuges in the Great Lakes Basin—Waterfowl and Public Use .....	67
17-33 Acres of Great Lakes Basin Coastal Wetlands of Significant Value to Fish and Wildlife .....	68
17-34 Total Hunters by Target Years in the Great Lakes Basin .....	73
17-35 Great Lakes Basin Projected Net Demands on Wildlife Habitat by Non- Consumptive Users by Target Years .....	73
17-36 Pennsylvania Game Harvest .....	74
17-37 Indiana Estimated Game Harvest .....	74
17-38 Illinois Estimated Game Harvest .....	74
17-39 Ohio Estimated Game Harvest .....	74
17-40 Minnesota Estimated Game Harvest .....	74
17-41 Wisconsin Estimated Game Harvest .....	74
17-42 Michigan Estimated Game Harvest .....	75
17-43 New York Game Harvest .....	75
17-44 Great Lakes Basin Fur Catch .....	76
17-45 Percent of Great Lakes Basin Habitat Base Lost to Urban Development	77
17-46 Cooperative Agreements in the Ohio Portion of Planning Subarea 4.2 .	86
17-47 Cooperative Agreements in Planning Subarea 4.3 .....	89
17-48 Total Hunters, Great Lakes Basin .....	95

Table	Page
17-49 Resident Licensed Hunters, Great Lakes Basin .....	96
17-50 Licenses and Gross and Net Demands for Hunting, Great Lakes Basin	98
17-51 Acres of Wildlife Habitat Needed to Satisfy Hunter Demands, Great Lakes Basin .....	99
17-52 Projected Net Demands on Wildlife Habitat by Non-Consumptive Users, Great Lakes Basin .....	99
17-53 Acres of Potentially Hunttable Land, Great Lakes Basin .....	100
17-54 Estimated Annual State Expenditures by Target Years, Planning Subarea 1.1, Minnesota .....	112
17-55 Estimated Annual State Expenditures by Target Years, Planning Subarea 1.1, Wisconsin .....	112
17-56 Estimated Annual State Expenditures by Target Years, Planning Subarea 2.1, Wisconsin .....	113
17-57 Estimated Annual State Expenditures by Target Years, Planning Subarea 2.2, Wisconsin .....	113
17-58 Estimated Annual State Expenditures by Target Years, Planning Subarea 2.2, Indiana .....	114
17-59 Estimated Annual State Expenditures by Target Years, Planning Subarea 2.3, Indiana .....	114
17-60 Estimated Annual State Expenditures by Target Years, Planning Subarea 4.2, Indiana .....	115
17-61 Estimated State Expenditures, Planning Subarea 2.3, Michigan .....	115
17-62 Estimated State Expenditures, Planning Subarea 3.2, Michigan .....	116
17-63 Estimated State Expenditures, Planning Subarea 4.1, Michigan .....	116
17-64 Estimated State Expenditures, Planning Subarea 2.4, Michigan .....	117
17-65 Estimated State Expenditures, Planning Subarea 2.1, Michigan .....	117
17-66 Estimated State Expenditures, Planning Subarea 1.2, Michigan .....	118
17-67 Estimated State Expenditures, Planning Subarea 3.1, Michigan .....	118
17-68 Estimated Annual State Expenditures by Target Years, Planning Subarea 4.2, Ohio .....	119
17-69 Estimated Annual State Expenditures by Target Years, Planning Subarea 4.3, Ohio .....	119
17-70 Estimated Annual State Expenditures by Target Years, Planning Subarea 4.4, Pennsylvania .....	120

Table		Page
17-71	Estimated Annual State Expenditures by Target Years, Planning Subarea 4.4, New York .....	120
17-72	Estimated Annual State Expenditures by Target Years, Planning Subarea 5.1, New York .....	121
17-73	Estimated Annual State Expenditures by Target Years, Planning Subarea 5.2, New York .....	121
17-74	Estimated Annual State Expenditures by Target Years, Planning Subarea 5.3, New York .....	122
17-75	Sample License Table .....	138
17-76	Sample Supply Areas Table, Planning Subarea 4.2 .....	138

## LIST OF FIGURES

Figure	Page
17-1 Great Lakes Region Planning Subareas .....	xviii
17-2 Typical Minnesota Forest Habitat in Planning Subarea 1.1 .....	5
17-3 Wildlife Habitat Zones, Planning Subarea 5.3, New York .....	10
17-4 Publicly Owned Lands Open to Hunting in Planning Subarea 1.1 as of 1970 .....	39
17-5 Publicly Owned Lands Open to Hunting in Planning Subarea 1.2 as of 1970 .....	40
17-6 Publicly Owned Lands Open to Hunting in Planning Subarea 2.1 as of 1970 .....	41
17-7 Publicly Owned Lands Open to Hunting in Planning Subarea 2.2 as of 1970 .....	42
17-8 Publicly Owned Lands Open to Hunting in Planning Subarea 2.3 as of 1970 .....	43
17-9 Publicly Owned Lands Open to Hunting in Planning Subarea 2.4 as of 1970 .....	44
17-10 Publicly Owned Lands Open to Hunting in Planning Subarea 3.1 as of 1970 .....	45
17-11 Publicly Owned Lands Open to Hunting in Planning Subarea 3.2 as of 1970 .....	46
17-12 Publicly Owned Lands Open to Hunting in Planning Subarea 4.1 as of 1970 .....	47
17-13 Publicly Owned Lands Open to Hunting in Planning Subarea 4.2 as of 1970 .....	48
17-14 Publicly Owned Lands Open to Hunting in Planning Subarea 4.3 as of 1970 .....	49
17-15 Publicly Owned Lands Open to Hunting in Planning Subarea 4.4 as of 1970 .....	50
17-16 Publicly Owned Lands Open to Hunting in Planning Subarea 5.1 as of 1970 .....	51
17-17 Publicly Owned Lands Open to Hunting in Planning Subarea 5.2 as of 1970 .....	52
17-18 Publicly Owned Lands Open to Hunting in Planning Subarea 5.3 as of 1970 .....	53

Figure	Page
17-19 Great Lakes Fall Migration Corridors of Diving Ducks .....	56
17-20 Great Lakes Fall Migration Corridors of Dabbling Ducks .....	57
17-21 Great Lakes Fall Migration Corridors of Canada Geese .....	58
17-22 Great Lakes Fall Migration Corridors of Blue and Snow Geese .....	59
17-23 Primary Waterfowl Use Area, Plan Area 1 .....	60
17-24 Primary Waterfowl Use Area, Plan Area 2 .....	61
17-25 Primary Waterfowl Use Area, Plan Area 3 .....	62
17-26 Primary Waterfowl Use Area, Plan Area 4 .....	63
17-27 Primary Waterfowl Use Area, Plan Area 5 .....	64
17-28 Great Lakes Basin National Wildlife Refuges .....	65
17-29 Cedar Point National Wildlife Refuge .....	69
17-30 Pointe Mouillee State Game Area Before Break in Barrier Beach, 1937.	70
17-31 Pointe Mouillee State Game Area After Break in Barrier Beach, Loss of Marshlands, 1957 .....	70
17-32 Pointe Mouillee State Game Area, Loss of Marshlands, 1970 .....	70
17-33 Marina and Boat Channel Construction Destroy Wetlands in Western New York .....	71
17-34 Wetlands Being Filled to Make Golf Course at Buck Pond, Beatty Point in Monroe County, New York .....	71
17-35 Industrial Development Threatens Round Pond, an Important Coastal Wetland West of Rochester, New York .....	71
17-36 Fill for Shipping and Docking Facilities Engulfing Marsh at Buffalo, New York .....	71
17-37 Canoga Marsh on Cayuga Lake .....	72
17-38 Sodus Bay Marsh on Lake Ontario .....	72
17-39 Forest Regeneration of the Same Site Over a 41-Year Period (1926-1967) in Cheboygan County, Michigan, 1926 .....	81
17-40 Forest Regeneration on the Same Site Over a 41-Year Period (1926-1967) in Cheboygan County, Michigan, 1967 .....	82
17-41 The Recent Shift to Monoculture Throughout Extensive Portions of Planning Subarea 4.2 Has Had an Adverse Effect on Wildlife .....	87
17-42 Stream Channelization of the Little Auglaize River, Paulding County, Ohio .....	87

Figure	Page
17-43 Stream Channelization of the Little Auglaize River, Paulding County, Ohio .....	88
17-44 Looking Across Little Auglaize from County Road 72 Bridge .....	88
17-45 Urban Encroachment—an Ever-Present Factor in Southern Great Lakes Wildlife Habitat .....	90
17-46 Two Satisfied Resident Pennsylvania Hunters .....	99
17-47 Typical Northern Wisconsin Potential Forest Game Habitat Treatment Site Showing Residual Aspen, Birch, and Maple Following a Commercial Aspen Harvest .....	103
17-48 Northern Wisconsin Forest Game Habitat .....	103

## INTRODUCTION

The study area includes portions of seven Great Lakes Basin States: Minnesota, Wisconsin, Illinois, Indiana, Ohio, Pennsylvania, New York, and all of Michigan. The scope of this Type I framework study includes inventory of the present wildlife resource situation, assessment of present State programs and plans for increased management, assessment of the losses in resource acreage and other problems, computation of present resource use, and projection of future use.

In keeping with the guidelines established by the Great Lakes Basin Commission, data and information in this report that are con-

sidered "present" are based on the year 1970 unless otherwise indicated.

The objectives of the study at the State level vary with each State and are keyed to the needs of each planning subarea. Although the *Great Lakes Basin Framework Study* emphasizes the study of river basin groups, the Great Lakes Basin Commission also considered the Great Lakes Region as 15 planning subareas, using county lines as boundaries. Since most available data on wildlife and its use (particularly hunting and trapping) are available on a State and county basis, this appendix is geared to the planning subareas.

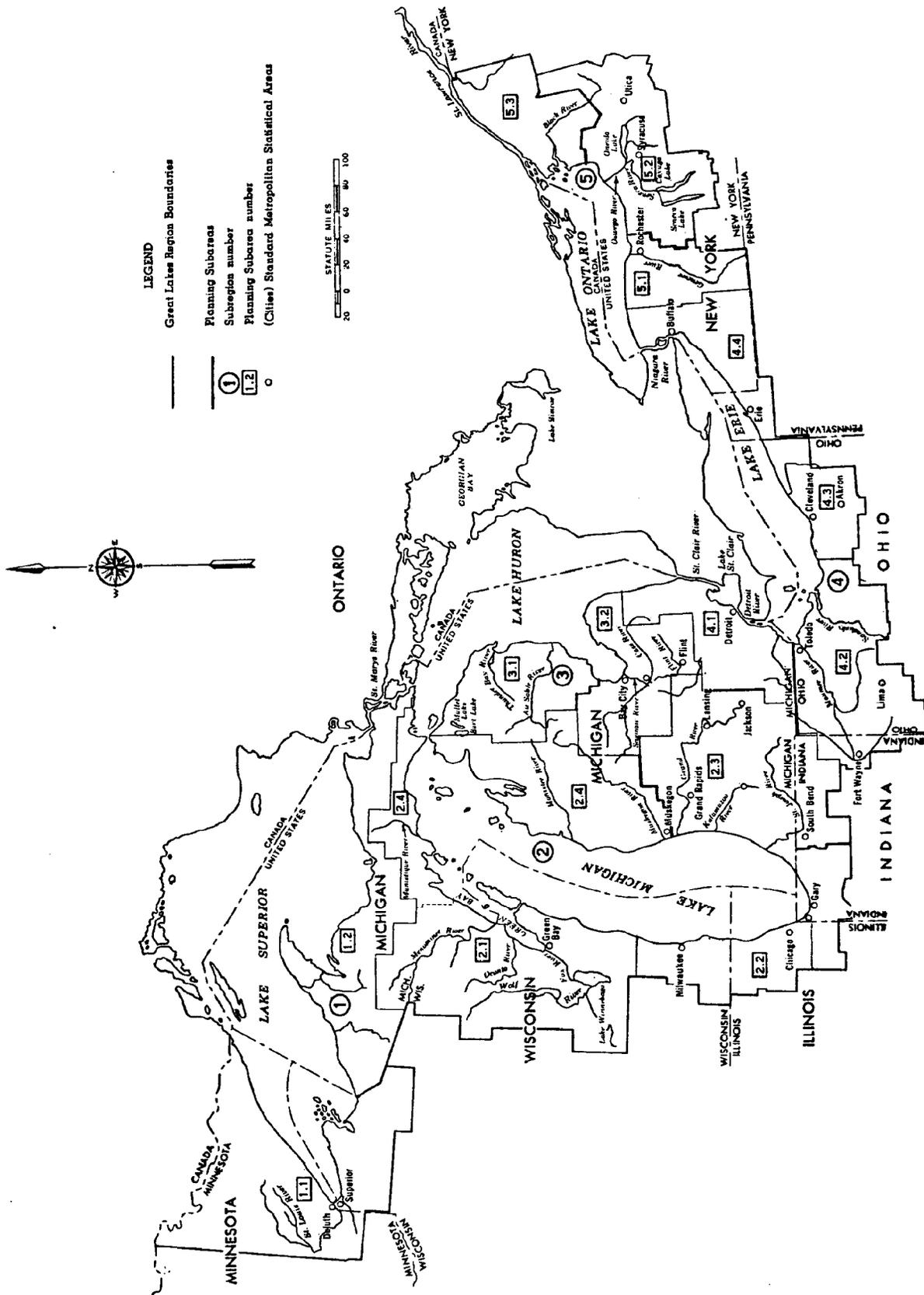


FIGURE 17-1 Great Lakes Region Planning Subareas

## Section 1

### BASIN DESCRIPTION

#### 1.1 Biophysical Characteristics

##### 1.1.1 Lake Superior Basin

This is the northernmost of the five Great Lakes basins and has ecological characteristics dissimilar to the others. Vegetative cover is predominantly a northern spruce-fir forest. Bogs and their associated plant species are common, as are aspen stands. Wetlands in this basin, with the exception of the St. Louis River area and a few others, are of low quality for waterfowl. The soils, waters, and the Lake itself are of low fertility because of the geology of the basin and its weather conditions. Like all of the Great Lakes basins, this basin was once glaciated. The northern extremities of the Great Lakes are part of what is referred to as the Laurentian Shield, where the glacier scoured the earth's surface deep enough to expose the granite substrata. Topsoils are thin and acidic and support only specialized plant species. Runoff is low in nutrients. Streams, lakes, and marshes are infertile and Lake Superior is a cold and infertile or oligotrophic lake.

The wildlife species of the basin reflect the soil types and plant ecology. There are fewer species, lower densities, and more specialization than elsewhere in the Great Lakes. Perhaps the timber wolf reflects this best. The wolf requires a vast unbroken wilderness with few human intrusions. He also requires white-tailed deer and moose populations as well as smaller mammals in sufficient numbers to sustain him through the winter. Other basin species include coyote, red fox, snowshoe hare, ruffed grouse, black bear, bald eagle, osprey, sharp-tailed grouse, woodcock, spruce grouse, bobcat, lynx, and furbearers including otter, fisher, beaver, mink, muskrat and pine marten.

The shorter growing season and colder climate, as well as precipitation amounts, have an important influence on the vegetative type. The tree, shrub, and other plant species found in the Lake Superior basin are adapted to the

climate. The harsh climate and poor soils have permitted less agricultural activity which has allowed the large forested areas to remain intact.

##### 1.1.2 Lake Michigan Basin

Lake Michigan and its extensive drainage basin encompass a wide variation in vegetative and climatological situations. The basin's northern extremities are forested with a spruce-fir biome on both sides of the Lake. South in Wisconsin the forest cover begins to change and gives way to agricultural lands at the Green Bay latitude. In Michigan, the forest cover extends further south, to approximately the Muskegon-Clare-Midland line. Land around the southern tip of the Lake (exclusive of urban areas) is completely agriculturalized with little tree cover remaining in Indiana and Illinois.

Wildlife species in the basin's northern areas are the same as those of Lake Superior basin with the exception of the very rare timber wolf. The black bear is found throughout the northern region. Farther south, wildlife species become less specialized. Farm game such as the ring-necked pheasant, cottontail rabbit, and gray and fox squirrel as well as big game, including the white-tailed deer and black bear, are common.

Planning Subarea 2.4 contains a pocket of prairie chicken habitat that supports a small population of these rare birds. Another rare species found in Planning Subarea 2.4 is the Kirtland's warbler, which nests in young pine forest lands. Bald eagles and ospreys, which used to be common in the Green Bay area and in the islands and bays on the opposite side of the Lake, are becoming less common but are still present seasonally. Remaining waterfowl marshes in the Green Bay area support nesting and loafing waterfowl. Significant waterfowl marshes exist in the Fox and Wolf River drainages and at Seney, Michigan. Small waterfowl marshes also exist at river mouths around the Lake.

Degraded habitat in the urbanized southern basin supports little wildlife. However, some paradoxes occur here. Large flocks of resting waterfowl are to be found off the Gary Steel complex during the fall. City parklands and forest preserves support small populations of rabbits, squirrels, furbearers, and numerous species of songbirds. These animals and birds are just as important as the wilderness species because they provide recreation and outdoor enjoyment in the urban areas.

### 1.1.3 Lake Huron Basin

The U.S. side of the Lake Huron basin is equally divided into two physiographic regions. The northern half is rolling and vegetated with a variety of cover types including northern forest jack pine and other timber, open grassy areas, wooded bogs, and brush lands. Many small lakes and marshes are present, and this region is interlaced with many streams of high fish and wildlife value. The southern half is generally flat terrain, heavily agriculturalized, and less wooded. Southern streams are slow-moving and of lower quality than northern streams, but wetlands important to wildlife are present.

The most outstanding physiographic feature is the Saginaw Bay complex. Many thousands of acres of fine waterfowl marsh surround the open waters of the Bay and extend inland up the Saginaw River system. The Bay is a nationally known waterfowl concentration area. Inland wetlands in the "Thumb" of Michigan also support nesting populations of geese and ducks.

The variety of wildlife species includes black bear, white-tailed deer, elk, turkey, sharp-tailed grouse, prairie chicken, mourning dove, ring-necked pheasant, woodcock, ruffed grouse, cottontail rabbit, snowshoe hare, gray squirrel, fox squirrel, aquatic and terrestrial furbearers, bobcat, waterfowl, shore birds, passerine birds and other songbirds. The endangered Kirtland's warbler nests in the basin. Eagles and osprey are also residents.

### 1.1.4 Lake Erie Basin

Erie, the southernmost of the Great Lakes, is the most fertile limnologically and morphologically. Historically, some of the largest expanses of fine waterfowl marsh in the U.S. existed here. Highly productive marshes, river mouths, and shoals still exist in the ba-

sin. Major unique features of the basin include the western shore marshes, Upper Sandusky River, Lake Erie Islands, Grand River Valley, Presque Isle Peninsula, Niagara Falls and several gorges in the eastern plateau. The Erie basin can be divided into eastern and western halves geologically. The flat lake plain of the west is heavily farmed and urbanized. Cover, where it is found, is brushy, consisting of idle farmland, small woodlots, and wooded stream bottoms. Stream gradients are very gentle and streams are wide, shallow, and slow-moving. The tree and shrub species are those of the eastern deciduous forest: oak, hickory, maple, beech, ash, elm, hawthorn, aspen, alder, and dogwood.

The very gently sloping character of the west end of the basin changes almost imperceptibly eastward, first to rolling country, then to plateaus and glaciated valleys in New York. Cover is much more extensive than in the western half of the basin. Tree and shrub species are the same as in the west but also include conifers—eastern hemlock, balsam fir, white pine—and shrub species associated with northern hardwoods, such as azalea, laurel and rhododendron. The basin's wildlife includes both those species adapted to farmed areas and low-to-medium populations of forest species. Although some white-tailed deer are found in the west, the Allegheny plateau in the east is the best forest habitat, with white-tailed deer, black bear, turkey, ruffed grouse and squirrels present. Probably the most important wildlife populations of the basin are the waterfowl located in the western basin and in scattered areas of the eastern basin.

### 1.1.5 Lake Ontario Basin

The Lake Ontario basin is the last in the Great Lakes drainage system and therefore the lowest in water level elevation. Relief in the basin, which includes the Adirondack Mountains, is the highest in the Great Lakes. The climate is relatively cool, and watershed fertility is low in the uplands.

A wide variation of sometimes complicated topographic features exists here. The level plain around the edge of the Lake gives way to rolling, glaciated topography. The uplands are plateaus or glaciated hills with steep slopes. Streams near the headwaters are fast-moving and cold, with high water quality.

Cover is good over most of the basin. Farming is restricted to localized areas of suitable soils, secondary forest cover remains

elsewhere. Tree species in its eastern half are those of the northern forests: balsam, fir, white pine, hemlock, birch, spruce, maple, and aspen. Tree species common to the deciduous forest are found at the lower elevations in the western half of the basin. The higher elevations of the western half also have the northern tree species.

Bays, river mouths, and shoreline estuaries in the St. Lawrence River include many thousands of acres of some of the finest freshwater marshes in New York State. There are also high quality inland marshes in the river systems, particularly downstream from the Finger Lakes and in the St. Lawrence Plain.

Wildlife species include waterfowl and shorebirds, farm and forest wildlife. White-tailed deer, black bear, ruffed grouse, and other forest species are found in medium densities. Cottontail rabbit, ring-necked pheas-

ant, gray and fox squirrels, and other farm-game species are found in medium-to-high densities. Wildlife habitat is varied and is generally of high quality.

Numerous areas throughout the marsh-island complex of the St. Lawrence River have unusual geologic, floral, and faunal features.

## 1.2 Demographic Considerations

Human populations are shown in Table 17-1 for the years 1940, 1950, 1960, 1970, 1980, 2000, and 2020. Most planning subarea projections indicate that populations will at least double during the study period. In three planning subareas, however, the increase ranges from a low of only 4 percent to a high of 35 percent for the 50-year period.

**TABLE 17-1 Population of Great Lakes Basin by Plan Area and Planning Subarea**

	Total Population (Thousands)						
	Census Final Count				Projections		
	1940	1950	1960	1970	1980	2000	2020
Great Lakes Basin Total	18,791	21,772	26,364	29,332	33,566	42,338	53,497
Plan Area 1.0	533	513	545	533	538	594	669
PSA 1.1	336	330	359	345	367	417	475
PSA 1.2	197	183	186	188	171	177	194
Plan Area 2.0	8,673	9,953	12,041	13,517	15,542	19,645	24,830
PSA 2.1	771	817	896	1,005	1,082	1,358	1,726
PSA 2.2	6,034	6,919	8,481	9,493	10,999	13,844	17,386
PSA 2.3	1,499	1,807	2,211	2,523	2,914	3,772	4,876
PSA 2.4	369	410	453	496	547	671	842
Plan Area 3.0	732	840	1,056	1,236	1,411	1,810	2,324
PSA 3.1	94	102	119	142	164	209	267
PSA 3.2	638	738	937	1,094	1,247	1,601	2,057
Plan Area 4.0	7,095	8,520	10,466	11,514	13,299	16,794	21,281
PSA 4.1	2,697	3,440	4,292	4,848	5,802	7,425	9,568
PSA 4.2	1,176	1,325	1,566	1,725	1,963	2,474	3,116
PSA 4.3	1,887	2,233	2,825	3,099	3,476	4,389	5,527
PSA 4.4	1,335	1,522	1,783	1,842	2,058	2,506	3,070
Plan Area 5.0	1,758	1,946	2,256	2,532	2,776	3,495	4,393
PSA 5.1	620	682	798	946	978	1,222	1,538
PSA 5.2	940	1,057	1,236	1,362	1,572	2,016	2,556
PSA 5.3	198	207	222	224	226	257	299

## Section 2

### PRESENT STATUS OF WILDLIFE

#### 2.1 Basin Wildlife Populations and Trends

#### 2.1.2 Wisconsin

##### 2.1.1 Minnesota

Long-term trends in the habitat are shown in Table 17-2. Plant succession changes have not benefited white-tailed deer and sharp-tailed grouse, and the population trend of these species is downward. The trend toward an increase in small-game species populations indicates conversion of forest land to agricultural and other uses. Historically strong species such as marten and fisher are making a strong comeback. Aquatic furbearers and waterfowl are not numerous, due to the low water fertility and lack of food plants and organisms. The area's most famous resident wildlife species, the timber wolf, remains stable over much of his range. A marked decrease in the deer herd could, however, reduce wolf populations.

Decreased quality of white-tailed deer habitat due to successional changes is reflected in Table 17-2. However, ruffed grouse and black bear populations are high. Grouse numbers, which tend to fluctuate, are difficult to correlate with the change in forest succession. However, decreases in aspen stands mean that as aspens give way to climax forest species, grouse populations will decline on the long term. The bear, on the other hand, is less affected by plant successional changes because it is more dependent on large blocks of undeveloped land which are plentiful in Planning Subarea 1.1.

Table 17-3 shows a more diverse habitat in the Wisconsin portion of Planning Subarea 2.1. Medium densities of farm-game species exist here, as compared to lower levels farther north. At the same time, medium and high densities of forest game also exist here. Me-



Courtesy of U.S. Bureau of Sport Fisheries and Wildlife



Courtesy of U.S. Bureau of Sport Fisheries and Wildlife

**FIGURE 17-2** Typical Minnesota Forest Habitat in Planning Subarea 1.1. (Left) Openings made by beaver ponds improve quality of wildlife habitat in extensive forest areas. (Right) Illustration of a good mixture of aspen and conifers. Young aspens are ideal food for wildlife.

dium densities of waterfowl and furbearers are supported by sizeable marshes.

Nearly uniform farm-game habitat exists in the southern Planning Subarea 2.2. Habitat near cities can both increase and decrease in value, since urbanization has a profound effect on wildlife populations. In the interim between cessation of farming and development, farmland reverts to an early successional (brushy) stage that temporarily improves habitat for wildlife such as cottontail rabbit, fox, raccoon and songbirds. However, high human populations exert enough pressure to preclude species with special habitat requirements such as the bobcat, beaver, and ruffed grouse (Table 17-3).

### 2.1.3 Illinois

Urbanization in the Illinois portion of Planning Subarea 2.2 has progressed to the point where only scattered areas of habitat support a diversity of wildlife species (Table 17-4). Habitat reduction by intense human pressure has reduced farm game and furbearers near the Chicago metropolitan area to low levels. White-tailed deer, surprisingly, are expanding their range in some counties. It is probable that this is due to adaptation to agricultural conditions, as well as increases in acres of brush lands in place of cultivated land.

### 2.1.4 Indiana

The same varied effects of urbanization on habitat are also evident in the Indiana portion of Planning Subarea 2.2 with increasing and decreasing populations of various species. Increases in cottontail rabbit and ring-necked pheasant populations reflected in Table 17-4 could be attributed to increased brushy habitat due to idle farms in the vicinity of cities. These increases will probably be temporary since idle farmland will soon be developed, with a resulting loss of habitat.

In Planning Subarea 2.3 the wildlife situation is much brighter (Table 17-5). Medium densities of white-tailed deer, small game, and furbearers, with a trend toward an increase in these species, and others, indicates that urbanization is not having much effect. Habitat in this part of Indiana is better than elsewhere in the lower tier of Basin states. A good diversity of habitat types exists, including wetlands, brushy land, meadows, cultivated land, sizeable tracts of woodland, lakes, and stream bottomlands.

The status of wildlife and its habitat in the three-county Indiana portion of Planning Subarea 4.2 is poor (Table 17-10).

### 2.1.5 Michigan

The status and density of wildlife species in the Upper Peninsula including Planning Subareas 1.2, 2.1, and 2.4 are shown by Tables 17-6 and 17-7, respectively. The full spectrum of northern Great Lakes forest wildlife exists here as well as healthy populations of farm game.

Changing forest succession is as important to wildlife here as it is in the western Great Lakes areas because similar trends in forest management and forest ecology are reducing the habitat value for wildlife.

White-tailed deer populations are of medium-to-low density and are slowly declining due to decreased habitat quality. Although ruffed grouse appear to be at a high point in their cycle, it is difficult to relate this high to habitat quality.

A fair interspersion of farmland exists in the Upper Peninsula of Michigan as is indicated by the presence of cottontail rabbits and pheasants. Waterfowl habitat is plentiful, but not all is of high quality. Furbearer populations are of medium-to-high density and in some cases are increasing. Marten and fisher have been reintroduced in the Upper Peninsula and are holding their own. The lynx has reestablished itself in the last two decades and is slowly increasing in numbers in remote parts of the Upper Peninsula.

The lower Peninsula has a much broader spectrum of wildlife habitats than the Upper Peninsula. Species diversity, density, and status for Planning Subareas 2.3, 2.4, 3.1, and 4.1 are noted in Tables 17-5, 17-7, and 17-8, respectively.

The northern half of the Lower Peninsula is nearly identical to the Upper Peninsula in habitat and species diversity. White-tailed deer and turkey populations are in better condition here, probably due to slightly better habitat. Forest succession changes have not been quite as detrimental here as farther north. Small-game populations are generally of medium density, with ruffed grouse increasing here as elsewhere in the Basin. Woodcock are also on the increase here, but since they are migratory, it is difficult to relate density to local habitat conditions.

Ring-necked pheasant densities are medium where suitable habitat occurs. At one time this bird was very common in the

Thumb-Saginaw Bay farmlands, but a decline in habitat quality has reduced the population.

A small population of rare prairie chickens appears to be losing its battle to declining habitat. Eagles and osprey are also becoming more rare. There is considerable scientific evidence that the decline of these birds is largely due to a chlorinated hydrocarbon-induced reproductive failure as a result of environmental contamination caused by the widespread use of pesticides. Other contributing causes are loss of habitat, human disturbance at nesting site, and illegal shooting.

The status of the Kirtland's warbler is uncertain. Joint private, State, and Federal habitat management has been initiated. However, the 1971 survey indicated that this has not been sufficient to prevent population decline. Further effort is being made to assure survival of this species, with particular attention being given to the problem of cowbird competition with Kirtland's warbler nest usage.

Most furbearers are doing well except in areas of marsh drainage and other habitat disturbances. The Canada lynx has not yet found its way south across the Straits of Mackinac or reestablished itself. Bobcat numbers are low-to-absent, which may indicate that while cat habitat exists, there are other limiting factors such as an inadequate food supply. Populations of the snowshoe hare, a prime prey species for both lynx and bobcat, are also low-to-absent. Like many other wildlife prey species the hare is highly cyclic. Wooded swamps, preferred habitat, are essential during lows in the cycle. Drainage of wooded wetlands can be very detrimental to this animal and other members of the food chain which depend upon this type of habitat.

The lower half of the Lower Peninsula has more homogeneous habitat than anywhere else in Michigan. With the exception of numerous wetlands, a mixture of woods and agricultural lands predominate. White-tailed deer, waterfowl, and small game are the major species. High deer populations indicate that Planning Subarea 3.2 (Table 17-8) probably has a higher percentage of woodland habitat than other southern Michigan planning subareas where white-tailed deer populations are medium or low. Reversion of former agricultural lands to brush in the vicinity of cities has increased the productivity of deer and other woodland game species in southern Michigan. Clean farming practices in some areas have been important factors in the decline of the pheasant from former high population levels.

Loss of marsh habitat is particularly impor-

tant to waterfowl and furbearers. Increased urbanization has resulted in either outright destruction of wetlands or degradation that reduces total productivity. Human disturbance of marshlands has resulted in the decline of populations of water-dependent wildlife in the Saginaw Bay area, St. Clair River, Lake St. Clair, Lake Erie shoreline, and inland southern Michigan. Although the remaining wetlands are still highly productive wildlife areas, there has been a noticeable reduction in total numbers of various species. This is especially true of herons, bitterns, rails, the sandhill crane, and shorebirds.

#### 2.1.6 Ohio

The density and status of wildlife populations in the Great Lakes Basin portion of Ohio are noted in Tables 17-9 and 17-10.

Planning Subarea 4.2 wildlife habitat has generally undergone the greatest detrimental change of all Basin planning subareas. Large-scale destruction of marshes has occurred in the past. More recently, changes in agriculture toward clean cultivation, larger equipment, and larger fields with the same crops each year have seriously reduced the value of other habitat types. Rabbits, pheasants, squirrels, and bobwhite quail are declining in this planning subarea, indicating that upland habitat is being reduced in productivity and quantity.

Raptorial birds are also declining in numbers. Part of their decline could be due to reduced prey species, but reproductive failure due to pesticides is undoubtedly a contributing factor.

The white-tailed deer increase in northwest Ohio is independent of declines in other wildlife species. Deer habitat here was under-occupied, but in recent years restrictive hunting regulations in Ohio and Michigan have helped the herd increase in size. Also, movement into Ohio from higher-density areas in the two adjoining States has been an important factor in increasing the population.

Furbearers are also losing ground as the quality of the marsh habitat declines due to water quality degradation. Muskrats in the northwest Ohio marshes are the principal reason for Ohio consistently having the second highest muskrat harvest in the United States. Loss of any significant amount of remaining habitat and consequent reduction of muskrats will result in local economic losses.

Habitat in the northeast quarter of Ohio definitely differs from the previously described

northwest quarter. A greater diversity of cover exists and the impact of agriculture is less intense. Unlike the northwest portion of the State, there are no large marshes and waterfowl habitat is scattered.

The forest cover in this area has not been appreciably reduced in recent years, but the timber stands are younger. Therefore, the value for white-tailed deer and other woodland game has increased. Northeast Ohio has medium densities of deer and ruffed grouse.

Change in ownership of nonurban land from agricultural to other private interests has resulted in many farms reverting to early successional stages. This is occurring on a broad scale in northeast Ohio, as elsewhere in the lower tier of Basin planning subareas, and has greatly improved upland game habitat. However, the decline in crop production has hurt the productivity of habitat for some seed-eating species, resulting in declines of the Ring-necked pheasant and bobwhite quail. Other wildlife species (with the exception of raptors, which are declining nearly everywhere) are doing well in this part of the State.

### 2.1.7 Pennsylvania

Wildlife habitat in Erie County, Pennsylvania, is similar to that in northeast Ohio. However, a transition occurs here. Eastward the land becomes more hilly and wooded. Declining farming is allowing the land to revert to early successional brush and young trees. Hawthorn thickets in former farm fields are common. Habitat value for upland game and white-tailed deer has increased in recent years.

Table 17-11 indicates density and status for the wildlife species in Erie County, Pennsylvania. White-tailed deer are at medium levels and stable, while ruffed grouse are high and increasing. Turkeys have been stocked and are found in low levels in the southeastern portion of the county. With the change in land use, some farm-game animals are declining. This county never had good pheasant habitat and populations are low. Mourning doves, also seed eaters, are at medium population densities and increasing.

Open water on Lake Erie and Erie Bay has declined in value for waterfowl due to pollution-caused reduction of food organisms. Ducks are still found in high numbers, but are decreasing. Furbearers in the inland marshes

and streams are doing well, with high populations of muskrat and beaver.

### 2.1.8 New York

Wildlife density and status for the New York portion of Planning Subarea 4.4 and Planning Subareas 5.1, 5.2, and 5.3 is noted in Tables 17-11, 17-12, and 17-13 through 17-16, respectively. A diversity of habitat exists across the New York portion of the basin, making it possible for a greater variety of wildlife to exist, as well as making the habitat more productive.

Wildlife habitat in Planning Subarea 4.4 is primarily of the farm-game type. It is located along the lake plain and hill country, extending northeast from the Pennsylvania line to the Lake Ontario shore. This land supports medium densities of most farm-game species except the mourning dove, which is of low density.

High-quality upland forest habitat is found in the southeast corner of the planning subarea. Medium white-tailed deer densities and occasional black bear and turkey (increasing) are indicators of the habitat quality. However, ruffed grouse populations are of low density here, in contrast to highs elsewhere in the Great Lakes Basin.

The Niagara River is an important waterfowl loafing and feeding area during migration. Scattered small wetlands are found mostly near the Lake Ontario shore, but none are of great importance.

Planning Subarea 5.1 is equally divided into forested uplands (southern half) and agriculturalized lowlands (northern half). The lowland portion contains numerous wetlands in lake bays and in inland areas.

Forest game populations in the southern half of the planning subarea, including white-tailed deer, black bear, turkey, and snowshoe hare, are of low-to-medium density. Turkey is increasing. Although high-quality forest habitat exists here, the bobcat is absent.

Farm game is doing well in the lowland portion of the Planning Subarea 5.1 and includes high pheasant populations and medium populations of cottontail rabbits, mourning doves, and squirrels. Woodcock populations are also of medium density. High pheasant populations, unusual in the basin, may indicate that changes in farming practices detrimental to habitat have not occurred here as extensively as they have elsewhere.

Many furbearers occur at medium densities in the shore marshes and the inland river associated marshes and streams.

To the east is Planning Subarea 5.2, a large area which encompasses a wide variety of habitats, including agricultural lands, small woodlots, idle farmlands, marshy stream bottoms, lake associated marshes, wooded river bottoms, and intermediate and mature forests. A broad urban belt bisects the planning subarea from east to west, and expansion of this zone is diminishing wildlife habitat. However, idle farmland is more common in the vicinity of urban areas, and increases in this acreage partially compensate for habitat losses.

A greater diversity of wildlife species exists here because of the variety of habitat types. Forest-game populations in the eastern and southern portions of the planning subarea are at low-to-medium densities. Black bears are common in the northern part of Herkimer County but occur only occasionally elsewhere, probably due to the proximity of humans. Bobcats are also found in low numbers in the forested portions of the planning subarea. Since these cats are moderately tolerant of humans, their presence is dependent on adequate second-growth hardwood and coniferous forests. Rodent and other mammal populations are necessary food sources to bobcats but are probably not a limiting factor here. Marten are occasionally seen in the planning subarea's coniferous forests. White-tailed deer are at medium density, and turkeys at low density but increasing. Other resident forest species include snowshoe hare, ruffed grouse, squirrels, and porcupines. The farm-game species, rabbit, ring-necked pheasant and mourning dove, are doing well. The woodcock is at medium density. Furbearers are also thriving. There is a high muskrat population and medium mink, weasel, beaver, raccoon, skunk and opossum populations; only the otter and fisher are at a low level. The planning subarea's plentiful wetland habitat is important to most furbearers as well as waterfowl. It is also important to the occasionally seen bald and golden eagles.

Planning Subarea 5.3 is the most complex region of the New York portion of the Great Lakes Basin. It includes a large part of the Adirondack Forest Preserve as well as a por-

tion of the St. Lawrence River island complex. Wildlife status and density figures are shown by zones (eight in all), because many differences in habitat types exist across the planning subarea (Tables 17-13 through 17-16 and Figure 17-3).

Forest-game populations vary. White-tailed deer populations vary from low to high, black bear from low to high, turkey from absent to low, and ruffed grouse from low to high. The more rare forest species such as bobcat, marten, fisher and spruce grouse range from absent to low. However, fisher populations range from medium to high in the three Adirondack zones shown in Figure 17-3.

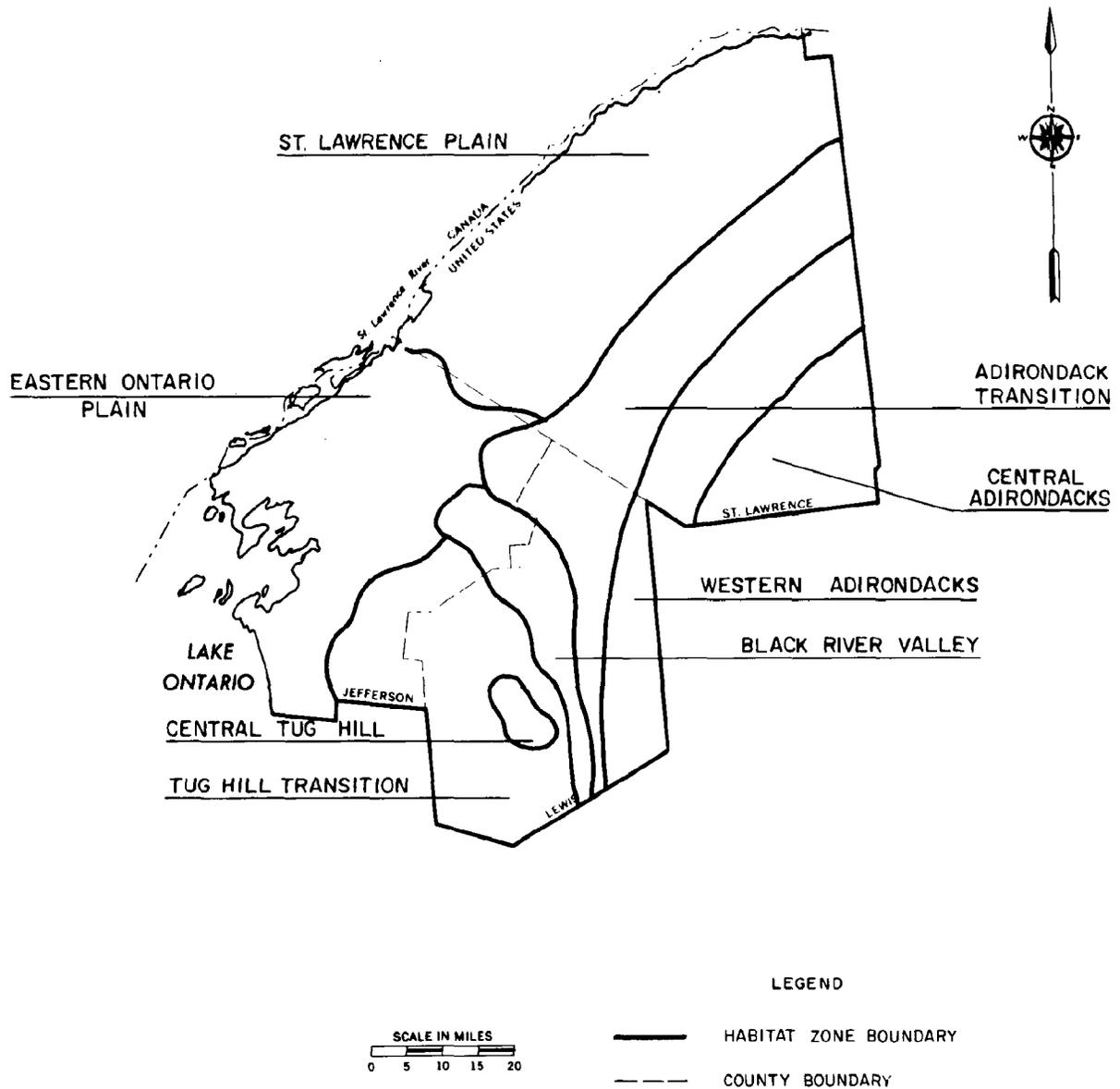
Furbearers are generally of medium density throughout the area, with some species at high levels in most zones. Mink and muskrat are common at high levels in the planning subarea. Otter population is also high in the western and central Adirondack zones, indicating high-quality stream habitat. The occurrence of other unusual wildlife species at high population levels is indicative of the high value of the wilderness habitat. One interesting species, the coyote, has become well established in Planning Subarea 5.3, adding more diversity to the fauna.

Although due to State policy no management practices can be carried out in the Adirondack Forest Preserve, there is benefit to wilderness-dwelling animals. These species are adapted to old growth and climax forests and do not need the diversity created by management practices.

Farm-game habitat is not as plentiful as forest and forest-transition habitat. Farm-game species are generally restricted to the farm lowlands along the Lake Ontario and St. Lawrence River shorelines. Cottontail populations vary from low to exceptionally high densities, and ring-necked pheasants and mourning doves are scarce. A fairly stable, huntable population of Hungarian partridge persists in several of the more active farming areas in this lowland zone.

The marshes of the St. Lawrence River and other river valleys support high populations of ducks and geese. Large wetland acreages in those areas serve as production areas as well as resting and feeding areas for migrating waterfowl.

*(continued on page 26)*



**FIGURE 17-3 Wildlife Habitat Zones, Planning Subarea 5.3, New York**

**TABLE 17-2 Status of Wildlife as of 1970, Planning Subarea 1.1, Minnesota and Wisconsin**

Class and Species	Planning Subarea 1.1--Minnesota			Planning Subarea 1.1--Wisconsin		
	Density	Trend	Notes	Density	Trend	Notes
<b>BIG GAME</b>						
White-tailed Deer	Medium	Decreasing	Due to forest succession and heavy snow	Medium	Decreasing	Douglas County best
Black Bear	High	Stable		High	Stable	Top harvest in State
Moose	High	Stable	High in suitable range	Low	Stable	Only area in State
<b>WATERFOWL</b>						
Ducks	Low	Stable	Poor waterfowl area	Low	Stable	
Geese	Low	Stable	Poor waterfowl area	Low	Stable	
<b>SMALL GAME</b>						
Ring-necked Pheasant	Low	Stable		Low	Stable	
Ruffed Grouse	High	Stable	Present top cycle	High	Stable	
Snowshoe Hare	Medium	Increasing		Medium	Stable	
Cottontail Rabbit	-----	-----		Low	Stable	
Sharp-tailed Grouse	Low	Decreasing		Low	Stable	Best range in State
Woodcock	Medium	Stable		High	Stable	
Mourning Dove	Low	Stable		Low	Stable	
Fox Squirrel	-----	-----		Low	Stable	
Gray Squirrel	-----	-----		Medium	Stable	
<b>FURBEARERS</b>						
Muskrat	Low	Stable		Medium	Stable	
Mink	Medium	Stable		Medium	Stable	
Beaver	Medium	Stable		High	Stable	
Weasel	Medium	Stable		Medium	Stable	
Raccoon	Low	Stable		Medium	Stable	
Otter	Medium	Stable		Medium	Stable	
Skunk	Low	Stable		Medium	Stable	
Opossum	-----	-----		Low	Stable	
Badger	-----	-----		Medium	Stable	
<b>NON-GAME</b>						
Woodchuck	Low	Stable		Low	Stable	
Porcupine	Medium	Stable		Medium	Stable	
Red Fox	Medium	Stable		Medium	Stable	
Gray Fox	Low	Stable		Low	Stable	
Bobcat	Low	Stable		Medium	Stable	
Crow	Low	Stable		Medium	Stable	
Raven	Medium	Stable		Medium	Stable	
Red Squirrel	Medium	Stable		Medium	Stable	
Coyote	Medium	Stable		Medium	Increasing	
Raptors	Medium	Stable		Medium	Stable	
<b>RARE(R) ENDANGERED(E) STATUS UNDETERMINED(S)<sup>1</sup></b>						
Eastern Timber Wolf (E)	Medium	Stable		Low	Stable	Rare-unknown packs
Pine Martin (S)	Low	Increasing		-----	-----	
Fisher (S)	High	Stable		Low	Increasing	
Canada Lynx (S)	Low	Stable		Low	Decreasing	
Bald Eagle (E) <sup>2</sup>	Low	Stable		Low	Decreasing	Downward trend
American Osprey (S)	Low	Stable		Low	Decreasing	Downward trend
Artic Peregrine Falcon (E)			Rare transient	Low	Decreasing	Migrant
Eastern Pigeon Hawk (S)			Rare transient	Medium	Decreasing	Occasional breeder
<b>UNUSUAL OR UNIQUE ANIMALS<sup>3</sup></b>						
Spruce Grouse	Low	Stable		Low	Stable	
Golden Eagle			Rare transient	Low	Decreasing	Occasional migrant
Sandhill Crane	-----	-----		Low	Stable	

<sup>1</sup> Rare and Endangered Fish and Wildlife of the United States, U.S. Bureau of Sport Fisheries and Wildlife. 1968 Edition. Also based on February 1972 data from the Bureau's Office of Endangered Species.

<sup>2</sup> For the purposes of this appendix the northern and southern subspecies of bald eagle are listed as bald eagle, the endangered status being the important consideration.

<sup>3</sup> Animal species considered to be unusual or unique on a regional, State, or planning subarea basis.

TABLE 17-3 Status of Wildlife as of 1970, Planning Subareas 2.1 and 2.2, Wisconsin

Class and Species	Planning Subarea 2.1--Wisconsin			Planning Subarea 2.2--Wisconsin		
	Density	Trend	Notes	Density	Trend	Notes
<b>BIG GAME</b>						
White-tailed Deer	Varied	Stable	Mod.--Brown County & S.E. of PSA. High--Marquette, Waushara, & Shawano Counties	Low	Stable	
Black Bear	Medium	Stable	Only north of line	-----	-----	
Turkey	Low	Stable	Local populations only	-----	-----	
<b>WATERFOWL</b>						
Ducks	Medium	Increasing	SE--high; N--low	Medium	Stable	
Geese	Medium	Increasing	SE--high; N--low	Medium	Stable	
<b>SMALL GAME</b>						
Cottontail Rabbit	Medium	Stable		Medium	Stable	
Ring-necked Pheasant	Varied	Stable	High--Fond Du Lac & Winnebago Counties None--Forest, Florence & Menominee	Medium	Stable	High--Racine & Kenosha Counties.
Ruffed Grouse	Varied	Stable	Low--Brown, Fond Du Lac, Manitowoc, & Winnebago Counties	Low	Stable	Only--Ozaukee & Washington Counties
Gray Squirrel	Medium	Stable		Medium	Stable	
Fox Squirrel	Varied	Stable	Common in S; uncommon in N	Medium	Stable	
Snowshoe Hare	Varied	Stable	None--S Counties	-----	-----	
Sharp-tailed Grouse	Low	Decreasing		-----	-----	
Woodcock	Medium	Stable		Low	Stable	
Mourning Dove	Varied	Stable	More--S Counties	Medium	Stable	
Bobwhite Quail	Low	Stable		Low	Stable	
Hungarian Partridge	Medium	Stable	Most--Brown, Calumet, & Kewaunee Counties	Low	Decreasing	
<b>FURBEARERS</b>						
Muskrat	High	Stable		Medium	Stable	
Mink	Medium	Stable		Medium	Stable	
Beaver	Varied	Increasing	Low--7 SE Counties	-----	-----	
Weasel	Medium	Stable		Medium	Stable	
Raccoon	High	Increasing		High	Increasing	
Otter	Varied	Stable		-----	-----	
Skunk	Medium	Stable		High	Stable	
Opossum	Medium	Stable		High	Stable	
Badger	Low	Stable		Low	Stable	
<b>NON-GAME</b>						
Woodchuck	Medium	Stable		Medium	Increasing	
Porcupine	Varied	Stable	Low/none--7 SE Counties	-----	-----	
Red Fox	Medium	Stable		Medium	Stable	
Gray Fox	Low	Stable		Low	Stable	
Bobcat	Low	Stable	Low--7 SE Counties	-----	-----	
Crow	Medium	Stable		Medium	Stable	
Red Squirrel	Medium	Stable		Low	Stable	Some --N Counties
Raven	Medium	Stable		-----	-----	
Raptors	Medium	Decreasing		Medium	Stable	
Coyote	Varied	Stable	Low--7 SE Counties	-----	-----	
<b>RARE (R) ENDANGERED (E) STATUS UNDETERMINED (S)<sup>1</sup></b>						
Fisher (S)	Low	Increasing	Local populations	-----	-----	
Canada Lynx (S)	Low	Stable	Very rare	-----	-----	
Bald Eagle (E) <sup>2</sup>	Low	Decreasing	Some inland hatches	Low	Decreasing	Rare Migrant
American Osprey (S)	Low	Decreasing	Downward trend	Low	Decreasing	No breeders, some migrants
Arctic Peregrine Falcon (E)	Low		Rare Migrant	Low		Rare Migrant
No. Gr. Prairie Chicken (R)	Low	Decreasing	Marquette & Waushara Counties	-----	-----	
Eastern Pigeon Hawk (S)	Medium	Stable	Breeds some	Medium	Stable	Migrant
<b>UNUSUAL OR UNIQUE ANIMALS<sup>3</sup></b>						
Sandhill Crane	Varied	Increasing	S only; most--SW in Green Lake & Waushara Counties	Low	Stable	
Spruce Grouse	Low	Increasing		-----	-----	
Golden Eagle	Low	Decreasing	Rare migrant	Low		Very rare migrant

<sup>1</sup>Rare and Endangered Fish and Wildlife of the United States, U.S. Bureau of Sport Fisheries and Wildlife, 1968 Edition  
Also based on February 1972 data from the Bureau's Office of Endangered Species.

<sup>2</sup>For the purposes of this appendix the northern and southern subspecies of bald eagle are listed as bald eagle, the endangered status being the important consideration.

<sup>3</sup>Animal species considered to be unusual or unique on a regional, State, or planning subarea basis.

TABLE 17-4 Status of Wildlife as of 1970, Planning Subarea 2.2, Indiana and Illinois

Class and Species	Planning Subarea 2.2--Indiana			Planning Subarea 2.2--Illinois (see note)		
	Density	Trend	Notes	Density	Trend	Notes
<b>BIG GAME</b>						
White-tailed Deer	Medium	Increasing		Medium	Increasing	Inc. some counties. Expanding range
<b>WATERFOWL</b>						
Ducks	Medium	Decreasing	Down 1970-71	Medium	Decreasing	Depends on annual Canada production
Geese	Low	Decreasing	Down 1970-71	High	Increasing	Depends on annual Canada production
<b>SMALL GAME</b>						
Cottontail Rabbit	Low	Increasing	Up 1969-70	Low	Decreasing	Low due to urbanization and habitat destruction
Ring-necked Pheasant	Medium	Increasing	Up 1969-70	Medium	Decreasing	Low due to urbanization and habitat destruction
Gray Squirrel	Low	Stable		Medium	Stable	
Fox Squirrel	Medium	Stable		Medium	Increasing	State upward trend
Woodcock	Low	Stable		Low	Stable	
Mourning Dove	Medium	Stable		High	Decreasing	
Bobwhite Quail	Low	Increasing	Up 1969-70	Medium	Decreasing	
Hungarian Partridge	-----	-----		Low	Stable	Expanding southward
<b>FURBEARERS</b>						
Muskrat	Medium	Stable		Medium	Stable	
Mink	Low	Stable		Low	Decreasing	
Beaver	Medium	Stable		Medium	Increasing	
Weasel	Low	Stable		Low	Decreasing	
Raccoon	Medium	Stable		Medium	Increasing	
Skunk	Low	Stable		Low	Stable	
Opossum	Medium	Stable		Medium	Stable	
Badger	Low	Decreasing		Low	Decreasing	
<b>NON-GAME</b>						
Woodchuck	Medium	Stable		Medium	Decreasing	
Red Fox	Medium	Decreasing		Low	Stable	
Gray Fox	Medium	Increasing		Low	Decreasing	
Crow	Low	Stable		Low	Decreasing	
Red Squirrel	Low	Stable				May be extinct
Coyote	Low	Stable		Low	Stable	
Raptors	Medium	Decreasing		Low	Decreasing	
<b>RARE (R) ENDANGERED (E) STATUS UNDETERMINED (S)<sup>1</sup></b>						
Bald Eagle (E) <sup>2</sup>	Low	Decreasing		Low	Decreasing	No breeders, some migration
American Osprey (S)	Low	Stable	Occasional	Low	Decreasing	No breeders, some migration
No.Gr. Prairie Chicken (R)			Last record--1970	-----	-----	
Eastern Pigeon Hawk (S)	Low	Stable				Very rare in State
Arctic Peregrine Falcon (E)	-----	-----		Low	Decreasing	No breeders, some migration
<b>UNUSUAL OR UNIQUE ANIMALS<sup>3</sup></b>						
Sandhill Crane	Low	Stable		-----	-----	
Golden Eagle	Low	Decreasing		Low		Some migration

Note: Planning Subarea 2.2 in Illinois is unique due to boggy cattail marshes, especially in Lake County. This is the only breeding area for the following Illinois birds: yellow-headed blackbird, Wilson's phalarope, Forster's tern, common tern, Wilson's snipe, Leconte's sparrow, mourning warbler, chestnut-sided warbler, veery, Brewer's blackbird, piping plover; also the only breeding records for canvasback, ruddy duck, pintail, black duck and shoveler are from this area.

<sup>1</sup> Rare and Endangered Fish and Wildlife of the United States, U.S. Bureau of Sport Fisheries and Wildlife, 1968 Edition. Also based on February 1972 data from the Bureau's Office of Endangered Species.

<sup>2</sup> For the purposes of this appendix the northern and southern subspecies of bald eagle are listed as bald eagle, the endangered status being the important consideration.

<sup>3</sup> Animal species considered to be unusual or unique on a regional, State, or planning subarea basis.

TABLE 17-5 Status of Wildlife as of 1970, Planning Subarea 2.3, Indiana and Michigan

Class and Species	Planning Subarea 2.3--Indiana			Planning Subarea 2.3--Michigan		
	Density	Trend	Notes	Density	Trend	Notes
<b>BIG GAME</b>						
White-tailed Deer	Medium	Increasing		Medium	Increasing	
Turkey	-----	-----		Low	Stable	
<b>WATERFOWL</b>						
Ducks	Medium	Decreasing		Medium	Increasing	
Geese	Low	Decreasing		High	Stable	
<b>SMALL GAME</b>						
Cottontail Rabbit	Low	Increasing	Up 1969-70	High	Stable	
Ring-necked Pheasant	Low	Stable		Medium	Stable	
Ruffed Grouse	Low	Stable	Some sightings in St. Joseph County	Low	Stable	
Gray Squirrel	Low	Stable		Low	Increasing	
Fox Squirrel	Medium	Stable		High	Stable	
Woodcock	Low	Stable		Low	Stable	
Mourning Dove	Low	Stable		Medium	Increasing	
Bobwhite Quail	Low	Increasing	Up 1969-70	Medium	Stable	
Hungarian Partridge	Low	Decreasing		Low	Stable	
<b>FURBEARERS</b>						
Muskrat	Medium	Stable		Medium	Stable	
Mink	Low	Stable		Medium	Stable	
Beaver	Low	Stable		Low	Decreasing	
Weasel	Low	Stable		Medium	Stable	
Raccoon	Medium	Stable		High	Stable	
Skunk	Low	Stable		Medium	Stable	
Opossum	Medium	Stable		Medium	Stable	
Badger	-----	-----		Low	Stable	
<b>NON-GAME</b>						
Woodchuck	Medium	Stable		Medium	Stable	
Red Fox	Medium	Stable		Medium	Stable	
Gray Fox	Medium	Increasing		Low	Stable	
Crow	Low	Stable		Medium	Increasing	
Red Squirrel	Low	Stable		Medium	Stable	
Coyote	Low	Stable		Low	Stable	
Raptors	Low	Decreasing		Medium	Stable	
<b>RARE(R) ENDANGERED(E) STATUS UNDETERMINED(S)<sup>1</sup></b>						
Bald Eagle (E) <sup>2</sup>	Low	Decreasing		-----	-----	
American Osprey (S)	Low		Occasional	-----	-----	
E. Pigeon Hawk (S)	Low	Stable	Occasional			Rare transient
Indiana Bat (E)			Unknown	-----	-----	
<b>UNUSUAL OR UNIQUE ANIMALS<sup>3</sup></b>						
Golden Eagle	Low	Decreasing				Rare transient
Sandhill Crane	-----	-----		Medium	Stable	

<sup>1</sup> Rare and Endangered Fish and Wildlife of the United States, U.S. Bureau of Sport Fisheries and Wildlife, 1968 Edition. Also based on February 1972 data from the Bureau's Office of Endangered Species.

<sup>2</sup> For the purpose of this appendix the northern and southern subspecies of bald eagle are listed as bald eagle, the endangered status being the important consideration.

<sup>3</sup> Animal species considered to be unusual or unique on a regional, State, or planning subarea basis.

TABLE 17-6 Status of Wildlife as of 1970, Planning Subareas 1.2 and 2.1, Michigan

Class and Species	Planning Subarea 1.2--Michigan			Planning Subarea 2.1--Michigan		
	Density	Trend	Notes	Density	Trend	Notes
<b>BIG GAME</b>						
White-tailed Deer	Medium	Decreasing		Medium	Decreasing	
Black Bear	Medium	Stable		Medium	Stable	
Moose	Low	Stable		-----	-----	
Turkey	-----	-----		Low	Increasing	
<b>WATERFOWL</b>						
Ducks	Medium	Stable		Medium	Increasing	
Geese	Medium	Increasing		Low	Increasing	
<b>SMALL GAME</b>						
Cottontail Rabbit	Low	Stable		Low	Decreasing	
Ruffed Grouse	High	Increasing		Medium	Increasing	
Gray Squirrel	Low	Stable		Low	Stable	
Fox Squirrel	Low	Stable		Low	Stable	
Sharp-tailed Grouse	Low	Decreasing		Low	Decreasing	
Woodcock	High	Increasing		High	Increasing	
Mourning Dove	Low	Stable		Low	Stable	
Snowshoe Hare	Medium	Stable		High	Stable	
Ring-necked Pheasant	-----	-----		Low	Stable	
<b>FURBEARERS</b>						
Muskrat	Low	Stable		Medium	Stable	
Mink	Low	Stable		Medium	Stable	
Beaver	Medium	Stable		Medium	Stable	
Weasel	Low	Stable		Medium	Stable	
Raccoon	Low	Stable		Low	Stable	
Otter	Low	Decreasing		Low	Decreasing	
Skunk	Low	Stable		Low	Stable	
Badger	-----	-----		Low	Stable	
<b>NON-GAME</b>						
Woodchuck	Low	Stable		Low	Stable	
Porcupine	High	Stable		High	Stable	
Bobcat	Medium	Decreasing		Low	Decreasing	
Crow	Medium	Stable		Medium	Stable	
Raven	Low	Stable		Low	Stable	
Red Squirrel	Medium	Stable		Medium	Stable	
Coyote	Medium	Stable		Medium	Stable	
Red Fox	-----	-----		Low	Stable	
Raptors	Medium	Stable		Medium	Stable	
<b>RARE(R) ENDANGERED(E) STATUS UNDETERMINED(S)<sup>1</sup></b>						
Eastern Timber Wolf (E)	Low	Stable		Low	Stable	
Pine Martin (S)	Low	Stable		Low	Stable	
Fisher (S)			Recent reintroduction	-----	-----	
Canada Lynx (S)	Low	Stable				
Bald Eagle (E) <sup>2</sup>	Low	Decreasing		Low	Decreasing	
American Osprey (S)	Low	Decreasing		Low	Decreasing	
Arctic Peregrine Falcon (E)			Rare transient			Rare migrant
Eastern Pigeon Hawk (S)	-----	-----				Rare transient
<b>UNUSUAL OR UNIQUE ANIMALS<sup>3</sup></b>						
Sandhill Crane	Low	Stable		Low	Stable	
Spruce Grouse	Medium	Stable		Low	Stable	
Golden Eagle			Rare transient			Rare transient

<sup>1</sup>Rare and Endangered Fish and Wildlife of the United States, U.S. Bureau of Sport Fisheries and Wildlife, 1968 Edition. Also based on February 1972 data from the Bureau's Office of Endangered Species.

<sup>2</sup>For the purposes of this appendix the northern and southern subspecies of bald eagle are listed as bald eagle, the endangered status being the important consideration.

<sup>3</sup>Animal species considered to be unusual or unique on a regional, State, or planning subarea basis.

TABLE 17-7 Status of Wildlife as of 1970, Planning Subareas 2.4 and 3.1, Michigan

Class and Species	Planning Subarea 2.4--Michigan			Planning Subarea 3.1--Michigan		
	Density	Trend	Notes	Density	Trend	Notes
<b>BIG GAME</b>						
White-tailed Deer	Medium	Decreasing		Medium	Decreasing	
Black Bear	Low	Decreasing		Low	Decreasing	
Moose	Low	Increasing		-----	-----	
Turkey	Low	Increasing		Varied	Increasing	Low/medium density
Elk	-----	-----		Low	Varied	Stable/increase trend
<b>WATERFOWL</b>						
Ducks	Medium	Stable		Medium	Stable	
Geese	Medium	Increasing		Low	Stable	
<b>SMALL GAME</b>						
Cottontail Rabbit	High	Stable		Medium	Stable	
Ring-necked Pheasant	Low	Stable		Low	Stable	Occasionally seen
Ruffed Grouse	High	Increasing		High	Stable	
Cray Squirrel	Medium	Increasing		Medium	Increasing	
Fox Squirrel	Medium	Increasing		Medium	Stable	
Snowshoe Hare	Low	Decreasing		Varied	Stable	Low/medium density
Woodcock	High	Increasing		High	Increasing	
Mourning Dove	Medium	Stable		Medium	Increasing	
Bobwhite Quail	Low	Stable		-----	-----	
Sharp-tailed Grouse	Low	Decreasing	Upper Peninsula	-----	-----	
<b>FURBEARERS</b>						
Muskrat	Medium	Decreasing		Medium	Stable	
Mink	Medium	Stable		Medium	Stable	
Beaver	High	Stable		High	Increasing	
Weasel	Medium	Stable		Medium	Decreasing	
Raccoon	High	Increasing		Medium	Increasing	
Otter	Low	Decreasing		Low	Decreasing	
Skunk	High	Increasing		High	Increasing	
Opossum	Medium	Increasing		Low	Increasing	
Badger	Low	Stable		Low	Stable	
<b>NON-GAME</b>						
Woodchuck	Medium	Stable		High	Stable	
Porcupine	Low	Decreasing		Medium	Decreasing	
Red Fox	Medium	Stable		Medium	Stable	
Bobcat	Low	Decreasing		Low	Decreasing	
Crow	High	Increasing		High	Stable	
Raven	Low	Stable		Medium	Stable	
Red Squirrel	Medium	Increasing		Medium	Stable	
Coyote	Low	Stable		Medium	Stable	
Raptors	Medium	Stable		Medium	Stable	
<b>RARE(R) ENDANGERED(E) STATUS UNDETERMINED(S)<sup>1</sup></b>						
Bald Eagle (E) <sup>2</sup>	Low	Decreasing		Low	Stable	
American Osprey (S)	Low	Decreasing		Low	Stable	
No. Gr. Prairie Chicken (R)	Low	Decreasing	Missaukee and Osceola Counties	Low	Decreasing	
Kirtlands Warbler (E)	Low	Decreasing		Low	Decreasing	Iosco County
Eastern Pigeon Hawk (S)			Rare transient			Rare transient
Canada Lynx (S)	Low	Increasing	Upper Peninsula	-----	-----	
<b>UNUSUAL OR UNIQUE ANIMALS<sup>3</sup></b>						
Sandhill Crane	Low	Increasing		Low	Stable	
Spruce Grouse	Low	Stable		Low	Stable	
Golden Eagle			Rare transient			Rare transient
Sharp-tailed Grouse	Low	Decreasing	Lower Peninsula	Low	Decreasing	

<sup>1</sup> Rare and Endangered Fish and Wildlife of the United States, U.S. Bureau of Sport Fisheries and Wildlife, 1968 Edition. Also based on February 1972 data from the Bureau's Office of Endangered Species.

<sup>2</sup> For the purpose of this appendix the northern and southern subspecies of bald eagle are listed as bald eagle, the endangered status being the important consideration.

<sup>3</sup> Animal species considered to be unusual or unique on a regional, State, or planning subarea basis.

TABLE 17-8 Status of Wildlife as of 1970, Planning Subareas 3.2 and 4.1, Michigan

Class and Species	Planning Subarea 3.2--Michigan			Planning Subarea 4.1--Michigan		
	Density	Trend	Notes	Density	Trend	Notes
<b>BIG GAME</b>						
White-tailed Deer	Medium	Stable		Low	Increasing	
Black Bear	Low	Decreasing		-----	-----	
Turkey	Low	Stable		-----	-----	
<b>WATERFOWL</b>						
Ducks	High	Stable		High	Stable	
Geese	High	Stable		Medium	Increasing	
<b>SMALL GAME</b>						
Cottontail Rabbit	Low	Stable		Medium	Stable	
Ring-necked Pheasant	Medium	Stable		High	Stable	
Ruffed Grouse	Medium	Stable		Low	Stable	
Gray Squirrel	Low	Stable		Low	Decreasing	
Fox Squirrel	Medium	Stable		Medium	Stable	
Woodcock	Medium	Increasing		Low	Stable	
Mourning Dove	High	Stable		High	Stable	
Snowshoe Hare	Low	Stable		-----	-----	
Bobwhite Quail	-----	-----		Low	Stable	
<b>FURBEARERS</b>						
Muskrat	High	Stable		High	Stable	
Mink	High	Stable		Medium	Stable	
Beaver	Medium	Stable		Low	Decreasing	
Weasel	Medium	Stable		Medium	Stable	
Raccoon	High	Stable		Medium	Increasing	
Skunk	Medium	Stable		High	Increasing	
Opossum	Medium	Stable		High	Stable	
Badger	Low	Stable		Low	Stable	
Otter	Low	Stable		-----	-----	
<b>NON-GAME</b>						
Woodchuck	Medium	Stable		Medium	Stable	
Red Fox	High	Stable		Medium	Stable	
Gray Fox			Occasional	Low	Stable	
Crow	Medium	Stable		High	Stable	
Red Squirrel	Medium	Stable		Low	Stable	
Coyote	Low	Stable		Low	Stable	
Raptors	Medium	Stable		Medium	Stable	
Porcupine	Low	Stable		-----	-----	
Bobcat	Low	Stable		-----	-----	
<b>RARE(R) ENDANGERED(E) STATUS UNDETERMINED(S)<sup>1</sup></b>						
Bald Eagle (E) <sup>2</sup>	Low	Stable		Low	Decreasing	
American Osprey (S)	Low	Decreasing		Low	Decreasing	
Kirtlands Warbler (E)	Low	Decreasing		-----	-----	
Eastern Pigeon Hawk (S)			Rare transient	-----	-----	
<b>UNUSUAL OR UNIQUE ANIMALS<sup>3</sup></b>						
Sandhill Crane	Low	Stable		Medium	Stable	
Golden Eagle			Rare transient			Rare transient

<sup>1</sup> Rare and Endangered Fish and Wildlife of the United States, U.S. Bureau of Sport Fisheries and Wildlife, 1968 Edition. Also based on February 1972 data from the Bureau's Office of Endangered Species.

<sup>2</sup> For the purpose of this appendix the northern and southern subspecies of bald eagle are listed as bald eagle, the endangered status being the important consideration.

<sup>3</sup> Animal species considered to be unusual or unique on a regional, State, or planning subarea basis.

TABLE 17-9 Status of Wildlife as of 1970, Planning Subarea 4.2, Ohio

Class and Species	Planning Subarea 4.2--Ohio		
	Density <sup>1</sup>	Trend	Notes
<b>BIG GAME</b>			
White-tailed Deer	Low	Increasing	One-half to two per section
<b>WATERFOWL</b>			
Ducks	Medium	Stable	
Geese	Medium	Increasing	
<b>SMALL GAME</b>			
Cottontail Rabbit	Low	Decreasing	99 to 144 per section
Ring-necked Pheasant	Low	Decreasing	7 to 124 per section
Fox Squirrel	Medium	Decreasing	2 to 3 per wooded acre
Woodcock	Low	Stable	
Mourning Dove	High	Stable	
Bobwhite Quail	Low	Decreasing	45 to 98 per section
Hungarian Partridge	Low	Decreasing	Local, 10 per section
<b>FURBEARERS</b>			
Muskrat	High	Decreasing	State consistently second in total U.S. catch.
Mink	Medium	Decreasing	
Beaver	Low	Stable	
Weasel	Low	Decreasing	
Raccoon	High	Stable	
Skunk	Medium	Stable	
Badger	Low	Stable	
Opossum	Medium	Stable	
<b>NON-GAME</b>			
Woodchuck	Medium	Stable	
Red Fox	Medium	Stable	
Gray Fox	Low	Increasing	
Crow	Medium	Decreasing	
Red Squirrel	Medium	Decreasing	
Coyote			Accidental
Raptors	Low	Decreasing	
<b>RARE(R) ENDANGERED(E) STATUS UNDETERMINED(S)<sup>2</sup></b>			
Bald Eagle (E) <sup>3</sup>	Low	Decreasing	Northern Bald Eagle--eight nesting pairs, but no reproduction in 1971. Southern Bald Eagle--very rare (result of summer movement of juveniles into planning subarea).
American Osprey (S)	Low	Decreasing	Decrease during migration. Regular nesting before 1900 is presumed.
Arctic Peregrine Falcon (E)	Low	Decreasing	Decrease from previous annual flights in recent years in Western Lake Erie Counties. Perhaps former nester.
Kirtland's Warbler (E)	Low	Decreasing	Irregular as a migrant.
Eastern Pigeon Hawk (S)	Low	Decreasing	Decrease from previous spring and fall flights in recent years in Western Lake Erie Counties. Perhaps former nester.
Indiana Bat (E)	Low	Stable	
<b>UNUSUAL OR UNIQUE ANIMALS<sup>4</sup></b>			
Sandhill Crane			Accidental migrant. Last nest reported in 1926. No longer recorded.
Golden Eagle			Accidental migrant. Not recorded annually.
Lake Erie Water Snake	Low	Stable	Lake Erie islands only.
Eastern Plains Garter Snake	Low	Decreasing	Range only in part of Wyandot County in and near Killdeer Plains Wildlife Area.

<sup>1</sup>Population densities shown represent the range in averages for drainages within the PSA.

<sup>2</sup>Rare and Endangered Fish and Wildlife of the United States, U.S. Bureau of Sport Fisheries and Wildlife, 1968 Edition. Also based on February 1972 data from the Bureau's Office of Endangered Species.

<sup>3</sup>For the purpose of this appendix the northern and southern subspecies of bald eagle are listed as bald eagle, the endangered status being the important consideration.

<sup>4</sup>Animal species considered to be unusual or unique on a regional, State, or planning subarea basis.

**TABLE 17-10 Status of Wildlife as of 1970, Planning Subareas 4.2, Indiana, and 4.3, Ohio**

Class and Species	Planning Subarea 4.2--Indiana			Planning Subarea 4.3--Ohio		
	Density	Trend	Notes	Density <sup>1</sup>	Trend	Notes
<b>BIG GAME</b>						
White-tailed Deer	Low	Increasing		Medium	Stable	Two to three per section
<b>WATERFOWL</b>						
Ducks	Low	Stable		Medium	Stable	
Geese	Low	Stable		Medium	Increasing	
<b>SMALL GAME</b>						
Cottontail Rabbit	Low	Increasing	Up 1969-70	Medium	Stable	23 to 144 per section
Ring-necked Pheasant	Low	Stable		Low	Decreasing	7 to 69 per section
Fox Squirrel	Low	Decreasing		High	Stable	2 to 3 per wooded acre in western half, one-half to one in eastern
Woodcock	Low	Stable		Medium	Stable	
Mourning Dove	Medium	Stable		Medium	Stable	
Bobwhite Quail	Low	Increasing	Up 1969-70	Low	Stable	7 to 25 per section
Hungarian Partridge	Low	Stable		-----	-----	
Ruffed Grouse	-----	-----		High	Stable	
<b>FURBEARERS</b>						
Muskrat	Low	Increasing		Medium	Stable	
Mink	Low	Stable		Medium	Stable	
Beaver	Low	Decreasing		Medium	Stable	
Weasel	Low	Stable		Low	Stable	
Raccoon	Medium	Stable		High	Stable	
Skunk	Low	Increasing		Medium	Stable	
Opossum	Medium	Stable		Medium	Stable	
Badger	Low	Increasing		Low	Stable	
<b>NON-GAME</b>						
Woodchuck	Low	Increasing		Medium	Stable	
Red Fox	Medium	Stable		Medium	Stable	
Gray Fox	Low	Stable		Low	Increasing	
Crow	Low	Stable		Medium	Stable	
Red Squirrel	Low	Increasing		Medium	Stable	
Coyote	Low	Increasing		-----	-----	
Raptors	Low	Stable		Medium	Decreasing	
<b>RARE(R) ENDANGERED(E) STATUS UNDETERMINED(S)<sup>2</sup></b>						
Bald Eagle (E) <sup>3</sup>	Low	Decreasing		Low	Decreasing	No. Bald Eagle, rare migrant. Former nester. So. Bald Eagle, rare (result summer movement of juveniles into area)
American Osprey (S)	-----	-----		Low	Decreasing	Decrease during migration. Regular nesting before 1900 presumed.
Eastern Pigeon Hawk (S)	Low	Stable				Rare--migrant only
Arctic Peregrine Falcon (E)	-----	-----		Low	Decreasing	Rare--migrant only
<b>UNUSUAL OR UNIQUE ANIMALS<sup>4</sup></b>						
Sandhill Crane	Low	Increasing		-----	-----	
Golden Eagle	Low	Decreasing				Accidental migrant
River Otter	-----	-----		Low	Decreasing	Recorded in Grand River watershed and vicinity
Eastern Smooth Green Snake	-----	-----		Low	Stable	
Boreal Redback Vole	-----	-----		Low	Decreasing	Formerly in Pymatuning Region--may be extirpated.

<sup>1</sup>Population densities shown represent the range in averages for drainages within the PSA.

<sup>2</sup>Rare and Endangered Fish and Wildlife of the United States, U.S. Bureau of Sport Fisheries and Wildlife, 1968 Edition. Also based on February 1972 data from the Bureau's Office of Endangered Species.

<sup>3</sup>For the purpose of this appendix the northern and southern subspecies of bald eagle are listed as bald eagle, the endangered status being the important consideration.

<sup>4</sup>Animal species considered to be unusual or unique on a regional, State, or planning subarea basis.

TABLE 17-11 Status of Wildlife as of 1970, Planning Subarea 4.4, New York and Pennsylvania

Class and Species	Planning Subarea 4.4--New York			Planning Subarea 4.4--Pennsylvania		
	Density	Trend	Notes	Density	Trend	Notes
<b>BIG GAME</b>						
White-tailed Deer	Medium	Stable		Medium	Stable	
Black Bear	Low	Stable		-----	-----	
Turkey	Low	Increasing		Low	Stable	Mostly stocked
<b>WATERFOWL</b>						
Ducks	Medium	Stable		Varied	Decreasing	High--Lake Erie Low--inland
Geese	Low	Stable		Low	Stable	
<b>SMALL GAME</b>						
Cottontail Rabbit	Medium	Stable	Lower elevations	Medium	Decreasing	
Ring-necked Pheasant	Medium	Stable		Medium	Stable	Mostly stocked
Ruffed Grouse	Low	Stable		High	Increasing	
Gray Squirrel	Medium	Stable		Low	Stable	
Fox Squirrel	Low	Stable		Medium	Stable	
Snowshoe Hare	Low	Stable		-----	-----	
Woodcock	Low	Stable		High	Increasing	
Sharp-tailed Grouse	-----	-----		Low	Decreasing	Introduced
Mourning Dove	Low	Stable		Medium	Increasing	
Bobwhite Quail	-----	-----		Low	Decreasing	
<b>FURBEARERS</b>						
Muskrat	Medium	Stable		High	Stable	
Mink	Low	Stable		Low	Stable	
Beaver	Low	Decreasing		High	Increasing	
Weasel	Low	Stable		Low	Stable	
Raccoon	Medium	Increasing		Medium	Stable	
Skunk	Medium	Stable		Medium	Stable	
Opossum	Medium	Increasing		Medium	Increasing	
Badger			Occasional transient	-----	-----	
<b>NON-GAME</b>						
Woodchuck	Medium	Stable		Medium	Stable	
Porcupine	Low		Few found in southern Chautauqua & Cattaraugus Counties	-----	-----	
Red Fox	Low	Stable		Medium	Increasing	
Gray Fox	Low	Stable		Low	Stable	
Crow	Medium	Stable		Medium	Decreasing	
Red Squirrel	Medium	Stable		Low	Stable	
Raptors	Medium	Stable		Medium	Stable	
<b>RARE(R) ENDANGERED(E) STATUS UNDETERMINED(S)<sup>1</sup></b>						
Indiana Bat (E)	Low	Unknown		-----	-----	
Eastern Pigeon Hawk (S)	Low	Unknown		-----	-----	
Bald Eagle (E) <sup>2</sup>	Low	Unknown	Frequent transients. No known breeding.	Low	Decreasing	
American Osprey (S)	Low	Unknown	Frequent transients. No known breeding.	Low	Decreasing	Occasional
<b>UNUSUAL OR UNIQUE ANIMALS<sup>3</sup></b>						
Common Loon			A few transients	-----	-----	
Great Blue Heron	Low	Unknown		-----	-----	
Least Bittern	Low	Unknown		-----	-----	
Lake Erie Water Snake	Low	Unknown		-----	-----	
Timber Rattlesnake	Low	Unknown		-----	-----	
Spotted Turtle	Low	Unknown		-----	-----	
Golden Eagle			A few transients	-----	-----	
Eastern Bluebird	Low	Unknown		-----	-----	
Goshawk	Low	Decreasing		-----	-----	

<sup>1</sup> Rare and Endangered Fish and Wildlife of the United States, U.S. Bureau of Sport Fisheries and Wildlife, 1968 Edition. Also based on February 1972 data from the Bureau's Office of Endangered Species.

<sup>2</sup> For the purpose of this appendix the northern and southern subspecies of bald eagle are listed as bald eagle, the endangered status being the important consideration.

<sup>3</sup> Animal species considered to be unusual or unique on a regional, State, or planning subarea basis.

TABLE 17-12 Status of Wildlife as of 1970, Planning Subareas 5.1 and 5.2, New York

Class and Species	Planning Subarea 5.1--New York			Planning Subarea 5.2--New York		
	Density	Trend	Notes	Density	Trend	Notes
<b>BIG GAME</b>						
White-tailed Deer	Medium	Stable	Only southern part of watershed. Low density in northern part	Medium	Stable	
Black Bear	Low	Stable	Only southern part of watershed	Low	Stable	Refers to actual watershed
Turkey	Low	Increasing	Only southern part of watershed	Low	Increasing	
<b>WATERFOWL</b>						
Ducks	Medium	Stable		Medium	Stable	
Geese	High	Increasing		High	Increasing	
<b>SMALL GAME</b>						
Cottontail Rabbit	Medium	Stable		Medium	Stable	
Ring-necked Pheasant	High	Stable	Only northern part of watershed	Medium	Stable	
Ruffed Grouse	Low	Stable	Only southern part of watershed	Medium	Stable	
Gray Squirrel	Medium	Stable		Medium	Stable	
Fox Squirrel	Low	Stable		-----	-----	
Snowshoe Hare	Low	Stable	Only certain areas in southern part of watershed	Medium	Stable	
Woodcock	Medium	Stable		Medium	Stable	
Mourning Dove	Medium	Stable		Medium	Stable	
Hungarian Partridge	-----	-----		Low	Stable	
<b>FURBEARERS</b>						
Muskrat	High	Stable		High	Stable	
Mink	Medium	Stable		Medium	Stable	
Beaver	Low	Decreasing		Medium	Stable	
Weasel	Medium	Stable		Medium	Stable	
Raccoon	Medium	Stable		Medium	Stable	
Skunk	Medium	Stable		Medium	Stable	
Opossum	Medium	Increasing		Medium	Increasing	
Otter	-----	-----		Low	Stable	
<b>NON-GAME</b>						
Woodchuck	High	Stable		Medium	Stable	
Porcupine	Low	Stable	Few in southern part	Low	Stable	
Coyote	-----	-----		Low	Stable	
Red Fox	Medium	Stable		Medium	Stable	
Gray Fox	Low	Stable		Low	Stable	
Crow	Medium	Stable		Medium	Stable	
Red Squirrel	Medium	Stable		Medium	Stable	
Bobcat	-----	-----		Low	Stable	
Raptors	Medium	Stable		Medium	Stable	
<b>RARE (R) ENDANGERED (E) STATUS UNDETERMINED (S)<sup>1</sup></b>						
Indiana Bat (E)	Low	Unknown		Low	Unknown	
Eastern Pigeon Hawk (S)	Low		Some seen in migration	Low	Unknown	
Bald Eagle (E) <sup>2</sup>	Low	Decreasing				A few transients
Bog Turtle (R)	Low	Decreasing				
American Osprey (S)	-----	-----		Low	Decreasing	Occasional resident
Arctic Peregrine Falcon (E)	-----	-----				A few transients
Fisher (S)	-----	-----		Low	Stable	Doing well under managed trapping
Pine Marten (S)	-----	-----		Low	Stable	
<b>UNUSUAL OR UNIQUE ANIMALS<sup>3</sup></b>						
Golden Eagle			Transients only			A few transients
Common Loon			A few transients			
Great Blue Heron	Low	Unknown		Low	Decreasing	
Least Bittern	Low	Unknown		Low	Unknown	
Goshawk	Low	Decreasing		Low	Decreasing	
Eastern Bluebird	Low	Unknown		Low	Unknown	
Massasauga Rattlesnake	Low	Unknown		Low	Unknown	
Spotted Turtle	Low	Unknown		Low	Unknown	
Timber Rattlesnake	Low	Unknown		-----	-----	
Arctic Three-toed Woodpecker	-----	-----		Low	Unknown	
Lincoln's Sparrow	-----	-----		Low	Unknown	
Bicknell's Thrush	-----	-----		Low	Unknown	

<sup>1</sup> Rare and Endangered Fish and Wildlife of the United States, U.S. Bureau of Sport Fisheries and Wildlife, 1968 Edition. Also based on February 1972 data from the Bureau's Office of Endangered Species.

<sup>2</sup> For the purpose of this appendix the northern and southern subspecies of bald eagle are listed as bald eagle, the endangered status being the important consideration.

<sup>3</sup> Animal species considered to be unusual or unique on a regional, State, or planning subarea basis.

**TABLE 17-13 Status of Wildlife as of 1970, Planning Subarea 5.3, New York, Black River Valley and Central Tug Hill**

Class and Species	Planning Subarea 5.3--New York					
	Black River Valley			Central Tug Hill		
	Density	Trend	Notes	Density	Trend	Notes
<b>BIG GAME</b>						
White-tailed Deer	Low	Stable	Low density due to illegal activities, dogs and land use	Medium	Increasing	No wintering areas, migrate
Black Bear	-----	-----		Low	Stable	
<b>WATERFOWL</b>						
Ducks	Medium	Stable	Enhancement potential	Medium	Stable	
Geese	High	Stable	Fall feeding area	Medium	Stable	
<b>SMALL GAME</b>						
Cottontail Rabbit	Medium	Stable		-----	-----	
Ring-necked Pheasant	Low	Stable		-----	-----	
Ruffed Grouse	Low	Stable		Low	Stable	
Snowshoe Hare	Low	Stable		Medium	Stable	
Gray Squirrel	Medium	Stable		-----	-----	
Woodcock	Low	Stable		Low	Stable	
Mourning Dove	Medium	Stable		Low	Stable	
<b>FURBEARERS</b>						
Muskrat	High	Stable		Medium	Stable	
Mink	High	Stable		High	Stable	
Beaver	Low	Stable		High	Stable	
Weasel	High	Stable		Low	Stable	
Raccoon	Medium	Stable		Low	Stable	
Otter	Low	Stable		Low	Stable	
Skunk	Medium	Stable		Low	Stable	
Opossum	Low	Stable		-----	-----	
<b>NON-GAME</b>						
Woodchuck	Medium	Stable		Medium	Stable	
Porcupine	Low	Stable		High	Stable	
Red Fox	Medium	Stable		Low	Stable	
Gray Fox	Low	Stable		Low	Stable	
Bobcat	Low	Decreasing	May be endangered	Medium	Decreasing	May be endangered and need protection
Crow	Medium	Stable		Medium	Stable	
Red Squirrel	Medium	Stable		Medium	Stable	
Coyote	Low	Stable		Medium	Stable	
Raptors	Medium	Stable		Medium	Stable	
<b>RARE (R) ENDANGERED (E) STATUS UNDETERMINED (S)<sup>1</sup></b>						
Bald Eagle (E) <sup>2</sup>	Low		Occasional transient	-----	-----	
American Osprey (S)	Low	Decreasing		Low	Decreasing	
Fisher (S)	Low	Stable		Low	Stable	
Eastern Pigeon Hawk (S)	Low	Unknown		-----	-----	
<b>UNUSUAL OR UNIQUE ANIMALS<sup>3</sup></b>						
Common Loon	Low	Decreasing		-----	-----	
Great Blue Heron	Low	Unknown		-----	-----	
Least Bittern	Low	Unknown		-----	-----	
Eastern Bluebird	Low	Unknown		-----	-----	

<sup>1</sup>Rare and Endangered Fish and Wildlife of the United States, U.S. Bureau of Sport Fisheries and Wildlife, 1968 Edition. Also based on February 1972 data from the Bureau's Office of Endangered Species.

<sup>2</sup>For the purpose of this appendix the northern and southern subspecies of bald eagle are listed as bald eagle, the endangered status being the important consideration.

<sup>3</sup>Animal species considered to be unusual or unique on a regional, State, or planning subarea basis.

**TABLE 17-14 Status of Wildlife as of 1970, Planning Subarea 5.3, New York, Tug Hill Transition and Western Adirondacks**

Class and Species	Planning Subarea 5.3--New York					
	Tug Hill Transition			Western Adirondacks		
	Density	Trend	Notes	Density	Trend	Notes
<b>BIG GAME</b>						
White-tailed Deer	Medium	Increasing	Good deer yards, illegal activity and dogs important	High	Stable	
Black Bear	Low	Stable		Medium	Stable	
<b>WATERFOWL</b>						
Ducks	Medium	Stable		Low	Stable	
Geese	Medium	Stable		Low	Stable	
<b>SMALL GAME</b>						
Cottontail Rabbit	Low	Stable		-----	-----	
Ruffed Grouse	High	Increasing	Land abandonment	Medium	Stable	
Gray Squirrel	Low	Unknown		-----	-----	
Snowshoe Hare	High	Increasing	Land abandonment	Medium	Stable	
Woodcock	High	Stable		Low	Stable	
Mourning Dove	Low	Stable		Low	Stable	
<b>FURBEARERS</b>						
Muskrat	Medium	Stable		Medium	Stable	
Mink	Medium	Stable		Medium	Stable	
Beaver	Low	Decreasing		High	Decreasing	
Weasel	Medium	Stable		Low	Stable	
Raccoon	Medium	Stable		High	Stable	
Otter	Low	Stable		High	Stable	
Skunk	Medium	Stable		Low	Stable	
Opossum	Low	Stable		-----	-----	
<b>NON-GAME</b>						
Woodchuck	Medium	Stable		Low	Stable	
Porcupine	Low	Stable		Medium	Stable	
Red Fox	Medium	Stable		Low	Stable	
Gray Fox	Low	Stable		-----	-----	
Bobcat	Low	Stable		Low	Stable	May be endangered
Red Squirrel	High	Stable		High	Stable	
Coyote	Low	Stable		Medium	Stable	
Crow	Medium	Stable		Low	Stable	
Raven	-----	-----		Low	Stable	
Raptors	Medium	Stable		Low	Stable	
<b>RARE (R) ENDANGERED (E) STATUS UNDETERMINED (S)<sup>1</sup></b>						
Fisher (S)	Low	Stable		High	Increasing	
Bald Eagle (E) <sup>2</sup>	Low	Decreasing		Low	Decreasing	Occasional transient
American Osprey (S)	Low	Increasing		Low	Decreasing	
Eastern Pigeon Hawk (S)	Low	Unknown		Low	Unknown	
Eastern Timber Wolf (E)	-----	-----		Low	Stable	Very rare
Pine Marten (S)	-----	-----		Low	Stable	
Canada Lynx (S)	-----	-----		Low	Stable	
<b>UNUSUAL OR UNIQUE, ANIMALS<sup>3</sup></b>						
Common Loon	Low	Unknown		Low	Decreasing	
Great Blue Heron	Low	Unknown		Low	Unknown	
Least Bittern	Low	Unknown		Low	Unknown	
Eastern Bluebird	Low	Unknown		-----	-----	
Lincoln's Sparrow	Low	Unknown		Low	Unknown	
Bicknell's Thrush	-----	-----		Low	Unknown	
Spruce Grouse	-----	-----		Low	Stable	
Golden Eagle	-----	-----		Low	Stable	
Goshawk	-----	-----		Low	Decreasing	
Arctic Three-toed Woodpecker	-----	-----		Low	Unknown	

<sup>1</sup> Rare and Endangered Fish and Wildlife of the United States, U.S. Bureau of Sport Fisheries and Wildlife, 1968 Edition. Also based on February 1972 data from the Bureau's Office of Endangered Species.

<sup>2</sup> For the purpose of this appendix the northern and southern subspecies of bald eagle are listed as bald eagle, the endangered status being the important consideration.

<sup>3</sup> Animal species considered to be unusual or unique on a regional, State, or planning subarea basis.

**TABLE 17-15 Status of Wildlife as of 1970, Planning Subarea 5.3, New York, Adirondack Transition and Central Adirondacks**

Class and Species	Planning Subarea 5.3--New York					
	Adirondack Transition			Central Adirondacks		
	Density	Trend	Notes	Density	Trend	Notes
<b>BIG GAME</b>						
White-tailed Deer	Medium	Stable		Medium	Stable	Winters and range conditions control numbers
Black Bear	Low	Stable		High	Stable	
<b>WATERFOWL</b>						
Ducks	Low	Stable		Low	Stable	
Geese	Low	Stable		Low	Stable	
<b>SMALL GAME</b>						
Cottontail Rabbit	Low	Stable		-----	-----	
Ruffed Grouse	High	Stable		Medium	Stable	
Gray Squirrel	Low	Stable		-----	-----	
Snowshoe Hare	High	Stable		Medium	Stable	
Woodcock	High	Stable		Low	Stable	
Mourning Dove	Low	Stable		Low	Stable	
Hungarian Partridge	Low	Stable		-----	-----	
<b>FURBEARERS</b>						
Muskrat	Medium	Stable		Medium	Stable	
Mink	High	Stable		High	Stable	
Beaver	Medium	Stable		Medium	Stable	
Weasel	Medium	Stable		Low	Stable	
Raccoon	Medium	Stable		Medium	Stable	
Otter	Medium	Stable		High	Stable	
Skunk	Medium	Stable		Low	Stable	
Opossum	Low	Stable		-----	-----	
<b>NON-GAME</b>						
Woodchuck	Low	Stable		Low	Stable	
Porcupine	High	Stable		High	Stable	
Red Fox	Medium	Stable		Low	Stable	
Gray Fox	Low	Stable		-----	-----	
Bobcat	Low	Stable	May be endangered	Medium	Stable	
Red Squirrel	High	Stable		High	Stable	
Coyote	Low	Stable		Medium	Stable	
Crow	Medium	Stable		Medium	Stable	
Raven	-----	-----		Low	Stable	
Raptors	Medium	Stable		Low	Stable	
<b>RARE (R) ENDANGERED (E) STATUS UNDETERMINED (S)<sup>1</sup></b>						
Fisher (S)	Medium	Decreasing		High	Increasing	
Bald Eagle (E) <sup>2</sup>	Low		Occasional transient	Low		Occasional transient
American Osprey (S)	Medium	Decreasing		Low	Decreasing	
Eastern Pigeon Hawk (S)	Low	Unknown		Low	Unknown	
Pine Marten (S)	-----	-----		Low	Stable	
Canada Lynx (S)	-----	-----		Low	Stable	
<b>UNUSUAL OR UNIQUE ANIMALS<sup>3</sup></b>						
Spruce Grouse	Low	Stable		Low	Stable	
Golden Eagle	Low	Decreasing		Low	Stable	
Goshawk	Low	Decreasing		Low	Decreasing	
Common Loon	Low	Decreasing		Low	Decreasing	
Great Blue Heron	Low	Unknown		Low	Unknown	
Least Bittern	Low	Unknown		Low	Unknown	
Arctic Three-toed Woodpecker	Low	Unknown		Low	Unknown	
Eastern Bluebird	Low	Unknown		-----	-----	
Lincoln's Sparrow	Low	Unknown		Low	Unknown	
Bicknell's Thrush	Low	Unknown		Low	Unknown	

<sup>1</sup> Rare and Endangered Fish and Wildlife of the United States, U.S. Bureau of Sport Fisheries and Wildlife, 1968 Edition. Also based on February 1972 data from the Bureau's Office of Endangered Species.

<sup>2</sup> For the purpose of this appendix the northern and southern subspecies of bald eagle are listed as bald eagle, the endangered status being the important consideration.

<sup>3</sup> Animal species considered to be unusual or unique on a regional, State, or planning subarea basis.

**TABLE 17-16 Status of Wildlife as of 1970, Planning Subarea 5.3, New York, St. Lawrence Plain and Eastern Ontario Plain**

Class and Species	Planning Subarea 5.3--New York					
	St. Lawrence Plain			Eastern Ontario Plain		
	Density	Trend	Notes	Density	Trend	Notes
<b>BIG GAME</b>						
White-tailed Deer	Low	Stable	Illegal activity and dogs controls numbers	Low	Stable	Illegal activity controls numbers
Black Bear	Low	Stable		Low	Stable	
Turkey	-----	-----		Low	Stable	
<b>WATERFOWL</b>						
Ducks	High	Increasing	Enhancement potential large	High	Stable	
Geese	Medium	Increasing	Enhancement potential large	High	Stable	
<b>SMALL GAME</b>						
Cottontail Rabbit	Low	Stable		High	Stable	
Ring-necked Pheasant	Low	Stable		Low	Stable	
Ruffed Grouse	High	Stable		Medium	Stable	
Gray Squirrel	Low	Stable		Medium	Stable	
Snowshoe Hare	Medium	Stable		Low	Stable	
Woodcock	High	Stable		High	Stable	
Mourning Dove	Low	Stable		Medium	Stable	
Hungarian Partridge	Medium	Stable		Medium	Decreasing	
<b>FURBEARERS</b>						
Muskrat	High	Stable		High	Stable	
Mink	High	Stable		Medium	Stable	
Beaver	Low	Stable		Medium	Stable	
Weasel	Medium	Stable		High	Stable	
Raccoon	Medium	Stable		High	Stable	
Otter	Low	Stable		Low	Stable	
Skunk	Medium	Stable		High	Stable	
Opossum	-----	-----		Low	Stable	
<b>NON-GAME</b>						
Woodchuck	Medium	Stable		Medium	Stable	
Porcupine	Medium	Stable		Low	Stable	
Red Fox	High	Stable		Medium	Stable	
Gray Fox	Low	Stable		Low	Stable	
Bobcat	Low	Stable		Low	Stable	
Crow	Medium	Stable		Medium	Stable	
Red Squirrel	Medium	Stable		Medium	Stable	
Coyote	Low	Stable		Low	Stable	
Raptors	Medium	Stable		High	Stable	
<b>RARE(R) ENDANGERED(E) STATUS UNDETERMINED(S)<sup>1</sup></b>						
Fisher (R)	Low	Decreasing	Endangered	Low	Decreasing	
Bald Eagle (E) <sup>2</sup>	Low	Decreasing		Low	Decreasing	
American Osprey (S)	Medium	Decreasing		Medium	Stable	
Eastern Pigeon Hawk (S)	Low	Unknown		Low	Unknown	
Arctic Peregrine Falcon (E)	Low		A few transients	-----	-----	
<b>UNUSUAL OR UNIQUE ANIMALS<sup>3</sup></b>						
Common Loon	Low	Decreasing		Low	Decreasing	
Great Blue Heron	Low	Unknown		Low	Unknown	
Least Bittern	Low	Unknown		Low	Unknown	
Eastern Bluebird	Low	Unknown		Low	Unknown	
Lincoln's Sparrow	Low	Unknown		Low	Unknown	
Goshawk	Low	Decreasing		-----	-----	

<sup>1</sup> Rare and Endangered Fish and Wildlife of the United States, U.S. Bureau of Sport Fisheries and Wildlife, 1968 Edition. Also based on February 1972 data from the Bureau's Office of Endangered Species.

<sup>2</sup> For the purpose of this appendix the northern and southern subspecies of bald eagle are listed as bald eagle, the endangered status being the important consideration.

<sup>3</sup> Animal species considered to be unusual or unique on a regional, State, or planning subarea basis.

## 2.2 Wildlife Habitat and Trends

Subsection 2.1 of this appendix considered the relationship of wildlife populations and trends to the habitat. Subsection 2.2 is divided into two parts: the first analyzes wildlife habitat base, the actual amounts of land considered capable of supporting wildlife, and the amounts of habitat available for use by both the hunter (consumptive user), and the non-hunter (non-consumptive user); the second considers the wetlands habitat of the Great Lakes Region.

### 2.2.1 The Wildlife Habitat Base

Tables 17-17 and 17-18 provide basic land resources data by planning subarea and State. Table 17-21 indicates the acres of cropland, pasture land, forest land, and other land for each target year and the estimated percent available for hunting. Included in the totals are public lands and wetlands, which are discussed separately but cannot be disaggregated from the totals because of the way the data were collected.

These data are derived from the Conservation Needs Inventory, U.S. Department of Agriculture, using percentages based on State fish and game personnel's knowledge of the areas. The percentages are judgments based on a number of important considerations, such as the extent of posting, farmer attitudes, physical access, and so on.

The successive target years indicate trends in the habitat base. Status and trends of wildlife habitat are also discussed in conjunction with Subsection 2.5, Existing Wildlife Problems. Table 17-19 indicates public land open to hunting by State in the mid-1960s. State totals of public lands closed to hunting, but open to nonconsumptive use are listed in Table 17-20. Figures 17-4 through 17-18 present recent data on public lands open to hunting in each planning subarea. The trend in all public lands is for acreage to remain the same or increase slightly. Due to rapidly increasing land values, particularly in the lower tier of States, large increases in public holdings are not likely. Public forest lands will probably increase as managing agencies block in private areas bounded by the forest. State game divisions' acquisition plans vary widely. Most increases in public hunting area will be made by adding land to existing units, rather than acquisition of new areas, with the possible exception of privately owned wetlands.

**TABLE 17-17 Total Acres and Percent of Farm and Forest Game Habitat by Planning Subarea in 1960<sup>1</sup>**

Planning Subarea	Total Land	Total Habitat	Farm-land Habitat	% of Total Land	Forest Land Habitat	% of Total Land
1.1	9,473.5	9,327.8	816.5	8	8,511.3	90
1.2	6,411.8	6,178.0	346.2	5	5,831.8	91
2.1	10,010.7	9,236.3	4,224.3	42	5,012.0	50
2.2	5,212.7	3,984.2	3,546.2	68	438.0	8
2.3	8,944.4	7,693.3	6,466.8	72	1,226.5	14
2.4	8,094.2	7,607.6	1,701.7	21	5,905.9	73
3.1	4,017.8	3,785.5	762.2	19	3,023.3	75
3.2	4,424.1	3,904.7	2,848.9	64	1,055.8	24
4.1	3,980.4	2,955.8	2,502.0	63	453.8	11
4.2	6,319.4	5,777.5	5,204.9	82	572.6	9
4.3	2,308.4	1,666.8	1,149.6	50	517.2	22
4.4	3,069.9	2,454.7	1,474.1	48	980.6	32
5.1	2,458.7	2,104.8	1,525.7	62	579.1	24
5.2	5,427.4	4,970.7	2,909.8	54	2,080.9	38
5.3	3,385.6	3,171.6	1,160.3	34	2,011.3	59

<sup>1</sup>Acres shown in thousands

**TABLE 17-18 Acres of Farm and Forest Game Habitat by State and Planning Subarea in 1960**

State	Planning Subarea	Farm	Forest
Minnesota	1.1	587,400	6,037,500
Wisconsin	1.1	229,100	2,473,800
	2.1	4,044,500	3,370,500
	2.2	1,232,900	158,900
	TOTAL	5,506,500	6,003,200
Illinois	2.2	1,466,500	148,100
Indiana	2.2	846,800	131,000
	2.3	1,249,900	145,000
	4.2	715,100	88,800
	TOTAL	2,811,800	364,800
Michigan	1.2	346,200	5,831,800
	2.1	179,800	1,641,500
	2.3	5,216,900	1,081,500
	2.4	1,701,700	5,905,900
	3.1	762,200	3,023,300
	3.2	2,848,900	1,055,800
	4.1	2,502,000	453,800
TOTAL	13,447,700	18,993,600	
Ohio	4.2	5,204,900	572,600
	4.3	1,149,600	517,200
	TOTAL	6,354,500	1,089,800
Pennsylvania	4.4	281,900	124,000
New York	4.4	1,192,200	856,600
	5.1	1,525,700	579,100
	5.2	2,909,800	2,080,900
	5.3	1,160,300	2,011,300
	TOTAL	6,788,000	5,527,900

TABLE 17-19 Acres of Public Lands Open to Hunting, Mid-1960s

State and PSA	National Forest	Public Hunting Areas	State Forest	Others
<b>Minnesota</b>				
1.1	2,134,000	500	544,500	
<b>Wisconsin</b>				
1.1	282,200	18,500	59,400	1,200 (State Park) Big Game
2.1	591,600	109,200	24,600	6,500 (County Park) All Hunting 3,900 (State Park) Big Game
2.2	-----	38,200	14,200	
TOTAL	873,800	165,900	98,200	11,600
<b>Illinois</b>				
2.2	-----	6,400	-----	
<b>Indiana</b>				
2.2	-----	7,800	-----	
2.3	-----	9,100	-----	
4.2	-----	-----	-----	
TOTAL	-----	16,900	-----	
<b>Michigan</b>				
1.2	1,082,500	-----	1,073,000	
2.1	171,400	-----	392,000	
2.3	4,000	113,800	-----	
2.4	992,300	59,000	1,392,000	95,000 (Seney N.W.R.) Big Game Only
3.1	415,600	100	880,000	
3.2	-----	65,400	172,200	
4.1	-----	29,900	-----	
TOTAL	2,665,800	268,200	3,909,200	
<b>Ohio</b>				
4.2	-----	14,300	2,900	
4.3	-----	13,700	-----	
TOTAL	-----	28,000	2,900	
<b>Pennsylvania</b>				
4.4	-----	11,700	-----	
<b>New York</b>				
4.4	-----	9,100	42,100	61,000 (State Park)
5.1	-----	16,700	44,700	16,600 (State Park)
5.2	13,800	53,900	129,200	
5.3	-----	36,900	81,400	8,200 (State Park)
TOTAL	13,800	116,600	297,400	85,800

TABLE 17-20 State Parks and Recreation Areas, Mid-1960s

State and PSA	Acres
Minnesota	26,100
Wisconsin	
1.1	5,200
2.1	17,100
2.2	500
TOTAL	22,800
Illinois	
2.2	67,231
Indiana	
2.2	4,000
2.3	2,400
4.2	-----
TOTAL	6,400
Michigan	
1.2	22,900
2.1	1,000
2.3	23,400
2.4	21,700
3.1	17,500
3.2	6,400
4.1	35,300
TOTAL	128,200
Ohio	
4.2	2,400
4.3	2,200
TOTAL	4,600
Pennsylvania	
4.4	3,000
New York	
4.4	65,700
5.1	20,500
5.2	13,800
5.3	10,100
TOTAL	110,100

\* Open to public recreational use other than hunting or trapping.

Private land habitat management programs include various land treatment measures of benefit to wildlife. Many of these measures are applied by landowners and operators with technical assistance provided by the Soil Conservation Service in the various Soil Conservation Districts within the Basin.

Land treatment measures of benefit to wildlife have been established in approximately 135 counties which represent 71 percent of the planning subareas of the Great Lakes Basin. These measures include 29,000 ponds, 177 miles of field borders, 2,429 miles of hedgerow planting, more than a million acres of wildlife wetland habitat management, and almost a million acres of wildlife upland habitat management.

A selected mix of land treatment measures could give the land a distinctive pattern of cultivated crops, grass, shrubs, trees, and water areas that make good wildlife habitat. Borders planted or cut along the edge of a field or woods provide food and cover. Hedges provide travel lanes, and ponds improve wildlife production and furnish stopover areas for migrating waterfowl.

As our population increases and land use becomes more intensive, planned production of wildlife will become more and more important in meeting the demand for wildlife uses. Obviously, landowners and operators hold the key to this production through application of good soil and water conservation practices. At the same time they can improve the quality of the environment and provide a viable wildlife resource in the Basin.

The trend for wetlands is downward. Tremendous losses have already occurred in wetlands close to large cities and in high-value agricultural land. Shore wetlands, having increased in value more than upland acreages, are increasingly more difficult to protect from development.

Unique, scenic, or natural areas are listed in Tables 17-22 through 17-29. These areas of unusual ecological significance are subject to the same degradation and loss as wetlands, but their protection is slightly easier to accomplish because they tend to be more contained than other marshlands or upland areas.

TABLE 17-21 Determination of Supply Acres of Wildlife Habitat

YEAR AND LAND USE	PLANNING SUBAREA 1.1		PLANNING SUBAREA 1.2			PLANNING SUBAREA 2.1		
	TOTAL ACRES	ACRES OF HUNTABLE LAND (%) TOTAL	TOTAL ACRES	ACRES OF HUNTABLE LAND (%) TOTAL	TOTAL ACRES	ACRES OF HUNTABLE LAND (%) TOTAL	TOTAL ACRES	ACRES OF HUNTABLE LAND (%) TOTAL
<b>1966-67</b>								
Cropland	430,100	64,515 (15%)	262,800	157,680 (60%)	3,316,400	663,200 (20%)		
Pasture	99,500	49,750 (50%)	65,800	59,220 (90%)	356,700	142,680 (40%)		
Forest	8,354,900	7,937,155 (95%)	5,909,600	5,909,600 (100%)	5,116,600	4,604,940 (90%)		
Other	304,500	213,150 (70%)	65,800	52,640 (80%)	757,100	378,550 (50%)		
		8,264,570		6,179,140		5,789,370		
<b>1980</b>								
Cropland	430,100	64,515 (15%)	262,800	157,680 (60%)	3,308,400	661,680 (20%)		
Pasture	99,500	49,750 (50%)	65,800	59,220 (90%)	355,800	142,320 (40%)		
Forest	8,354,200	7,936,490 (95%)	5,909,600	5,909,600 (100%)	5,104,200	4,593,780 (90%)		
Other	304,500	213,150 (70%)	65,800	52,640 (80%)	755,300	377,650 (50%)		
		8,263,905		6,179,140		5,775,430		
<b>2000</b>								
Cropland	429,700	64,455 (15%)	262,800	157,680 (60%)	3,293,400	658,680 (20%)		
Pasture	99,400	49,700 (50%)	65,800	59,220 (90%)	354,200	141,680 (40%)		
Forest	8,347,200	7,929,840 (95%)	5,908,600	5,908,600 (100%)	5,081,000	4,572,900 (90%)		
Other	304,200	212,940 (70%)	65,800	52,640 (80%)	751,900	375,950 (50%)		
		8,256,935		6,178,140		5,749,210		
<b>2020</b>								
Cropland	429,000	64,350 (15%)	262,700	157,620 (60%)	3,274,900	654,980 (20%)		
Pasture	99,000	49,500 (50%)	65,800	59,220 (90%)	352,200	140,880 (40%)		
Forest	8,333,700	7,917,015 (95%)	5,905,500	5,905,500 (100%)	5,052,400	4,547,160 (90%)		
Other	303,700	212,590 (70%)	65,800	52,640 (80%)	747,700	373,850 (50%)		
		8,243,455		6,174,980		5,716,870		
YEAR AND LAND USE	PLANNING SUBAREA 2.2		PLANNING SUBAREA 2.3		PLANNING SUBAREA 2.4			
	TOTAL ACRES	ACRES OF HUNTABLE LAND (%) TOTAL	TOTAL ACRES	ACRES OF HUNTABLE LAND (%) TOTAL	TOTAL ACRES	ACRES OF HUNTABLE LAND (%) TOTAL	TOTAL ACRES	ACRES OF HUNTABLE LAND (%) TOTAL
<b>1966-67</b>								
Cropland	2,843,400	710,850 (25%)	5,374,800	1,074,960 (20%)	1,481,500	592,600 (40%)		
Pasture	237,400	71,220 (30%)	459,400	413,460 (90%)	351,800	316,620 (90%)		
Forest	340,700	272,560 (80%)	1,704,700	1,363,760 (80%)	5,434,300	4,890,870 (90%)		
Other	580,100	290,050 (50%)	598,000	239,200 (40%)	411,800	288,260 (70%)		
		1,344,680		3,091,380		6,088,350		
<b>1980</b>								
Cropland	2,477,000	619,250 (25%)	5,305,400	1,061,080 (20%)	1,478,600	591,440 (40%)		
Pasture	206,800	62,040 (30%)	453,500	408,150 (90%)	351,100	315,990 (90%)		
Forest	296,800	237,440 (80%)	1,682,700	1,346,160 (80%)	5,423,600	4,881,240 (90%)		
Other	505,300	252,650 (50%)	590,300	236,120 (40%)	411,000	287,700 (70%)		
		1,171,380		3,051,510		6,076,370		
<b>2000</b>								
Cropland	1,999,800	499,950 (25%)	5,199,900	1,039,980 (20%)	1,473,000	589,200 (40%)		
Pasture	167,000	50,100 (30%)	444,500	400,050 (90%)	349,800	314,820 (90%)		
Forest	239,700	191,760 (80%)	1,649,200	1,319,360 (80%)	5,403,200	4,862,880 (90%)		
Other	407,900	203,950 (50%)	578,600	231,440 (40%)	409,500	286,650 (70%)		
		945,760		2,990,830		6,053,550		
<b>2020</b>								
Cropland	1,641,000	410,250 (25%)	5,070,000	1,014,000 (20%)	1,466,600	586,640 (40%)		
Pasture	137,100	41,130 (30%)	433,400	390,060 (90%)	348,300	313,470 (90%)		
Forest	196,700	157,360 (80%)	1,608,000	1,286,400 (80%)	5,379,600	4,841,640 (90%)		
Other	334,700	167,350 (50%)	564,100	225,640 (40%)	407,600	285,320 (70%)		
		776,090		2,916,100		6,027,070		

TABLE 17-21 (continued) Determination of Supply Acres of Wildlife Habitat

YEAR AND LAND USE	PLANNING SUBAREA 3.1		PLANNING SUBAREA 3.2		PLANNING SUBAREA 4.1	
	TOTAL ACRES	ACRES OF HUNTABLE LAND (%) TOTAL	TOTAL ACRES	ACRES OF HUNTABLE LAND (%) TOTAL	TOTAL ACRES	ACRES OF HUNTABLE LAND (%) TOTAL
<u>1966-67</u>						
Cropland	531,200	265,600 (50%)	2,370,000	474,000 (20%)	2,215,600	332,340 (15%)
Pasture	173,600	156,240 (90%)	185,200	138,900 (75%)	117,700	88,275 (75%)
Forest	2,914,300	2,185,725 (75%)	1,194,700	955,760 (80%)	665,700	532,560 (80%)
Other	219,100	153,370 (70%)	285,200	142,600 (50%)	222,000	88,800 (40%)
		<u>2,760,935</u>		<u>1,711,260</u>		<u>1,041,975</u>
<u>1980</u>						
Cropland	530,100	265,050 (50%)	2,339,400	467,880 (20%)	2,013,000	301,950 (15%)
Pasture	173,200	155,880 (90%)	182,800	137,100 (75%)	107,000	80,250 (75%)
Forest	2,908,000	2,181,000 (75%)	1,179,300	943,440 (80%)	604,800	483,840 (80%)
Other	218,600	153,020 (70%)	281,500	140,750 (50%)	201,700	80,680 (40%)
		<u>2,754,950</u>		<u>1,689,170</u>		<u>946,720</u>
<u>2000</u>						
Cropland	528,600	264,300 (50%)	2,294,800	458,960 (20%)	1,726,000	258,900 (15%)
Pasture	172,700	155,430 (90%)	179,300	134,475 (75%)	91,800	68,850 (75%)
Forest	2,899,700	2,174,775 (75%)	1,156,800	925,440 (80%)	518,600	414,880 (80%)
Other	218,000	152,600 (70%)	276,100	138,050 (50%)	173,000	69,200 (40%)
		<u>2,747,105</u>		<u>1,656,925</u>		<u>811,830</u>
<u>2020</u>						
Cropland	526,700	263,350 (50%)	2,264,300	452,860 (20%)	1,535,900	230,385 (15%)
Pasture	172,100	154,890 (90%)	176,900	132,675 (75%)	81,700	61,275 (75%)
Forest	2,899,400	2,167,050 (75%)	1,141,400	913,120 (80%)	461,500	369,200 (80%)
Other	217,200	152,040 (70%)	272,400	136,200 (50%)	154,000	61,600 (40%)
		<u>2,737,330</u>		<u>1,634,855</u>		<u>722,460</u>
YEAR AND LAND USE	PLANNING SUBAREA 4.2		PLANNING SUBAREA 4.3		PLANNING SUBAREA 4.4	
	TOTAL ACRES	ACRES OF HUNTABLE LAND (%) TOTAL	TOTAL ACRES	ACRES OF HUNTABLE LAND (%) TOTAL	TOTAL ACRES	ACRES OF HUNTABLE LAND (%) TOTAL
<u>1966-67</u>						
Cropland	4,735,100	710,265 (15%)	741,300	593,040 (80%)	858,700	214,675 (25%)
Pasture	213,800	192,420 (90%)	131,300	118,170 (90%)	252,600	126,300 (50%)
Forest	453,400	453,400 (100%)	538,800	538,800 (100%)	1,364,500	818,700 (60%)
Other	349,300	139,720 (40%)	288,200	201,740 (70%)	109,100	21,820 (20%)
		<u>1,495,805</u>		<u>1,451,750</u>		<u>1,181,495</u>
<u>1980</u>						
Cropland	4,683,400	702,510 (15%)	680,000	544,000 (80%)	841,200	126,180 (15%)
Pasture	211,500	190,350 (90%)	120,500	108,450 (90%)	247,500	74,250 (30%)
Forest	448,500	448,500 (100%)	494,300	494,300 (100%)	1,336,700	668,350 (50%)
Other	345,500	138,200 (40%)	264,400	185,080 (70%)	106,900	16,035 (15%)
		<u>1,479,560</u>		<u>1,331,830</u>		<u>884,815</u>
<u>2000</u>						
Cropland	4,599,800	689,970 (15%)	566,500	453,200 (80%)	810,400	81,040 (10%)
Pasture	207,700	186,930 (90%)	100,400	90,360 (90%)	238,400	59,600 (25%)
Forest	440,500	440,500 (100%)	411,800	411,800 (100%)	1,287,700	515,080 (40%)
Other	339,300	135,720 (40%)	220,300	154,210 (70%)	103,000	15,450 (15%)
		<u>1,453,120</u>		<u>1,109,570</u>		<u>671,170</u>
<u>2020</u>						
Cropland	4,511,900	676,785 (15%)	471,300	377,040 (80%)	781,900	78,190 (10%)
Pasture	203,700	183,330 (90%)	83,600	75,240 (90%)	230,000	57,500 (25%)
Forest	432,100	432,100 (100%)	342,600	342,600 (100%)	1,242,500	497,000 (40%)
Other	232,800	93,120 (40%)	183,300	128,310 (70%)	99,400	14,910 (15%)
		<u>1,385,335</u>		<u>923,190</u>		<u>647,600</u>

TABLE 17-21 (continued) Determination of Supply Acres of Wildlife Habitat

YEAR AND LAND USE	PLANNING SUBAREA 5.1		PLANNING SUBAREA 5.2			PLANNING SUBAREA 5.3		
	TOTAL ACRES	ACRES OF HUNTABLE LAND (%) TOTAL	TOTAL ACRES	ACRES OF HUNTABLE LAND (%) TOTAL	TOTAL ACRES	ACRES OF HUNTABLE LAND (%) TOTAL	TOTAL ACRES	ACRES OF HUNTABLE LAND (%) TOTAL
<b>1966-67</b>								
Cropland	1,055,100	263,775 (25%)	1,759,100	527,730 (30%)	633,900	316,950 (50%)		
Pasture	162,900	73,305 (45%)	443,700	221,850 (50%)	254,400	152,640 (60%)		
Forest	871,500	479,325 (55%)	2,545,700	1,781,990 (70%)	2,215,400	2,104,630 (95%)		
Other	98,100	19,620 (20%)	428,200	85,640 (20%)	136,000	40,800 (30%)		
		836,025		2,617,210		2,615,020		
<b>1980</b>								
Cropland	1,040,500	156,075 (15%)	1,734,600	260,190 (15%)	633,700	253,480 (40%)		
Pasture	160,700	64,280 (40%)	437,500	196,875 (45%)	254,300	127,150 (50%)		
Forest	859,500	429,750 (40%)	2,510,200	1,506,120 (60%)	2,214,900	1,993,410 (90%)		
Other	96,700	14,505 (15%)	422,200	63,330 (15%)	136,000	27,200 (20%)		
		664,610		2,026,515		2,401,240		
<b>2000</b>								
Cropland	1,020,900	153,135 (15%)	1,703,600	255,540 (15%)	632,300	158,075 (25%)		
Pasture	157,700	31,540 (20%)	429,700	171,880 (40%)	253,700	101,480 (40%)		
Forest	843,300	337,320 (40%)	2,465,400	1,232,700 (50%)	2,210,100	1,989,090 (90%)		
Other	94,900	14,235 (15%)	414,700	62,205 (15%)	135,700	20,355 (15%)		
		536,230		1,722,325		2,269,000		
<b>2020</b>								
Cropland	996,100	99,610 (10%)	1,670,300	250,545 (15%)	630,700	157,675 (25%)		
Pasture	153,900	30,780 (20%)	421,300	168,520 (40%)	253,100	101,240 (40%)		
Forest	822,800	329,120 (40%)	2,417,200	1,208,600 (50%)	2,204,600	1,984,140 (90%)		
Other	92,600	13,890 (15%)	406,600	60,990 (15%)	135,400	20,310 (15%)		
		473,400		1,688,655		2,263,365		

TABLE 17-22 Areas of Ecological Significance in Minnesota (1971)

PSA	County	Name of Area	Importance	Ownership	Acres
1.1	Carlton	Perch Lake	Wild Rice Bed	Indian Lands	778
	Carlton	---	Wild Rice Bed	State	200
	Carlton	Jay Cook State Park*	---	State	11,196
	Cook	Cascade River State Park	---	State	2,813
	Cook	Cross River State Wayside	---	State	2,560
	Cook	Devils Tract State Wayside	---	State	240
	Cook	Judge C.R. Magney State Park	---	State	4,514
	Cook	Kodonce River State Park	---	State	128
	Cook	Temperance River State Park	---	State	133
	Cook	Pigeon Point	Rugged Lake Shore & Island Complex	Private Lands	6,000
	Lake	Baptism River State Park	---	State	706
	Lake	Caribou Falls State Wayside	---	State	97
	Lake	Flood Bay State Wayside	---	State	19
	Lake	George Crosby Manitou State Park	---	State	4,790
	Lake	Gooseberry Falls State Park	---	State	1,662
	Lake	Split Rock Lighthouse State Park	---	State	996
	St. Louis	Bearhead Lake State Park	---	State	4,373
	St. Louis	McCarthy Beach State Park	---	State	3,737
	St. Louis	Savanna Portage State Park	---	State	15,758
	St. Louis	Tower Soudan State Park	---	State	982
	Lake/Cook/ St. Louis	Boundary Waters Canoe Area	Vast Lake & Forest Wilderness	U.S. Forest Service	1,000,000

\*The Minnesota Department of Natural Resources acquires State Parks for the purpose of preserving their scientific and natural values.

TABLE 17-23 Areas of Ecological Significance in Indiana (1969)

PSA	County	Name of Area	Ownership	Acres
2.2	Lake	Merrillville Mire	Private	30
	Lake	Mystery Mounds	Private	10
			Total	40
	LaPorte	Mt. Pleasant Swamp	Private	45
	LaPorte	Pinhook Bog	Private	170
	LaPorte	South LaPorte Woods	Private	26
	LaPorte	Shoemaker Bog	---	50
	LaPorte	Barker Woods	Private	30
			Total	321
	Porter	Cowles Bog & Dunes	Dunes Acres	20
	Porter	Ancient Pines Nature Area, Indiana Dunes State Park	State*	180
	Porter	Ecology Coves, Dunes State Park	State*	25
	Porter	Little Calumet River	Various	--
			Total	225
	Elkhart	Parsons Swamp Woods	Private	17
	Elkhart	Wear Woods	Private	12
			Total	29
	LaGrange	Lane Lake	Pigeon River State Fish & Game Area*	20
	LaGrange	Nasby Overlook Prairie	Pigeon River State Fish & Game Area*	10
	LaGrange	Olin Lake & Broward Woods	Purdue University & Private	180
	LaGrange	Quog Lake	Private	100
	LaGrange	Tamarack Bog	Pigeon River State Fish & Game Area*	65
			Total	375
	Noble	Lloyd W. Bender Preserve	Acres, Inc.	60
	Noble	Gene Stratton Porter State Mem. Woods	State*	6
	Noble	Griders Woods	Tri-County State Fish & Game Area*	17
	Noble	Long Swamp Woods & Pond	Private	40
	Noble	Loni Daw Nature Preserve	Acres, Inc.	25
	Noble	Merry Lea Nature & Religious Center	Merry Lea Foundation	600
	Noble	Edna W. Spurgeon Woodland Reserve	Acres, Inc.	65
			Total	713
2.3	St. Joseph	Clingenspell Woods & New-Oak-Road Bog	Private (State to purchase)	80
	St. Joseph	St. Marys College Nature Area	St. Marys College	100
	St. Joseph	Bendix Gift Park Woods	St. Joseph County Park Dept.	30
	St. Joseph	Spicer Lake	Private	30
			Total	240
	Steuben	Fawn River below Orland	State stream through private land	4.7 miles
	Steuben	Barnes Swamp	Private	125
	Steuben	Beaverdam Lake	State*	55
	Steuben	Beechwood Nature Preserve	Acres, Inc.	19
	Steuben	Cedar Marsh	Private	small
	Steuben	Charles McClue Reserve	County	80
	Steuben	Marsh Lake	Club & individuals	70
	Steuben	Stayner Dry Prairie	Pigeon River State Fish & Game Area*	15
	Steuben	Wing Haven	Private	200
	Steuben	Woodland Bog	Acres, Inc.	20
			Total	584
4.2	Allen	Spring Lake Woods & Bog	Private	20
	Allen	Bluecast Woods	Private	25
	Allen	Fox Island	Private	200
			Total	245
	Dekalb	Kado-lato Woods	Private	40

\* All State owned areas are managed by the Indiana Department of Natural Resources.

TABLE 17-24 Areas of Ecological Significance in Wisconsin (1970)\*

PSA	County	Name of Area	Importance	Acres
1.1	Ashland	Bad River-Kakagon Marsh	Vast marshland	10,000
	Bayfield-Ashland	Apostle Islands	21 Islands - natural state	40,000
	Douglas	Brule River	Important trout stream	1,000
	Douglas	Douglas County Grouse Area	Jack pine barren, sharp-tailed grouse mgmt. area	240
2.1	Door	Peninsula Beech Forest	Beech forest	30
	Door	Peninsula Cedar-Spruce Grove	White cedar, white spruce, open forest	40
	Door	Ridges Sanctuary-Baileys Harbor	Abandoned beach ridge, many rare plants	700
	Door	Sister Islands	Gull nesting area & wildlife refuge	15
	Door	Tofts Point	Hemlocks, white pine, & northern hardwoods, white cedar & spruce on dolomite outcrop	300
	Door	Whitefish Bay Dunes	Best dunes on Lake Michigan in State	400
	Door	Rock Island State Park	Isolated island, supports excellent northern hardwood timber	900
	Fond du Lac	Ripon Prairie	Assortment of prairie relics	1.5
	Fond du Lac	Spruce Lake Bog	Open bog & tamarack, spruce forest	117
	Fond du Lac	Top O' the Thumb**	Marshes, islands, & bays	4,800
	Fond du Lac	Waupun Park Maple Forest	Old growth sugar maple, basswood, & red oak forest	40
	Fond du Lac	Haskell Noyes Memorial Woods	Sugar maple, red oak, & basswood forest with the Kettle Moraine State Forest	70
	Langlade	Flora Lake	Spring pond surrounded by swamp conifers	40
	Manitowoc	Wilderness Ridge	Abandoned beach line, pine forest with hemlock	8
	Manitowoc	VanderBloemen Bog	Rich growth of ferns, bog shrubs, & insectivorous plants	24
	Manitowoc	Maribel Caves	Niagara dolomite escarpment, shaded cliff community	8
	Manitowoc	Two Creek Buried Forest	Exposed remains of a boreal forest	12
	Marinette	Marinette County Beech Forest	Northern hardwoods with areas of nearly pure beech	40
	Marinette	Lawrence Creek	One-half mile of trout stream used for research	25
	Oconto	Charles Pond	Lake inlet & marsh, 40 acres of maple, elm, basswood	110
	Sheboygan	Cedar Grove, Hawk	Gathering place for hawks during migration	32
	Sheboygan	Terry Andrae St. Park Extension**	Sand dunes and marsh	1,000
	Waupaca	Cactus Rock	Dry prairie, includes rare dwarf cactus on granite outcrop	20
	Kenosha	Silver Lake Bog	Excellent open bog	30
	Kenosha	New Muster Bog Island	15 acres of sand knoll of oaks in tamarack bog	55
	Kenosha	Chiwaukee Prairie	Finest prairie remaining in State	65
	Ozaukee	Fairy Chasm	80 foot deep chasm with cold microclimate	55
	Ozaukee	Cedarburg Beech Woods	Healthy stand of beech, hard maple, & white ash	50
	Ozaukee	Cedarburg Bog	Tamarack swamp forest with black spruce & open bog	392
	Racine	Sanders Park Hardwoods	Red oak & white ash forest	30
	Waukesha	Scuppernong Prairie	Wet prairie with small oak opening	25
	Waukesha	Eagle Oak Opening	Showy pasque flowers & other dry prairie species with burr & white oak on morainal debris	60

\* All areas have been designated scientific or natural areas by the State Board for the Preservation of Scientific Areas and are in State ownership.

\*\* Areas not currently under public ownership but are slated for State ownership.

TABLE 17-25 Areas of Ecological Significance in Illinois (1969)

PSA	County	Name of Area	Importance	Acres
2.2	Lake	Illinois Beach State Park	Sand & marsh terrace with dune ridges, prairie grasses, other unusual flora	1,550
	Lake	Illinois Beach State Park Ext.*	Sand ridge & marshes	2,000
	Lake	Volo Bog*	Unusual flora	47
	Lake	Wauconda Bog*	Unusual flora	67
	Kane	Trout Park* (Elgin Botanical Garden)	Over 60 species of grass and other unique flora	60

\* Private ownership

TABLE 17-26 Areas of Ecological Significance in Michigan (1969)

PSA	County	Name of Area	Importance	Acres
1.2	Chippewa & Luce	Betsie Lake Natural Area Preserve		14,137
	Baraga & Marquette	Huron Mountains*	Highest terrain in Michigan wilderness. Habitat for lynx & wolf.	100,000
	Alger	Pictured Rocks*	Cliffs, sand dunes, lakes, & ponds	100,000
	Chippewa	Vermilion Beach*	Beaches, bogs, & marshes	3,200
	Chippewa	Whitefish Bay*	Beaches, dunes, marshes, & forests	600
	Chippewa	Raber Point*	Geologic interest, fossils, lakes, & forest	5,800
	Chippewa	Potagonnissing Bay*	21 Island complex with marshes	2,800
	Chippewa	St. Vital Point*	Wide beaches & mixed conifer, hardwood forest	5,600
2.3	Muskegon & Ottawa	County Line*	Massive dune complex one mile wide, fine beaches	2,500
	Allegan	Saugatuck*	Dune complex, beaches, & deciduous forest	1,400
	Van Buren	Thunder Mountain*	Dune complex, wide beaches, & deciduous forest	500
	Berrien	Stevensville* (3 units)	Dune complex, shallow lakes, & marsh	2,000
2.4	Benzie	Betsie Point*	Sand dunes & deciduous forest	500
	Benzie	Herring Lake*	Bluffs, dunes, & lake complex	900
	Benzie	Arcadia*	Bar Lake & fine beaches	700
	Mason	Bass Lake Dunes*	High dunes & beaches	600
	Oceana & Muskegon	Flower Creek Dunes*	Dunes, creek mouth beaches	1,200
	Mackinac	Boise Blanc Nature Study Area		696
	Mackinac	Point Patterson*	Beaches, marsh, dunes	12,000
	Schoolcraft	Seul Choix*	Beaches, dunes, marshes, & deciduous forest	5,500
	Emmet	Sturgeon Bay*	High dunes, connects State Forest to State Park	2,200
	Charlevoix	Fisherman Island*	Shoal area around island & shore dunes	1,500
	Leelanau	Cat Head Bay*	Fine beach, dunes, & shallow water	3,000
	Leelanau	Sleeping Bear*	One of the highest & largest sand dune complexes in Great Lakes with National significance	30,000
	Leelanau	South Manitou Island		
		Gulf Point Nature Study Area		453
		Nature Reservation		551
		Natural Area Preserve		1,038
Roscommon	Roscommon Red Pine Nature Area Preserve		160	
3.1	Presque Isle	Besser Natural Area		135
	Presque Isle	Lake Breeze*	Beach, dunes, & coniferous forest	1,000
	Presque Isle	Thompsons Harbor*	Rocky points, harbor, & bays	1,200
	Alpena	South Point*	Wide shoal area, beach, & forest	3,400
	Alcona	Sturgeon Point*	Beaches, gull nesting point, shallow bays	4,000
	Iosco	Au Sable Point*	Shallow waters, wide beaches, dunes, & conifers	300
	Iosco	Tawas Point*	Beaches, tamarack bog, forest	1,500
	3.2	Bay	Tobico Marsh*	Marsh & lagoon complex
Huron		Port Crescent*	River course through sand dunes & marsh	2,000
4.4	Wayne	Celeron Island	Vital shallow water waterfowl feeding area and shore marshes	1,000

\* Areas not currently in public ownership.

TABLE 17-27 Areas of Ecological Significance in Ohio (1969)

PSA	County	Name of Area	Importance	Acres
4.2	Allen	Heslers Woods	Rich flora	30
	Allen	Roberts Property	Woods	25
	Allen	Shenk Property	Wildflowers	15
	Crawford	Crawford County Prairie	Burr oak, savanna tall grass prairie	5
	Crawford	Tschanen Woods	Good beech, maple	26

TABLE 17-27 (continued) Areas of Ecological Significance in Ohio (1969)

PSA	County	Name of Area	Importance	Acres	
4.2	Defiance	Krills Lake	Odonata fauna	30	
	Defiance	"Tree Farm"	Sample of flora for the region	78	
	Erie	Berlin Heights Ravine	Flora (hemlock & others)	Unknown	
	Erie	Resthaven Wildlife Area*	Former wet-marl prairie	2,328	
	Erie	Cedar Point	Marsh vegetation	325	
	Erie	Galpin Wildlife Preserve*	Rich flora	37	
	Erie	Lotus Beds	American & Oriental lotus	Unknown	
	Erie	Sheldons Folley	White oak, beech, hickory, sassafras, & black walnut	54	
	Erie	Kellys Island*	Unique geology, upland game habitat	670	
	Erie	Glacial Grooves*	National Natural Landmark	1	
	Erie	Plum Brook	Dunes & marsh, high value shore & wading bird habitat	1,400	
	Fulton	Maumee State Forest*	Some dunes & wet prairie	3,071	
	Fulton	Goll Woods*	Old growth hardwood forest, nearly virgin	50-70	
	Ottawa	Cooks Woods	Great variety of trees, shrubs, & herbs	80	
	Ottawa	Haunks Pond, Middle Bass Island	Pond succession & swamp forest	2	
	Ottawa	Lakeside Daisy	Lakeside daisy	Unknown	
	Ottawa	Middle Harbor*	First class sanctuary for waterfowl & wildlife	200	
	Ottawa	Redbuds	Mature redbuds	Unknown	
	Ottawa	Sand Point	Dunes & marsh	Unknown	
	Lucas	Irwin Prairie	Wet prairie	80	
	Lucas	Oak Openings Metro Park*	Unusual flora, sand dunes	3,200	
	Seneca	Swamp & Marsh	Good, unspoiled wetlands	160	
	Van Wert	Heistand Woods	Wet forest	18	
	Van Wert	York Township Woods	Believed to be a virgin swamp forest	Unknown	
	Williams	Hayes Lake	Water with small bog	5	
	Williams	Mud Lake	Small, shallow lake with bog meadow	Unknown	
	Williams	Nettle Lake	Natural pothole surrounded by wooded hills	94	
	Williams	Opdycke Woods	Good burr oak, white oak	45	
	Wood	New Rochester Woods	Spring flora	375	
	Wood	Steidman Wildlife Sanctuary <sup>1</sup>	Second growth timber	65	
	Wood	Weston Cemetery Pond	Heavy aquatic vegetation		
	Wyandot	Killdeer Plains*	Formerly wet prairie (try to restore)	6,174	
	4.3	Ashtabula	Armstrong Hemlock Grove	Bog with sphagnum, mature hemlocks	4-5
		Ashtabula	Conneaut Creek	Spring flora, hemlocks & other northern species	225
		Ashtabula	Fillingham Road Woods	Spring flora & second growth timber	70
		Ashtabula	Geneva-on-the-Lake	Lagoons & deciduous forested creek mouth	244
		Ashtabula	Heronry (Great Blue)	Mature beech forest	Unknown
		Ashtabula	Lisowski Property	Beech-maple, yellow birch, & hemlock forest, spring flora	Unknown
		Ashtabula	Pennline Bog	Swamp forest recently cut, larch	50
		Ashtabula	Plymouth Marsh	Elm swamp forest	20
		Ashtabula	Swamp Forest	Elm humid swamp forest	Unknown
		Ashtabula	Thoburn Property	Old farm & second growth forest	160
Ashtabula		Vort Woods	Excellent herbaceous flora	50	
Ashtabula		Warners Hollow	Gorge with Canadian zone life, newts & salamanders	Unknown	
Cuyahoga		Cleveland Metro Park District*	Hemlock coves, gorges, oak forests, ponds, swamps, beech-maple forest	Unknown	
Cuyahoga		Lake Abrams	Open water marsh	20-30	
Cuyahoga		Tinkers Creek*	National Natural Landmark	1,335	
Cuyahoga		North Chagrin Reservation*	Good forest & spring flora	1,719	
Cuyahoga		Brecksville Reservation*	Good forest	2,500	
Geauga		Ansells Ldges	Beech, sweet birch, hemlock & mountain maple	Unknown	
Geauga		Fern Lake <sup>2</sup>	Glacial bog lake with floating margin	20	
Geauga		Holden Arboretum	National Natural Landmark	2,100	
Geauga		Little Mountain	Rainfall up to 50-60 inches, white pine & hemlock	Unknown	
Geauga		Parkman Gorge	Gorge of Grand River, hemlocks & mountain maple	Unknown	
Geauga		Punderson Lake State Park*	Emerald Lake, boggy margin	25	
Geauga		Raised Bog	Raised iron bog on hillside	1	
Geauga		Stebbins Gulch	Deep ravine of northern species	Unknown	
Geauga		White Pine Bog Forest	Peat bog forest	50-100	
Geauga		Whittam Memorial Forest*	Woodland rich in species of trees	90	
Lake		Cascade Falls	Scenic falls on shale	Unknown	
Lake		Chapin State Forest*	Mature red oak, cucumber, tulip, etc.	361	
Lake		Daykin Swamp <sup>3</sup>	Essentially virgin	23	
Lake		Hells Hollow*	Undisturbed valley	500	

TABLE 17-27 (continued) Areas of Ecological Significance in Ohio (1969)

PSA	County	Name of Area	Importance	Acres
4.3	Lake	Indian Point*	High flattopped point, essentially virgin	116
	Lake	Kimball Woods <sup>3</sup>	Second growth woods, rolling terrain	100
	Lake	Kitts Gully	White pine, hemlock, Canada honeysuckle	Unknown
	Lake	Mentor Marsh*	Virgin swamp forest, marsh & open water	560
	Lake	Mill Creek Hogback*	Buffalo berry, hemlock, spring flora	172
	Lake	Paine Hollow	Hardwood, pine, hemlock	Unknown
	Lake	Penitentiary Gulch	Deep ravine, northern species	Unknown
	Lake	Taxus (Canada Yew) Habitat	Steep slope with mature hemlock & stand of Taxus	Unknown
	Lake	Wickliffe High School*	Large woods & swamp	Unknown
	Lorain	Chance Creek	Hemlock, beech-maple forest	68
	Medina	Hardscrabble Heronry	Beech, maple, elm, white ash, & about 20 blue heron nests	Unknown
	Medina	Hinckley Reservation	Pond, lowland forest, sandstone cliffs	1,890
	Medina	Spruce Run	Probably best fern flora in county	Unknown
	Portage	Bird Bog	Laborador tea, leather leaf, etc.	25
	Portage	Crystal Lake	Glacial lake with jellyfish	Unknown
	Portage	Nelson-Kennedy Ledges*	Azaleas, trillium, & sandstone formation	167
	Portage	Dollar Lake	Tamarack-sphagnum bog lake	Unknown
	Portage	Mantua Swamp	Rare orchids, Philadelphia lily, Castalleja, azalea, shrubby cinquefoil	140
	Portage	Beverly Woods <sup>3</sup>	Swamp & mixed hardwood forest	42
	Portage	Jennings Woods <sup>3</sup>	Wildflower habitat	72
	Portage	Frame Lake Bog <sup>3</sup>	Tamarack, shrubby cinquefoil, bayberry, buckthorn	28
	Portage	Triangle Lake	Glacial bay, grass-of-parnassia	Unknown
	Portage	Eagle Creek <sup>2</sup>	Swamp forest & bog	278
	Summit	Cranberry Bog	Sphagnum, cranberry, poison sumac	Several
	Summit	532 Swamp	Swamp with much open water	Unknown
	Summit	Furnace Run*	Young valley, great variety of habitat	885
	Summit	Green Township	Singer Lake, smaller ponds, marsh, bog, swamp	Unknown
	Summit	Knight Property	About 14,000 bd ft/ acre of tulip, cucumber, red oak, etc.	Unknown
	Summit	Nimisila Bog Meadow	Open meadows of sphagnum, shrubby cinquefoil, blazing star, fringed gentian, orchids	Several
	Summit	Sand Run Metro Park*	Rugged terrain	987
	Summit	Stumpy Basin <sup>3</sup>	Old canal basin, marsh, mixed mesophytic forest	22
	Summit	Tamarack Swamps	Beech-maple, oak forest, & hemlock	1,600
	Summit	Virginia Kendall Metro Park*	Beech-maple on Sharon conglomerate formation	1,575

\* Publicly owned; all others are private except those with special reference marks as follows:

<sup>1</sup> Owned by Bowling Green State University      <sup>2</sup> Owned by Nature Conservancy      <sup>3</sup> Owned by Kent State University

TABLE 17-28 Areas of Ecological Significance in Pennsylvania (1970)

PSA	County	Name of Area	Importance	Acres
4.4	Erie	Elk Creek*	Unique ravine with hemlock-hardwood forest & beach at mouth of ravine	850
	Erie	Presque Isle State Park	7.8 mile peninsula with marshes, beaches, & unique ecology	4,370
	Erie	Siegal Marsh*	Unusual marsh & swamp ecosystem	1,303
	Erie	State Game Land No. 109	Wetland forest area	1,638

\* Area not currently in public ownership.

TABLE 17-29 Areas of Ecological Significance in New York (1969)

PSA	County	Name of Area	Importance	Acres
4.4	Chautauqua	Canadaway Creek, Game Mgmt. Area <sup>2</sup>	Heron rookery	2,180
	Erie & Cattaraugus	Zoar Valley <sup>2</sup>	Geologic features and unusual flora	3,534
	Erie	Springville Bog*	Unusual flora	26
	Niagara	Niagara Power Dam & Niagara Falls <sup>2&amp;3</sup>	Geologic feature	N/A
5.1	Allegany	Hanging Bog, Game Mgmt. Area <sup>2</sup>	Unusual flora, rare orchids	4,350
	Allegany	Moss Lake*	Unusual flora	26

TABLE 17-29 (continued) Areas of Ecological Significance in New York (1969)

PSA	County	Name of Area	Importance	Acres	
5.1	Genesee & Monroe	Bergen Swamp*	Massasauga rattler, marl bog, unusual flora	1,200	
	Genesee & Orleans	Oak Orchard Complex <sup>2</sup>	Unusual flora & fauna	17,000	
	Livingston	Rattlesnake Hill Game Mgmt.Area <sup>2</sup>	Timber rattlers	5,150	
	Livingston	Danville/Woodville*	Unusual flora	N/A	
	Livingston	Caledonia State Fish Hatchery <sup>2</sup>	First fish hatchery in U.S.	N/A	
	Livingston & Wyoming	Letchworth State Park <sup>2</sup>	Geologic features & unusual flora	14,337	
	Monroe	Kennedys Bog*	Unusual flora, Canadian muskeg	5	
	Monroe	Point at Hamlin Beach State Park <sup>2</sup>	Nesting area for bank swallows	1,113	
	Monroe	Braddock Bay Marsh <sup>2</sup>	Marsh & ponds, waterfowl & furbearers	---	
	Monroe	Thousand-acre Swamp	Waterfowl, furbearers, rattlesnakes, & unique plant life	1,000	
	Monroe	Genesee Falls*	Scenic value in Rochester	---	
	Monroe	Devils Nose*	Waterfowl & geologic value	190	
	Orleans	East of Hulberton along Barge Canal <sup>2</sup>	Unusual flora, bastard paw paw	N/A	
	Wyoming	Warsaw Glen*	Unusual flora, mountain saxifrage	N/A	
	5.2	Cayuga & others	Cayuga Lake*	Geologic features	42,496
		Cayuga & Seneca	Montazuma Marsh <sup>1</sup>	Marsh habitat	6,175
		Cayuga	Wood Mill, Town of Scipio*	<i>Jeffersonia diphylla</i> , Twin leaf	N/A
Cayuga		Duck Lake Bogs, Town of Conquest*	Unusual flora	N/A	
Cayuga		Howlands Island State Game Mgmt.Area <sup>2</sup>	Waterfowl & furbearer value	4,900	
Madison		Chittenango Falls State Park <sup>2</sup>	Unusual flora	123	
Oneida		Fish Creek, Taberg*	Unusual flora, Canadian primrose & butterwort	N/A	
Oneida		Rome Sand Plains*	Geologic feature	3,200	
Onondaga		Cicero Swamp <sup>2</sup>	Unusual flora & fauna including Massasauga rattler	3,720	
Onondaga		Clark Reservation <sup>2</sup>	Unusual flora, Hart's tongue fern	228	
Oswego		Barrier Beaches <sup>2&amp;*</sup>	Geologic features	5 miles <sup>4</sup>	
Oswego		Salmon River Falls, Orwell*	Unusual flora, Canadian primrose & mountain saxifrage	N/A	
Oswego		Deer Creek Marsh	Waterfowl & furbearers, shore wetland	---	
Oswego		Three Mile Bay State Game Mgmt.Area, includes Toad Harbor & Big Bay Creek <sup>2</sup>	Fishery, waterfowl, & furbearers	---	
Oswego		Butterfly Marsh*	Lake shore marshes, waterfowl & furbearers	---	
Oswego		Teal Marsh, Oswego Harbor*	Waterfowl & furbearers	---	
Oswego		Peter Scott Swamp*	Waterfowl & furbearer value	---	
Entire Area		Finger Lakes*	Unique group of fresh water lakes & marshes	---	
Oswego & Wayne		Lake Ontario Barrier Beaches*	Beaches & associated wetlands	---	
Herkimer		Moose River Plains, headwaters of Moose River <sup>2</sup>	Wilderness area	---	
Herkimer		Fulton Chain of Lakes <sup>2</sup>			
Herkimer		Mud Pond, Jordanville*	Unusual flora, rare orchids	---	
Herkimer		Mountain Peaks 2000'+ <sup>2&amp;*</sup>			
Wayne		Mud Pond, Town or Zurich*	Unusual flora	---	
Wayne		Zurich Swamp*	Unusual flora	100	
Wayne		Chimney Bluffs*	Geological features	3 miles <sup>4</sup>	
Seneca		Junius Ponds*	Unusual flora & fauna, rare orchids, Bog or Muhlenberg's turtle	---	
Seneca & others		Seneca Lake*	Geologic features	42,688	
Tompkins		Fall Creek Gorge, Ithaca*	Unusual flora	N/A	
Tompkins		Taughannock Falls State Park <sup>2</sup>	Unusual flora & geological features	794	
Tompkins		Connecticut Hill Game Mgmt.Area <sup>2</sup>	Unusual flora, coal skink	11,610	
Yates		Parish Glen, Naples*	Heron rookery	N/A	
5.2 & Herkimer & St. Lawrence		Adirondack Forest & Preserve <sup>2&amp;*</sup>	Wilderness, forest, & mountains	---	
5.3					
5.3	Jefferson	Perch River Game Mgmt.Area <sup>2</sup>	Waterfowl, fishery, & furbearers values	---	
	Jefferson	Lakeview Marsh, includes Ponds & Beach <sup>2</sup>	Waterfowl, fishery, & furbearers values. Scenic area	---	
	Jefferson	Dexter Marsh <sup>2</sup>	Lakeshore marsh, waterfowl & furbearers	---	
	Jefferson	Eldorado Shore, includes Black Pond*	Lakeshore marsh, waterfowl & furbearers	---	
	Jefferson	Indian River & Lakes*	River & lake system, waterfowl, fish & furbearers	---	

TABLE 17-29 (continued) Areas of Ecological Significance in New York (1969)

PSA	County	Name of Area	Importance	Acres
5.3	Jefferson	Little Galloo Island*	Geologic & scenic values	---
	Jefferson	Goose Bay Islands*	Geologic & scenic values	---
	Jefferson	Goose Bay*	Waterfowl significance	---
	Jefferson	Wilson Bay Marsh*	Waterfowl & wilderness	---
	Jefferson	High Bluffs, Henderson area*	Harbor & Point, waterfowl & fishery values	---
	Jefferson	N.Y. State Great Lakes Fisheries Station <sup>2</sup>	Sport & commercial fish Research & Management Center	---
	Jefferson	Lake Ontario Off-Shore islands*	High value for fishing, shorebirds, and diving ducks. Includes one nesting colony of Double-crested Cormorant.	---
	Jefferson	1,000 Island Complex*	Geologic features	---
	Jefferson	Gull Island*	Ring-billed Gull rookery	---
	Jefferson	Galloo Island*	Herring Gull rookery	5,000
	Jefferson	Tug Hill Plateau*	Wilderness	---
	Jefferson	Limestone Bluffs, Henderson Hbr.*	Geologic features	2 miles <sup>4</sup>
	St. Lawrence	Wilson Hill Wildlife Mgmt. Area <sup>2</sup>	Waterfowl	---
	St. Lawrence	Chippewa Bay*	Waterfowl & fishery values	---
	St. Lawrence	Mountain Peaks 2000'+ <sup>2&amp;*</sup>	---	---
St. Lawrence	Upper & Lower Lakes <sup>2</sup>	Waterfowl & fishery values	---	
St. Lawrence	Fish Creek, Game Mgmt. Area <sup>2</sup>	Waterfowl, fishery, & furbearers	---	
4.4, 5.1 & 5.2	St. Lawrence	Erie Barge Canal <sup>2</sup>	Connecting waterway between Great Lakes and Hudson River system. Recreation, fishing, hunting, allows interchange of aquatic life.	---

<sup>1</sup> US Bureau of Sport Fisheries and Wildlife ownership.

<sup>2</sup> New York State Agencies ownership.

<sup>3</sup> New York State Power Authority ownership.

<sup>4</sup> Length of shoreline.

\* Private ownership.

## 2.2.2 Great Lakes Wetlands and Waterfowl

conspicuous feature, are included in the definition, but the permanent waters of streams, reservoirs, and deep lakes are not included.

### 2.2.2.1 Introduction

Although waterfowl, fish, and other forms of wildlife are not restricted to political boundaries, this discussion will concentrate on the United States portion of the Great Lakes and their basins. There are two major categories of water in the Great Lakes: the open waters of the Lakes with their associated shoreline marshes and shoal areas, and inland open waters and associated marshes in the Basin's drainage area.

This definition works well for the inland wetlands, but presents a confused picture along the shores of the Great Lakes. Shoal area and shoreline marshes overlap, because shoals include both marshes and adjacent shallow open water. For the purpose of this appendix we will consider shoal areas as wetlands. The eight wetland types found in the Great Lakes Basin are defined in the Glossary.

### 2.2.2.2 Defining Wetlands

It is necessary to understand the term "wetlands." The U.S. Fish and Wildlife Service in its Circular 39 published in 1956 describes the nature of wetlands:

The term "wetlands" as used in this report and in the wildlife field generally refers to lowlands covered with shallow and sometimes temporary or intermittent waters. They are referred to by such names as marshes, swamps, bogs, wet meadows, potholes, sloughs, and river over-flow lands. Shallow lakes and ponds, usually with emergent vegetation as a

### 2.2.2.3 Wildlife and Great Lakes Wetlands

The open water of the Lakes produces millions of pounds of fish and is also important to many species of waterfowl. Migrating and wintering waterfowl use the open waters as resting areas. Large "rafts" of ducks and geese have been observed many miles from land.

Although many species of waterfowl use the open water, its overall value is low when compared to the shoal and marsh areas along the lakeshores. While the open water is used primarily as a resting area, the shoals and marshes are used for resting, nesting, and

(continued on page 54)

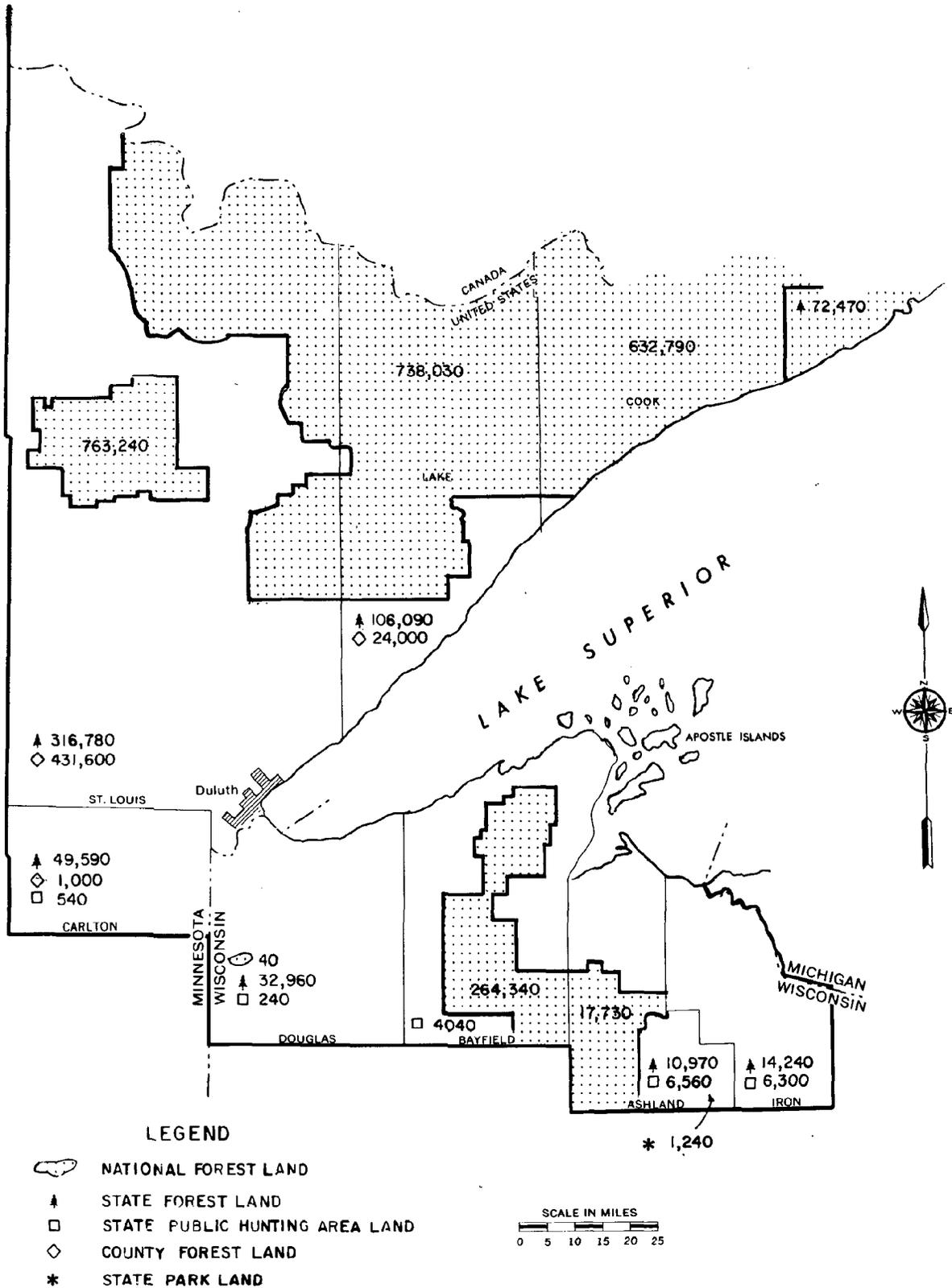


FIGURE 17-4 Publicly Owned Lands Open to Hunting in Planning Subarea 1.1 as of 1970

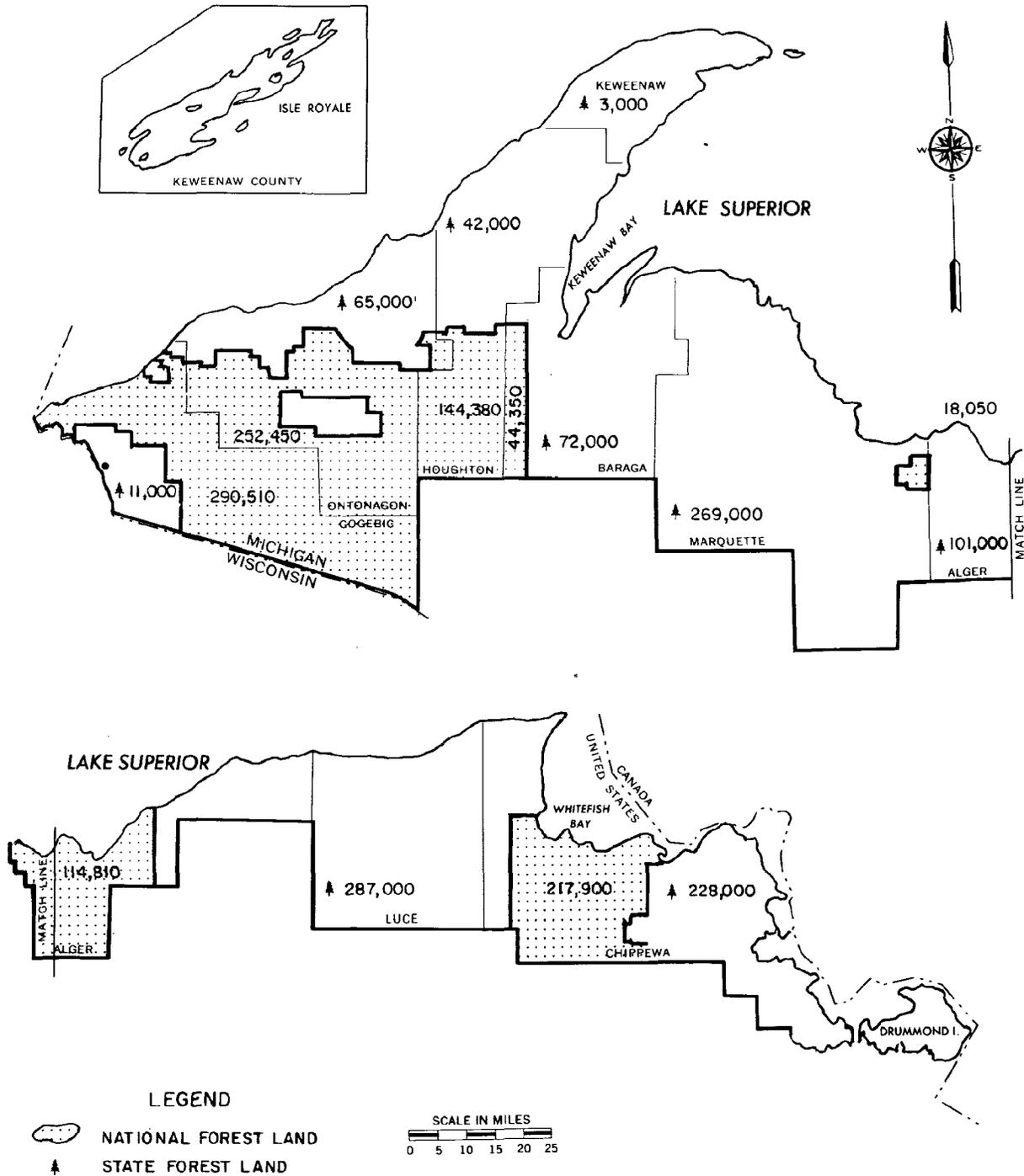


FIGURE 17-5 Publicly Owned Lands Open to Hunting in Planning Subarea 1.2 as of 1970

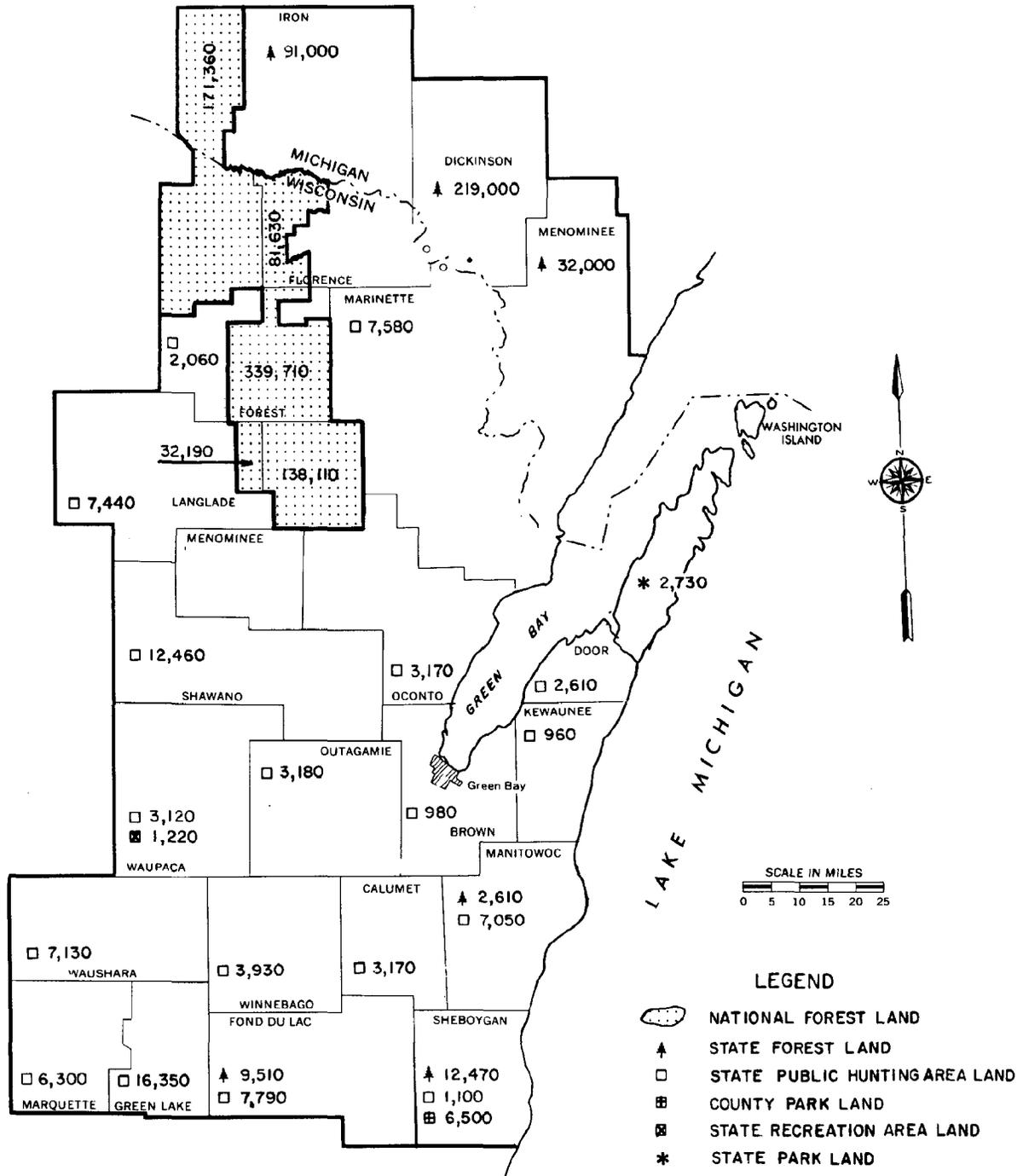


FIGURE 17-6 Publicly Owned Lands Open to Hunting in Planning Subarea 2.1 as of 1970

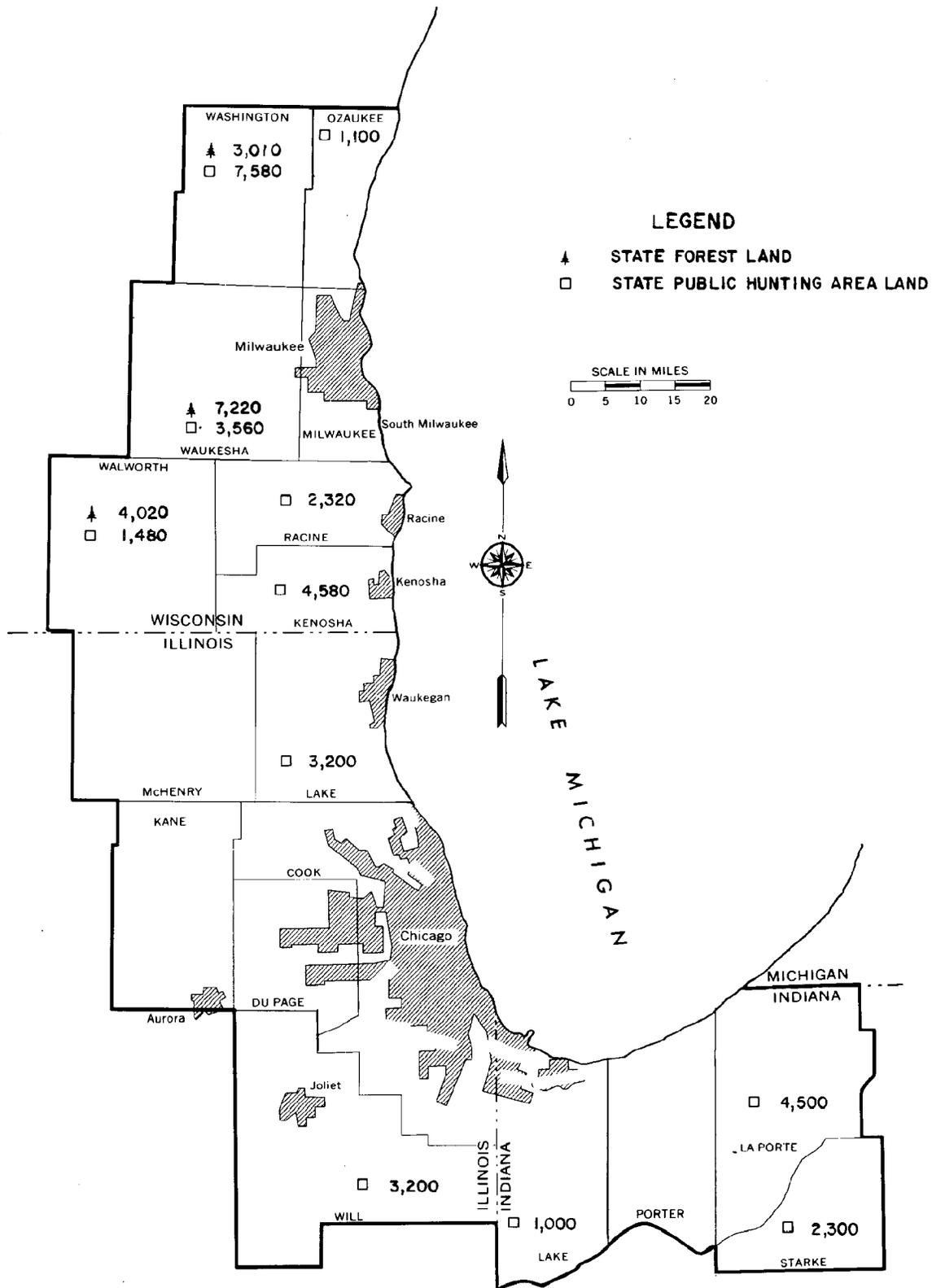
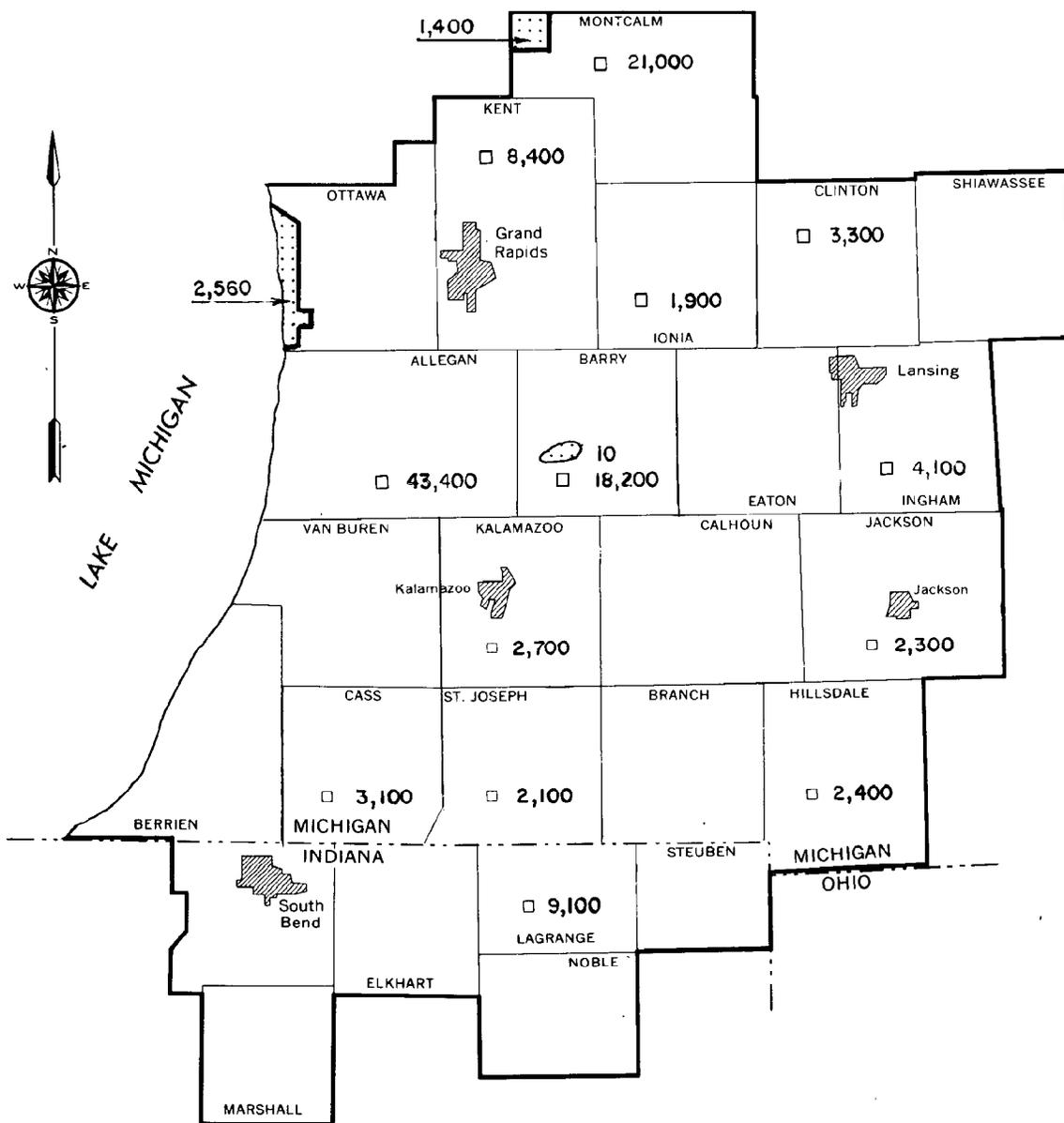


FIGURE 17-7 Publicly Owned Lands Open to Hunting in Planning Subarea 2.2 as of 1970



**LEGEND**  
 NATIONAL FOREST LAND  
 STATE PUBLIC HUNTING AREA LAND

SCALE IN MILES  
 0 5 10 15 20 25

FIGURE 17-8 Publicly Owned Lands Open to Hunting in Planning Subarea 2.3 as of 1970

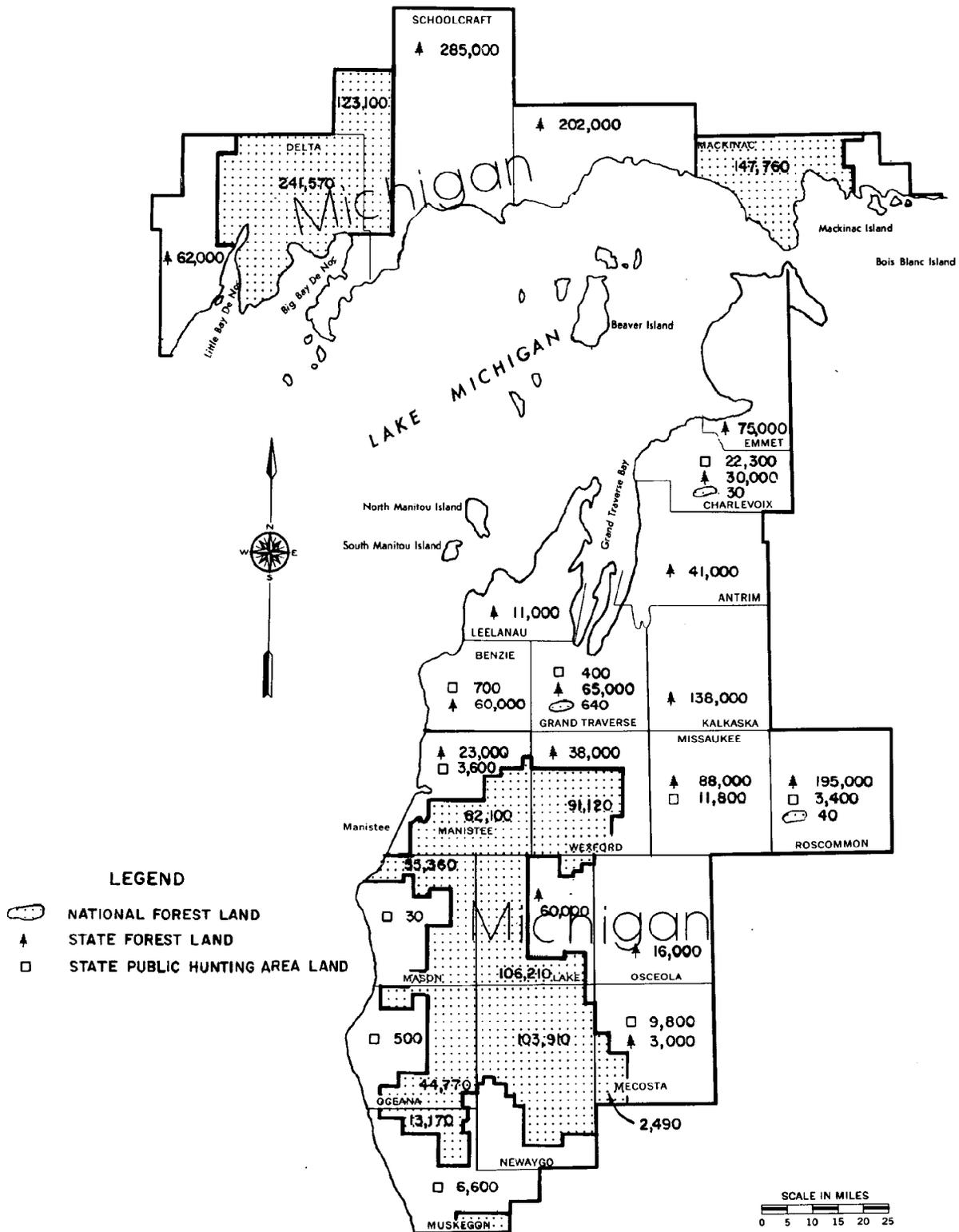


FIGURE 17-9 Publicly Owned Lands Open to Hunting in Planning Subarea 2.4 as of 1970

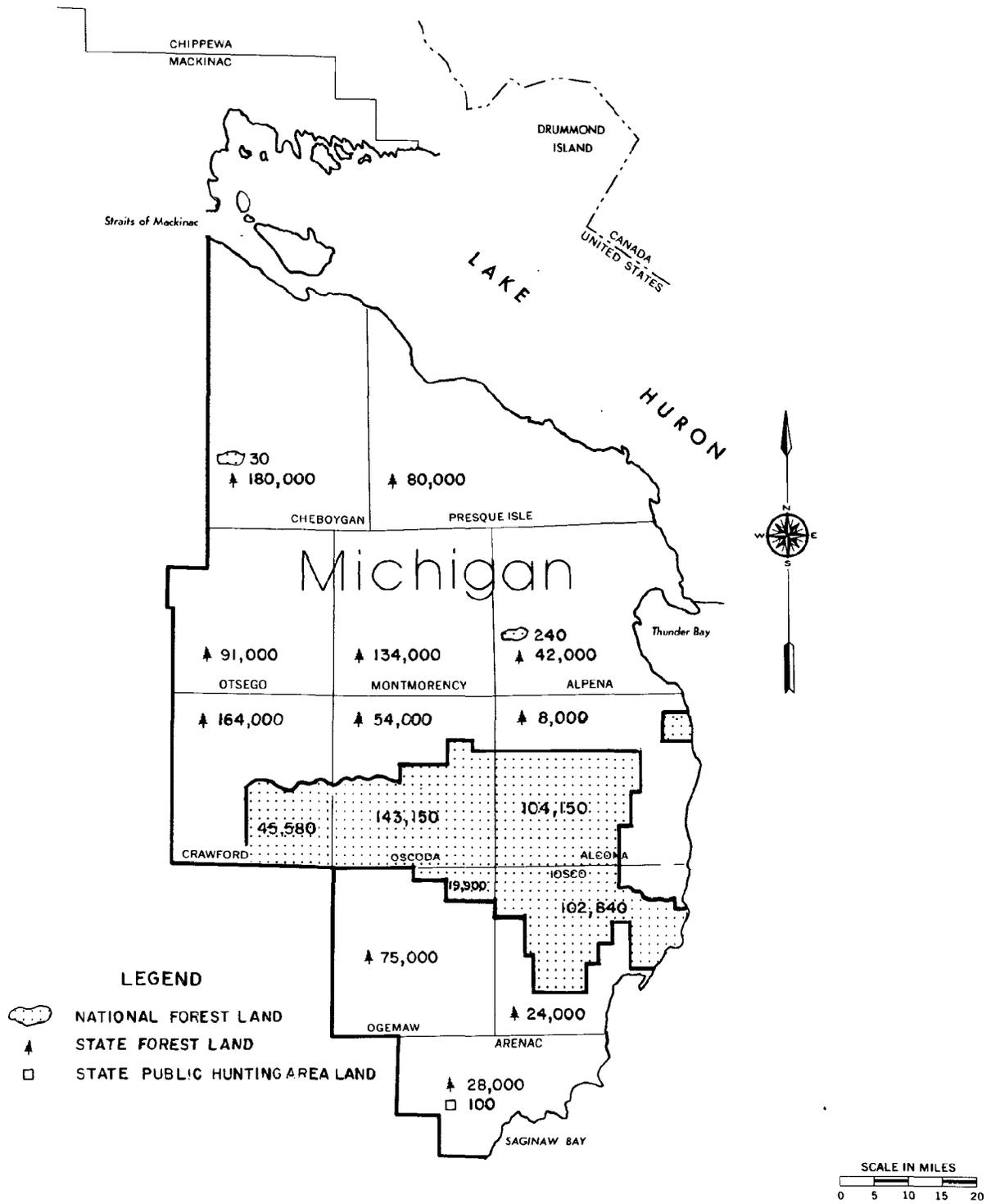
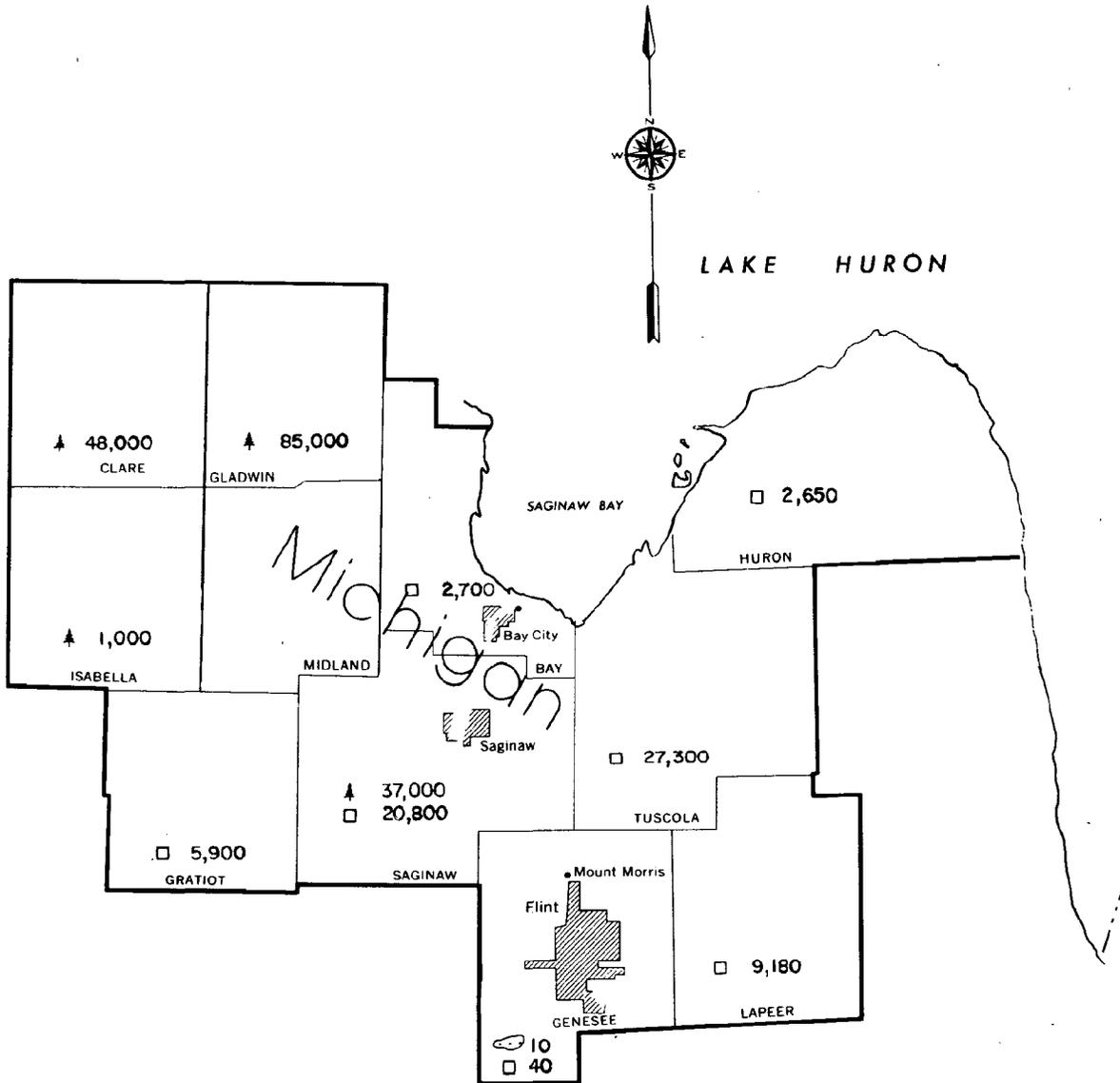
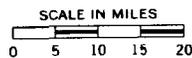


FIGURE 17-10 Publicly Owned Lands Open to Hunting in Planning Subarea 3.1 as of 1970



**LEGEND**

-  NATIONAL FOREST LAND
-  STATE FOREST LAND
-  STATE PUBLIC HUNTING AREA LAND



**FIGURE 17-11 Publicly Owned Lands Open to Hunting in Planning Subarea 3.2 as of 1970**

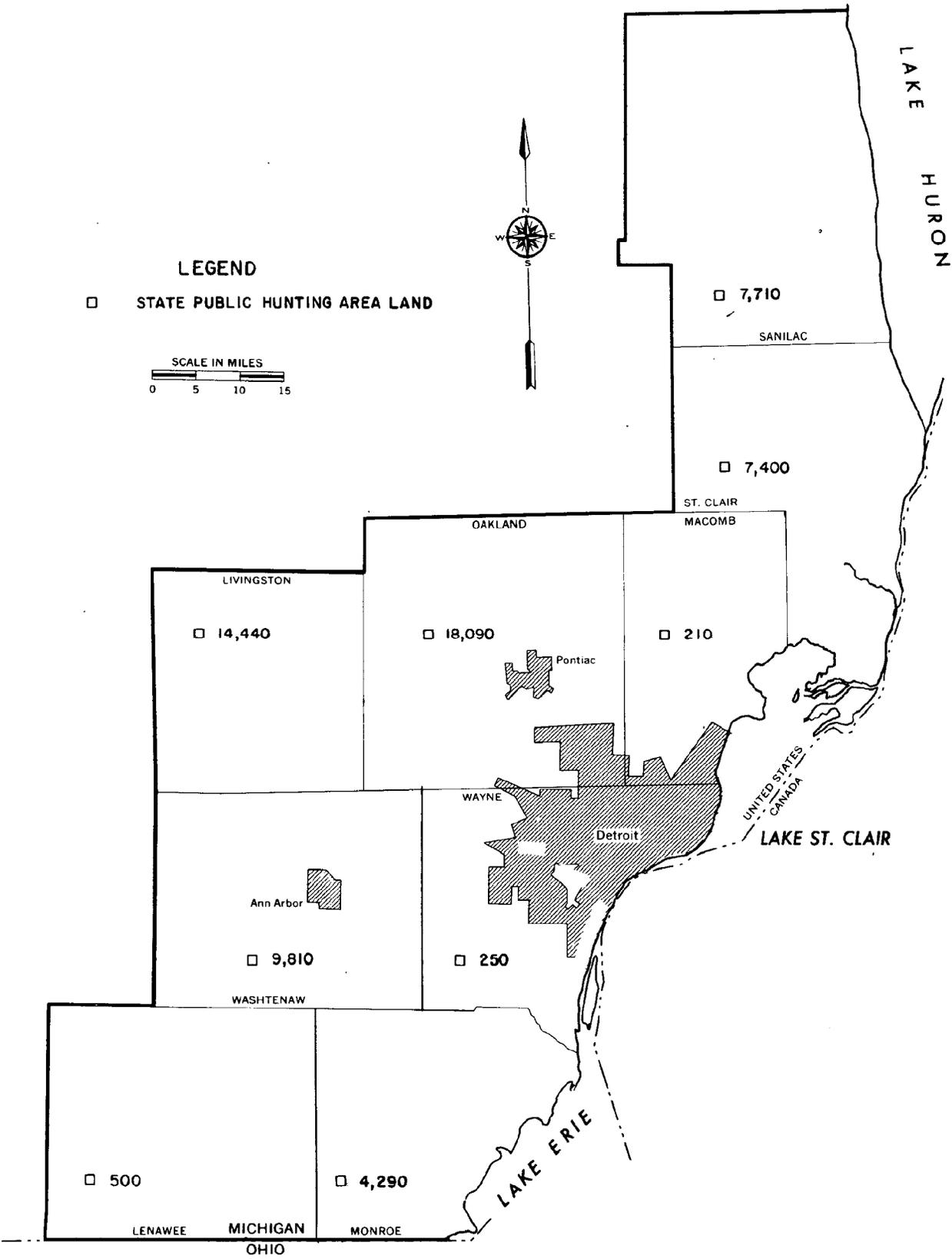


FIGURE 17-12 Publicly Owned Lands Open to Hunting in Planning Subarea 4.1 as of 1970

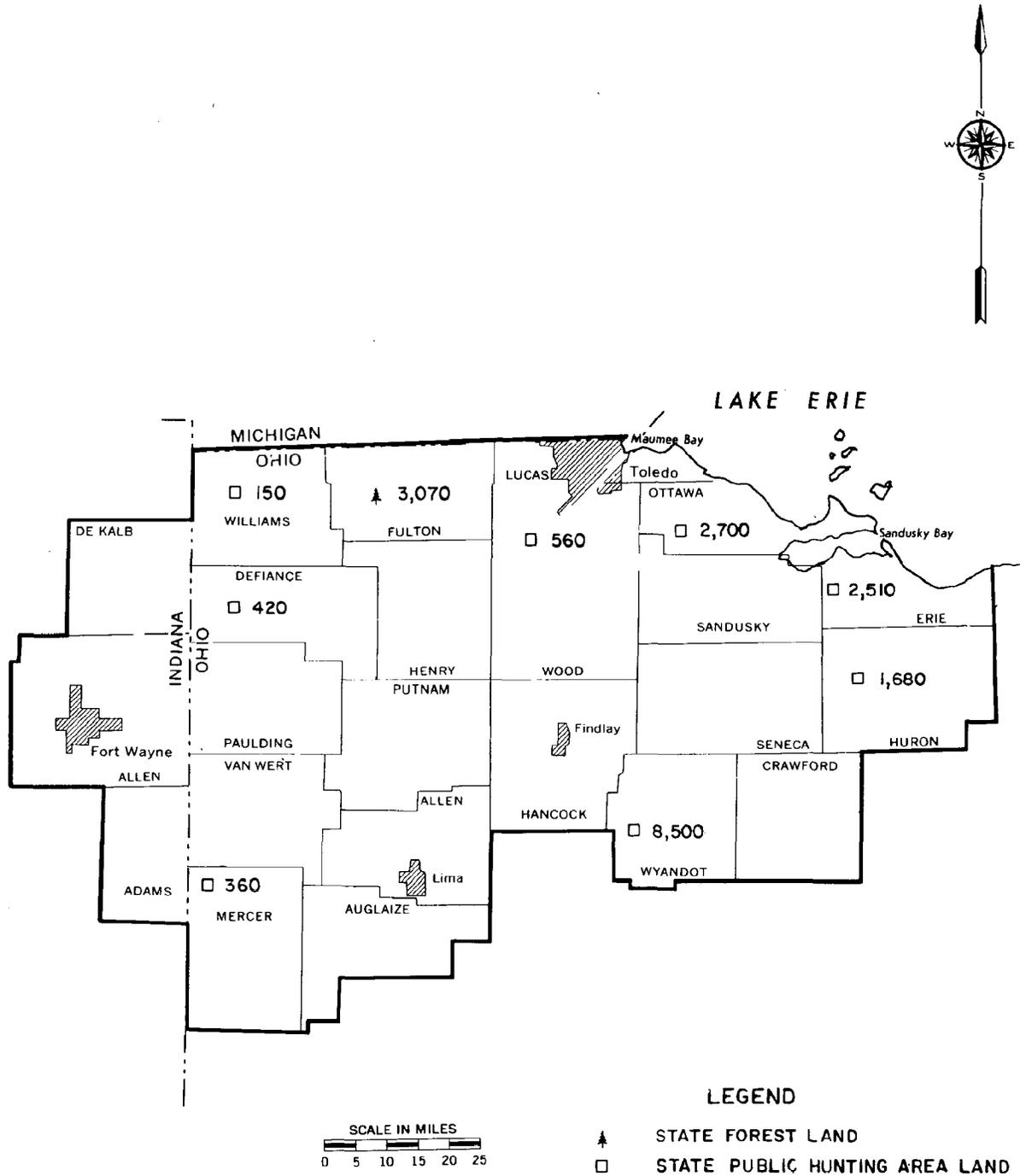
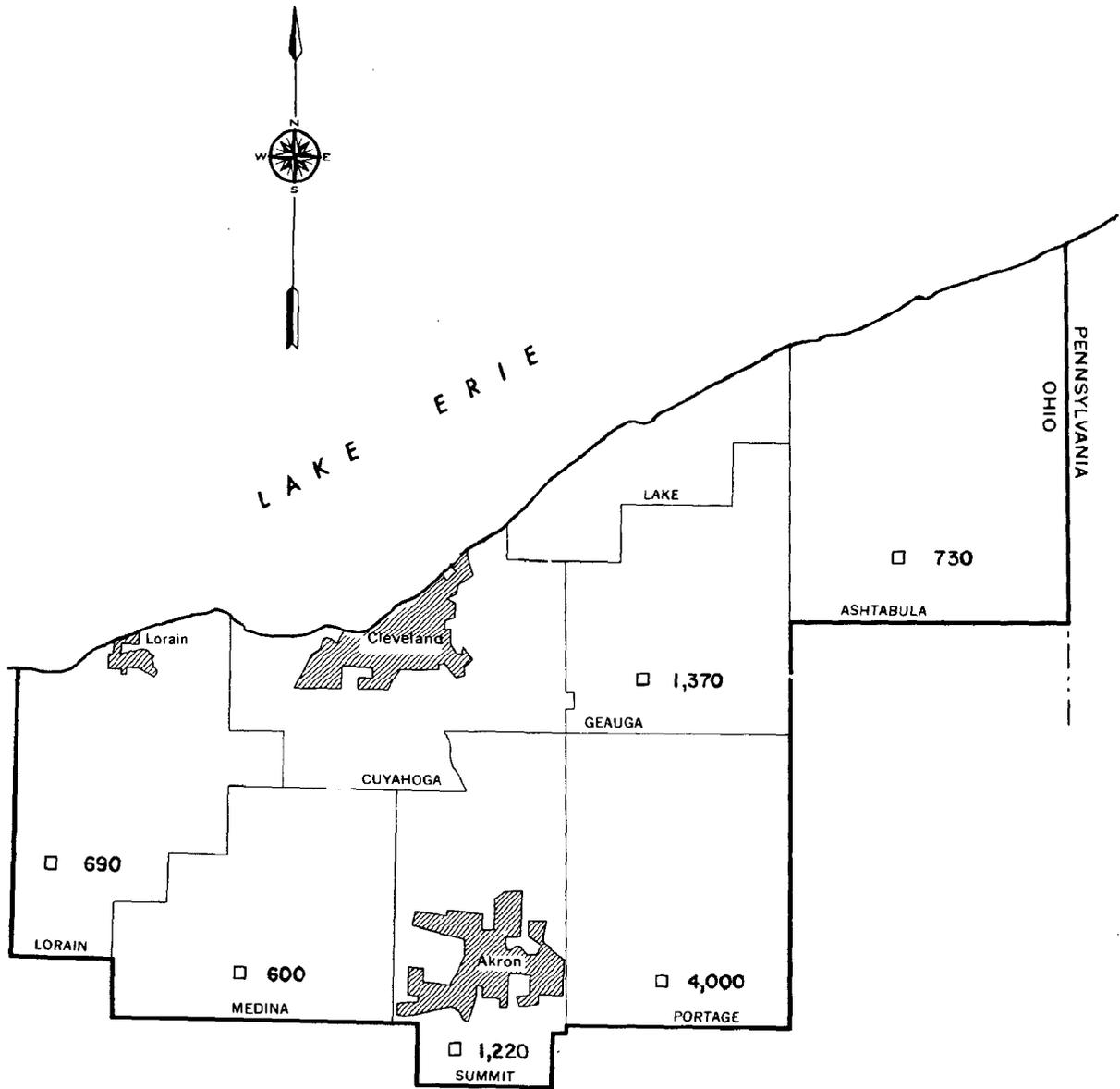


FIGURE 17-13 Publicly Owned Lands Open to Hunting in Planning Subarea 4.2 as of 1970



LEGEND

□ STATE PUBLIC HUNTING AREA LAND

FIGURE 17-14 Publicly Owned Lands Open to Hunting in Planning Subarea 4.3 as of 1970

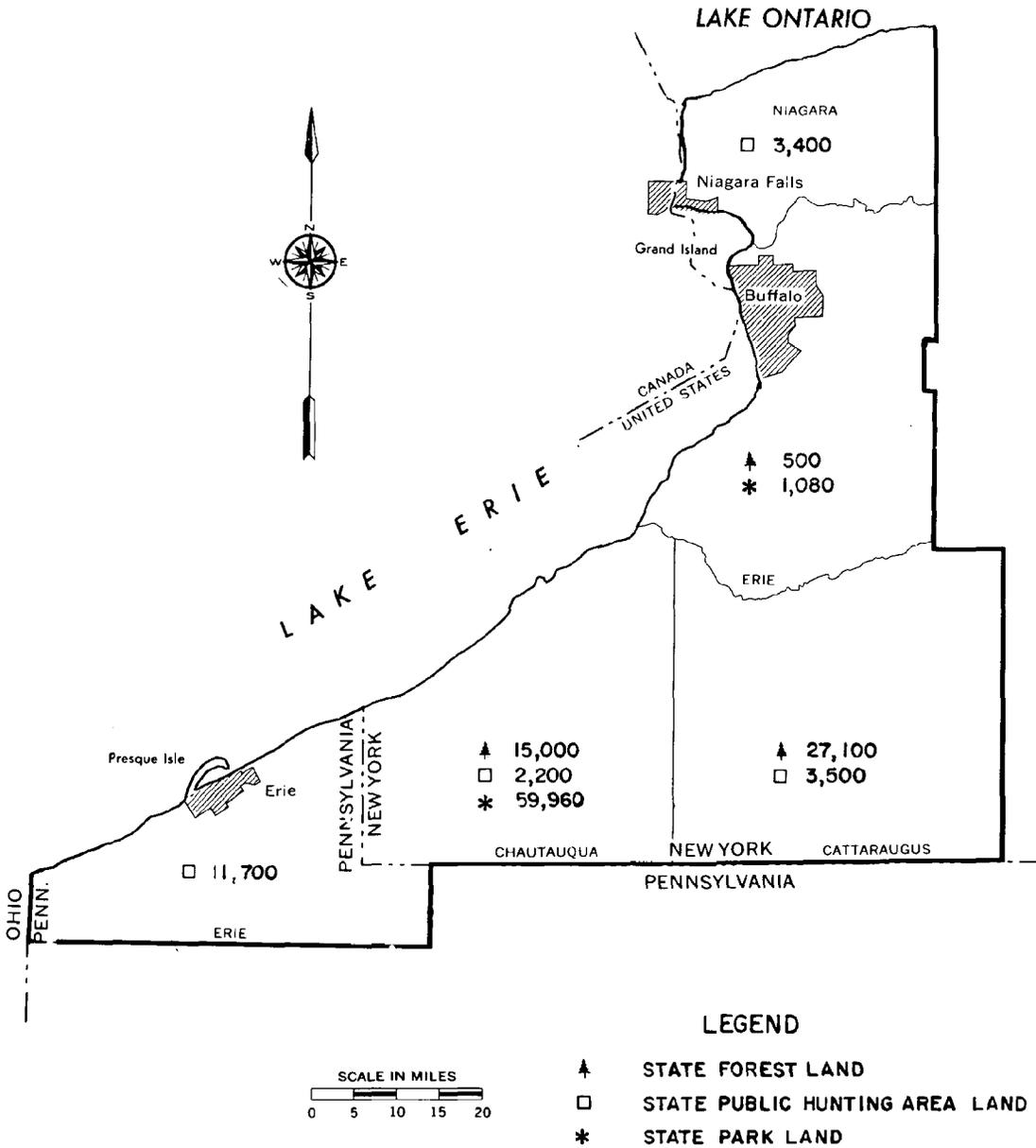


FIGURE 17-15 Publicly Owned Lands Open to Hunting in Planning Subarea 4.4 as of 1970

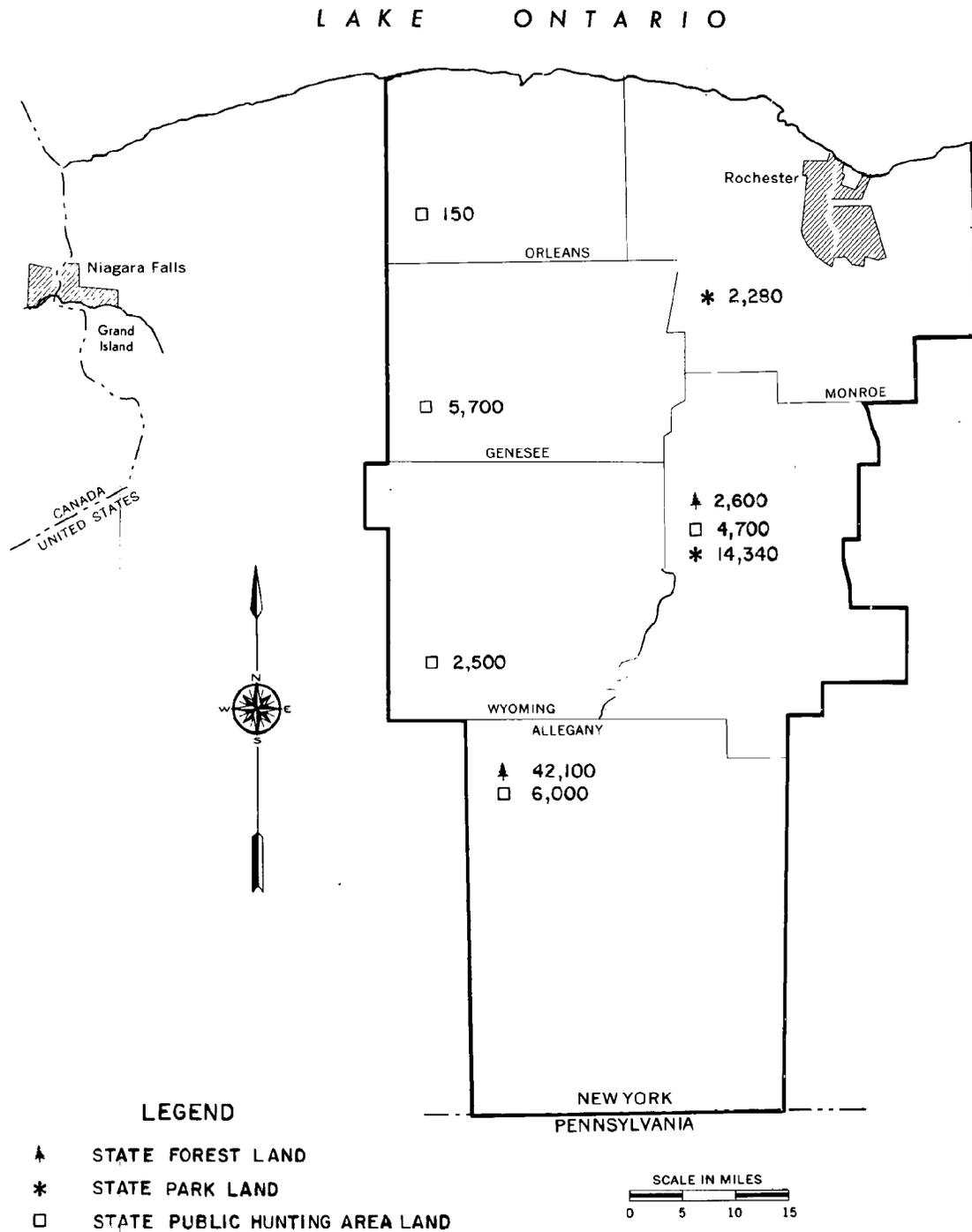


FIGURE 17-16 Publicly Owned Lands Open to Hunting in Planning Subarea 5.1 as of 1970

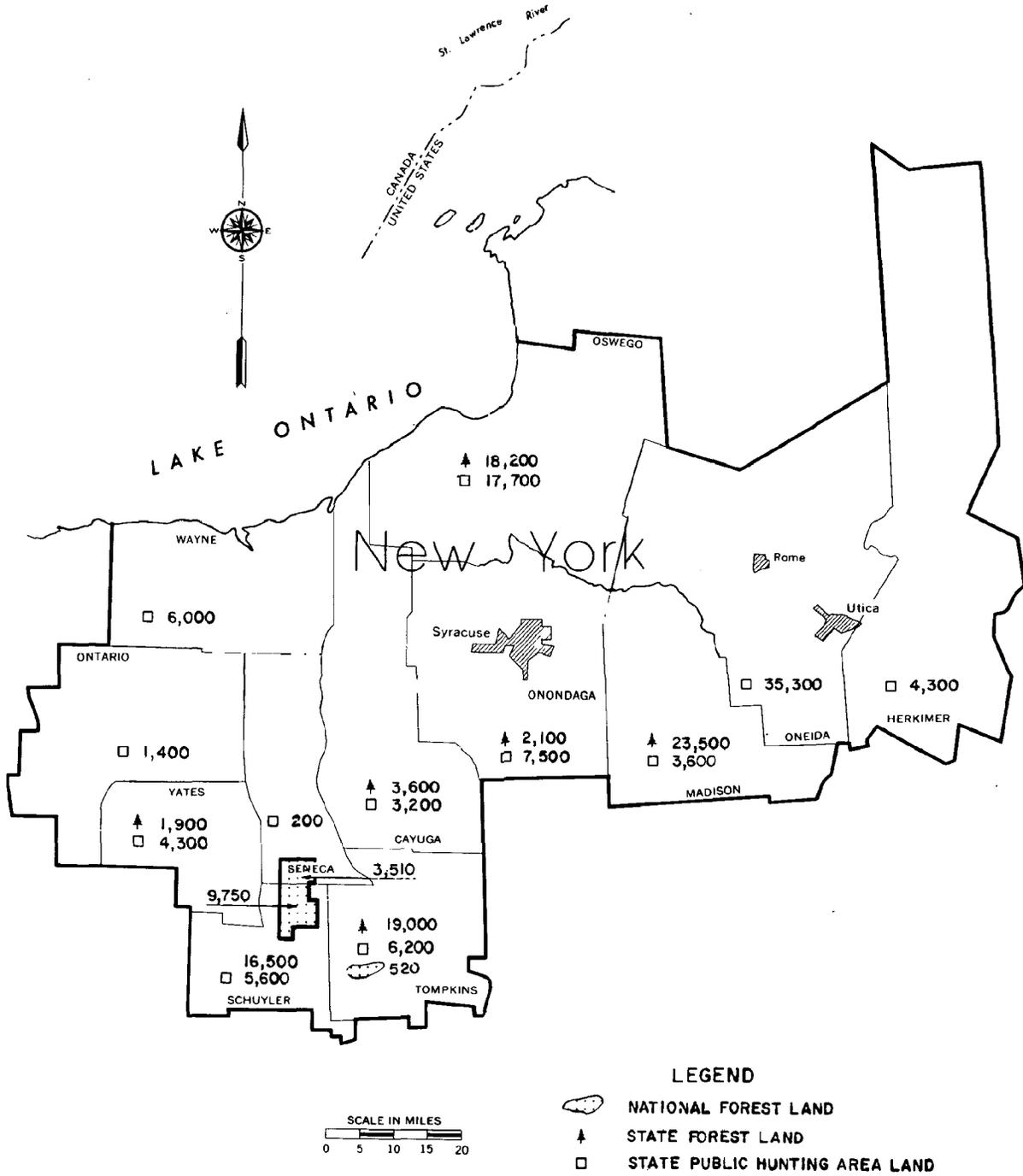


FIGURE 17-17 Publicly Owned Lands Open to Hunting in Planning Subarea 5.2 as of 1970

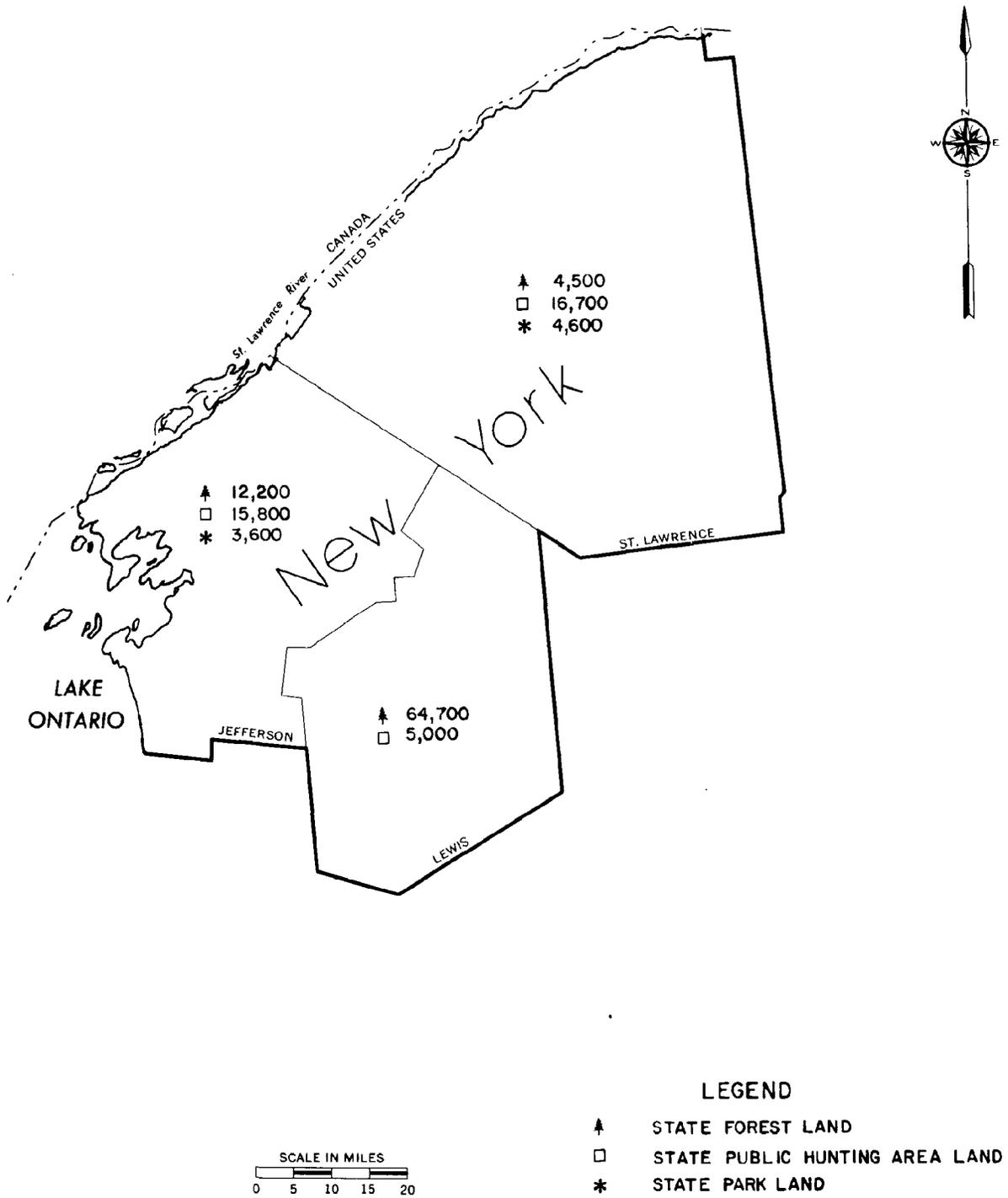


FIGURE 17-18 Publicly Owned Lands Open to Hunting in Planning Subarea 5.3 as of 1970

feeding. These shore areas are also some of the most important waterfowl hunting areas. The Great Lakes and connecting waterways have a total of 610,150 acres of shoal areas, of which 491,156 acres are considered important to wildlife (Table 17-30).

Shoreline shoals and wetlands are influenced by the fluctuating water levels of the Great Lakes. With a steep gradient relatively few acres of shoreline may be affected, but a fluctuation of as little as six inches may affect thousands of acres of wetlands where the gradient is low.

Shallow water is one of the prime requirements for the production and maintenance of waterfowl populations as well as many other forms of animal life. It is used as spawning grounds by many Great Lakes fishes. The control of water depths through the use of dikes and levees with controlled outlet structures is a major waterfowl management technique. Large acreages of these diked-off, controlled wetlands have been established around the shoreline of Saginaw Bay on Lake Michigan and on the western end of the shoreline of Lake Erie.

Because water-level fluctuations bring about changes in aquatic plant communities, control over these fluctuations is necessary to maintain optimum conditions for wildlife over an extended period of time. It is probably impossible to regulate the Lakes' water levels to assure ideal conditions for waterfowl and furbearers, but if the levels could be regulated within specified limits, successful long-term control over marsh water levels through erection of structures separating the marshes from the Lakes is possible.

#### 2.2.2.4 Waterfowl Use Patterns

Although the Great Lakes Basin cannot compare in importance to the prairie-pothole country of the Dakotas and the western provinces of Canada for waterfowl production, the Basin may be of greater importance to waterfowl than is generally acknowledged. It is an important link in waterfowl migration between Canada and the southern United States. At least three million waterfowl migrate into or through the Basin annually. Divers and some dabblers (puddle ducks) migrate from west to east across the Great Lakes Region, while the rest of the dabblers and the majority of geese move in a north-south pattern across the Basin. The migration patterns of four categories of waterfowl are shown in

**TABLE 17-30 Great Lakes and Connecting Waterways Shoal Acreages (1970)<sup>1</sup>**

Zone by State	Total Shoal	Important to Fish and Wildlife
St. Lawrence River New York	17,939	17,939
Lake Ontario New York	28,290	14,290
Niagara River New York	2,420	2,420
Lake Erie New York	6,420	
Pennsylvania	5,970	
Ohio	61,265	
Michigan	14,170	
Total	87,825	67,825
Detroit River Michigan	4,519	4,519
Lake St. Clair and St. Clair River Michigan	37,447	37,447
Lake Huron Michigan	160,945	140,945
Lake Michigan Michigan	107,234	
Wisconsin	63,388	
Illinois	2,710	
Indiana	2,100	
Total	175,432	140,432
St. Marys River Michigan	34,040	34,040
Lake Superior Michigan	37,266	
Wisconsin	19,708	
Minnesota	4,325	
Total	61,299	31,299
<b>BASIN TOTAL</b>	<b>610,156</b>	<b>491,156</b>

<sup>1</sup>Shoal acreages include all Great Lakes waters six feet and under in depth

figures as follows: diving ducks, Figure 17-19; dabbling ducks, Figure 17-20; Canada geese, Figure 17-21; and Blue-Snow geese, Figure 17-22.

National wildlife refuges play an important role in providing feeding and resting habitat to these migrating waterfowl. These refuges are discussed in Subsection 2.2.2.5.

The role of the Great Lakes Basin in the production of waterfowl is also important. Both the Great Lakes coastal marshes and the

inland wetlands furnish significant amounts of nesting habitat, as well as migration resting areas. Figures 17-23 through 17-27 show the coastal zone and inland areas of greatest value to waterfowl. Some of these production, migration, and wintering areas are listed below.

(1) The east-central portion of Wisconsin in Planning Subarea 2.1 contains valuable wetlands along the Fox and Wolf Rivers, and Lakes Winnebago, Poygan, and Butte Des Morts. The area is especially important to migrating waterfowl, but some nesting does occur. The west shore of Green Bay has many productive wetland areas located near the mouths of the Big and Little Suamico, Pensaukee, Oconto, and Peshtigo Rivers. The nationally known Horicon National Wildlife Refuge in east-central Wisconsin is just outside of the planning subarea.

(2) Southeastern Wisconsin in Planning Subarea 2.2 in the Lake Michigan basin is an important dabbling nesting area.

(3) The Upper Peninsula of Michigan from Munising eastward is an important breeding and nesting ground for the ring-necked duck as well as several species of dabblers and the Canada goose.

(4) The western part of the Upper Peninsula from Munising west has scattered but significant acreages of good waterfowl production habitat for the same species as those in the eastern portion.

(5) The upper half of the Lower Peninsula of Michigan has scattered but significant acreages of good waterfowl production habitat. One area, Grand Traverse Bay, should be noted because of its rather unusual populations of mute swans. The swans use this area mainly as a migration stop with some nesting and wintering on the tributary rivers of the bay. The Thunder Bay area has important wetlands for waterfowl production and migration. The State of Michigan manages approximately 1,400 acres of these wetlands for waterfowl use.

(6) The southern half of the Lower Peninsula has some of the best waterfowl production areas in Michigan. The Grand River basin in Planning Subarea 2.3 and the area inland from Saginaw Bay in Planning Subarea 3.2 are outstanding waterfowl production zones. Wood ducks and mallards nest throughout this zone. The giant Canada goose, *Branta canadensis maxima*, nests generally throughout this region and winters here in significant numbers. The blue-winged teal nests in the coastal marshes and the

larger interior marshes. The sandhill crane has established a breeding population in the Grand River basin.

The open waters of Saginaw Bay are used extensively by all forms of migrating waterfowl, including ducks, geese, and swans. The Michigan Department of Natural Resources manages approximately 20,000 acres of wetlands on or near Saginaw Bay, and the Bureau of Sport Fisheries and Wildlife manages nearly 9,000 acres of wetlands in the Shiawassee National Wildlife Refuge, just south of Saginaw Bay. Both areas are extremely important for migrating waterfowl, and portions of the areas are used for nesting and wintering. Industrial and urban development is a continual threat to the wetlands around Saginaw Bay.

(7) The waterways which connect Lake Huron with Lake Erie are important to waterfowl. The St. Clair River is used by migrating waterfowl. Lake St. Clair is nationally known for its high use by migrating waterfowl from both the Mississippi and Atlantic flyways and is one of the most important stops in the United States for canvasbacks and redheads. The St. Clair flats is an area of open water and cattails, which in addition to migration use offers excellent nesting sites for both dabbling and diving ducks. The State of Michigan and the Bureau of Sport Fisheries and Wildlife manage approximately 10,000 acres of this wetland. The Detroit River, on which cutter races were staged during the early 1900s, is now an important wintering area for ducks because the United States side of the river no longer freezes. Waterfowl wintering here are under constant threat of death from these heat- and oil-polluted waters. Pollution caused the deaths of approximately 10,000 ducks in 1948. Another 1,000 were killed in 1960 and 1964. Pointe Mouillee, near the mouth of the Detroit River, contains a 2,600-acre wetlands area managed by the Michigan Department of Natural Resources.

(8) The marshes in Planning Subarea 4.2 at the western end of Lake Erie are well known for their excellent waterfowl hunting. This marsh area, extending from Sandusky to Toledo, Ohio, contains approximately 30,000 acres. State and Federal ownership approximates 13,000 acres of these wetlands and private duck clubs control several thousand additional acres. These marshes offer excellent resting areas for migrating waterfowl and provide nesting areas for giant Canada geese, mallards, black ducks, blue-winged teal, wood

(continued on page 66)

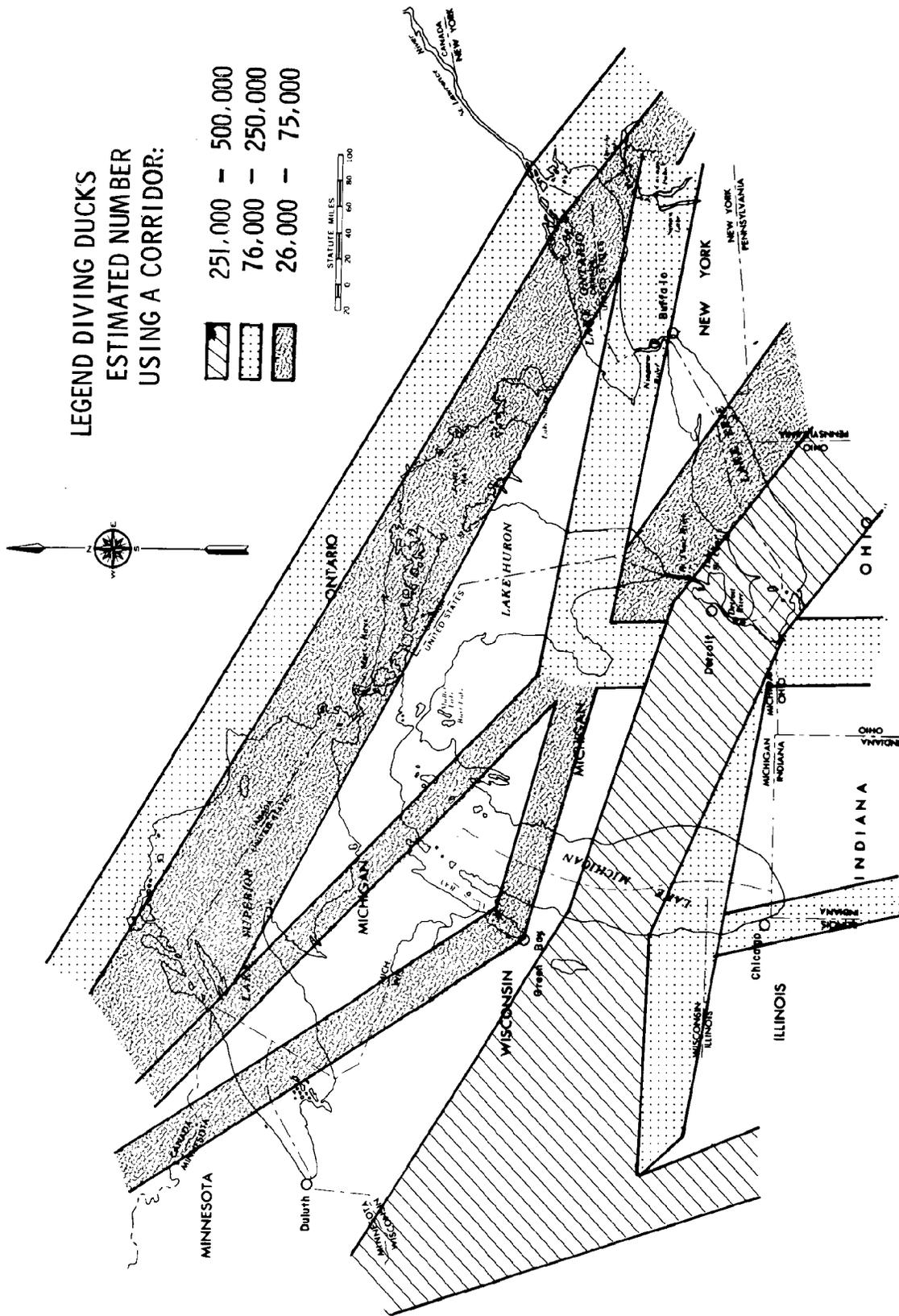


FIGURE 17-19 Great Lakes Fall Migration Corridors of Diving Ducks (Adapted from Bellerose *Waterfowl Migration Corridors* 1968)

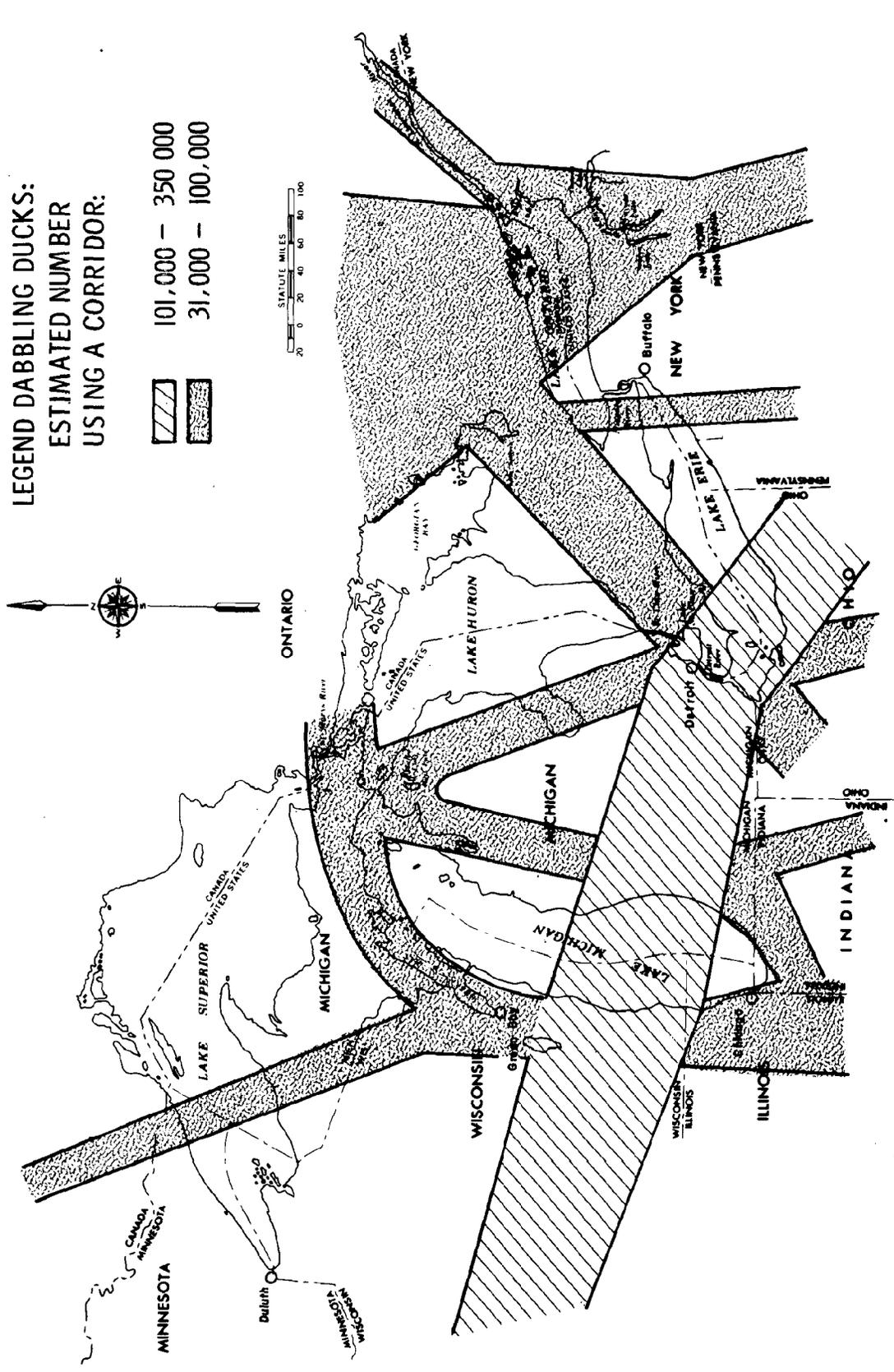
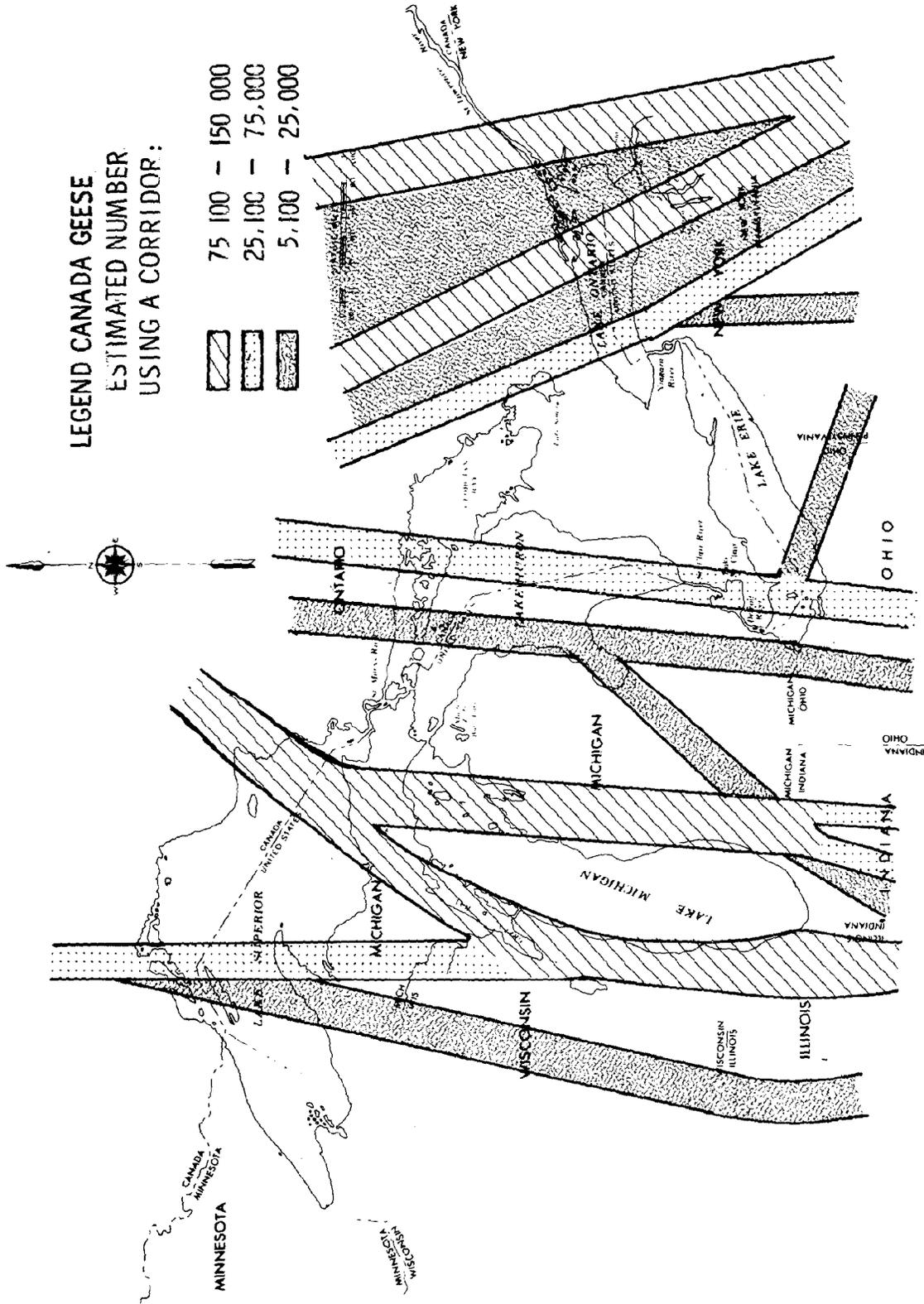


FIGURE 17-20 Great Lakes Fall Migration Corridors of Dabbling Ducks (Adapted from Bellerose Waterfowl Migration Corridors 1968)



**FIGURE 17-21** Great Lakes Fall Migration Corridors of Canada Geese (Adapted from Bellerose *Waterfowl Migration Corridors 1968*)

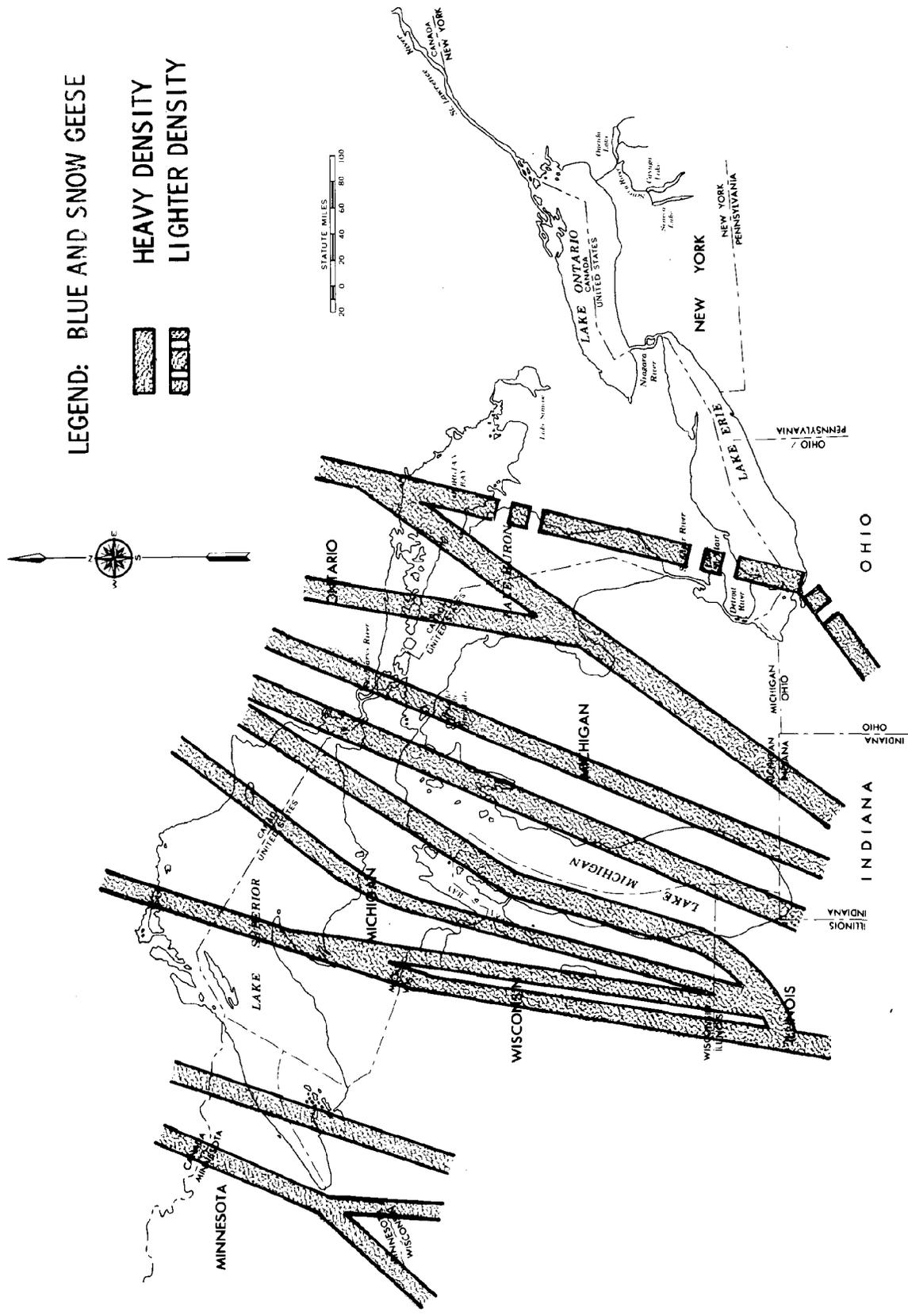


FIGURE 17-22 Great Lakes Fall Migration Corridors of Blue and Snow Geese (Adapted from Bellerose *Waterfowl Migration Corridors* 1968)

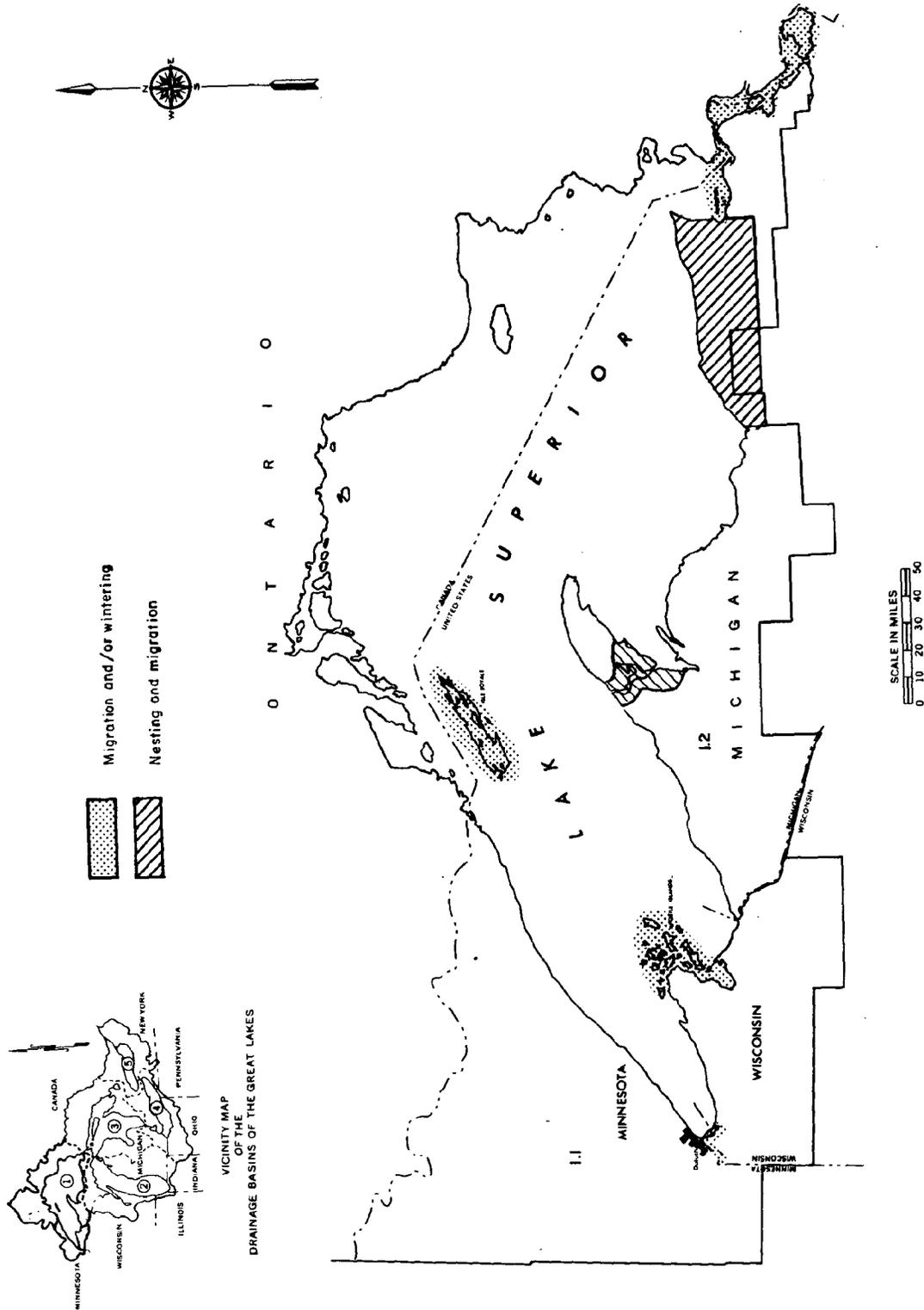


FIGURE 17-23 Primary Waterfowl Use Area, Plan Area 1

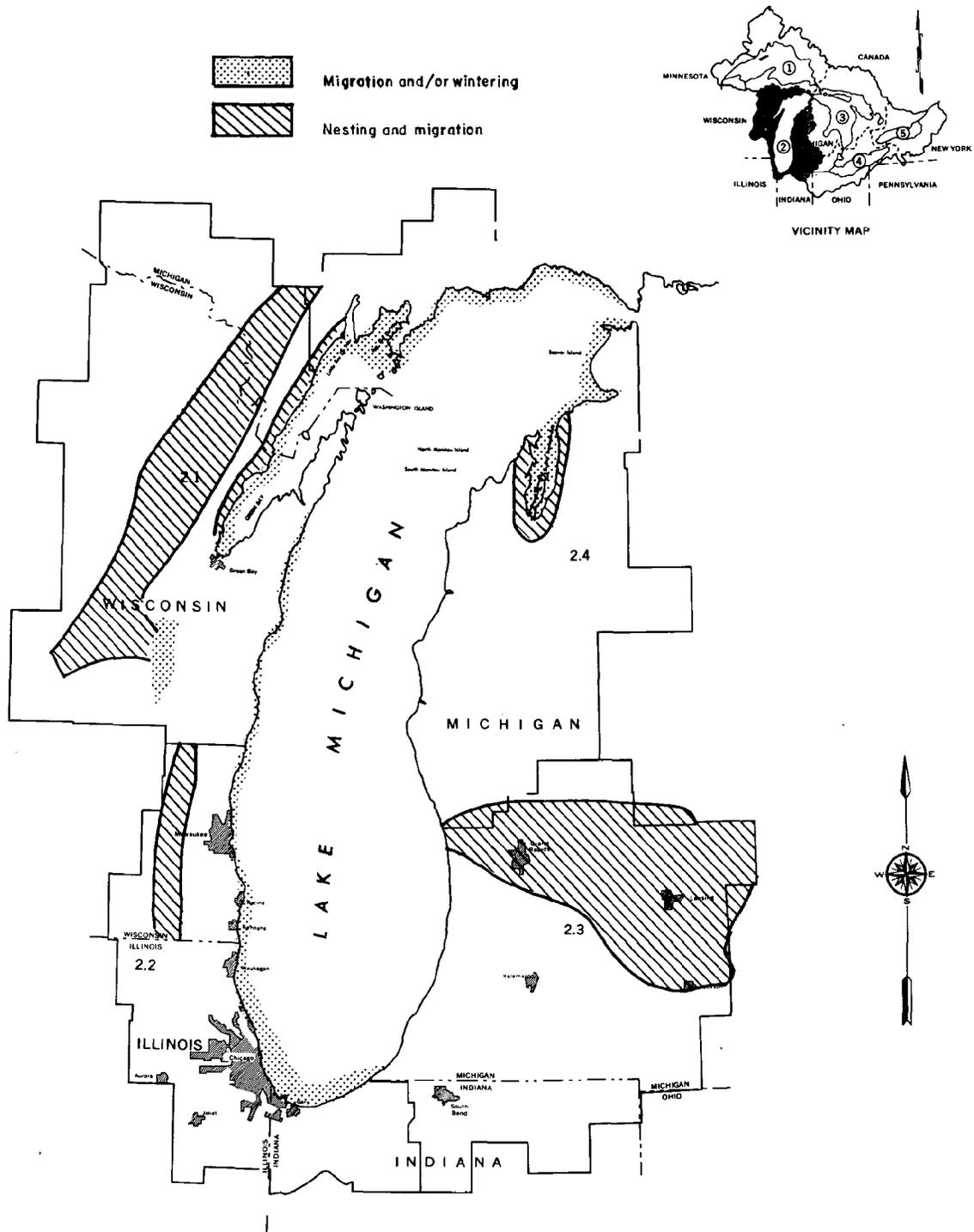


FIGURE 17-24 Primary Waterfowl Use Area, Plan Area 2

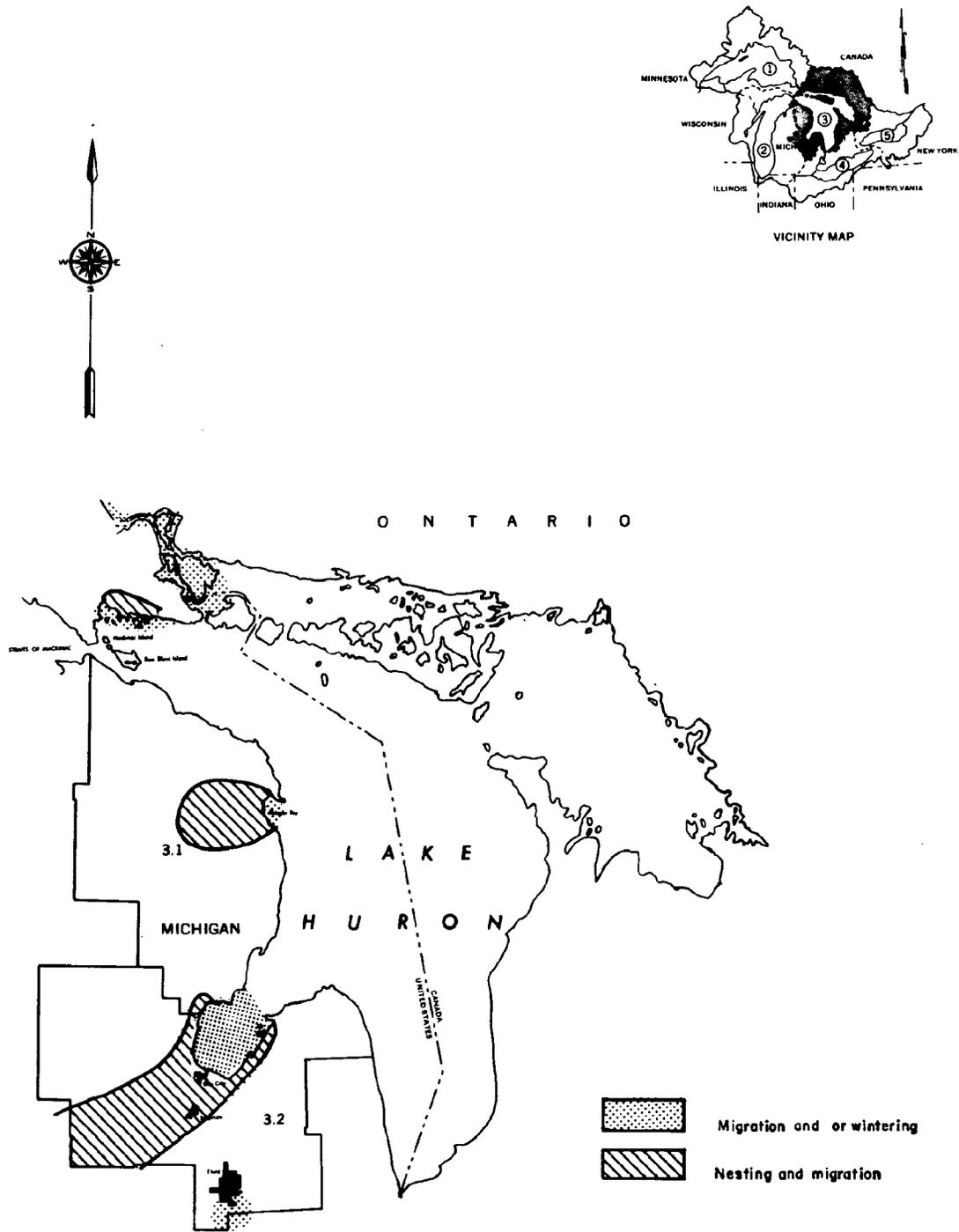


FIGURE 17-25 Primary Waterfowl Use Area, Plan Area 3

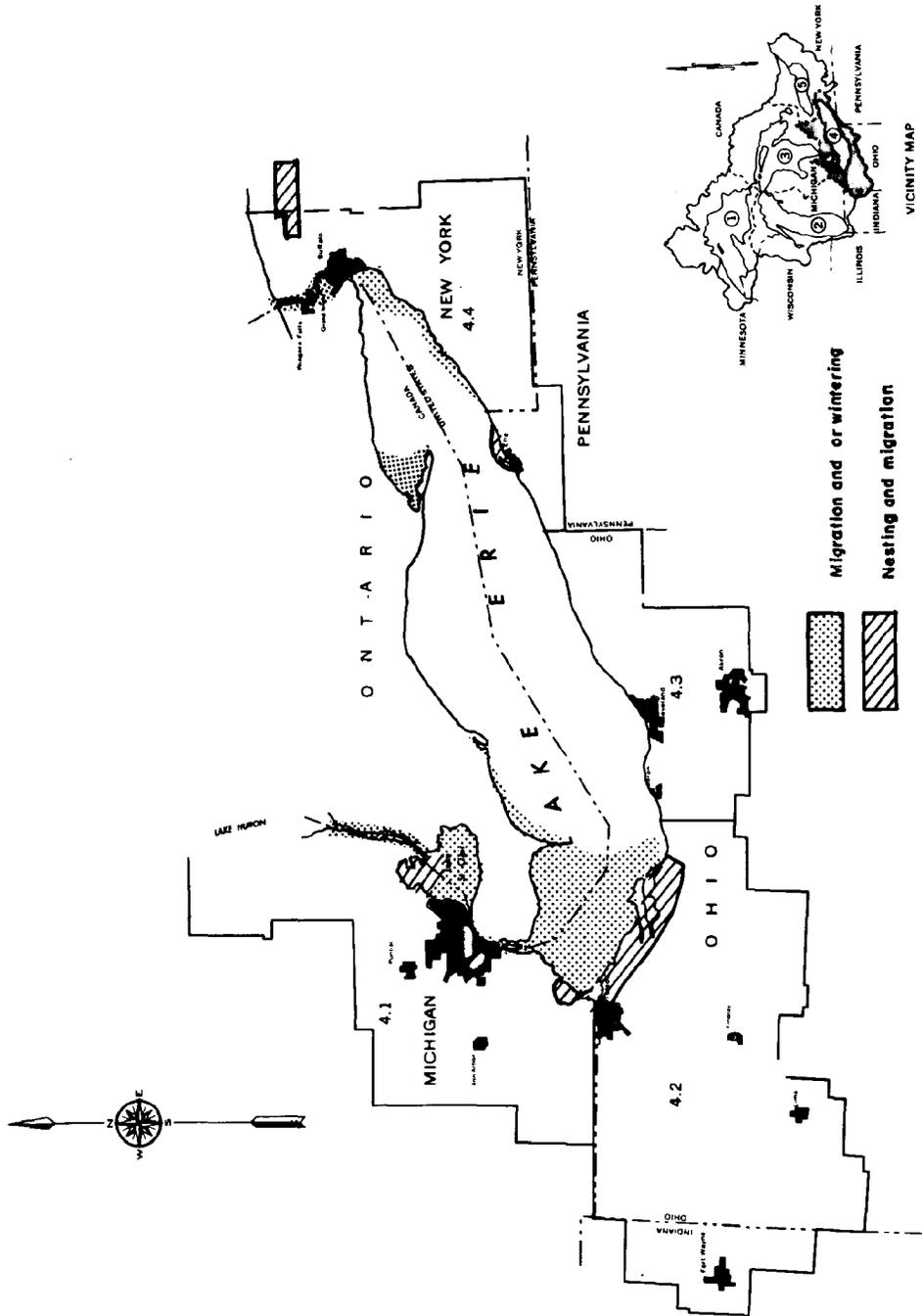


FIGURE 17-26 Primary Waterfowl Use Area, Plan Area 4

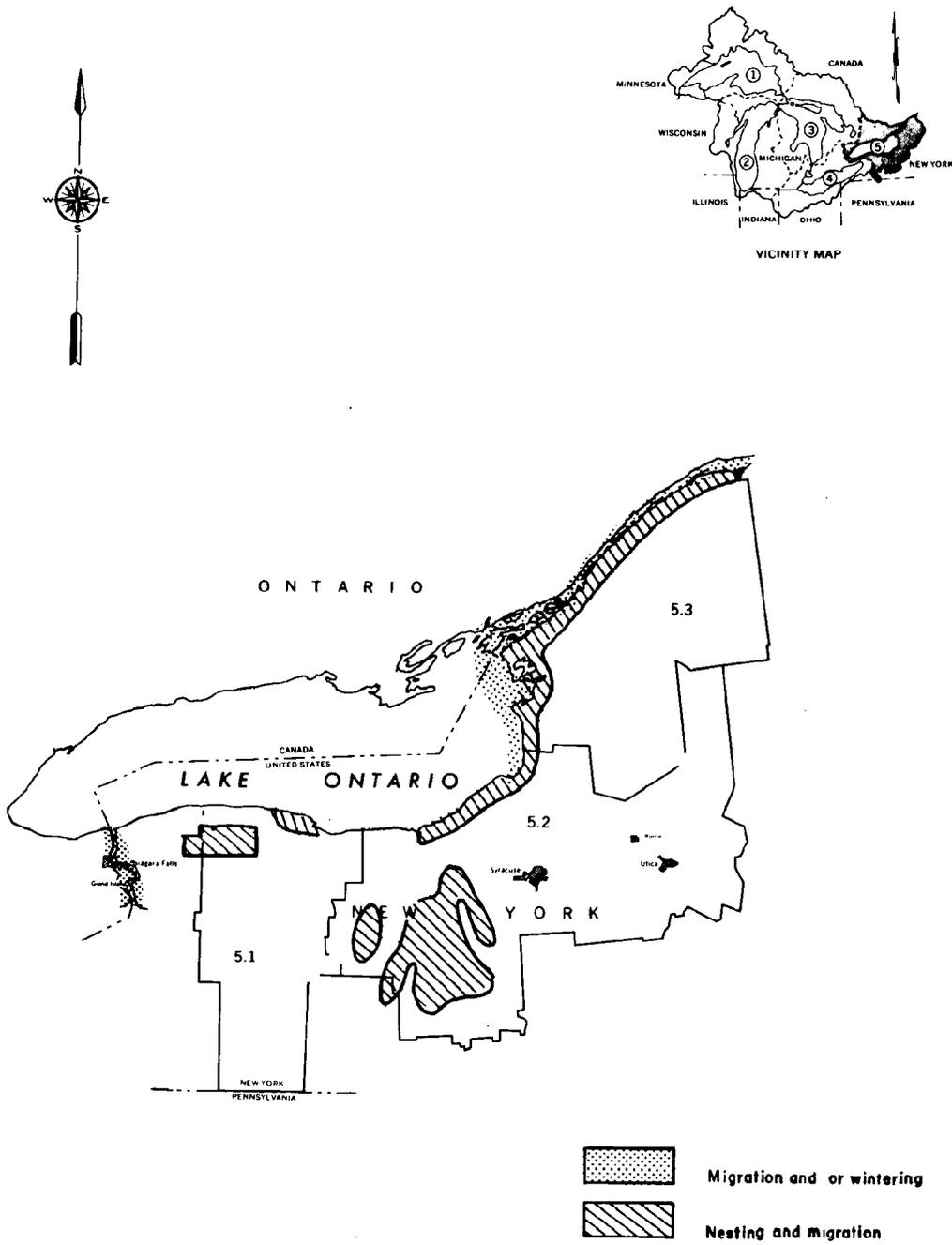


FIGURE 17-27 Primary Waterfowl Use Area, Plan Area 5

NATIONAL WILDLIFE REFUGE

1. HURON IS.
2. HORICON
3. GRAVEL IS.
4. GREEN BAY IS.
5. SENEY
6. MICHIGAN IS
7. SHIAWASSEE
8. LAKE ST. CLAIR
9. WYANDOTTE
10. CEDAR POINT
11. OTTAWA
12. WEST SISTER ISLAND
13. IROQUOIS
14. MONTEZUMA

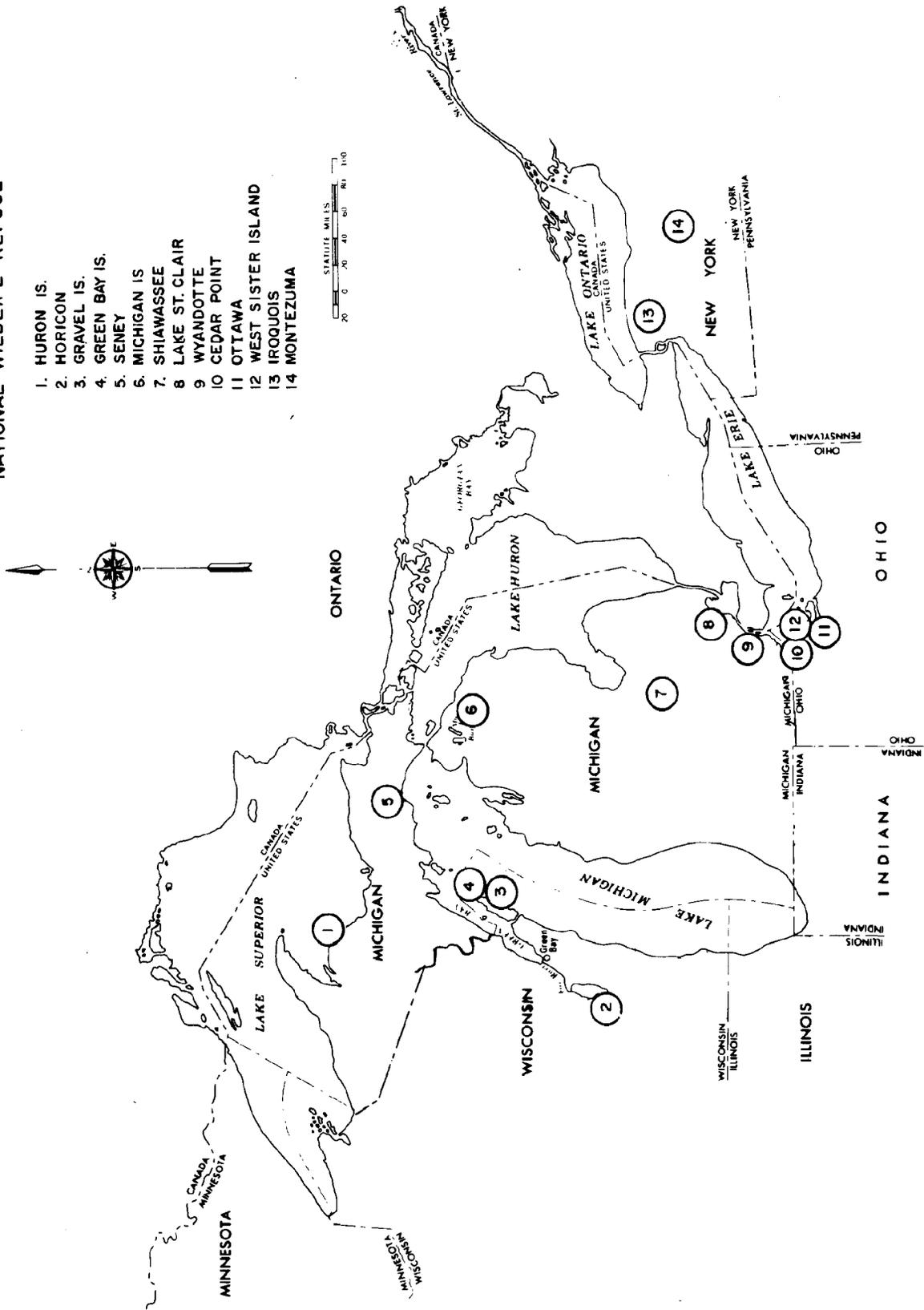


FIGURE 17-28 Great Lakes Basin National Wildlife Refuges

ducks, and pintails. The open waters of western Lake Erie, especially around the islands, provide resting areas for ducks and geese during spring and fall migrations.

(9) In the Pennsylvania portion of Planning Subarea 4.4, Presque Isle is the only area that has significant waterfowl use.

(10) The eastern end of Lake Erie in New York in Planning Subarea 4.4 (including the Niagara River) is an important concentration area for spring and fall migrations of ducks, geese, and whistling swans. The Niagara River has become noted recently as a wintering area for canvasbacks and scaup.

(11) The 19,000-acre State and Federally developed area on the Niagara-Orleans-Genesee County borders, in Planning Subareas 4.4 and 5.1 is a stopping-off place for as many as 100,000 Canada geese during spring migration. Many ducks and some geese also breed in this wetland complex.

(12) One area of valuable New York wetlands is the Finger Lakes region, Planning Subarea 5.2. Small marshes around and between the lakes offer valuable nesting habitat for waterfowl. The Montezuma National Wildlife Refuge, a 6,000-acre wildlife area located at the north end of Cayuga Lake, is used by thousands of ducks and geese during migration and some use the refuge for nesting.

(13) Another area of high waterfowl value in New York includes the lowlands and marshes along the eastern end of Lake Ontario and the St. Lawrence River in Planning Subareas 5.2 and 5.3. This area is important both for the harvest and production of many species of dabbling and diving ducks. A significant acreage of undeveloped, privately owned wetlands with a high wildlife enhancement potential and a potential for public acquisition exist along the St. Lawrence Plain.

#### 2.2.2.5 National Wildlife Refuges

In 1903 President Theodore Roosevelt set aside Pelican Island on the east coast of Florida to protect a nesting colony of pelicans and herons. This was the first national wildlife refuge in a system that now includes 330 refuges totaling 30 million acres. The Great Lakes Basin contains approximately 139,000 acres of National Wildlife Refuge lands managed primarily for waterfowl (Figure 17-28).

Refuges in the Great Lakes Basin are managed basically as stopover areas for migrating

waterfowl and vary in size from the two-acre Green Bay National Wildlife Refuge to the 95,500-acre Seney National Wildlife Refuge. Most of these refuges are also used as breeding and nesting areas for some waterfowl and many other species of wildlife, including furbearers, songbirds, forest and farm game, and reptiles and amphibians. Refuges are not only important to animals, but also provide protection for many types of plant life.

Recreational use of these refuges is not limited to nonconsumptive use (nature study, photography, picnicking, etc.), but includes consumptive use (fishing and hunting) on certain refuges in designated areas at specific times. Many refuges have visitor-interpretive centers for the general public, and many provide self-guiding automobile tours and walking trails. Most recreational visits to these refuges are for the purpose of observing wildlife. Visitations usually peak during the spring and fall migration periods. Some refuges receive most of their visitations during the summer months by families on vacation.

National wildlife refuges in the Great Lakes Basin are listed in Table 17-31. These refuges are located on the primary migration routes and are situated in 9 of the 15 Great Lakes Basin planning subareas.

Horicon National Wildlife Refuge is located outside of the Great Lakes drainage basin but is partially in Planning Subarea 2.1. This refuge is noted for its fall and spring concentrations of migrating waterfowl, when as many as 150,000 geese may be present at one time. Two small refuges, Gravel Island and Green Bay, are administered from Horicon and are used by herons, gulls, Caspian terns, and waterfowl.

Seney National Wildlife Refuge, located in the Great Manistique Swamp in Michigan's Upper Peninsula, is the Basin's largest refuge. Huron National Wildlife Refuge, which is administered from Seney, consists of five islands along the south shore of Lake Superior in Marquette County. These five islands are being considered for wilderness status. Species found on these islands include cormorants, gulls, terns, and waterfowl.

Shiawassee National Wildlife Refuge, noted for its high numbers of whistling swans, is located approximately 30 miles south of Saginaw Bay. Shiawassee also administers Wyandotte National Wildlife Refuge, a 304-acre island and water area in the Detroit River, which is used extensively by migrating diving ducks. Michigan Islands National Wildlife Refuge, consisting of three islands in

TABLE 17-31 Great Lakes Basin National Wildlife Refuges

PSA	Refuge	Location	Primary Use	Acres of Habitat			
				Upland	Open Water	Marsh	Total
1.2	Huron	Marquette, Mich.	Cormorants, gulls, terns	-----	-----	-----	147
2.1	Horicon	Fond du lac, Dodge, Wis.	Waterfowl	7,165	7,325	6,346	20,836
2.1	Gravel Island Green Bay	Door, Wis.	Hérons, gulls, Caspian terns	-----	-----	-----	29
2.4	Seney	Schoolcraft, Mich.	Waterfowl	27,327	7,243	60,885	95,455
2.4	Michigan Island	Charlevoix, Mich.	Hérons, gulls, terns	-----	-----	-----	363
3.1		Alpena, Mich.					
3.2	Shiawassee	Saginaw, Mich.	Waterfowl	7,486	192	1,179	8,857
4.1	Lake St. Clair	St. Clair, Mich.	Waterfowl	-----	-----	-----	4,200
4.1	Wyandotte	Wayne, Mich.	Diving ducks	-----	-----	-----	304
4.2	Cedar Point	Lucas, Ohio	Waterfowl	100	445	1,700	2,245
4.2	Ottawa	Lucas, Ottawa, Ohio	Waterfowl	2,403	540	2,426	5,369
4.2	West Sister Is.	Ottawa, Ohio	Heron rookery	-----	-----	-----	82
5.1	Iroquois	Genesee, Orleans, N.Y.	Waterfowl	3,649	-----	7,134	10,783
5.2	Montezuma	Seneca, N.Y.	Waterfowl	702	-----	5,340	6,042

TABLE 17-32 National Wildlife Refuges in the Great Lakes Basin—Waterfowl and Public Use (1970)

Refuge <sup>1</sup>	Waterfowl Use Days				Public Use Days			Total
	Ducks	Geese	Whistling Swans	Coots	Hunting	Fishing	Non-Consump.	
Horicon	1,238,755	12,121,201	6,875	1,033,550	2,745	6,375	289,392	298,512
Seney	293,735	204,963	84	615	5,569	7,995	77,686	91,249
Shiawassee	5,523,735	3,311,203	74,466	69,818	9,623	-----	15,811	25,434
Cedar Point	736,016	26,532	11,634	201,497	-----	-----	-----	-----
Ottawa	4,708,222	1,183,380	16,224	535,064	-----	-----	-----	3,642
Iroquois	1,069,268	915,343	851	31,394	-----	-----	-----	177,636
Montezuma	2,326,788	1,939,803	330	239,377	-----	-----	-----	41,000

<sup>1</sup>No data are available for the following areas: Huron, Gravel Island, Green Bay, Michigan Islands, Lake St. Clair, Wyandotte, and West Sister Island

Lake Huron and Lake Michigan, is administered from Shiawassee and is used by herons, gulls, and terns. A large area in Lake St. Clair, consisting of 4,200 acres of shallow water and marsh habitat, serves as a refuge and is posted during the waterfowl season to provide resting and feeding areas for large concentrations of canvasbacks, redheads, scaup, and black ducks. This area is also administered from Shiawassee.

Some of the best remaining waterfowl habitat in the Lake Erie marshes is included in the Ottawa National Wildlife Refuge. Ottawa, containing more than 5,000 acres, also administers the 2,245-acre Cedar Point National Wildlife Refuge and the West Sister Island National Wildlife Refuge. West Sister Island supports a large black-crowned night heron rookery and is being considered for wilderness status.

Iroquois and Montezuma National Wildlife Refuges, located in the Lake Ontario basin,

are primary migration stops for waterfowl in the Atlantic flyway. Montezuma, located in the Finger Lakes region, receives more waterfowl-use days, but Iroquois, northeast of Buffalo, provides more people-use days (Table 17-32).

#### 2.2.2.6 Status of Wetlands

Wetlands are the single most important type of wildlife habitat in the Great Lakes Basin. Their preservation is important for two reasons: first, they are considered to be the most productive of all types of wildlife habitat; and second, they are the most vulnerable to the urban growth since they can be drained, diked, filled, or dredged and converted to other types of land or water use. Natural causes are also responsible for degradation and loss of wetlands. Erosion by wind and water has caused great changes in Great Lakes coastal

**TABLE 17-33 Acres of Great Lakes Basin Coastal Wetlands of Significant Value to Fish and Wildlife (1970)**

PSA	Reach and State	Acres	PSA	Reach and State	Acres
Lake Ontario			Lake Huron (continued)		
4.4	Niagara River outlet to Orleans-Monroe county line--N.Y.	None	3.2	Sanganing River to Linwood--Mich.	4,885
5.1	Orleans-Monroe County line to Rochester --N.Y.	2,890		Kawkawlin River outlet--Mich.	170
5.2	Monroe-Wayne County line to Sterling Creek outlet--N.Y.	2,670		Bay City to Point Aux Barques--Mich.	28,645
	South Pond and Deer Creek Marsh to Sandy Creek outlet--N.Y.	10,635		Point Aux Barques to Port Hope--Mich.	225
	Total	13,305		Hardwood Point to Harbor Beach--Mich.	440
5.3	Stony Creek outlet to Wilson Bay--N.Y.	4,311		Harbor Beach to Forestville--Mich.	110
	Black River Bay to Wilson Bay--N.Y.	2,100	4.1	Forestville to Port Huron--Mich.	None
	Total	6,411		TOTAL--Lake Huron	49,190
	TOTAL--Lake Ontario	20,506	Lake Superior		
Lake Michigan			1.1	North Shore--Minn.	None
2.1	Menominee County Line to Menominee--Mich.	622		Superior to west boundary of Red Cliff Indian Reservation--Wis.	2,430
	Marinette to Suamico--Wis.	8,350		West boundary of Red Cliff Indian Reservation to Mich. State Line--Wis.	11,820
	Suamico to Point Sable--Wis.	4,380		Total	14,250
	Total	13,352	1.2	Copper Harbor to Point Abbaye--Mich.	1,255
2.2	Wisconsin, Illinois, Indiana	None		Keeweenaw Waterway--Mich.	2,730
2.3	South Haven to Muskegon--Mich.	2,827		Point Abbaye to Au Train River--Mich.	550
2.4	Muskegon to Ludington--Mich.	2,827		Au Train River to Whitefish Point--Mich.	1,265
	Ludington to Empire--Mich.	3,370		Total	5,800
	Empire to Mackinac Bridge--Mich.	715		TOTAL--Lake Superior	20,050
	Mackinac Bridge to Peninsula Point--Mich.	3,390	Lake Erie		
	Peninsula Point to Escanaba--Mich.	3,210	4.1	Huron River to Ottawa River--Mich.	11,025
	Escanaba to Menominee County Line--Mich.	622	4.2	Ottawa River to Marblehead--Ohio	12,305
	Total	14,134		Sandusky Bay--Ohio	10,385
	TOTAL--Lake Michigan	30,313		Total	22,690
Lake Huron			4.3	Erie-Lorain County Line to Penn. State Line--Ohio	None
3.1	St. Ignace to Detour--Mich.	5,195	4.4	Presque Isle--Penn.	960
	Mackinac Bridge to Stoneport--Mich.	955		Penn.-N.Y. line to Niagara River--N.Y.	None
	Stoneport to Point Au Sable--Mich.	1,685		Total	960
	Au Gres River outlet--Mich.	940		TOTAL--Lake Erie	34,675
	Point Au Gres to Sanganing River--Mich.	5,940		TOTAL--GREAT LAKES	154,734
	Total	14,715			

marshlands. This loss and degradation of wetlands is critical in many sections of the United States.

In 1953 and 1954, the U.S. Fish and Wildlife Service, working in cooperation with various State fish and game agencies, conducted a nationwide inventory of wetlands. This survey has been followed by various individual State wetlands appraisals. Because of variations in the coverages and time periods of these later studies, no uniform data are available on which to base an up-to-date assessment of wetlands losses for the entire Great Lakes Region. There was, however, a determination of the acres of coastal wetlands in the Great Lakes as of 1970 (Table 17-33), developed by the Bureau of Sport Fisheries and Wildlife as part of its activities for the International Joint Commission's Great Lakes studies. However, to correlate these data with

the 1953-54 studies would be nearly impossible.

Losses have been significant in many parts of the Basin. The western Lake Erie marshes of Ohio and Michigan and the connecting waterway and associated shoals and marshes between Lake Erie and Lake Huron have been especially hard-hit in recent years. Within the last ten years thousands of acres of prime wetlands in the northern part of Lake St. Clair have been lost to Venetian-type housing development. Further south in the vicinity of Monroe, Michigan, hundreds of acres of prime wetlands have been used as sanitary fill areas by the City of Detroit and slated for industrial development.

The existing 30,000 acres of wetlands in Planning Subarea 4.2 in Ohio are all that remain of the original 100,000-odd acres of Lake Erie marshes. Representative of these rem-



Courtesy of U.S. Bureau of Sport Fisheries and Wildlife

**FIGURE 17-29** Cedar Point National Wildlife Refuge. Maumee Bay, top background; Lake Erie, right.

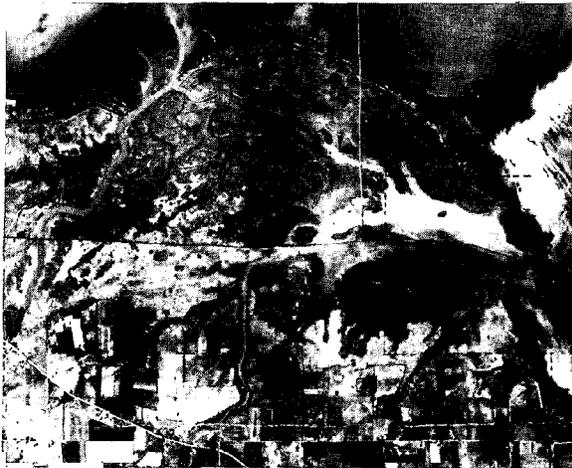
nant Lake Erie marshes in this planning subarea are the wetlands of the Cedar Point National Wildlife Refuge, shown in an aerial photograph taken in October 1966 (Figure 17-29).

Wetlands loss or change due to natural causes, such as erosion by wind and water, is dramatically illustrated by three aerial photos of the Pointe Mouillee area taken in 1937, 1957, 1970 (Figures 17-30, 17-31 and 17-32). A storm from the southeast in 1952 with the highest water on record did the greatest damage, breaking the barrier beach on the east side of the wetlands and eroding marshlands behind the beach. By 1957 this erosion had proceeded to the extent shown in Figure 17-31.

The restoration and then preservation of this barrier beach, as well as others in the Great Lakes, is fundamental to the perpetuation of thousands of acres of coastal marshes. Restoration is a costly process and in most

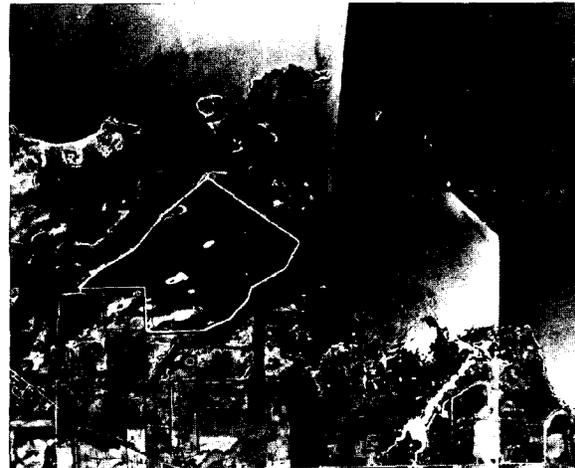
cases is beyond the financial capability of local and State governments. In the case of the Pointe Mouillee area, it is possible that this barrier beach can be at least partially restored during the nearby Trenton channel commercial navigation project of the U.S. Army Corps of Engineers. Rock taken from the channel could be placed in offshore dikes at Pointe Mouillee. If this measure were successful in providing barrier-beach protection, approximately 2,700 acres of shoals and marshes could be managed and eventually stabilized.

Further east in the New York portion of the Basin, wetlands are generally scattered and in short supply. In several places pressure for more recreation areas has resulted in wetlands being dredged or filled by various levels of government to provide additional parklands and facilities such as boat channels, marinas, boat ramps, roads, building sites, and golf courses. Two examples of these trade-offs of wetlands to other recreational in-



Courtesy of State of Michigan Department of Natural Resources

**FIGURE 17-30** Pointe Mouillee State Game Area Before Break in Barrier Beach, 1937



Courtesy of State of Michigan Department of Natural Resources

**FIGURE 17-32** Pointe Mouillee State Game Area, Loss of Marshlands, 1970



Courtesy of State of Michigan Department of Natural Resources

**FIGURE 17-31** Pointe Mouillee State Game Area After Break in Barrier Beach, Loss of Marshlands, 1957

terests are illustrated by recent aerial photos of construction of a marina and boat channel (Figure 17-33) and filling wetlands to make a golf course at Buck Pond, Beatty Point in Monroe County (Figure 17-34), both in Planning Subarea 5.1. Industry and commerce also take their toll of wetlands as illustrated by an aerial photo of industrial development at Round Pond, Monroe County just west of Rochester (Figure 17-35), and one of fill for shipping and docking facilities engulfing a marsh at Buffalo (Figure 17-36). The former is in Planning Subarea 5.1 and the latter in 4.4.

New York State biologists describe Round Pond as follows:

Round Pond is the most easterly unit of a once-contiguous high-value wetland situated along the south shore of Lake Ontario, starting at Rochester and stretching westward. All of the various units have been critically affected through commercial, industrial, and housing development. Fish and wildlife productivity of desirable species has been reduced from an extreme high to a moderate level through pollution, loss of littoral zone through filling, and high human disturbance factors. Albeit Round Pond with reference to its location in a highly populated area has considerable value as open space, for educational demonstrative purposes, and possibly an outdoor laboratory for ecological studies.

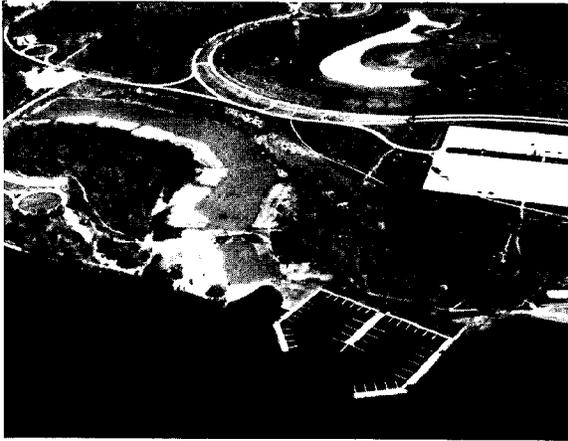
The Fish and Wildlife Division of the New York State Department of Environmental Conservation as the result of these devastating effects of man's activities has completed studies of wetlands in three regions in the Lake Ontario basin as follows:

(1) Lake Ontario coastal wetlands and Finger Lakes wetlands in Planning Subareas 5.1 and 5.2 from the Niagara River eastward to Cayuga County

(2) Erie and Oswego Canal wetland units in Planning Subarea 5.2

(3) wetlands of eastern Lake Ontario and the St. Lawrence River from Oswego County in Planning Subarea 5.2 north and east along the coast and down the St. Lawrence River Plain in St. Lawrence County in Planning Subarea 5.3

These wetlands were classified for their fish and wildlife habitat value as high, medium, or low. In addition each wetland surveyed was



Courtesy of State of New York Department of Environmental Conservation  
**FIGURE 17-33 Marina and Boat Channel Construction Destroy Wetlands in Western New York**



Courtesy of State of New York Department of Environmental Conservation  
**FIGURE 17-35 Industrial Development Threatens Round Pond, an Important Coastal Wetland West of Rochester, New York**



Courtesy of State of New York Department of Environmental Conservation  
**FIGURE 17-34 Wetlands Being Filled to Make Golf Course at Buck Pond, Beatty Point in Monroe County, New York**



Courtesy of State of New York Department of Environmental Conservation  
**FIGURE 17-36 Fill for Shipping and Docking Facilities Engulfing Marsh at Buffalo, New York**

assigned a destruction vulnerability classification:

(1) Class 1—an area which is in immediate danger of being destroyed within the next five years

(2) Class 2—an area that could be destroyed in the foreseeable future

(3) Class 3—an area that is safe from destruction due to its ownership, isolation location, or other factors

Nine units totaling 2,801 acres of wetlands were surveyed in study 1, 23 units totaling 5,378 acres of wetlands in study 2, and 53 units totaling 9,918 acres of wetlands in study 3.

Two units have been selected at random to illustrate the type of information these three studies contain; the State's comments are quoted directly from its report. The two units are Canoga Marsh (Figure 17-37) on Cayuga Lake in the Finger Lakes region and Sodus Bay Marsh (Figure 17-38) on the Lake Ontario coast in Wayne County, both marshes in Planning Subarea 5.2.

The New York State Study describes the Canoga Marsh on Cayuga Lake as follows:

Location: Map Reference U.S.G.S. Union Spring, 1:24,000 quad. Town of Fayette, County of Seneca. Acreage, 180±. Cover type



Courtesy of State of New York Department of Environmental Conservation

**FIGURE 17-37** Canoga Marsh on Cayuga Lake

composition, marsh, 90%; open marsh, 8%; woody swamp, 2%. Fish and Wildlife Value Classification, high. Destruction Vulnerability Class 2.

**Remarks:** This wetland unit has already suffered from landfill activities in the vicinity of Canoga Island. The area which has high fish and wildlife values, is used extensively by fishermen and hunters. Man's activities to date have not materially affected the productive nature of the marsh insofar as waterfowl, aquatic furbearers, marsh birds, and fish are concerned. Trends for recreational developments along all of the Finger Lakes will ultimately result in destruction of Canoga Marsh if it is not dedicated as an important ecological area and placed under jurisdiction of the Department of Environmental Conservation.

**Enhancement Possibilities:** The productive nature of the area could be improved by more favorable regulation of lake levels, and interspersed of potholes and level ditching.

The New York State Study describes Sodus Bay Marsh on Lake Ontario as follows:

**Location:** Map Reference U.S.G.S. Sodus Point, 1:24,000 quad. Town of Huron, County of Wayne. Acreage, 240±. Cover type composition, marsh, 60%; open marsh, 35%; woody swamp, 5%. Fish and Wildlife Value Classifi-



Courtesy of State of New York Department of Environmental Conservation

**FIGURE 17-38** Sodus Bay Marsh on Lake Ontario

cation, high. Destruction Vulnerability Class 1.

**Remarks:** This is a key marsh area in the Wayne County Wetlands complex. All of the surrounding uplands have been acquired under the Recreational Bond Act Program and are under the administration of the Department of Environmental Conservation. To complete control and permit initiation of development and management activities, the unallocated underwater lands should be placed under the Department of Environmental Conservation, the agency having responsibilities for management of the fish and wildlife resources.

**Enhancement Possibilities:** Manipulation of aquatic vegetation by various management techniques.

## 2.3 Use of Wildlife Resources and Trends

### 2.3.1 Species Utilization

Although the percentage of the populace buying hunting licenses has decreased in most planning subareas over the last decade, the projected sales of hunting licenses are increasing (Table 17-34). This upward trend is based on the projection that the population is increas-

**TABLE 17-34 Total Hunters by Target Year in the Great Lakes Basin (in thousands)**

PSA	Base Year <sup>1</sup>	Target Years <sup>2</sup>		
	1970	1980	2000	2020
1.1	81.0	87.0	92.0	97.0
1.2	54.1	55.8	55.8	57.9
2.1	224.1	235.2	270.2	315.2
2.2	384.1	670.9	821.6	1,009.2
2.3	337.0	410.0	486.0	570.0
2.4	129.0	139.2	154.5	175.2
3.1	61.5	65.1	71.9	80.5
3.2	199.7	241.1	285.0	335.3
4.1	337.5	469.9	577.8	720.2
4.2	165.0	225.6	260.8	298.3
4.3	134.0	198.0	241.0	294.0
4.4	153.3	190.1	206.9	218.0
5.1	74.9	92.7	109.1	125.3
5.2	153.5	179.6	211.9	246.7
5.3	35.6	41.3	44.0	47.8
Total	2,524.3	3,301.5	2,888.5	4,590.6

<sup>1</sup>Includes resident and non-resident licensed hunters and unlicensed hunters.

<sup>2</sup>Includes resident and non-resident licensed hunters, unlicensed hunters, and latent demand hunters.

ing faster than the decline in hunting license sales. A decreasing participation rate was used for the successive target years to reflect the expected decline in the quality of the hunting experience. However, nonconsumptive (non-hunter) use of wildlife and wildlife lands will increase more rapidly than hunter use and will compensate for decreases in hunting where they occur. Table 17-35, for example reveals that the desire of the non-hunter to enjoy wildlife will exceed the opportunity to do so by nearly 5 million man-days in Planning Subarea 2.2 by 2020.

Harvest is a function of game population density, habitat quality, and hunter access. In northern wilderness areas total kill is lower for game animals than in more southern areas because there are often fewer animals and because it is more difficult for the hunter to reach them. Kill is also lower in areas with high percentages of posted land and in agricultural areas where habitat value has been lowered by clean farming practices and poor land management. Harvest data are provided in Tables 17-36 through 17-43.

The value of the furbearer harvest in the eight Great Lakes States in 1965 was over two million dollars. Table 17-44 presents detailed

**TABLE 17-35 Great Lakes Basin Projected Net Demands on Wildlife Habitat by Non-Consumptive Users by Target Years (in thousands)<sup>1</sup>**

PSA	1980	2000	2020
1.1	26.0	27.0	32.0
1.2	15.0	7.2	27.9
2.1	330.0	632.7	896.5
2.2	2,507.4	3,754.0	4,946.1
2.3	504.5	753.6	966.4
2.4	202.3	332.4	514.7
3.1	16.1	66.5	132.1
3.2	396.6	786.3	1,203.7
4.1	1,596.4	2,474.2	3,539.0
4.2	581.1	921.8	1,273.5
4.3	896.7	1,420.6	2,035.1
4.4	169.2	262.3	331.0
5.1	83.8	161.2	240.7
5.2	138.3	293.8	461.1
5.3	23.2	36.3	53.6
Total	7,486.6	11,929.9	16,653.4

<sup>1</sup>Net demand is measured in thousands of man-days. Net demand represents the unsatisfied demand, which is the amount that the desire to do something exceeds the opportunity necessary to meet this desire.

information on the 1965 Basin furbearer harvest.

## 2.4 Existing Wildlife Problems

### 2.4.1 Basinwide Problems

A description of wildlife-related problems is essentially a description of the environmental status of the Basin. Wildlife has been accurately described as a barometer of the quality of the environment. If the quality of the environment is low, the diversity of wildlife species will be low and populations unstable. If environmental quality is high and habitat is plentiful, nearly all habitat will be occupied, by healthy populations of a wide variety of species.

The Great Lakes Basin, because of its extensive latitudinal and longitudinal range, encompasses a diversity of wildlife habitat and weather conditions and, therefore has a variety of wildlife problems. The single most important Basinwide wildlife problem is the loss of habitat. A total of 5,099,000 acres in the Great Lakes Basin will be lost over the 50-year

**TABLE 17-36 Pennsylvania Game Harvest (1970)<sup>1</sup>**

Species	Planning Subarea
	4.4
Deer	710
Turkey	75
Ducks	7,950
Geese	175
Cottontail Rabbit	20,000
Pheasant	6,600
Ruffed Grouse	2,000
Squirrel	2,000
Woodcock	3,500
Mourning Dove	4,700
Muskrat	30,000
Beaver	215
Raccoon	5,500
Woodchuck	14,000

<sup>1</sup>All are estimates except deer, turkey, and beaver, which are actual harvest figures.

**TABLE 17-37 Indiana Estimated Game Harvest (1966)**

Species	Planning Subarea		
	2.2	2.3	4.2
Waterfowl	2,500 <sup>1</sup>	15,000 <sup>1</sup>	1,000 <sup>1</sup>
Squirrel	50,000	75,000	10,000
Rabbit	75,000	60,000	20,000
Quail	30,000	20,000	8,000
Pheasant	5,000	7,000	2,000
Woodcock	1,000 <sup>2</sup>	500 <sup>2</sup>	----- <sup>2</sup>
Deer	200 <sup>2</sup>	760 <sup>2</sup>	160 <sup>2</sup>

<sup>1</sup>1970

<sup>2</sup>1969

**TABLE 17-38 Illinois Estimated Game Harvest (1968-1969)**

Species	Planning Subarea
	2.2
Dove	82,000
Squirrel	35,000
Pheasant	125,000
Quail	18,000
Rabbit	152,000
Raccoon	22,000
Hungarian Partridge	2,000
Fox	9,000
Woodcock	1,500

**TABLE 17-39 Ohio Estimated Game Harvest (1970)<sup>1</sup>**

Species	Planning Subarea	
	4.2	4.3
Ducks	72,577	36,075
Pheasant	93,000	46,000
Cottontail Rabbit	498,000 <sup>2</sup>	168,000
Hungarian Partridge	----- <sup>2</sup>	0
Squirrel	200,000	165,000
Fox	4,200 <sup>2</sup>	2,065 <sup>2</sup>
Quail	----- <sup>2</sup>	----- <sup>2</sup>
Deer	206	312
Badger	3	1
Beaver	0	175
Mink	1,839	308
Muskrat	200,416	59,065
Opposum	2,420	899
Raccoon	48,701	20,877
Skunk	52	15
Weasel	38	34

<sup>1</sup>All harvest data are estimates except beaver and deer which are actual harvest. Other fur-bearer harvest data are based on fur buyer annual reports.

<sup>2</sup>Number harvested was insignificant.

**TABLE 17-40 Minnesota Estimated Game Harvest (1968-1970)**

Species	Planning Subarea
	1.1
Deer	31,130
Ducks	32,400
Ruffed Grouse	23,330

**TABLE 17-41 Wisconsin Estimated Game Harvest (1967-1968)**

Species	Planning Subarea		
	1.1	2.1	2.2
Coot	7,000	82,000	21,000
Duck	26,000	265,000	79,000
Geese	500	8,000	800
Pheasant	0	128,000	95,000
Hungarian Partridge	0	18,000	8,000
Ruffed Grouse	45,000	136,000	2,000
Woodcock	1,500	26,000	5,000
Snowshoe Rabbit	13,000	0	0
Cottontail Rabbit	0	207,000	125,000
Squirrel	12,000	242,000	90,000
Raccoon	200	39,000	12,000
Deer	9,123	39,912	782
Bear	186	171	0

TABLE 17-42 Michigan Estimated Game Harvest (1969)

Small Game	Planning Subarea						
	1.2	2.1	2.3	2.4	3.1	3.2	4.1
Pheasant	0	4,000	224,000	13,000	4,000	127,000	51,000
Ruffed Grouse	46,000	15,000	9,000	107,000	61,000	61,000	6,000
Woodcock	4,500	4,000	15,000	74,000	30,000	21,000	700
Ducks	27,000	11,000	80,000	107,000	27,000	133,000	149,000
Geese	5,000	500	10,000	15,000	1,000	15,000	3,500
Coots	600	600	6,000	9,000	1,200	21,000	21,000
Cottontail Rabbit	9,000	9,000	320,000	91,000	46,000	183,000	439,000
Snowshoe Rabbit	47,000	23,000	200	60,000	23,000	5,000	0
Squirrel	14,500	7,000	254,000	182,000	15,000	145,000	109,000
Raccoon	300	300	152,000	32,000	700	34,000	118,000
Big Game	Upper Peninsula (PSA 1.2, 2.1, & 2.4)		Upper ½ Lower Peninsula (PSA 2.4, 3.1, & 3.2)		Lower ½ Lower Peninsula (PSA 2.3 & 4.1)		
Deer	20,893		71,368		17,192		
Bear	840		No season		No season		

TABLE 17-43 New York Game Harvest (1960-1968)<sup>1</sup>

Species	Planning Subarea			
	4.4	5.1	5.2	5.3
Pheasant (1963-64)	83,000	64,000	86,000	11,000
Woodcock (1960-61)	10,000	7,000	15,000	2,000
Snowshoe Hare (1961-62)	No Season	No Season	29,000	76,000
Cottontail Rabbit (1963-64)	107,000	93,000	270,000	47,000
Ducks & Coots (1967-68)	19,000	23,000	66,000	29,000
Geese & Brant (1964-65)	600	3,000	8,000	1,500
Ruffed Grouse (1967-68)	33,000	27,000	60,000	32,000
Squirrel (1965-66)	98,000	74,000	159,000	26,000
Deer	6,000	8,000	11,000	8,000

<sup>1</sup>Latest figures available by species.

study period (Table 17-45). Much of this acreage will be fertile lands in flood plains and peripheral to cities, inland and estuarine wetlands, and other valuable habitat. Degradation of remaining habitat is an inseparable part of the former problem and is nearly as serious. In either case, a change in land use is usually at fault although all types of environmental pollution also degrade wildlife habitat.

The expected loss of wildlife habitat due to land-use change is largely a result of human population expansion, with attendant housing developments, road construction, power lines, power plants, landfill for waste disposal, and

increasing demands for sewage treatment, water supply, industrial expansion, hospitals, schools, and airports.

Secondary effects of land use changes include the intensification of agricultural activity on presently cultivated lands. Agricultural land is important wildlife habitat, but as more clean farming is instituted, the wildlife value of agricultural land diminishes. The resulting fewer acres of idle land, woodland, fencerows, and field borders support less wildlife.

Other land use changes which have serious impact on wildlife include strip mining, rural

TABLE 17-44 Great Lakes Basin Fur Catch (1965)

Species	Catch	Average Unit Value (dollars)	Total Value (dollars)	Species	Catch	Average Unit Value (dollars)	Total Value (dollars)
Minnesota--10% of State Total				Michigan--100% of State Total			
Beaver	1,550	9.00	13,950	Beaver	16,800	16.00	26,880
Bobcat	5	17.00	85	Coyote	3,290	3.00	9,870
Coyote	30	7.00	210	Fox	29,300	6.00	175,800
Fox	1,450	6.00	8,700	Mink	11,700	7.50	87,750
Lynx	25	20.00	500	Muskrat	177,000	2.00	354,000
Mink	6,320	12.00	74,740	Otter	825	25.00	20,625
Muskrat	72,730	1.25	90,900	Raccoon	214,800	3.00	644,400
Otter	40	20.00	800	Weasel	2,400	.75	1,800
Raccoon	10,000	3.50	35,000		465,115		1,321,125
Skunk	140	1.00	140	Ohio--25% of State Total			
Weasel	240	.50	120	Beaver	60	9.00	540
	92,530		225,142	Fox	1,290	2.00	2,580
Wisconsin--30% of State Total				Mink	1,840	8.00	14,720
Beaver	2,700	9.00	24,300	Muskrat	104,650	1.25	156,810
Fox	3,600	6.00	21,600	Opossum	2,440	.30	732
Mink	7,500	12.00	90,000	Raccoon	35,900	1.50	48,850
Muskrat	110,000	1.25	137,500	Skunk	170	.60	102
Opossum	200	.25	50	Weasel	310	.80	248
Otter	200	20.00	4,000		146,660		224,582
Raccoon	18,000	3.00	54,000	Pennsylvania <sup>1</sup>			
Skunk	100	1.00	100	Beaver	215	9.00	1,935
	142,300		331,500	Muskrat	30,000	1.25	37,500
Indiana--5% of State Total				Raccoon	5,500	1.50	8,250
Beaver	15	9.00	135		35,715		47,685
Fox	1,500	2.00	3,000	New York--50% of State Total			
Mink	450	8.00	3,600	Fisher	181	12.00	2,172
Muskrat	9,300	1.25	14,000	Otter	159	24.00	3,816
Opossum	1,450	.30	435		340		5,988
Raccoon	5,550	1.50	8,325	Illinois			
Skunk	40	.60	24	No data			
Weasel	15	.80	12				
	18,320		29,531				

<sup>1</sup>Percent of State total unknown

residence construction, filling and draining of wetlands, and water development projects. Attrition of wetland acreage and degradation continue to be a problem in spite of the recent public awareness of the value of these lands. This problem arises from conflicts over economic values, such as whether it is more expedient to destroy a marsh by drainage or by use as a land fill site rather than to use it for waterfowl production and general aesthetics. Marsh destruction often accompanies Federal, State, or local dredging projects in harbors and rivers due to the need for spoil disposal.

In some cases channelization of streams makes drainage of wet areas and type II wetlands possible where prior to the project land-

owners would not have had the means to undertake drainage on their own. Practices such as these, which result in bringing more land into crop production and more intensive use of existing cropland, seem questionable in view of the Federal efforts to regulate crop surpluses through cropland retirement programs.

Stream channelization for flood control and agricultural benefit conflicts seriously in nearly every case with wildlife values. It is particularly bad in areas where clean farming practices are used, because stream bottom habitat which often is the best remaining cover is destroyed. Flood control could be best served in most cases by attempting to hold

**TABLE 17-45 Percent of Great Lakes Basin Habitat Base Lost to Urban Development**

PSA	Resource Base in Acres		Loss	
	1966-67	2020	Acres	Percent
1.1	9,189,000	9,165,600	23,400	.25
1.2	6,304,000	6,299,800	4,200	.07
2.1	9,546,700	9,427,200	119,500	1.25
2.2	4,001,600	2,309,500	1,692,100	42.29
2.3	8,136,900	7,675,500	461,400	5.67
2.4	7,679,400	7,602,200	77,200	1.01
3.1	3,838,200	3,805,400	32,800	.85
3.2	4,035,100	3,855,000	180,100	4.46
4.1	3,221,000	2,233,100	987,900	30.67
4.2	5,751,600	5,480,500	271,100	4.71
4.3	1,699,600	1,080,800	618,800	36.41
4.4	2,584,900	2,353,800	231,100	8.94
5.1	2,187,600	2,065,500	122,100	5.58
5.2	5,176,700	4,915,400	261,300	5.05
5.3	3,239,700	3,223,800	15,900	.49
TOTAL	76,592,000	71,493,000	5,099,000	6.66

water on the land through land treatment practices rather than letting it run off faster. Moreover the long-range detrimental impact of stream channelization projects on wildlife values cannot be adequately considered in conventional benefit/cost analyses. Methods must be developed to allow such intangible values to successfully compete with other land uses.

A problem having a serious impact on all planning taking place in the Great Lakes Basin is the lack of adequate funding to State agencies which are being asked to carry out much of the work.

Hunter access to wildlife lands is a major problem in all but the northern planning sub-areas, which have adequate public land. Access is becoming more restricted in New York, Pennsylvania, Ohio, Indiana, Illinois, southern Michigan and southern Wisconsin. As the population densities of these areas increase, so do problems resulting from public use and over-use of private land. In the face of increasing demand for the opportunity to enjoy wildlife, the trend is toward complete restriction of consumptive and nonconsumptive wildlife use to limited areas of public land.

#### 2.4.2 Wildlife Problems in Each Planning Subarea

##### 2.4.2.1 Planning Subarea 1.1, Minnesota and Wisconsin

Planning Subarea 1.1 is characterized by

vast expanses of forest, heavy snowfall, and low human population density. Wildlife management problems are important here, but some serious problems are appearing due to human activity. Degradation and loss of habitat are occurring from surface mining operations and associated facilities. The expected increase in acres devoted to this practice will eventually result in a significant portion of the planning subarea being devoted to this single-purpose use. There is a serious conflict because the area, due to its high environmental quality, is much more suited to outdoor recreational use. The economic benefits of this use are traded for economic benefits derived from mining, which may preclude the area's returning to recreational use at a later date.

The long-term trend in big-game populations is downward, due primarily to the effects of natural succession away from a young, uneven-aged, mixed hardwood-conifer forest toward the even-aged homogeneous spruce-fir climax forest. Timber harvest activity and wildlife management programs tend to arrest this trend and may create the variety of vegetation necessary to sustain suitable game populations. All of the big game in the area (white-tailed deer, moose, black bear, and timber wolf), do best when the forest is broken up into a mosaic of stands of different age and species composition. The carrying capacity of the habitat is sustained for deer and moose populations, and wolf populations are thus kept healthier, too.

Habitat conditions for ruffed grouse, snowshoe hare, and woodcock have deteriorated for the same reasons as big game. However, the trend toward a climax spruce-fir forest results in improved habitat for spruce grouse. Habitat for all wildlife species can be improved by forestry and wildlife management practices that create diversity of habitat types.

Waterfowl populations are limited in spite of the abundance of water in the planning subarea. Low fertility of soil and water limits the production of waterfowl food. The most favorable habitat for waterfowl consists of small flows, beaver ponds, and lake bays.

Planning Subarea 1.1 is noted for heavy snowfalls. Annual accumulated depths are up to 80 inches or more in some areas. This snow causes severe deer management problems. During times of deep snow, deer concentrate in "yards" thereby putting undue stress on the food supply of that area. Deer losses occur directly due to malnutrition and indirectly due to reduced reproductive capability of the herd in future years.

Populations of white-tailed deer and ruffed grouse, the major game species, are probably underharvested in the remote northern reaches of the planning subarea because of limited access by public roads. On the other hand, shore areas of Lake Superior close to public roads are heavily hunted. Snow is seldom a contributing factor to the underharvest because the hunting season is scheduled before winter.

The largest remaining concentration of timber wolves in the United States, with the exception of Alaska, is found in the Minnesota portion of Planning Subarea 1.1. Although the State of Minnesota does not consider the wolf an endangered species (population is currently placed at 750 animals), the U.S. Bureau of Sport Fisheries and Wildlife officially regards this animal (eastern timber wolf) as rare and endangered. Wolf numbers are limited directly by availability of their principal prey, deer, and thus indirectly by the carrying capacity of deer habitat. The U.S. Forest Service believes that the high demand for wolves as trophies, pelts, pups, exhibits, and scientific purposes has resulted in an increasing number of persons searching for timber wolf dens each spring, thereby creating a problem on those portions of National Forest lands where access is not limited.

The moose population has been declining slightly in recent years, apparently from some winter losses and lowered productivity caused by habitat limitations. The population is at or above the carrying capacity of the range, due to changes in forest succession.

A conflict between forest management and wildlife management is avoided when cutting operations in aspen and other hardwood stands attempt to regenerate aspen rather than release a thick understory of small hardwood trees. The maintenance of aspen and its associated undergrowth as a component of forest habitat is necessary if white-tailed deer and ruffed grouse are to be perpetuated.

Snowmobiles, although a boon to the winter recreation industry in this planning subarea, constitute a potentially serious threat to wildlife. These vehicles are capable of making their own roads, and irresponsible individuals have used them for such illegal purposes as harassing wildlife in remote areas. However, Minnesota has specific regulations about the use of snowmobiles in the taking of either game or non-game species and in the operation of snowmobiles on public land.

#### 2.4.2.2 Planning Subarea 2.1, Wisconsin

Population growth, hunting pressure from the Milwaukee-Chicago area, and a reduction in the resource base underlie the problems in Planning Subarea 2.1. Projected figures indicate the population will double by year 2020 (to 1.7 million) and the resource base will be reduced by 125,000 acres. The population in adjacent Planning Subarea 2.2 (Milwaukee-Chicago) is expected to double, to a total of 17.4 million.

Loss of wildlife habitat from changing land use is as much a problem in this planning subarea as it is elsewhere, except that perhaps the value of the habitat is a little higher here. Types III, IV, and V (high waterfowl value) wetlands are found in this part of the Great Lakes Basin. Types II and VI wetlands provide winter cover for ring-necked pheasants and act as alternative cover to offset nest losses suffered in Wisconsin's abundant hay fields. Agricultural practices and the demand for rural home sites are having an adverse effect on the quality of wildlife habitat in general, with the drainage of wetlands having the most serious impact.

In the 1960s small watershed activities increased in Planning Subarea 2.1, which includes wetland areas of value to wildlife. One of the watershed projects contains 12,391 acres of wetlands. Preliminary project proposals could directly or indirectly result in the drainage of 7,700 acres of these wetlands. This watershed lies approximately 10 miles north of the Horicon National Wildlife Refuge and surrounds the southern tip of Lake Winnebago, the largest lake in Wisconsin. Potholes and marshes in this area of Wisconsin have the highest concentrations of migratory waterfowl in the State, and the region ranks among the highest in number of breeding pairs of ducks. These wetlands also provide excellent furbearer habitat. The extensive fresh meadows and brush marshes contribute substantially to the fact that Fond du Lac County regularly ranks among the top ten Wisconsin counties in the harvest of ring-necked pheasants. This danger of habitat loss due to channelization is not limited to this area and may occur in nearly every watershed in southern Wisconsin.

The snowmobile boom of the past ten years has caused serious conflicts of use among the sportsman, general recreationist, and rural resident. Stricter regulation of snowmobiles is needed to insure that each interest can pursue

its activity without interference from another. Snowmobile problems are especially acute on those public lands where access is not restricted.

The Wisconsin Forest Crop Law, Woodland Tax Laws, and County Forest Laws enable the State to manage private lands for forestry purposes, while making them available to the public for hunting. The total acreage involved is approximately 675,000 acres in Planning Subarea 2.1. This acreage of private land represents nearly one-third of the total acreage of land open to the public for hunting. If present public access arrangements are lost, many acres of habitat would be closed to the public. In addition to private lands open to hunting, there are 63 State-owned or leased public hunting areas and tracts of State forest, national forest, county park, and State park lands, which contribute to the total 10.15 acres per hunter in Planning Subarea 2.1.

Pollution from agricultural pesticides will continue to be a problem in sections of Planning Subarea 2.1, especially in the Door Peninsula where spraying of fruit trees is extensive. Thermal pollution poses a potential problem in that waterfowl may be enticed to winter if there is open water. This unnatural situation may increase waterfowl losses. Artificial feeding could be required if the water becomes ice-covered during periods of excessive cold weather or facility shut-down. Artificial feeding is usually considered as a "last resort" management practice.

Activities of large canning companies and muck farmers cause problems in several ways. The canning companies leave large blocks of land and then clean-farm the area, removing fence rows and wildlife pockets. Early plowing (August-September) of open flatlands exposes the soil to wind and water erosion throughout much of the year.

Muck farmers are in direct competition with the State of Wisconsin for wetlands acquisition and use. On several occasions muck farmers have been able to outbid the State to acquire wetlands for farming purposes. After these wetlands are drained, serious wind and water erosion problems can be expected.

Rural residential development, both seasonal and year-round housing, reduces available wildlife habitat to the extent that laws and building sites often replace undisturbed woodlots. It restricts hunting opportunity substantially because the entire area is often posted. Residential development also drives woodlot and wetland values upward so that

preservation under State acquisition programs becomes more costly.

The northern forested area of Planning Subarea 2.1 is suffering from a loss of white-tailed deer and ruffed grouse habitat because of forest succession. When the larger aspen and other hardwoods are cut, the other hardwoods will regenerate unless management steps are taken to perpetuate the aspen. The maintenance of aspen and its associated undergrowth is necessary if deer and grouse populations are to be perpetuated.

Destruction of waterfowl habitat by carp poses problems on major streams and lakes. The State of Wisconsin has a rough fish removal program and is working on methods to make it more effective and economical.

The Fox-Wolf River basins project in east-central Wisconsin proposed by the Corps of Engineers may help solve a problem in one of the State's most valuable wildlife areas. The major problem is that marshes in the area are deteriorating due to flooding and erosion. A cooperative effort is needed to provide flood control, bank stabilization, improved navigation routes, and preservation or enhancement of fish and wildlife resources in portions of the basin.

#### **2.4.2.3 Planning Subarea 2.2, Wisconsin, Illinois, and Indiana**

This is the most densely populated planning subarea in the Great Lakes Basin. A total of 8,481,000 people reside in three major population centers: Chicago, Illinois; Milwaukee, Wisconsin; and Gary, Indiana. The character of the area is predominantly suburban, with only three outlying counties in Wisconsin and two in Indiana retaining a rural character. The greatest concentration of people is along the Lake Michigan shore in a nearly unbroken belt from Mequon, Wisconsin, to Michigan City, Indiana.

The planning subarea's foremost wildlife problem is loss of habitat and hunting opportunity caused by the conversion of woodlots, wetlands, and farms to residential, industrial, and private recreational uses. Hunting is the first casualty, due to increasing posting against trespass and demands for restrictions on the use of firearms. Temporary improvements in wildlife habitat and small-game populations which occur on the fringes of suburban developments are more than offset by permanent losses of habitat associated with

intensive development of real estate and its associated transportation systems.

Loss of wildlife habitat is also of concern to nonconsumptive wildlife interests, which are probably greater in this planning subarea than are consumptive (hunter) interests. Open space, even if only low-quality wildlife habitat, will become increasingly important as the planning subarea becomes more urbanized. An open space program similar to the 67,231 acres of forest preserves and parks in northern Illinois is of exceptional importance. This is particularly true in view of the planning subarea's expected population increase and expected urban expansion, such as the proposed Indiana Seaport at Burns Ditch, which could result in the complete urbanization of Porter County.

The resource base of 3,626,115 acres (1970) is expected to be reduced to 1,813,270 acres by 2020. During this same period of time the population is expected to increase from 9,786,000 to 17,356,000. The rural regions of the Wisconsin portion of the planning subarea are productive agricultural lands with less than 15 percent tree cover. Muck farming and clean farming are contributing to the degradation of the wildlife potential of these lands. The drainage activities of various public agencies are also having an adverse impact on the resource base.

Stream channelization through small watershed development projects could be easy to dismiss as a minimal threat to wildlife due to the comparatively small acreages involved. However, since the stream bottoms are important not only as the last remaining natural cover, but also as potential green belts, channelization will be a more serious problem in this planning subarea than in planning subareas of lower population density and more abundant stream habitats.

The Lake Michigan shore also provides some wildlife benefits in the form of waterfowl hunting, but public access is poor due to private ownership of most of the shoreline. The acreage of public hunting lands per licensed hunter is 125. Compounding the problems of lack of opportunity and loss of open space is an increase in pollution, particularly in the southern tip of Lake Michigan. Air and water quality are so low that they sometimes constitute a direct hazard to the health and well-being of fish and wildlife as well as the human population.

#### 2.4.2.4 Planning Subarea 2.3, Indiana and Michigan

Wildlife problems, needs, and solutions are discussed at length in Appendix K of the *Comprehensive Water Resources Study of the Grand River Basin*, Michigan, published in March 1968, which covers approximately one-half of Planning Subarea 2.3.

This planning subarea has few public land-use problems, because a homogeneous distribution of public land already exists. The Michigan portion has many State game and wildlife areas. Game and wildlife, and recreation lands are located in 14 of the 19 Michigan counties. Three of the six Indiana counties have either State Fish and Game Areas or State Parks. Furthermore, most of the areas in both States are located close to large population centers.

Major problems in providing opportunity for hunters and nonconsumptive wildlife users in this planning subarea are related to a decreasing resource base. In 1960, the base included a total of 7,693,300 acres of public and private lands. Preliminary projected resource base for 2020 is 7,194,050 acres, which includes only wildlife habitat in the "other land" inventory category (excludes urban areas of 10 acres or under). This means 500,000 acres of habitat will be lost to various developments. This loss occurs within the same time-span as an expected increase of 2,664,000 people in the area, more than twice the 1960 population. During this period another loss of 62,189 acres is expected to occur as private lands now under contract with the USDA, ASCS, for public hunting (Cropland Adjustment Program land) will revert to private control. This could result in a critical reduction in public hunting opportunity.

Rapid population increases, coupled with a shrinking resource base, will result in greatly increased pressure on existing public hunting lands. Other complications are the increasing difficulty of expanding public hunting lands as land values rise, and the degradation of all outdoor recreational experiences resulting from crowding. Crowding and the resultant lowering of the quality of wildlife habitat and outdoor opportunity is a problem in southern Michigan public areas, due in part to the dramatic increase in use of off-road vehicles, including four-wheel-drive vehicles, motorcycles, snowmobiles, and other special purpose all-terrain machines. As of 1970, no effective controls had been imposed on these specialized conveyances. Public hunting lands

are subjected to heavy use by these special vehicles, since access to private lands is limited. The noise, damage to vegetation, impact on wildlife, and litter from this use is on the increase. Even horseback riders, when added to an already crowded scene, present a problem in some areas.

Programs of stream channelization by all levels of government and by private individuals pose a serious conflict of interest problem, materially contributing to a shrinking wildlife habitat base. This work often results in the complete destruction of the streambanks and stream borders. Removal of vegetation from streambanks and sides can have a disastrous effect on furbearers, upland game, and non-game populations in heavily-agriculturalized areas where the bank vegetation is often the only significant cover left over vast regions.

The recent expansion of the Federal interstate highway system, as well as construction of State and local highways where stream crossings are necessary, has contributed to stream bottom destruction in the planning subarea. Approximately 20 miles of stream have been channeled at highway crossings, disturbing not only the immediate area but also the downstream ecosystem. In addition, channel modifications completed under the provisions of Public Law 83-566 have resulted in 9.1 miles of stream channelization, 104.9 miles proposed for channelization, and there are four projects under consideration for channelization.

Insecticide (chlorinated-hydrocarbon) runoff from orchards and nonagricultural application in southern Michigan has created problems in marshes, as well as the more well-known problems of fishery ecology, such as the DDT build-up in coho salmon. The pesticide enters the food chain through the water, through plant life, and through small aquatic organisms, becoming more and more concentrated in the larger organisms. Fish-eating birds, such as eagles, osprey, wading and shore birds, have high concentrations of insecticide in body tissues and are experiencing reproductive difficulties.

A lesser problem, but related to that of providing opportunity for increased demand, is the provision for different types of hunting and nonconsumptive opportunity. Presently, most big-game hunters travel out of the planning subarea to hunt. This is due to the presence of large tracts of State and national forests to the north which provide better white-tailed deer habitat than is generally found in the planning subarea. This is not as

significant a problem as trying to provide opportunity for waterfowl hunters and nonconsumptive users. Although many public lands within the planning subarea include wetlands, thousands of acres of high-value wetlands are privately owned and unprotected. Wetlands within Michigan have been severely damaged in the past, and future damage in this planning subarea is likely to be the most serious in the State.

There is less reason to be concerned about continued upland game opportunity than waterfowl opportunity. Wetlands are subject to conversion into agricultural lands as well as urban lands. If wetland losses continue, the proportion of wetland habitat to upland habitat will become increasingly smaller.

#### **2.4.2.5 Planning Subareas 1.2, 2.4, and 3.1, Michigan**

Planning Subareas 1.2, 2.4, and 3.1 are characterized by large tracts of State and national forest. Human population densities are low, and problems here are of resource management rather than the people-related problems of the southern areas.

Historically, the forested areas of the Great Lakes were burned regularly by lightning-ignited fires. The arrival of white men and clear-cut logging practices increased the acreage of large open areas with their early successional forest plant communities. The openings first revegetated with brush species such as viburnum and blueberry, followed by intolerant tree species such as aspen, jack pine, and scrub oak. A continual process of fires (later combined with logging) kept the forests in a state of change and provided a good variety of cover and food for wildlife species such as Kirtland's warbler, bobcat, snowshoe hare, prairie chicken, sharp-tailed grouse, white-tailed deer, and ruffed grouse (Figures 17-39 and 17-40).

In recent years forest fires have been effectively controlled, and it is now unusual for more than a few thousand acres a year to burn in Michigan's Upper Peninsula and northern Lower Peninsula. In addition, forestry practices have encouraged too great a component of conifers. Open areas have been regularly planted to pine, and forest types are being changed through longer harvest rotation (conversion of mixed aspen and white pine to solid stands of white pine, which provide no browse accessible to deer for most of the trees' maturation). This leads to declining habitat



Courtesy of State of Michigan Department of Natural Resources

**FIGURE 17-39** A Cheboygan County, Michigan, Site in 1926. Only sparse and ragged cover remained in 1926 after logging and fires in 1919 and 1925. This gives fair to good wildlife habitat but is of low timber value.

value for deer and other forest game. This trend needs to be reversed, as these animals are decreasing in density in many areas.

Off-road vehicles, particularly snowmobiles, are becoming a more serious problem as their numbers and versatility increase. The Michigan Department of Natural Resources has established trails and regulations governing the use of off-road vehicles on public lands, but sheer numbers may soon overwhelm the existing controls.

The decline of rare and endangered species is a problem that in some cases is very difficult to remedy, since the reasons for the decline of these animals and birds are often tied to politics and economics.

The timber wolf was once a common resident of the northern forests of Michigan. Encroachment of civilization has been a factor in wolf decline, but large expanses of suitable habitat still exist. The wolf was reduced by hunting, poisoning, and trapping to protect livestock. Today, however, for many people the chance to observe and photograph rare animals like the wolf in his natural surroundings is a supreme outdoor experience. Yet ignorance and politics still prevent the reestab-

lishment and management of the wolf. If there is loss of livestock, it would seem expedient to simply pay the farmer for this loss to predators, rather than spend large sums to destroy a unique wildlife resource.

The bald eagle, osprey, and peregrine falcon are declining over all of their southern range. There is considerable scientific evidence that this decline is due to the presence of persistent pesticides in the food chain. These chemicals are used to increase agricultural production, and with the exception of DDT, their use has not been discontinued. Residues of DDT will remain in the environment for many years.

Other rare and endangered species of this part of the Great Lakes Basin are probably affected more by habitat loss and over-harvest than by pesticides. Efforts are being made to preserve scarce habitat for the Kirtland's warbler and prairie chicken. Efforts have been made to reintroduce pine marten and fisher, two species that were wiped out by over-harvest and by logging practices that reduced habitat. The Canada lynx, also over-harvested, is making a comeback on its own.

Less encroachment from human activity has occurred here than in other areas, but



Courtesy of State of Michigan Department of Conservation

**FIGURE 17-40** Forest Regeneration on the Same Site (see Figure 17-39) Over a 41-Year Period (1926-1967). In 1967, the planted pine plus natural growth of maple and other hardwoods had achieved a close stand and wildlife had become sparse.

114,000 acres will be lost by 2020.

#### 2.4.2.6 Planning Subarea 3.2, Michigan

Wildlife habitat in the planning subarea is diverse. It includes northern forest, active and fallow farmland, and fine waterfowl marsh. Urban areas make up a significant portion of the area, and their associated problems have seriously degraded wildlife habitat. Changes in forest succession are occurring here, but this problem is not as great as it is in the more northern Michigan planning subareas.

Loss and degradation of wetland habitat around Saginaw Bay is the most critical people-oriented wildlife resource problem. Approximately 40,500 acres of fine marsh exist along the shores of the Bay. The Bay and its extensive marsh complex are a nationally known waterfowl concentration area, providing feeding, resting, nesting, and nursery habitat for transient and breeding ducks. This area is vital in the support and protection of many species of waterfowl, shorebirds, marsh birds, and passerine birds which frequent the North American Continent. It is also the

year-round home of numerous aquatic and terrestrial fur animals, upland game, and white-tailed deer. Inland marshes in State and Federal refuges and in private holdings also provide important habitat for these birds and animals.

Although the State owns submerged land to the normal highwater mark, shoreline marshes are still subjected to degradation by humans. Due to the extremely gentle gradient of the shore, a minor lowering of the water level during a dry year exposes large expanses of marshes. Riparian shore owners can, under permit, cut and remove marsh vegetation when the water level drops. This contributes to the decline in marsh area value. Agency actions causing a loss of habitat are dredging for navigation, marina construction, and filling for garbage disposal and spoil deposition. Private actions such as the construction of small-boat channels, docks, and groins also adversely affect wildlife resources.

Planning Subarea 3.2 at one time was good ring-necked pheasant habitat, but lately the situation has declined. Clean farming practices, particularly in the Thumb on the east side of Saginaw Bay, have hurt pheasant nest-

ing and winter cover and reduced the pheasant food supply. Mercury-treated grain and pesticide use will continue to have an impact on ring-necked pheasant populations.

Clean farming means many things in terms of the wildlife situation. It is a change to new and bigger farm machinery; it is combination corn picking and shelling operation; it means more intensive row cropping; it means less unharvested grain and stalks left in the field; and it means that due to the size of the plows and harvesting equipment, fence rows and field borders are being eliminated to facilitate maneuvering of the larger machines. In all, the cleaner, more efficient farming provides much less wildlife habitat and reduces the winter-survival chances of game species such as ring-necked pheasants.

In addition to the degradation of the wildlife value of farmlands, losses of wildlife habitat are occurring from urban expansion in and around the planning subarea's major cities. The construction of highways, subdivisions, and new utilities is taking a significant amount of land. The total acreage expected to be lost to these uses by 2020 is 180,000.

Channelization activity in Planning Subarea 3.2 is potentially more damaging than elsewhere in the State due to the presence of wetlands. Species such as the woodcock will be hurt the most by channel and drainage activities, which dry out the soil and eliminate food sources in wet woodlands and fields. The clearing of stream bottoms will also reduce habitat for ruffed grouse.

There are problems in the implementation of programs such as the Public Law 83-566 Small Watershed and ACP (now Rural Environmental Assistance Program), which, if corrected, could greatly help wildlife. Federal cost-sharing programs take considerable credit for providing wildlife habitat enhancement but actually do not spend enough of their budget on these programs to provide any tangible benefits.

#### **2.4.2.7 Planning Subarea 4.1, Michigan**

This planning subarea has the most complicated wildlife management problems in the entire Great Lakes Basin. The most productive and largest expanse of marshland in the Basin is found here and is being overrun by a huge metropolitan complex. Five million people live in and around Detroit, Ann Arbor, and Pontiac, making this the second most densely populated planning subarea in the

Basin. This gigantic biomass places an overwhelming strain on the area's ecosystem. River systems, airsheds, and natural values are seriously degraded. Wildlife problems are those of survival, rapidly diminishing and degraded habitat, use conflict, and numerous other people-oriented problems.

The most important wildlife resource of the planning subarea is the western Lake Erie marsh complex that stretches along the shore from the Ohio line to the lower Detroit River. Large marsh areas also exist in Lake St. Clair at the mouth of the St. Clair River. These marshes, once vast and productive, have been reduced to small segments of their original size. The prevailing attitude over the years has been that marshes are wastelands unfit for anything unless man interferes. Precisely the opposite is true from a natural viewpoint. Marshes are the single most productive wildlife habitat type and are fit for many living things as long as man does not interfere. This fact has been recognized in Planning Subarea 4.1 by only a few people, and only the efforts of the Michigan Department of Natural Resources and other conservation agencies have protected parcels of the marshlands.

Inland areas are also being degraded. Stream courses are not only seriously polluted but are damaged by dumping and channel modifications. Federally administered channel modification and local action have increased pollution in streams such as Red Run Drain near Mt. Clemens.

Loss and degradation of wetlands is complicated by the expected rise in real estate value of these lands once they have been filled or drained. This filling has increased the value of any surrounding marshes to a price often higher than the State can afford. Even though shore marshlands are invaluable to wildlife, their high real estate value in Planning Subarea 4.1 results in a shift to State purchase of lower-priced, important wildlife lands elsewhere. Consequently, industrial and private interests are winning the race for the acquisition of shore areas.

A number of problems threaten waterfowl and habitat in the lower Detroit River, a wildlife area of extreme importance. The problems include oil and other chemical pollutants from city and private development activity on Celeron Island. Both situations seriously degrade and jeopardize the habitat and dependent waterfowl resources. Marine facilities and expanding year-round housing on Celeron Island threaten to destroy all waterfowl feed-

ing areas on and immediately adjacent to the island. Oil and other pollutants kill birds outright, and most chemical pollutants also kill invertebrate animals, reducing diving duck food supplies.

Celeron Island and the surrounding marsh areas are the heart of the waterfowl food and cover supply, providing high-quality vegetable foods such as wild celery and sago pond weed. These plants constitute 50 to 60 percent of the standing waterfowl food crop. Other food sources such as invertebrate animals (mollusks, etc.) are abundant and at times provide 20 to 50 percent of the diet of diving ducks. A total of 5,000 acres of high-quality waterfowl food crops exist around Celeron Island. Species found here in large numbers include canvasback and scaup ducks and whistling swans.

This habitat is utilized year-round due to an artificial situation which has been in effect since the thirties. Heated waters from power plants and industry have kept the lower Detroit River ice-free, and waterfowl have become winter residents. Concentrations of ducks are thus very vulnerable to the above problems, particularly oil pollution, even in the winter.

The description of wildlife management problems associated with Federal programs providing cost-sharing and funding for wildlife habitat enhancement applies to most of the Lower Peninsula of Michigan.

(1) Federally cost-shared drainage and channelization projects do not require protective measures to mitigate wildlife habitat losses, and in many cases do not require protective measures needed to insure the planned life of the installations.

(2) Some tree planting programs are used as much or more to raise funds for local organizations as they are to provide needed habitat improvement.

(3) The influence of the State level planning committee for ACP is low because it can act only in an advisory capacity. As a result, fish and wildlife interests are outnumbered and critical decisions are made without a wildlife interest vote.

(4) A total of 116,551 acres are presently open to hunting under CAP agreement. The 1965 act that provided for these lands also provided for a ten-year contract which will soon expire. Unless the legislation is renewed, these acreages will be closed to public hunting.

(5) Federal budgets to provide wildlife management practices on Federal forest lands in Planning Subareas 2.4 and 3.1

amount to 1.5 cents per acre per year. Present State programs for wildlife habitat management on State forests in these same planning subareas are 20 times greater than the Forest Service Program.

#### 2.4.2.8 Planning Subarea 4.2, Indiana and Ohio

The problems of Planning Subarea 4.2 are similar to those of Planning Subarea 2.3. A shrinking resource base is the most serious problem. In this case the 1960 resource base was 5,777,700 acres, while the 2020 projected base is 5,480,500 acres, a loss of 297,000 acres. The population during this period is projected to go from 1,566,000 in 1960 to 3,116,000 in 2020.

In all, there are 13 public hunting areas totaling 19,955 acres in the Ohio portion of the planning subarea. These areas range in size from 153 to 8,162 acres, average 1,535 acres, and occur in 9 of the 20 counties. Eight of the 13 areas are less than 600 acres in size. This amounts to 0.12 acres of public hunting land per hunter within the planning subarea. The Statewide ratio is one acre of public land per hunter.

The Ottawa and Cedar Creek National Wildlife Refuges provide significant wetland habitat (approximately 7,921 acres) and non-consumptive wildlife recreational opportunity. The remaining public areas that provide general outdoor recreation opportunity are for the most part highly developed for intensive use with few natural areas. Thus the productivity and use of these areas for wildlife purposes is limited.

In 1962 between 54 and 67 percent of the farms in the Ohio portion of the planning subarea were open to the public for hunting with or without permission. Under a Division of Wildlife Cooperative Hunting Program, which provides control of hunters on private land, a total of 154,267 acres were available in 1970 to the public for hunting with permission in the Ohio portion of the planning subarea. Table 17-46 is a list of these acreages by county as of December 31, 1970.

In 1970 the USDA Cropland Adjustment Program provided public access on only 9,358 acres of diverted cropland for hunting in the Ohio portion of this planning subarea. Only 27 percent of the farmers participating in CAP elected to participate in the public access phase of the program. Approximately 60 percent of CAP public access acres were in the Cooperative Hunting Program.

The shrinking resource base is particularly

**TABLE 17-46 Cooperative Agreements in the Ohio Portion of Planning Subarea 4.2 (December 31, 1970)**

County	Number of Agreements	Acres
Allen	31	2,803
Auglaize	123	24,478
Crawford	10	1,692
Defiance	86	12,175
Erie	30	6,010
Fulton	39	4,969
Hancock	8	942
Henry	3	332
Huron	44	7,398
Lucas	9	734
Mercer	43	5,612
Ottawa	1	50
Paulding	139	27,416
Putnam	17	1,856
Sandusky	21	3,045
Seneca	203	33,970
Van Wert	27	3,444
Williams	79	12,460
Wood	6	703
Wyandot	21	4,178
TOTAL	940	154,267

critical in this planning subarea due to the intense agricultural use. Farming activity over much of the planning subarea has left little relatively undisturbed cover, as illustrated in Figure 17-41. It is not uncommon to see an absence of fence rows, which are vital as wildlife cover. The preliminary figures of the Land Use Work Group indicate that forest land in particular and other land (idle lands) categories are proportionately small compared to those in other planning subareas.

Most present cropland is dependent upon drainage. Tiling and drainage ditches are extensive. These agricultural drainage ditches, which sometimes occupy former intermittent natural watercourses, frequently provide habitat diversity. Many miles of agricultural ditches are renovated annually.

Degradation and destruction of stream bottom habitat resulting from channelization of major natural watercourses has the most deleterious effect upon wildlife, even though less miles of watercourse are affected. Figures 17-42, 43, and 44 illustrate the impact of this activity.

Part of Planning Subarea 4.2 contains some of the finest wildlife habitat in Ohio with Statewide, if not national importance. Ohio ranks second in the harvest of muskrats in the United States, with 25 percent of the take coming from this planning subarea. The five Lake Erie shoreline counties are classified by the U.S. Bureau of Sport Fisheries and Wildlife Wetlands Inventory as high-value waterfowl habitat. Extensive Type IV wetlands (deep fresh marsh) existed here at one time. A small but significant portion of them still remain, but these remaining wetlands are still subjected to many kinds of degradation. Both natural destruction from wave action and destruction from man's activities, such as filling and drainage, have contributed to the loss of wetlands. Many thousands of acres of Ohio wetlands have already been drained for agricultural, industrial, or urban home development in Planning Subarea 4.2 and elsewhere.

#### 2.4.2.9 Planning Subarea 4.3, Ohio

The most serious wildlife problem in Planning Subarea 4.3 is a diminishing resource base. This is due mostly to the presence of the second largest city in the Lake Erie basin, Cleveland, which touches the cities of Lorain and Elyria in Lorain County on the west side, Akron and Cuyahoga Falls in Summit County on the south side, and parts of Geauga and Lake Counties on the east side. In addition to this large urban area there are many small towns, all of which contribute to the urban character of the planning subarea. One county, Ashtabula, still retains rural characteristics. The population of Planning Subarea 4.3 in 1960 was 2,625,000 and is projected to increase to 5,527,000 by 2020. The resource base is projected to be reduced from 1,666,800 acres to 1,017,500 acres during the same period. Again as in other planning subareas, when population density doubles much wildlife habitat is lost.

While the 13 public hunting areas totaling 10,036 acres are well-distributed, the preponderance of this acreage lies east of the Cleveland-Akron area. These hunting areas range from 69 to 4000 acres in size and all but three are less than 1,000 acres in size. Only 0.07 acres of public hunting land per hunter occur within the basin. The Statewide ratio is one acre of public land per hunter. The small size of most public hunting areas severely limits their ability to provide quality hunting



Courtesy of State of Ohio Department of Natural Resources

**FIGURE 17-41** The Recent Shift to Monoculture Throughout Extensive Portions of Planning Subarea 4.2 Has Had an Adverse Effect on Wildlife.

**FIGURE 17-42** Stream Channelization of the Little Auglaize River, Paulding County, Ohio, Looking Downstream From County Road 72 Bridge. Productive fish habitat (stream) and wildlife habitat (woody vegetation along each bank) have been transformed to a sterile ditch.

Courtesy of State of Ohio Department of Natural Resources





Courtesy of U.S. Bureau of Sport Fisheries and Wildlife

**FIGURE 17-43** Stream Channelization of the Little Auglaize River, Paulding County, Ohio. (Same view as Figure 17-42, four years later.) Shallow, warm water limits fish life and grassed banks are of little value as wildlife habitat.

**FIGURE 17-44** Looking Across Little Auglaize (West to East) From County Road 72 Bridge. Three to five acres of woods were removed during channelization. Note scraggly row of shrubs planted (center of photo) to mitigate the loss of wildlife habitat.

Courtesy of U.S. Bureau of Sport Fisheries and Wildlife



opportunity for major game species. These areas, along with the sizable Cleveland, Akron, and Lorain Metropolitan Park Systems, the Mentor Marsh Natural Area, the Kent State University natural areas system, and city water supply reservoirs do, however, contribute significantly to the public wildlife habitat base in this highly urbanized area.

Hunting opportunity exists for upland game and waterfowl. The deficiency of big-game hunting opportunity is remedied by the closeness of more hilly and forested lands just out of the planning subarea to the south. Use of public lands for both consumptive and non-consumptive purposes will become more intense. Crowding and the resultant lowering of the quality of the outdoor experience will probably be the foremost of the foreseeable problems on public lands.

Hunting access on private land is highly restricted in many counties in this planning subarea. In 1962 less than 50 percent of farms in the planning subarea were open to the public for hunting with or without permission. Under a cooperative hunting agreement between the Division of Wildlife and private landowners, a total of 23,670 acres were available in 1970 to the public for hunting with permission. Acreage of cooperative hunting land by county is shown in Table 17-47.

In 1970, public access to diverted cropland acres under the USDA Cropland Adjustment Program provided only 13,411 acres for hunting. Approximately 30 percent of the farmers in this planning subarea participating in CAP elected to receive additional payments for providing public access on their diverted cropland acres. Nearly 50 percent of CAP public access acres were also in the Cooperative Hunting Program.

Another problem made more acute by the presence of a high-density human population is water pollution. Many miles of waterways within the Greater Cleveland-Akron area are grossly populated. This area is second only to Detroit in its deleterious effect on the water quality of Lake Erie. The Cuyahoga, Black, Chagrin, and Rocky Rivers are all in various stages of degradation.

The lower Cuyahoga River valley still has a great deal of potential as a green belt development in conjunction with the Tinkers Creek Wildlife Area. The grossly polluted condition of the stream detracts from the valley, being a fire and health hazard. Once stringent water-pollution controls are enforced and the stream is rehabilitated, the development of a green belt could meet part of the extremely

TABLE 17-47 Cooperative Agreements in Planning Subarea 4.3 (1970)

County	Number of Agreements	Acres
Astabula	69	10,465
Cuyahoga	5	177
Geauga	3	465
Lake	--	-----
Lorain	31	4,090
Medina	37	5,512
Portage	24	2,307
Summit	6	654
TOTAL	175	23,670

high demand for nonconsumptive wildlife experiences in the metropolitan areas of Cleveland and Akron.

Air pollution has an influence on nonconsumptive wildlife values in urban areas. It seems futile to plan for outdoor users when medical experts are advising city dwellers to remain indoors. Habitat development is also restricted because of planting limitations as far as 30 miles distant from industrial centers. Established white pine plantations are dying within this zone of influence, reportedly due to air pollution. The full potential of any nonconsumptive wildlife developments within urban areas with air pollution problems will not be realized until air pollution controls are more effective.

It is anticipated that locally financed stream channelization will be of significance in this planning subarea in the future as a result of private and local government action. The U.S. Army Corps of Engineers has several projects in the area. Most of these are navigation projects and will probably have little effect on wildlife resources.

One project involves the construction of a reservoir which does affect wildlife. The proposed Grand River reservoir pool will inundate thousands of acres of wildlife habitat that will be difficult if not impossible to replace. This river valley is unique because it is a semi-wilderness area located close to a large city. The river bottom and adjacent land is high-value habitat for ruffed grouse, white-tailed deer, and beaver. Therefore, while the reservoir would add to fishing opportunity and probably to the waterfowl resources and to general recreation potential, the irreplaceable wilderness and the deer, grouse, and



**FIGURE 17-45 Urban Encroachment—An Ever-Present Factor in Southern Great Lakes Wildlife Habitat**

beaver habitat would for all practical purposes be lost.

The potential for degradation of wildlife benefits by commercial navigation will be of concern if the Lake Erie and Ohio River Canal proposed in conjunction with this project ever becomes a reality.

#### **2.4.2.10 Planning Subarea 4.4, Pennsylvania and New York**

The Cleveland, Ohio-Erie, Pennsylvania-Buffalo, New York urban belt flows along the Lake Erie shore in a band from one side of this planning subarea to the other. Habitat loss is the most serious problem. An estimated 240,000 acres of habitat will be lost by 2020, while human populations will increase from 1.3 million persons to a total of 3.1 million. Increased land values, taxes, and more expensive farm operations are forcing small farmers out of business. Although the spread of urbanization causes more idle farmland, the reversion of this land to early successional brush and small trees greatly benefits wildlife (Figure 17-45).

Important waterfowl habitats exist in the Erie County, Pennsylvania, section of the

Lake Erie shore and the Niagara County, New York, section of Lake Ontario shore. Water pollution in the tributaries and open waters of these sections, stemming from pesticide runoff from the numerous grape orchards, organic loads from grape processing, and industrial and municipal sewage, is therefore a serious problem. Added to this is poor quality water from sources in the western basin of Lake Erie affecting eastern Lake Erie and Lake Ontario.

The shoreline of Lake Erie at Erie County, Pennsylvania, lies on a main migration route. At one time 20,000 to 30,000 greater scaup, ringneck, and other diving ducks wintered in Erie Bay. A thermal outfall from the Erie General Electric plant keeps the water open east of the Bay and has recently also attracted large winter flocks of waterfowl. Papermill wastes and other industrial pollutants have reduced the production of aquatic food organisms in the littoral zone so drastically that the numbers of wintering ducks and migrating ducks (stopping to feed) have declined to only a few thousand.

The upper and lower Niagara River is another important wintering area. It is a terminal migration area for redheads, canvasbacks, and scaup (as many as 20,000 scaup have been observed). This situation is an un-

natural one, again due to open water caused by thermal pollution. It is very serious, because food and cover are poor and extreme oil pollution hazards are present. The source of these problems is the Buffalo, North Tonawanda, Tonawanda and Niagara Falls industrial complex, including a power plant at Niagara Falls that causes a fluctuation of as much as four feet in water levels. This degrades food-producing capabilities of the river and backwaters, and at the same time, induces the thermal condition. Industrial operations also produce oil, tar, and other waste chemicals that threaten waterfowl and other animal life.

Industrial pollution in Dunkirk Harbor has reduced its value as a waterfowl area. Steel slag dumped into the open waters of Lake Erie from the Lackawanna steel plants, and glue and tannery wastes from factories in Tonawanda are other water quality problems affecting wildlife.

Dredge and fill activity of the U.S. Army Corps of Engineers beach erosion control project at Presque Isle Peninsula, Pennsylvania, has damaged the planning subarea's most unique marshland.

Restricted access to private lands is a wildlife use problem in New York, with posted farmland common in rural areas. The situation is better in Pennsylvania because of a good supply of public hunting land. The total of 119,150 acres of the State Game lands, Safety Program lands, and Farm Game Cooperative Program lands provided 3.7 acres per resident hunter in 1968 in the Pennsylvania portion of Planning Subarea 4.4.

#### **2.4.2.11 Planning Subarea 5.1, New York**

This planning subarea is divided into three physiographic regions—uplands, transition zone, and lowlands. The uplands or headwaters region, which is forested and hilly, extends into Pennsylvania. The Genesee River forms a canyon and waterfalls as it cuts through the escarpment at the transition zone. The lake plain is the predominant land feature of the lowlands region, with agriculture the primary activity. Urban development is intruding into the river valleys and uplands.

Urban encroachment into valuable wildlife habitat is the most important of the lowland problems. Land-use changes such as conversion of agricultural land to residential or industrial activities not only permanently destroys wildlife habitat but also restricts hunt-

ing and wildlife management on surrounding lands.

By 2020 population is projected to increase to 1,538,000 from 884,000 in 1970. Most of the increase will occur in the northern or lowland region. In all, 122,200 acres of wildlife habitat will be lost to urbanization during the study period. The construction of new houses along secondary roads forms a barrier against use of remaining lands behind these houses.

Another problem restricting access to wildlife lands all over the basin is posting. This practice causes the most restriction of access to huntable wildlife lands, nearly all of which are private. As human populations increase, the incidence of nuisance trespass increases, both from wildlife users and others. The landowners then post more land to attempt to reduce their own problems of crop damage, fire, fence damage, and stock losses.

A use problem that goes hand in hand with posting is the tendency for sport groups to reserve the right to hunt on private lands by direct payment to the landowner. This is a partial solution to the restricted access problem, but aggravates the overall problem. If well-managed hunting preserves were open to a larger segment of the hunters, the pressure on public areas would be reduced. However, hunting preserves are operated well below maximum sustained yield, which further limits overall hunting opportunity. If the trend toward shooting preserves continues, as much as 40 percent of the planning subarea's private lands will be in private preserves by the year 2020.

Loss of wetlands is a serious problem because this habitat is in short supply in the planning subarea. The losses are usually due to agricultural, industrial, and municipal developments, often partially funded by governmental programs. Single-purpose flood control, navigation, and agricultural drainage programs have been responsible for wetland losses throughout the Great Lakes Basin. Shore marshes have been damaged by navigation projects and by the usual filling for garbage and trash disposal.

The shore and related areas of Planning Subarea 5.1 have a total of 2,890 acres of marshland habitat remaining. A factor of great concern is the plan to manipulate levels and flows. An across-the-board determination of an optimum water level for the most effective management of shoreline marshes is not possible. Each marsh or wetland along the shore will require an individual biological assessment before an optimum water level can

be recommended. In some cases higher levels will result in loss of wetland productivity by inundation, while in others decreased levels will dry out shoreline marshes.

Inland marshes exist mainly along the river systems. These areas are threatened by the usual flood control projects and land-use changes. Shallow swamp areas are being filled by developers for cottage sites. Coordinated and carefully-planned water resource development can not only expedite flood control, but enhance the diminishing waterfowl habitat.

Water pollution in the planning subarea has so adversely affected approximately 100 miles of streams that their ability to support a fishery has been impaired. Wherever disruption or destruction of the aquatic food chain occurs, dependent mammalian and avian species are also affected. Mink, raccoon, muskrats, shorebirds, wading birds, ducks, and geese depend wholly or partly on aquatic organisms for food. Reduced food supplies mean fewer of these animals and birds.

In addition to diminished wildlife populations, the aesthetic qualities of the water systems are impaired, thereby diminishing the ability to support nonconsumptive wildlife demand. This is particularly true in the lower Genesee River.

#### 2.4.2.12 Planning Subarea 5.2, New York

Wildlife problems here are similar to those of Planning Subarea 5.1. However, the Oswego basin (Planning Subarea 5.2) has larger tracts of rural land and fewer people problems. The planning subarea population in 1970 was 1,385,000 and is expected to grow to 2,557,000 by 2020. During the same period 261,300 acres of wildlife habitat will be lost to urban encroachment.

The greatest concentration of people in this area occurs in an urban complex strung out along Interstate 90 from Rochester in Planning Subarea 5.1 to Syracuse and Utica, both in Planning Subarea 5.2. This urban belt also includes the communities at the mouths of the Finger Lakes. These lakes attract cottage and summer home development, which have brought in the usual support facilities, roads, and utilities, making the planning subarea rather uniformly urbanized in the southern half.

In sharp contrast to the more urban southern half of the planning subarea is the forest land in and around the Adirondack Forest

Preserve in the northern half. Here problems are similar to forest management problems elsewhere in the Great Lakes Basin and are more solvable than urban problems.

The following problems are specific to Planning Subarea 5.2.

##### (1) waterfowl-wetland problems

(a) Water pollution (oil and some chemicals) causes a direct loss of waterfowl.

(b) Water level control is an important consideration of both inland lakes and Lake Ontario. Drastic changes of water level can be disastrous. Recent lower levels in Lake Ontario are having damaging effects on the shoreline marshes.

(c) Marina developments, construction of shoreline cottages, resorts, and road construction where they intrude on wetlands and other important wildlife habitat are a significant zoning problem.

(d) Dredge and fill activity for whatever purpose is contributing heavily to loss of wetlands, shallow water areas, and aesthetic values.

(e) Drainage of inland wetlands for agricultural purposes, mosquito control, etc., is a serious problem.

(f) Hunter access to wetlands and water areas is often blocked by private ownership of peripheral lands.

(g) The presence of lead shot in shallow waters is a continuing problem responsible for waterfowl mortality each year.

##### (2) small-game problems, farm and upland

(a) Intensive agricultural practices, such as clean farming, row cropping, and woodlot clearing, decrease wildlife habitat.

(b) Posting of private lands reduces hunter access.

(c) Early-season haying operations result in direct mortality of ring-necked pheasants and cottontails and nest destruction.

(d) Fall plowing reduces winter cover, food, and nest areas for cottontails and pheasants.

(e) Herbicides applied to grain crops reduce weed seed production of fall and spring food supplies.

(f) Farmland abandonment results in loss of farm-game habitat.

(g) Increased use of pesticides and herbicides may have serious reproductive implications for small game.

(h) Adequate early-stage forest successional habitat must be maintained.

(i) Lack of interspersed conifer cover for snowshoe hare and ruffed grouse over much of their range limits the population.

(j) Woodcock habitat is decreasing due to vegetational succession and reduced grazing, both of which result from farmland abandonment.

(k) Posting of private lands reduces hunter access.

(3) big-game problems

(a) Winter cover in northern Herkimer County has been damaged by high white-tailed deer populations. Lack of conifers is also a factor. This part of the planning subarea has the most severe winter weather conditions.

(b) Uncontrolled and feral dogs are a factor in high winter mortality of deer, precluding population establishment and herd expansion in much of the planning subarea.

(c) Illegal kill, particularly in Oswego and Oneida Counties along with dogs running deer, is a limiting factor in deer populations.

(4) other problems

(a) Degraded water quality (particularly nutrient enrichment) causes early aging of lakes and ponds and reduces wildlife value of streams. All kinds of pollution limit the value of stream courses. Water milfoil invasion of inland lakes has resulted from excessive nutrient enrichment.

(b) Private ownership of key resource areas locks the public out and prevents wise management. There is also a problem on State owned lands (not under the jurisdiction of the New York Department of Environmental Conservation, i.e., lands under water) of preserving unique fish and wildlife values.

(c) Trout streams in the mountains are sometimes degraded by numerous beaver dams. Concentrations of these animals increase water temperature and turbidity by clearing trees from the banks, impounding water, and creating bottom disturbances. At the same time, beaver dams provide valuable edge effect and are attractive to waterfowl and other wildlife.

#### 2.4.2.13 Planning Subarea 5.3, New York

The following problems are specific to Planning Subarea 5.3.

(1) wildlife problems

(a) Damage to wetland areas is the foremost environmental preservation prob-

lem. Presently substantial wetland reduction is occurring at an alarming rate due to filling and dredging; agricultural drainage and channelization; landfills; urbanization; pollution—including over-enrichment; creation of impoundments—deep water or fluctuating water levels; and artificial lowering of Lake Ontario water levels detrimental to shoreline estuaries in relation to the St. Lawrence Seaway Development and Power Project water management plan.

(b) Advanced vegetative succession, coupled with selective cutting of softwood trees, has seriously reduced productive forest habitat in many areas.

(c) White-tailed deer winter concentration areas are destroyed by timber harvest and the construction of impoundments. Deer are harrassed by snowmobiles.

(d) Lack of logging because State constitutional constraints prevent harvest on State lands within Forest Preserves results in general deterioration of white-tailed deer winter range.

(e) Illegal shooting and dog predation are important limiting factors to distribution of deer and some other species.

(f) Cycles of severe winters seriously curtail wildlife species not adapted to subarctic conditions.

(g) Physical access for hunters in Adirondack zones are needed. Forest Preserve laws prevent construction of additional roads. Many roads and trails are not well identified or plowed in winter.

(h) There is a lack of information concerning population status of several species, including some forms considered to be endangered, such as the pine marten.

(i) Many hunters are opposed to antlerless deer seasons and other harvest-management techniques.

(j) Some species such as beaver tend to cause problems wherever they occur in areas of intensive land use.

(k) Some zones have stable land-use patterns, but lack wildlife species adapted to such use.

(2) other problems

Other problems are the same in Planning Subarea 5.3 as in Planning Subareas 5.2 and 5.1.

## Section 3

### FUTURE USE OF WILDLIFE RESOURCES

Planning for future wildlife resource use is influenced by many factors including human population increases, land-use practices, increased urbanization, and related socio-economic factors.

In this study as in most comprehensive studies the hunter day is used as a measure of comparative need. In addition to the hunter day an attempt was made to project the actual number of acres of habitat needed to satisfy the increase in hunting demand. The Addendum provides the rationale and methodology for determining acres of habitat needed, as well as a detailed step-by-step discussion of the methodology used to develop hunter day demands and related data. All projections were made on a planning subarea basis with the county as the base unit.

#### 3.1 Projected Human Populations

Projected population figures for the Basin and each planning subarea were provided by the Office of Business Economics, U.S. Department of Commerce, in Appendix 19, *Economic and Demographic Studies* (Table 17-1). Present and future population figures are used as a basis for projecting the future demand for hunting, with per square mile and acre of habitat per capita being two of the important factors used in our projection equation.

#### 3.2 Projected Hunter Use

Projections of future hunter use are based on certain assumptions and can be revised if future conditions show these assumptions to be misleading. Hunter use, expressed in man-days, is a function of the number of hunters and the annual participation rate.

##### 3.2.1 Projected Participants

The projected number of hunters for the

Great Lakes Basin consists of actual hunters and potential hunters. The actual hunter category consists of resident licensed hunters, non-resident hunters, and unlicensed hunters. Potential hunters include all hunters plus the number of latent hunters. Table 17-48 lists the total number of hunters in the Basin for the years 1970, 1980, 2000, and 2020.

##### 3.2.1.1 Licensed Resident Use

Hunting license sales, considered the best index for projecting future hunting demands, are recorded and readily available on a county basis. Resident hunting license sales for all counties in a planning subarea were totaled to arrive at the resident licenses per capita

**TABLE 17-48 Total Hunters, Great Lakes Basin (in thousands)**

PSA	1970 <sup>1</sup>	1980 <sup>2</sup>	2000 <sup>2</sup>	2020 <sup>2</sup>
1.1	81.0	87.0	92.0	97.0
1.2	54.1	55.8	55.8	57.9
2.1	224.1	235.2	270.2	315.2
2.2	384.1	670.9	821.6	1,009.2
2.3	337.0	410.0	486.0	570.0
2.4	129.0	139.2	154.5	175.2
3.1	61.5	65.1	71.9	80.5
3.2	199.7	241.1	285.0	335.3
4.1	337.5	469.9	577.8	720.2
4.2	165.0	225.6	260.8	298.3
4.3	134.0	198.0	241.0	294.0
4.4	153.3	190.1	206.9	218.0
5.1	74.9	92.7	109.1	125.3
5.2	153.5	179.6	211.9	246.7
5.3	<u>35.6</u>	<u>41.3</u>	<u>44.0</u>	<u>47.8</u>
Basin Total	2,524.3	3,301.5	2,888.5	4,590.6

<sup>1</sup>Includes resident and non-resident licensed hunters and unlicensed hunters.

<sup>2</sup>Includes resident and non-resident licensed hunters, unlicensed hunters, and latent demand hunters.

for use in the projective process. Resident license sales per capita were considered indicative of the acres of potential hunting land per capita. In 1960 Planning Subarea 3.1 in the upper part of Michigan's Lower Peninsula had both the highest resident licensed hunter per capita rate, .395, and the largest number of acres of potential hunting land per capita, 32 acres. Conversely, Planning Subarea 2.2 (Chicago, Milwaukee, and Gary) had only a .040 resident licensed hunter per capita rate and .47 acres of habitat per capita. In the *Ohio River Basin Comprehensive Survey* it was found that the correlation coefficient ( $r$ ) between licensed resident hunter per capita and acres of potential hunting land per capita was highly significant at the 99 percent probability level. Population density, also a factor in projecting the number of licensed hunters for the target years, was found to be highly significant.

After considering several factors related to projecting future use of wildlife resources, population densities and acres of habitat per capita were determined to be the best factors in projecting future hunting demand in most planning subareas.

However, in three planning subareas with high population densities and low acres of habitat per capita, it was found that better results could be obtained by using total population and total area as the factors involved in making the projections. These three are Planning Subareas 2.2, 4.1, and 4.3.

Multiple regression equations (Introduction) were used to project the number of licensed hunters per capita for 1960 in each planning subarea. The computed 1960 licensed hunter per capita figure was then adjusted as it deviated from the known 1960 licensed hunter per capita figure. The correction factor was derived by dividing the actual per capita figure by the computed per capita figure for each planning subarea. The projected per capita figure was then multiplied by this correction factor to partially account for various unknown determinants specific to each particular planning subarea. Adjustment factors were not large but were thought to provide increased accuracy when applied to projections for the future.

The Addendum shows the calculation procedure using Planning Subarea 4.2 as an example. Table 17-49 lists the total number of licensed hunters in the Basin for the base year 1970 and the projected numbers of licensed hunters for the target years 1980, 2000, and 2020.

**TABLE 17-49 Resident Licensed Hunters, Great Lakes Basin (in thousands)**

PSA	1970	1980	2000	2020
1.1	69.0	69.0	73.0	77.0
1.2	45.2	44.1	44.1	45.8
2.1	187.9	183.6	210.9	246.1
2.2	327.4	425.7	521.3	640.4
2.3	291.0	317.0	376.0	441.0
2.4	109.6	110.8	123.0	139.5
3.1	51.7	52.7	58.1	65.1
3.2	170.7	189.3	223.7	263.3
4.1	289.4	324.3	398.8	497.1
4.2	158.0	187.3	216.5	247.7
4.3	128.0	137.1	167.0	204.0
4.4	129.1	132.1	143.8	151.5
5.1	64.1	66.1	77.8	89.4
5.2	131.3	133.5	157.6	183.4
5.3	30.2	31.4	33.5	36.3
Basin Total	2,182.6	2,404.0	2,825.1	3,327.6

### 3.2.1.2 Licensed Non-Resident Use

The method used in projecting non-resident participation was to find the 1960 ratio of non-resident to resident hunters and apply this factor to the projected resident licensed hunters. It was assumed that no significant change would occur in this ratio during the projected years.

### 3.2.1.3 Unlicensed Use

Adjustments for unlicensed hunters were made from statistics developed in the 1965 National Survey of Fishing and Hunting and data received from the various State fish and game agencies. Some unlicensed hunters were hunting in violation of existing laws requiring licenses. However, most unlicensed hunters are exempted from the license requirements by legislation. Typical exemptions are property owners on their own land, persons under or over certain ages, disabled or active servicemen, and so on. No significant change in legislation concerning exemptions is anticipated for the target years.

### 3.2.1.4 Latent Demand

Latent demand is that desire to hunt inherent in the total population but not fulfilled because of lack of facilities, time, money, or for

other reasons. A national survey published in 1962 probed this problem of latent demand and estimated that five percent of the adult population (18 years and older) would like to begin hunting, and five percent would like to hunt more. In the *Ohio River Basin Comprehensive Study*, based on these national figures, the scope of coverage was expanded to make the factors adaptable to total population. The results show that 1.62 percent of the total population of the Ohio basin have unfulfilled demand for hunting.

In this appendix, latent-demand hunters were projected as a percent of the actual 1960 resident licensed hunters. In order to determine this percent factor, 1.62 percent of the total population in each planning subarea was divided by the number of actual resident hunters for that planning subarea. The results ranged from 5 percent to 40 percent. The same percent factor determined for each planning subarea was used for the target years.

### **3.2.2 Projected Annual Use Rates Per Participant**

Estimates of average annual hunter participation rates were based on State data for each planning subarea. The average annual estimated Basin participation rate for 1970 was 10.0 days and 8.8 days in 2020. Annual participation rates ranged from a low of 4 days to a high of 15 days per hunter. Participation rates were reduced 4 percent for each target year to account for increasing population densities and a decreasing habitat base.

### **3.2.3 Projected Gross Demand**

To arrive at total (gross) demand figures for the target years 1980, 2000, and 2020, the number of projected participants for each planning subarea was multiplied by the hunter participation rate for that planning subarea. Gross demands in hunter days are shown in Table 17-58.

### **3.2.4 Projected Net Demand**

After projecting gross demand for each planning subarea, it becomes necessary to estimate future change in opportunity (supply) represented by acres of habitat. A comparison

of supply and demand permits an evaluation of future net hunting needs or excess supply. To arrive at the 1980 net demand, the 1970 gross demand was subtracted from the 1980 gross demand and then adjusted for acres of habitat lost and acres gained of intensively managed hunting areas. An intensively managed area provides higher use than an unmanaged area. For example, if 20,000 acres of private land were lost with a use of .20 man-days per acre (4,000 man-days lost), and only 2,000 acres is gained but managed intensively with a use factor of 3.00 man-days per acre (6,000 man-days gained), there would be a net gain of 2,000 man-days of hunting.

Net demands for 2000 and 2020 were determined using the same method used for determining 1980 net demands. Therefore, 2000 and 2020 net demands were a function of changes in gross demands during the years 1980-2000 and 2000-2020, the carry-over net demand from the previous target year, and the effects of land-use changes on opportunity and use. Table 17-50 shows the net demand in man-days for the base year 1970 and the target years 1980, 2000, and 2020.

### **3.2.5 Planning Subareas: Hunters and Needs**

Table 17-51 provides data on the acreages of wildlife habitat required to provide hunting opportunity. Data are provided for the base year 1970 as well as projected data for the target years 1980, 2000, and 2020. The projections made in the table are considered to be reliable indications of the future relationships between numbers of persons desiring to use wildlife, total acreage required to meet this desire, the actual supply of acreage expected to be available under present land management and use programs, and the expected unsatisfied demand (unsatisfied opportunity) to use wildlife resources. The net (unsatisfied) demands are presented in two tables. Table 17-50 shows the unsatisfied or net demand in terms of number of hunter man-days of use, while Table 17-51 presents the unsatisfied opportunity to use wildlife in terms of net (deficit) acres of wildlife habitat needed.

Factors which contribute to the loss of wildlife habitat and the resultant shortage in future target years are discussed in other sections of the appendix. (See Table 17-53 and Figure 17-46.)

TABLE 17-50 Licenses and Gross and Net Demands for Hunting, Great Lakes Basin (in thousands)

PSA	Year	Resident Licensed Hunters	Un- Licensed Hunters	Non- Resident Hunters	Latent Hunters	Actual Hunters	Potential Hunters	Gross Demand Man-days	Net Demand Man-days
1.1	1970	69	11	.7	--	81	--	808	--
	1980	69	11	.7	6	81	87	838	26
	2000	73	12	.7	6	81	92	842	27
	2020	77	13	.7	6	81	97	849	32
1.2	1970	45.2	7.4	1.5	--	54.1	--	702.5	--
	1980	44.1	7.2	1.5	3	52.8	55.8	717.5	15
	2000	44.1	7.2	1.5	3	52.8	55.8	709.6	7.2
	2020	45.8	7.5	1.5	3.1	54.8	57.9	729.6	27.9
2.1	1970	187.9	30.6	5.6	--	224.1	--	2,584.7	--
	1980	183.6	29.9	5.5	16.2	219.0	235.2	2,982.6	330.0
	2000	210.9	34.4	6.3	18.6	251.6	270.2	3,285.3	632.7
	2020	246.1	40.1	7.3	21.7	293.5	315.2	3,678.5	896.5
2.2	1970	327.4	53.4	3.3	--	384.1	--	3,840.8	--
	1980	425.7	69.4	4.3	171.5	499.4	670.9	6,440.2	2,507.4
	2000	521.3	85.0	5.3	210.0	611.6	821.6	7,558.3	3,754.0
	2020	640.4	104.4	6.5	257.9	751.3	1,009.2	8,880.8	4,946.1
2.3	1970	291	44	2	--	337	--	3,502	--
	1980	317	48	2	43	367	410	4,031	504.5
	2000	376	56	3	51	435	486	4,308	753.6
	2020	441	66	3	60	510	570	4,541	966.4
2.4	1970	109.6	17	2.4	--	129	--	1,947.2	--
	1980	110.8	18.1	2.3	8.0	131.2	139.2	2,003.6	202.3
	2000	123.0	20.0	2.6	8.9	145.6	154.5	2,132.2	332.4
	2020	139.5	22.7	2.9	10.1	165.1	175.2	2,313.5	514.7
3.1	1970	51.7	8.4	1.4	--	61.5	--	800.3	--
	1980	52.7	8.6	1.4	2.4	62.7	65.1	814.6	16.1
	2000	58.1	9.5	1.6	2.7	69.2	71.9	862.6	66.5
	2020	65.1	10.6	1.8	3.0	77.5	80.5	925.1	132.1
3.2	1970	170.7	27.8	1.2	--	199.7	--	2,597.1	--
	1980	189.3	30.9	1.3	19.6	221.5	241.1	3,014.0	396.6
	2000	223.7	36.5	1.6	23.2	261.8	285.0	3,418.8	786.3
	2020	263.3	42.9	1.8	27.3	308.0	335.3	3,856.6	1,203.7
4.1	1970	289.4	47.2	.9	--	337.5	--	2,902.1	--
	1980	324.3	52.9	1.0	91.7	378.2	469.9	4,510.6	1,596.4
	2000	398.8	65.0	1.2	112.8	465.0	577.8	5,315.3	2,474.2
	2020	497.1	81.0	1.5	140.6	579.6	720.2	6,337.9	3,539.0
4.2	1970	158.0	6.0	1.0	--	165.0	--	1,844.1	--
	1980	187.3	7.5	1.4	29.4	196.2	225.6	2,413.8	581.1
	2000	216.5	8.7	1.6	34.0	226.8	260.8	2,738.6	921.8
	2020	247.7	9.9	1.8	38.9	259.8	298.3	3,072.5	1,273.5
4.3	1970	128	5.0	.9	--	134	--	1,592.0	--
	1980	137.1	5.5	1.0	54	144	198	2,344.6	896.7
	2000	167	7.0	1.2	66	175	241	2,791.4	1,420.6
	2020	204	8.1	1.5	81	214	294	3,352.5	2,035.1
4.4	1970	129.1	21.0	3.2	--	153.3	--	613.4	--
	1980	132.1	21.5	3.3	33.2	156.9	190.1	760.6	169.2
	2000	143.8	23.4	3.6	36.1	170.8	206.9	827.5	262.3
	2020	151.5	24.7	3.7	38.1	179.9	218.0	872.0	331.0
5.1	1970	64.1	10.4	.4	--	74.9	--	299.7	--
	1980	66.1	10.8	.4	15.4	77.3	92.7	370.7	83.8
	2000	77.8	12.7	.5	18.1	91.0	109.1	436.5	161.2
	2020	89.4	14.6	.6	20.8	104.5	125.3	501.3	240.7
5.2	1970	131.3	21.4	.8	--	153.5	--	614.0	--
	1980	133.5	21.8	.8	23.5	156.1	179.6	718.4	138.3
	2000	157.6	25.7	.9	27.7	184.2	211.9	847.7	293.8
	2020	183.4	29.9	1.1	32.3	214.4	246.7	986.8	461.1
5.3	1970	30.2	4.9	.4	--	35.6	--	142.2	--
	1980	31.4	5.1	.4	4.3	37.0	41.3	165.1	23.2
	2000	33.5	5.5	.4	4.6	39.4	44.0	176.2	36.3
	2020	36.3	5.9	.5	5.0	42.8	47.8	191.1	53.6



Courtesy of State of Pennsylvania Game Commission

FIGURE 17-46 Two Satisfied Resident Pennsylvania Hunters

TABLE 17-51 Acres of Wildlife Habitat Needed to Satisfy Hunter Demands, Great Lakes Basin (in thousands)

PSA	1980	2000	2020	Factor <sup>1</sup>
1.1	0.0	60.0	150.0	15
1.2	0.0	0.0	50.0	25
2.1	0.0	495.0	1,125.0	15
2.2	1,383.6	2,730.0	4,406.4	12
2.3	299.0	986.0	1,734.0	10
2.4	26.0	316.0	708.0	20
3.1	22.0	152.0	316.0	20
3.2	217.0	619.0	1,082.0	10
4.1	439.5	873.5	1,447.0	5
4.2	312.0	618.0	944.0	10
4.3	100.0	410.0	800.0	10
4.4	36.0	175.0	266.0	10
5.1	24.0	161.0	296.0	10
5.2	26.0	307.0	609.0	10
5.3	28.0	76.0	144.0	20
<b>TOTAL</b>	<b>2,913.1</b>	<b>7,978.5</b>	<b>14,077.4</b>	

<sup>1</sup>Number of acres required for each additional hunter.

TABLE 17-52 Projected Net Demands on Wildlife Habitat by Non-Consumptive Users, Great Lakes Basin<sup>1</sup>

PSA	1980	2000	2020
1.1	26.0	27.0	32.0
1.2	15.0	7.2	27.9
2.1	330.0	632.7	896.5
2.2	2,507.4	3,754.0	4,946.1
2.3	504.5	753.6	966.4
2.4	202.3	332.4	514.7
3.1	16.1	66.5	132.1
3.2	396.6	786.3	1,203.7
4.1	1,596.4	2,474.2	3,539.0
4.2	581.1	921.8	1,273.5
4.3	896.7	1,420.6	2,035.1
4.4	169.2	262.3	331.0
5.1	83.8	161.2	240.7
5.2	138.3	293.8	461.1
5.3	23.2	36.3	53.6
<b>TOTAL</b>	<b>7,486.6</b>	<b>11,929.9</b>	<b>16,653.4</b>

<sup>1</sup>Net demand (measured in thousands of man-days) is unsatisfied demand, the amount the desire to do something exceeds the opportunity.

TABLE 17-53 Acres of Potentially Huntable Land, Great Lakes Basin (in thousands)

PSA	Year	Required	Supply	Needs <sup>1</sup>	PSA	Year	Required	Supply	Needs <sup>1</sup>
1.1	1970	8,264.6	8,264.6	0	3.2	2000	2,275.9	1,656.9	619.0
	1980	8,263.9	8,263.9	0		2020	2,716.9	1,634.9	1,082.0
	2000	8,316.9	8,256.9	60.0	4.1	1970	1,042.0	1,042.0	0
	2020	8,393.5	8,243.5	150.0		1980	1,386.2	946.7	439.5
1.2	1970	6,179.1	6,179.1	0		2000	1,685.3	811.8	873.5
	1980	6,179.1	6,179.1	0	2020	2,169.5	722.5	1,447.0	
	2000	6,178.1	6,178.1	0	4.2	1970	1,495.8	1,495.8	0
	2020	6,225.0	6,175.0	50.0		1980	1,791.6	1,479.6	312.0
2.1	1970	5,789.4	5,789.4	0		2000	2,071.1	1,453.1	618.0
	1980	5,775.4	5,715.4	0		2020	2,329.3	1,385.3	944.0
	2000	6,244.2	5,749.2	495.0	4.3	1970	1,451.75	1,451.75	0
	2020	6,841.9	5,716.9	1,125.0		1980	1,431.83	1,331.83	100.0
2.2	1970	1,344.7	1,344.7	0		2000	1,519.57	1,109.57	410.0
	1980	2,555.0	1,171.4	1,383.6		2020	1,723.19	923.19	800.0
	2000	3,675.8	945.8	2,730.0	4.4	1970	1,181.5	1,181.5	0
	2020	5,182.5	776.1	4,406.4		1980	920.8	884.8	36.0
2.3	1970	3,091.4	3,091.4	0		2000	846.2	671.2	175.0
	1980	3,350.5	3,051.5	299.0		2020	913.6	647.6	226.0
	2000	3,976.8	2,990.8	986.0	5.1	1970	836.0	836.0	0
	2020	4,650.1	2,916.1	1,734.0		1980	688.6	664.6	24.0
2.4	1970	6,088.4	6,088.4	0		2000	697.2	536.2	161.0
	1980	6,102.4	6,076.4	26.0		2020	769.4	473.4	296.0
	2000	6,369.6	6,053.6	316.0	5.2	1970	2,617.2	2,617.2	0
	2020	6,735.1	6,027.1	708.0		1980	2,052.5	2,026.5	26.0
3.1	1970	2,760.9	2,760.9	0		2000	2,029.3	1,722.3	307.0
	1980	2,776.9	2,754.9	22.0		2020	2,297.7	1,688.7	609.0
	2000	2,899.1	2,747.1	152.0	5.3	1970	2,615.0	2,615.0	0
	2020	3,053.3	2,737.3	316.0		1980	2,429.2	2,401.2	28.0
3.2	1970	1,711.3	1,711.3	0		2000	2,345.0	2,269.0	76.0
	1980	1,906.2	1,689.2	217.0		2020	2,407.4	2,263.4	144.0

<sup>1</sup> Acres needed are cumulative by target years.

### 3.2.6 Estimated Non-Hunter Use

Basin nonconsumptive (non-hunter) use, based on a judgment decision by the Wildlife Work Group, is at least equal to projected consumptive use. It therefore is listed in Table 17-53 as a function of net hunter demand. Nonconsumptive use will probably increase faster than projected hunter use in some areas. This increase will be due largely to crowding in the southern tier of Basin States.

Local ordinances, State laws, and other safety limitations are forcing a decrease in the use of firearms. Lower-quality hunting experience due to degraded habitat and fewer game animals is reducing the desire to hunt, while the desire to use wildlife habitat for non-hunting purposes is increasing greatly. State game lands near cities are receiving more off-season than hunting use. Increases in these areas and other wildlife lands will benefit the non-consumptive user more as time goes on.

## Section 4

### ALTERNATIVES FOR SATISFYING FUTURE REQUIREMENTS

#### 4.1 Capabilities of Wildlife Resources to Sustain Future Demands

Wildlife populations seek the maximum carrying capacity of the habitat as dictated by its potential and level of management. The finite dimension most important to wildlife, the resource base in acres, will not increase, but will decrease in the future due to other pressures. The only means of maintaining a wildlife population to meet increasing demand is through more intensive management.

#### 4.2 Known Future Management Programs and Recommendations

The following is a series of brief discussions of State and Federal management programs listed by State. These discussions are for future programs only in the sense that no Basin State is in a position to project increases in management much beyond the present rate of increase. Changes in politics are not within the realm of projection, and methodology and future State programs are dependent on future political situations as well as unforeseen shifts in the local and national economy.

Also included is a list of recommendations for management, and solutions to the problems of each State.

##### 4.2.1 Minnesota

##### 4.2.1.1 Future Management Programs

The Minnesota Department of Natural Resources, Division of Game and Fish, expects to acquire 233,000 acres (Statewide) of game and fish lands by 1975.

Generally speaking Cook, Lake, Carlton and St. Louis Counties have an abundance of pub-

lic lands, and acquisition will be limited to deer wintering sites.

The State assistance program to private land owners will be continued. The Federal Rural Environmental Assistance Program (REAP) and State game funds will continue to be available to provide necessary incentives for private development of wildlife habitat.

Minnesota Department of Natural Resources and Superior National Forest personnel are working together on a wolf management plan that is now in review.

##### 4.2.1.2 Management Recommendations (Planning Subarea 1.1)

(1) Give top priority to forest management practices that save or maintain existing openings, but also create a diversity of habitat types for wildlife.

(2) Seed logging roads with a mixture of legumes and grasses for wildlife food and maintain hunter access by slowing invasion by trees and shrubs.

(3) Create openings in the forest and then seed with a mixture of legumes and grasses to provide wildlife food as well as an area to observe and harvest game.

(4) Institute prescribed burning of forest lands to create wildlife openings and retard vegetative succession, allowing the growth of young succulent food for wildlife.

(5) Release post-sale aspen in forest openings by knocking down all small hardwoods, creating a favorable condition for aspen regeneration.

(6) Complete acquisition of public lands within purchase boundary of national forest.

(7) Subsidize industry practices by State game divisions to keep forest land acreage in early succession stages and continue cooperation between all governmental levels in game and timber management practices.

(8) Prohibit or regulate snowmobile use as to time and areas, i.e., prohibit use during big-game hunting season in hunting areas,

and confine use to marked snowmobile trails.

(9) Institute zoning laws regulating residential and commercial development within a certain distance of inland lakes and the Lake Superior shore.

(10) Identify low-yield timber areas and manage these areas for forest game species and public hunting.

(11) Purchase, lease, obtain easements, or offer other incentives to local government bodies and private landowners to encourage the preservation of open spaces and natural unique ecological and scenic areas for non-consumptive use.

(12) Develop more markets for forest products in the area.

(13) Manage the timber wolf more intensively, including protection-directed control, habitat management, and establishment of game animal status.

(14) Establish game animal status for black bear.

(15) Institute a regulated trapping season on fishers.

(16) Emphasize and utilize important furbearers such as beavers, muskrat, mink, and others.

(17) Continue to develop specific regulations to control the damage and changes in ecology of wilderness areas caused by canoeist overuse.

#### 4.2.2 Wisconsin

##### 4.2.2.1 Future Programs

The Wisconsin Department of Natural Resources, Division of Forestry, Wildlife and Recreation, planning goals call for the acquisition of 385,335 acres of land (Statewide) by 1981. Game lands alone are being purchased at the rate of approximately 15,000 acres per year. A total of 912,841 acres was owned by the Department of Natural Resources on July 1, 1971. The U.S. Forest Service plans to acquire 5,165 acres of additional land in the northern national forests in a five-year period.

Department efforts to protect wetlands by acquisition and easements will continue. Wildlife habitat needs and management on public forest lands are expected to receive additional consideration under an expanded multiple-use concept of forest management. The future of farm-game habitat maintenance and improvement lies in preserving existing non-cropland acreage and by improving cover on

cropland diverted from agricultural production.

##### 4.2.2.2 Management Recommendations for Northern Forest Region (Planning Subarea 1.1 and Northern Half of Planning Subarea 2.1)

(1) Increase wildlife habitat management under the multiple management planning concept for State and county forest lands.

(2) Seek improved Federal funding to strengthen the wildlife management program on national forest lands.

(3) Maintain sun-loving, early successional timber types such as aspen, jack pine, and oak, which constitute a critical component of forest-game habitat on private lands, by improving the market for these species and by offering cost-sharing to encourage treatments that create favorable conditions for their regeneration (Figures 17-47 and 17-48).

(4) Inventory and maintain existing forest openings on public lands for their wildlife habitat and aesthetic value.

(5) Identify low-yield timber areas, designate their primary management objective as wildlife production and public hunting, and manage them to this end.

(6) Initiate research efforts to determine status of and management needs for nongame wildlife.

(7) Restore wildlife law enforcement program to the 1960 level.

(8) Continue to develop and maintain logging roads and permanent firebreaks as wildlife openings. This will also provide access for hunters.

(9) Complete acquisition of public lands within purchase boundaries of national, State, and county forests.

(10) Improve land-use zoning and wildlife management programs on the county level to provide for preservation and enhancement of wildlife habitat.

(11) Provide for the preservation of unique ecological and scenic areas through public acquisition, easements, or tax incentives for private landowners.

(12) Expand wildlife management extension services, cost-sharing, and other incentives to private landowners to encourage development and maintenance of forest-game habitat.

(13) Regulate the use of snowmobiles, trail bikes, and other off-road vehicles as to time and area. Prohibit use entirely in certain areas, restrict use to certain hours during the



Courtesy of State of Wisconsin Department of Natural Resources

**FIGURE 17-47** Typical Northern Wisconsin Potential Forest Game Habitat Treatment Site Showing Residual Aspen, Birch, and Maple Following a Commercial Aspen Harvest



Courtesy of State of Wisconsin Department of Natural Resources



Courtesy of State of Wisconsin Department of Natural Resources

**FIGURE 17-48** Northern Wisconsin Forest Game Habitat. Left Photo: "Shearing" is often done after commercial aspen harvest to remove residual trees. Right Photo: Same area 1½ years later (two growing seasons) showing young aspen regeneration, good wildlife habitat.

deer hunting season, and confine use to marked trails where adverse effects on wildlife, habitat or the environment occur.

(14) Reintroduce the timber wolf in areas of suitable habitat.

#### **4.2.2.3 Management Recommendations for Farm and Urban Region (Planning Subarea 2.2 and Southern Half of Planning Subarea 2.1)**

(1) A State or Federal water bank easement program or property tax incentives to preserve privately owned wetlands should be initiated and adequately funded.

(2) Enact legislation which will extend the principles of wildlife management and public access contained in Title IV of the Cropland Adjustment Program—Food and Agriculture Act of 1965.

(3) State and counties should continue to acquire land to preserve critical components of wildlife habitat as well as unique ecological and scenic areas.

(4) Local zoning ordinances should be adopted or amended to limit proliferation of residential, transportation, and industrial developments and to maintain open space and environmental corridors.

(5) Restore waterfowl and furbearer habitat in lakes and streams by improving water quality and reducing turbidity. Development of specific toxins for control of rough fish (especially carp) would yield immediate benefits.

(6) Survey wildlife resources and comment on impact statements (NEPA-1969) to insure that the environmental ramifications of proposed developments of projects (such as PL 566) are understood and that all beneficial uses of water and land resources, including wildlife habitat, have been taken into consideration.

(7) Retain and expand lease agreements between the State and private landowners to provide controlled access for public hunting.

(8) Items number 6 and 7 in Subsection 4.2.2.2 also apply to the southern half of Planning Subarea 2.1.

### **4.2.3 Illinois**

#### **4.2.3.1 Known Future Management Programs**

The State is in the process of writing a long-

range master plan, but it is not complete at the time of this writing. The Illinois Park Districts and Forest Preserves add valuable open space lands (in some cases high quality wildlife habitat) to their holdings at a rate of 7 percent annually. Total district holdings to date are 25,000 acres Statewide.

Potential projects significant to wildlife in the Illinois portion of the Basin include: expansion of the existing Chain O' Lakes and Illinois Beach State Parks to their maximum available land limit, and acquisition of additional State parks wherever possible; acquisition of the 31 recreation resource areas identified in the Northeastern Illinois Metropolitan Area Planning Commission Report, "Open Space in Northeastern Illinois;" encouragement of National Recreation Area development of the shore of Lake Michigan from Waukegan north to Kenosha, Wisconsin, and development of the Chicago, Aurora, and Elgin Railroad right-of-way and other abandoned rights-of-way in this area into a system of recreation trails and prairie vegetation preserves.

#### **4.2.3.2 Management Recommendations (Planning Subarea 2.2)**

(1) Local zoning ordinances should be adopted or amended to limit the proliferation of residential and industrial developments and to maintain open space.

(2) The State and counties should continue to acquire land to conserve critical components of wildlife habitat and to guarantee public access to natural areas.

(3) A State wetland or Federal water bank easement program to prevent drainage and filling of privately owned wetlands should be initiated.

(4) Obtain easements or offer other incentives to private landowners to insure the preservation of natural, unique ecological, and scenic areas.

(5) Retain and expand lease agreements between State agencies and private landowners for controlled access to private lands.

(6) Continue the Federal Cropland Adjustment Program or enact other legislation which will extend the principles contained in Title IV of the Cropland Adjustment Program of the Food and Agriculture Act of 1965.

(7) Enhance waterfowl and furbearer habitat by improving water quality and reducing carp populations in lakes and streams.

(8) Improve coordination among all local,

State, and Federal agency programs to insure that the potential environmental ramifications of proposed projects are understood and that all beneficial uses of water and land resources, including fish and wildlife habitat, have been taken into consideration. Use to full advantage all opportunities under PL 566 for preserving, improving, and creating fish and wildlife habitat and open space.

#### **4.2.4 Indiana**

##### **4.2.4.1 Future Management Programs**

The Indiana Division of Fish and Wildlife plans to acquire 2,500 to 3,000 acres by 1980 as additions to existing game lands in the three planning subareas. Also planned is the acquisition of 4,000 acres of wetlands. The State hopes to initiate a natural stream preservation program which would initially include 72 miles of streams. Expansion of the Indiana Dunes area by the Federal government to include all significant dunes and open lands is probable.

##### **4.2.4.2 Management Recommendations (Planning Subareas 2.2, 2.3, and 4.2)**

(1) Local zoning ordinances should be adopted or amended to limit proliferation of residential and industrial development and maintain open space.

(2) The State and counties should continue to acquire land to conserve critical components of wildlife habitat and to guarantee public access to natural areas.

(3) A State wetland or Federal water bank easement program to prevent drainage and filling of privately owned wetlands should be initiated.

(4) Obtain easements or offer other incentives to private landowners to insure the preservation of natural, unique ecological, and scenic areas.

(5) Retain and expand lease agreements between State agencies and private landowners for controlled access to private lands.

(6) Continue the Federal Cropland Adjustment Program or enact other legislation which will extend the principles contained in Title IV of the Cropland Adjustment Program of the Food and Agriculture Act of 1965.

(7) Enhance waterfowl and furbearer habitat by improving water quality and reducing

carp populations in lakes and streams.

(8) Improve coordination between all local, State, and Federal agency programs to insure that the potential environmental ramifications of proposed projects are understood and that all beneficial uses of water and land resources, including fish and wildlife habitat, have been taken into consideration.

(9) Encourage and support the activities of local and national conservation organizations in the preservation and improvement of the quality of the environment.

(10) If supported by biological data, enact State legislation to permit the hunting of mourning doves.

(11) Enact legislation and develop a policy on stream and lakeshore filling that would prevent further destruction of privately owned marshes as well as degradation of watercourses by municipal dumps. The new Ohio Stream Littering Law and the 1968 Indiana Department of Natural Resources, Natural Resource Commission Wetlands Policy Statement should be helpful in the development of this policy.

(12) Enact more effective legislation on water pollution that could improve the water quality of streams such as the Maumee and thereby enhance the waterfowl wintering and production potential, furbearer potential, fishing potential, and general aesthetic quality.

(13) Amend PL 83-566 (Small Watershed Program) to include cost of additional land rights for mitigation as a construction cost to be cost-shared at the same rate as the structural measure creating the need for mitigation.

#### **4.2.5 Michigan**

##### **4.2.5.1 Future Programs**

By 1977 the Michigan Department of Natural Resources has proposed to acquire 198,000 acres of land for wildlife purposes including scarce habitat, game land additions, and recreation areas. Most of this acquisition is proposed for southern areas, since the demand is highest there and the number of users per acre is higher. Additional capital expenditures (items not funded through existing or foreseeable fund sources) may provide for 257,800 more acres of land. This would include scarce habitat, deer and upland habitat, and wetlands. The U.S. Forest Service has plans to

purchase blocks of private land remaining in the six national forests in northern Michigan.

#### 4.2.5.2 Management Recommendations for Southern Part of the State

(1) Update and strengthen existing zoning laws and ordinances. High-value wildlife habitats such as the Lake Erie marshes, lower Detroit River marshes, Lake St. Clair marshes and remaining good stream bottoms should be rigidly zoned against further development and destruction. Zoning classifications that preclude development, and modifications of these areas would help protect them and result in a freeze or lowering of real estate values to a point commensurate with the resource agencies' ability to purchase lands for permanent protection.

(2) Amend PL 83-566 to include cost of additional land rights for mitigation as a construction cost to be shared at the same rate as the structural measure creating the need for mitigation.

(3) Intensify water-pollution control activities, particularly in cases of floating oil, persistent pesticides, and heavy metals.

(4) Strengthen or amend ASCS, Forest Service and SCS activities to benefit the wildlife programs as follows:

(a) Institute policy changes that require earmarking funds specifically for wildlife enhancement, and provide for administrative follow-up on the use of these funds.

(b) Protect project-construction work such as drainage ditches and channels by fencing from livestock and other wildlife habitat degrading uses.

(c) Emphasize funding for routine wildlife enhancement practices, such as food and cover plot plantings.

(d) Legislate to provide renewal of the Cropland Adjustment Program land contracts.

(5) Change the funding of water resources planning to include States that have the most to gain or lose from these plans.

(6) Include provision for public access to lands covered by any future crop diversion program or continuation of the current program under the Food and Agricultural Act of 1965. Approximately 62,189 acres of private land now open to public access under the Cropland Adjustment Program of the U.S. Department of Agriculture will revert to private control by the year 1976.

(7) Provide the Michigan Wildlife Division with permit-granting authority for marsh vegetation modifications.

(8) Provide greater protection of marsh areas through legislative action, or through policy changes by such agencies as the U.S. Army Corps of Engineers, placing wetland preservation on an equal basis with navigation and shoreline construction activity.

(9) Provide legislative or policy changes to assure the enhancement of wildlife habitat in the application of PL 566 and REAP projects. Expansion of the Michigan Department of Natural Resources private land habitat management program should include providing technical service to the Rural Environmental Assistance Program. Cost-sharing by the State or another public agency, in addition to the cost-sharing already provided the private landowner under REAP, could greatly increase management practices and improve the quality of wildlife habitat.

(10) Continue efforts to purchase as much wetland habitat and as many parcels of important pheasant habitat as possible.

(11) Continue action to restrict the manufacture, sale, and use of remaining hard and persistent pesticides.

(12) Develop a program to assist and guide urban homeowners and others in the preservation and enhancement of open space for wildlife.

#### 4.2.5.3 Management Recommendations for Northern Part of the State

The problems of changing plant succession in the northern forests of Michigan have been partially resolved by an updated policy for managing State forest lands which was put into effect in June 1970. The main emphasis in this plan is multiple use, with the recommendation that timber management be modified to give equal consideration to wildlife management. Modification of timber management practices is the most effective method of indirectly improving wildlife habitat. Other approaches are direct wildlife habitat improvement measures, such as cutting to produce deer browse, food and cover planting, and development of trails and wildlife openings. The following are recommended timber management practices:

- (1) Scatter small timber sales.
- (2) Spread cutting on large sale areas over several years.
- (3) Preserve uncut plots and travel lanes

for wildlife in large clear cuttings.

(4) Use selective cutting to open the canopy of dense forests.

(5) Maintain adequate cover in deer winter concentration areas.

(6) Plan cutting programs to retain mature male aspen for ruffed grouse and mast-producing oaks for deer and bear.

(7) Plan winter cuttings so food for deer is provided when and where needed.

(8) Recycle aspen by noncommercial means when demand is not sufficient to secure harvest before deterioration of stand and subsequent conversion to shade tolerant species. Aspen stands of several ages in fairly close proximity are desirable.

(9) Use in-stand conversion to preserve buffer strips of original type between planted areas and other timber.

(10) Preserve and maintain existing small openings.

(11) Reserve openings in larger plantations.

(12) Break large planted areas with natural cover strips.

The following are recommended wildlife habitat management practices:

(1) Employ controlled burns to stimulate aspen and jack pine regeneration and growth of cherries, birch, Juneberries, dogwood, blueberries, raspberries, and other herbaceous plants; create or maintain forest openings; and open selected 10- to 20-acre areas adjacent to deer yards.

(2) Mechanically create openings and trails in the forest.

(3) Cut, spray, or bulldoze deer browse plants to increase sprouts and shoots available to deer.

(4) Release or plant fruit-producing trees and shrubs.

(5) Establish evergreen cover in extensive stands of aspen or hardwoods.

(6) Plant browse, particularly male aspen, and cover-producing trees in areas of maximum benefit to wildlife.

The solution to overuse of public lands by snowmobiles and other off-road vehicles lies in measures intended to reduce the numbers of these vehicles. Higher registration fees, more restrictions on their use, and outright limiting of their numbers on public lands are possibilities.

The problem of protecting and perpetuating rare and endangered species should employ specific solutions for each species:

(1) Timber wolf should be reintroduced

into wilderness areas and habitat with little chance of conflict with livestock. Improvement of deer habitat should have secondary benefits to wolves.

(2) Bald eagle and osprey need nest-site acquisition and protection, tightening of controls on persistent pesticides, and clean-up of heavy concentrations of pesticides in polluted waters to survive.

(3) The prairie chicken needs continued protection and management of scarce prairie chicken habitat.

(4) Kirtland's warbler needs continued management of jack pine stands to maintain an adequate supply of habitat, and possibly a study of wintering grounds in the Bahamas to determine wintering habitat requirements.

(5) Pine marten and fishers need protection from trapping in release site areas. Efforts to reestablish the animals in suitable habitat, and manage habitat in areas of successful reestablishment should be continued.

(6) Canada lynx should be protected from trapping and hunting in the Upper Peninsula where they are making a comeback.

(7) The program of controlling cowbirds should continue in areas where they are parasitizing Kirtland's warbler nests.

## 4.2.6 Ohio

### 4.2.6.1 Future Programs

The Ohio Division of Wildlife has tentative plans to purchase 20,000 acres of wildlife lands in the Basin portion of Ohio. In addition to these lands (most of which are additions to existing State upland wildlife lands), the Division also hopes to purchase much of the remaining 15,000 acres of Lake Erie marshes. Other divisions of the Ohio Department of Natural Resources will purchase 9,500 acres of natural areas. Acquisition of the remaining marshes will be by far the Ohio Division of Wildlife's most important land purchase in the near future. These marshes are prime wildlife habitat with Basinwide importance to seasonal concentrations of waterfowl and public use. The ability of marshlands to support non-consumptive wildlife use is far greater than their consumptive-use potential. Even though the cost of this program is the highest in the budget, the acquisition of these wetlands may be the most efficient and economical recommendation proposed.

#### 4.2.6.2 Management Recommendations (Planning Subareas 4.2 and 4.3)

(1) Acquire public lands, including at least 15,000 acres of the remaining wetlands in the Lake Erie marsh region of Ohio.

(2) Obtain perpetual easements or purchase unique and critical wildlife areas.

(3) Alter existing zoning laws to provide for preservation of natural open space.

(4) Provide legislation to strengthen and broaden the State's wildlife management authority to include all native wildlife species. Companion legislation providing additional funding to meet this broader responsibility is also needed.

(5) Enact State legislation to permit the hunting of mourning doves, based upon biological data.

(6) Provide better legislation on stream and lakeshore filling that would prevent further destruction of privately owned marshes. Legislation similar to the new Ohio Stream Littering Law should be adopted.

(7) Provide more effective legislation on water pollution to improve the water quality of streams such as the Maumee and thereby enhance the waterfowl wintering and production potential, furbearer potential, fishing potential, and general aesthetic quality.

(8) Amend Public Law 83-566 (Small Watershed Program) to include the cost of additional land rights together with the cost of development for wildlife use for mitigation as a construction cost to be cost-shared at the same rate as the structural measures creating the need for mitigation.

(9) Initiate and improve continuing resource inventories to monitor wildlife population changes and land-use changes of major significance to wildlife. Wildlife population inventories need to be more comprehensive, more precise, and of sufficient sample size to permit analysis by relatively small sampling units (county size or smaller). Existing soil and water conservation needs inventories and forest surveys by the U.S. Department of Agriculture should be modified to provide additional data of wildlife significance. Other environmental parameters (e.g., water quality) should also be monitored.

(10) Increase the Ohio Department of Natural Resources technical assistance to enhance wildlife habitat benefits through soil and water conservation practice, cost-share programs, and crop production adjustment programs of the U.S. Department of Agriculture.

(11) Continue and expand the wildlife habitat benefits and public access opportunities on USDA diverted cropland as program requirements.

(12) Expand assistance and guidance to urban homeowners and others to preserve and enhance open space for wildlife.

(13) Provide increased technical assistance to individuals and public agencies so that wildlife benefits can be incorporated into their land management operations (e.g., mowing of roadside berms during the pheasant nesting season).

(14) Institute rental and lease agreements between public agencies and owners of private land to provide public access.

(15) Encourage, advise, and support the activities of local and national conservation organizations in the preservation and improvement of the quality of the environment.

(16) Develop and strengthen means to ensure that recreational and other uses of public hunting areas will not prevent these lands from continuing to contribute to the regional wildlife habitat base, and provide safeguards to ensure quality hunting and wildlife-related outdoor recreational opportunity. This would include improved planning and development of these areas compatible with biological considerations and restrictions on types of recreational use, the number of users, and time of use.

(17) Give more attention to the consumptive and nonconsumptive use of furbearers. Ohio is currently one of the two top commercial muskrat harvesting States in the nation. Planning Subarea 4.3 also contains some of the State's better beaver habitat. Landowner complaints indicate that more recreational use could be made of these species to help satisfy some of the projected demand. Expanded educational programs on the aesthetic and wildlife values created by the beaver are needed to reduce land owner resistance to this species where little economic damage is involved.

#### 4.2.7 Pennsylvania

##### 4.2.7.1 Future Management Programs (Planning Subarea 4.4)

The Pennsylvania Game Commission plans expansion of the 14 State Game Land Units within Erie County as funds and land become available. However, escalating land costs may

limit acquisition. The Land and Water Conservation and Reclamation Bond Issue, commonly called Project 500, will provide funds for game habitat improvement and hunter access. This bond issue provides funds to the Game and Fish Commissions for development, but no acquisition can be undertaken with the funds. Intensive development for small game, forest game and waterfowl is underway on five State game lands and work is in the planning stage for the other management units with bond issue funds.

An additional source of funding for wildlife habitat development will be available through the Penn Soils Resource Conservation and Development Project that includes Erie County. Emphasis within this project will be on waterfowl habitat improvement by the use of small ponds and dikes.

Expansion of existing Farm-Game Cooperative units is also planned for the future.

Experimental introduction of the sharp-tailed grouse, a western species, may help compensate for low pheasant productivity in this area. The Game Commission is also experimenting with Korean pheasants here.

#### **4.2.7.2 Management Recommendations (Planning Subarea 4.4)**

(1) Improve legislation and provide strict enforcement of water quality standards to alleviate degradation of waterfowl feeding areas.

(2) Develop agreements with the Corps of Engineers to prevent further destruction of the Erie Bay marshes.

(3) Preserve green areas by zoning to control urban expansion.

(4) Expand farm-game conservation projects and safety zone programs to promote better landowner-hunter relationships.

(5) Increase land acquisition programs.

(6) Develop a conservation education program to reach all segments of the population.

(7) Continue an effective law enforcement program.

(8) Initiate research programs that will provide information on maximum carrying capacity for native species, and possible introduction of exotic species.

(9) Expand land management program to improve habitat for forest- and farm-game species.

(10) Develop waterfowl habitat areas.

## **4.2.8 New York**

### **4.2.8.1 Future Programs**

The New York State Department of Environmental Conservation has plans for wildlife enhancement in the Basin through 1976. These plans include the development of 40,000 acres of wetlands for waterfowl production, purchase of 69,000 additional acres of wetlands, provision of 170 miles of hunting access roads, and improvement of 11,000 acres of wildlife habitat.

#### **4.2.8.2 General Management Recommendations (Planning Subareas 4.4, 5.1, 5.2, and 5.3)**

(1) Promote better private landowner-hunter relationships through State fish and game agency educational programs with emphasis on the recreational and economic benefits realized by both parties. This could alleviate public access restrictions. This program could also be used to improve the existing hunting preserves by informing landowners of sound wildlife management practices.

(2) Increase acquisition of public hunting lands to offset the trend toward diminished private land access.

(3) Improve zoning by increased emphasis on green belts and open space, and improve watershed planning by establishing regulatory powers. These are means of controlling urban encroachment into wildlife habitat.

(4) Improve effectiveness of Federal conservation programs such as REAP by promoting more landowner participation in fish and wildlife management.

(5) Take measures to rehabilitate degraded streams after pollution levels are reduced through rigid pollution control regulation and strong enforcement.

#### **4.2.8.3 Waterfowl and Wetland Recommendations**

(1) Maintain and preserve the Lake Ontario and St. Lawrence River marshes as well as other wetlands, including the Barge Canal and large inland marshes.

(2) Enhance remaining waterfowl habitat

by giving high priority to legal protection of remaining wetlands and waterfowl developments in conjunction with State and Federal water development programs.

(3) Reduce user access problems by wildlife management and development of suitable State owned wetlands not currently managed by the Bureau of Wildlife.

(4) Establish small shallow-water areas and marshes throughout the basin to improve local waterfowl production and to increase areas available to migratory waterfowl. Planning Subarea 5.3 is particularly well-suited for marsh development.

(5) Provide ownership or control of State owned underwater wetlands including buffer strips by the agency most concerned with natural resource management. This would solve conflicts of interest which arise over marina developments and other intrusions into wetland habitat.

(6) Acquire first-priority wetlands still in private ownership.

(7) Curtail agricultural stream channelization projects threatening wetlands.

(8) Stabilize water on Lake Ontario at seasonal levels compatible with the best interests of shore wetland management.

(9) Consider wetland values in all land-use planning efforts, and help preserve these areas through local governmental open space and natural land-use zoning or easement agreements.

(10) Institute better liaison and cooperation between the New York Department of Environmental Conservation and other State and Federal agencies. The New York State Conservation Law, Section 429, is a factor in the protection of wetland degradation from dredging and filling.

#### 4.2.8.4 Farm-Game Recommendations

(1) Provide more recreational opportunity through reduction of posted land or access agreements with private landowners.

(2) Modify present farming methods. For example, use flushing bars on haymowers, retain small hedgerows and fencerows, protect and manage woodlots and wetlands, and encourage crop rotation.

(3) Provide technical assistance to farmers and rural landowners on land use in developing the wildlife potential (wider FWMA program involvement).

#### 4.2.8.5 Upland Game Recommendations

(1) Manage both farm-game and upland game through leases of abandoned farms.

(2) Reduce posted land to improve hunter access.

(3) Manage forest-game habitat through FPA and FWMA programs.

(4) Purchase additional land for public use.

(5) Fence woodlots to protect against excessive grazing except where grazing is desirable as a woodcock management measure.

#### 4.2.8.6 Big-Game Recommendations

(1) Reduce illegal kill and control free running dogs in large zones where deer are reduced by such factors. This could result in an increase of as much as five times the present buck harvest.

(2) Reduce and maintain deer populations in Central Adirondacks and Central Tug Hill and southern tier zones at a level commensurate with available food and cover. This will result in an improved deer herd and will allow depleted winter yard areas to recover.

(3) Provide greater access to deer populations. This could increase recreational opportunity and desired harvest.

(4) Increase publicly owned land area to a level commensurate with future nonconsumptive use.

(5) Further influence land management practices to benefit deer.

(6) Institute policy changes to insure an adequate deer harvest, including special seasons in problem areas.

#### 4.2.8.7 Other Recommendations

(1) Improve enforcement of anti-pollution laws and improve laws needed to solve pollution problems. Water milfoil problems in inland lakes might be solved if nutrients were reduced. Changes in detergent legislation could have a bearing on this problem (nutrient enrichment) everywhere.

(2) Provide firm State policy decisions to protect and preserve unique habitat types and enact protective legislation to solve the problem of wetland drainage for agricultural purposes.

(3) Provide wildlife management practices to control beaver, such as live trapping and

relocating or increased trapping pressure, to help solve water quality problems on mountain streams.

- (4) Monitor effects of pollutants on wildlife.

#### **4.2.8.8 Additional Recommendations Specific to Planning Subarea 5.3**

- (1) Make no attempt to promote species acclimated to more temperate areas, such as pheasants. Effects of weather on all indigenous wildlife should be publicized.

- (2) Provide better legislation and increased law enforcement and conduct intensive public relations campaigns to alleviate illegal shooting and dog predation on deer.

- (3) Liberalize harvest regulations in areas of intensive land-use. Extension programs are needed to provide informational material to landowners to aid in eliminating wildlife problems (beaver damage, etc.).

- (4) Provide better techniques to monitor wildlife populations, particularly in wilderness areas.

- (5) Build additional improved boat launching sites on large water bodies to provide increased hunter access to wilderness areas. Long-term cooperative agreements with large land holding interests are also important.

- (6) Institute changes in forest preserve management policy to permit wildlife habitat management practices.

- (7) Provide extension programs to help prevent pulpwood operations in deer yards. Planning, legislation, and zoning efforts are also needed to prevent impoundments on important deer wintering areas as well as deer yard harrassment by off-road vehicles.

- (8) Administer long-range public relations programs to better inform the public on the issue of deer harvest regulations.

- (9) Provide a program of wildlife tree plantings on private lands recently abandoned from farming. Concentration on slow-growing species and those known to be preferred by

important wildlife species should be emphasized.

- (10) Investigate the possibility of new species introduction in grassland zones (St. Lawrence Plain) and the possible problems from such introductions.

The following are recommended wetlands actions:

- (1) Identify important wetlands including littoral zones adjacent to navigable waters.

- (2) Dedicate State owned littoral zones to wildlife purposes and control select adjoining uplands to sever riparian interest.

- (3) Protect remaining wetlands by impact reviews and zoning.

- (4) Acquire most important inland wetland units (to State ownership).

- (5) Provide better coordination with public agencies promoting agricultural drainage and other land use affecting wildlife.

- (6) Encourage wetland development and enhancement.

#### **4.3 Estimated State Budgets for the Study Period**

Tables 17-54 through 17-74 provide cost information by State and planning subarea for the 50-year study period. These tables are arranged in the same sequence as the discussion in Subsection 4.2. "Ongoing Budgets" covers the management programs generally discussed in Subsection 4.2. "Additional Capital Expenditures" covers the management recommendations in Subsection 4.2, including a breakdown of proposed acreage acquisition.

All Basin States but Michigan are listed as having annual budgets, with the cumulative ongoing budgets (1971-1980, 1981-2000, 2001-2020) at the bottom of the table. Michigan's cumulative budget is listed under the main heading.

Information is not presented for the Illinois section of Planning Subarea 2.2 because it is a completely urbanized area.

**TABLE 17-54 Estimated Annual State Expenditures by Target Years, PSA 1.1, Minnesota**

ITEM	1970	1980	2000	2020
On-going Budgets <sup>1</sup>	\$ 200,000	300,000	400,000	500,000
Additional Capital Expenditures <sup>2</sup>	150,000	250,000	350,000	450,000
Other <sup>3</sup>	60,000	100,000	150,000	200,000
<b>TOTAL</b>	<b>410,000</b>	<b>650,000</b>	<b>900,000</b>	<b>1,150,000</b>

<sup>1</sup>Projection of annual budgets of State agencies for habitat management, enforcement, research, etc., for wildlife. Pittman-Robertson funds are included and are 20 percent of budget.

<sup>2</sup>Items recommended in the plan that cannot be funded through existing or foreseeable fund sources.

<sup>3</sup>Wildlife research conducted by State-supported universities; private investments in wildlife management; etc.

"Additional Capital Expenditures" and recommended programs include: wildlife habitat management practices on 693,200 acres; subsidized forestry practices on 28,200 acres; acquisition of 14,480 acres of deer yards; establishment of a hunting season on moose; establishment of a trapping season on fisher; establishment of intensive management and game animal status for the timber wolf.

Estimated cumulative "On-going Budgets" for the target years are as follows: 1971-1980 = \$2,550,000; 1981-2000 = \$7,050,000; 2001-2020 = \$9,050,000.

**TABLE 17-55 Estimated Annual State Expenditures by Target Years, PSA 1.1, Wisconsin**

ITEM	1970	1980
On-going Budgets <sup>1</sup>	\$ 372,000	520,000
Additional Capital Expenditures <sup>2</sup>	--	300,000
Other <sup>3</sup>	--	80,000
<b>TOTAL</b>	<b>372,000</b>	<b>900,000</b>

<sup>1</sup>Projection of annual budgets of State agencies for habitat management, enforcement, research, etc., for wildlife. Pittman-Robertson funds are included and are 22 percent of budget.

<sup>2</sup>Items recommended in the plan that cannot be funded through existing or foreseeable fund sources.

<sup>3</sup>Wildlife research conducted by State-supported universities; private investments in wildlife management; etc.

"Additional Capital Expenditures" for the period 1971-1980 include: 40,000 acres of improved forest habitat (through management); 16,000 acres of maintained aspen regeneration; 6,000 acres of maintained forest openings; 120 miles of developed and 4,000 miles of maintained trails and firebreaks; 6,000 acres of land acquisition; improved law enforcement; research on nongame wildlife species; extensive wildlife management practices; management of low yield timber areas—20,000 acres of improved habitat. The estimated costs for these programs are \$3,414,000 for the period 1971-1980. The estimated "On-going Budget" for 1971-1980 is \$4,534,000.

**TABLE 17-56 Estimated Annual State Expenditures by Target Years, PSA 2.1, Wisconsin**

ITEM	1970	1980
On-going Budgets <sup>1</sup>	\$ 1,680,000	2,350,000
Additional Capital Expenditures <sup>2</sup>		1,300,000
Other <sup>3</sup>		350,000
<b>TOTAL</b>	<b>1,680,000</b>	<b>4,000,000</b>

<sup>1</sup>Projection of annual budgets of State agencies for habitat management, enforcement, research, etc., for wildlife. Pittman-Robertson funds are included and are 40 percent of budget.

<sup>2</sup>Items recommended in the plan that cannot be funded through existing or foreseeable fund sources.

<sup>3</sup>Wildlife research conducted by State-supported universities; private investments in wildlife management; etc.

"Additional Capital Expenditures" for the period 1971-1980 include: 40,000 acres of improved forest habitat; 32,000 acres of maintained aspen regeneration; 10,500 acres of maintained access trails; 15,000 acres of forest land acquisition; improved law enforcement practices; management of low yield timber areas for wildlife; 65,000 acres of wetlands preservation; 100,000 acres of wildlife cover on diverted cropland; 150,000 acres of restored lakes and streams; 50,000 acres of public hunting leases; research on nongame wildlife species; extensive wildlife management practices. Estimated costs for these programs are \$12,320,000. The estimated cumulative "On-going Budget" for the period 1971-1980 is \$20,485,000.

**TABLE 17-57 Estimated Annual State Expenditures by Target Years, Planning Subarea 2.2, Wisconsin**

ITEM	1970	1980
On-going Budgets <sup>1</sup>	\$ 388,000	550,000
Additional Capital Expenditures <sup>2</sup>	--	350,000
Other <sup>3</sup>	--	75,000
<b>TOTAL</b>	<b>388,000</b>	<b>975,000</b>

<sup>1</sup>Projection of annual budgets of State agencies for habitat management, enforcement, research, etc., for wildlife. Pittman-Robertson funds are included and are 37 percent of budget.

<sup>2</sup>Items recommended in the plan that cannot be funded through existing or foreseeable fund sources.

<sup>3</sup>Wildlife research conducted by State-supported universities; private investments in wildlife management; etc.

"Additional Capital Expenditures" for the period 1971-1980 include: preservation of 40,000 acres of wetlands; improved wildlife cover on 25,000 acres of diverted cropland; 50,000 acres of restored lakes and streams; wildlife surveys and environmental impact studies; 40,000 acres of public hunting leases; nongame wildlife research; improved law enforcement. The cost for these programs for the 1971-1980 period is \$3,460,000. The estimated "On-going Budget" cost for 1971-1980 is \$4,771,000.

TABLE 17-58 Estimated Annual State Expenditures by Target Years, PSA 2.2, Indiana

ITEM	1970	1980	2000	2020
On-going Budgets <sup>1</sup>	\$ 216,000	240,000	280,000	320,000
Additional Capital Expenditures <sup>2</sup>	--	696,000	659,000	862,000
Other <sup>3</sup>	--	--	--	--
TOTAL	216,000	936,000	939,000	1,182,000

<sup>1</sup>Projection of annual budgets of State agencies for habitat management, enforcement, research, etc., for wildlife. Pittman-Robertson funds are included and are 29 percent of budget.

<sup>2</sup>Items recommended in the plan that cannot be funded through existing or foreseeable fund sources.

<sup>3</sup>Wildlife research conducted by State-supported universities; private investments in wildlife management; etc.

"Additional Capital Expenditures" and recommended programs include: a natural stream preservation program for acquisition of easements, in-fee or rights-of-way, along 19 miles of stream; leasing of 16,000 acres of private land to provide hunter access; acquisition of 1,000 acres of wetlands, mark boundaries and provide access; acquisition of 1,930 acres of fish and wildlife lands; establishment of a wildlife habitat classification act.

Estimated cumulative "On-going Budgets" for the target years are as follows: 1971-1980 = \$2,532,000; 1981-2000 = \$5,220,000; 2001-2020 = \$6,020,000.

TABLE 17-59 Estimated Annual State Expenditures by Target Years, PSA 2.3, Indiana

ITEM	1970	1980	2000	2020
On-going Budgets <sup>1</sup>	\$ 173,900	200,000	240,000	280,000
Additional Capital Expenditures <sup>2</sup>	--	732,000	1,285,000	1,425,000
Other <sup>3</sup>	Unknown			
TOTAL	173,900	932,000	1,525,000	1,705,000

<sup>1</sup>Projection of annual budgets of State agencies for habitat management, enforcement, research, etc., for wildlife. Pittman-Robertson funds are included and are 23 percent of budget.

<sup>2</sup>Items recommended in the plan that cannot be funded through existing or foreseeable fund sources.

<sup>3</sup>Wildlife research conducted by State-supported universities; private investments in wildlife management; etc.

"Additional Capital Expenditures" and recommended programs include: natural stream preservation program for acquisition of easements, rights-of-way, or in-fee along 48 miles of stream; acquisition of 3,000 acres of wetland; lease of 3,500 acres of private land for public access; acquisition of 2,000 acres of Fish and Wildlife lands; establishment of a wildlife habitat classification act.

Estimated cumulative "On-going Budgets" for the target years are as follows: 1971-1980 = \$1,883,000; 1981-2000 = \$4,420,000; 2001-2020 = \$5,220,000.

**TABLE 17-60 Estimated Annual State Expenditures by Target Years, PSA 4.2, Indiana**

ITEM	1970	1980	2000	2020
On-going Budgets <sup>1</sup>	\$ 66,000	79,000	85,000	100,000
Additional Capital Expenditures <sup>2</sup>	--	80,000	135,000	20,000
Other <sup>3</sup>	Unknown			
<b>TOTAL</b>	<b>66,000</b>	<b>155,000</b>	<b>220,000</b>	<b>120,000</b>

<sup>1</sup>Projection of annual budgets of State agencies for habitat management, enforcement, research, etc., for wildlife. No Pittman-Robertson funds are included in this budget.

<sup>2</sup>Items recommended in the plan that cannot be funded through existing or foreseeable fund sources.

<sup>3</sup>Wildlife research conducted by State-supported universities; private investments in wildlife management; etc.

"Additional Capital Expenditures" and recommended programs include: a natural stream preservation program for acquisition of easements, rights-of-way, or in-fee along 5 miles of stream; lease of 34,000 acres of private land for hunter access; establishment of a wildlife habitat classification act.

Estimated cumulative "On-going Budgets" for the target years are as follows: 1971-1980 = \$709,500; 1981-2000 = \$1,605,000; 2001-2020 = \$1,857,500.

**TABLE 17-61 Estimated State Expenditures, Planning Subarea 2.3, Michigan**

ITEM	1971-1980	1981-2000	2001-2020
On-going Budgets <sup>1</sup>	\$ 7,001,959 <sup>2</sup>	14,200,000	14,900,000
Additional Capital Expenditures <sup>3</sup>	6,400,000	11,850,000	9,850,000
Other <sup>4</sup>	575,000	900,000	950,000
<b>TOTAL</b>	<b>13,976,959</b>	<b>26,950,000</b>	<b>25,700,000</b>

<sup>1</sup>Projection of annual budgets of State agencies for habitat management, enforcement, research, etc., for wildlife. Pittman-Robertson funds are included and are 17.5 percent of budget.

<sup>2</sup>Includes State recreational bonding funds.

<sup>3</sup>Items recommended in the plan that cannot be funded through existing or foreseeable fund sources.

<sup>4</sup>Wildlife research conducted by State-supported universities; private investments in wildlife management; etc.

"Additional Capital Expenditures" items include: acquisition of 11,800 acres of upland habitat; acquisition of 11,500 acres of wetlands; development of 24,000 acres of wetlands; information and ecology training centers; Canada goose release program; waterfowl identification training; development of nonconsumptive use of waterfowl; more conservation officers.

TABLE 17-62 Estimated State Expenditures, Planning Subarea, 3.2, Michigan

ITEM	1971-1980	1981-2000	2001-2020
On-going Budgets <sup>1</sup>	\$ 8,270,267 <sup>2</sup>	10,000,000	12,000,000
Additional Capital Expenditures <sup>3</sup>	18,600,000	35,000,000	17,750,000
Other <sup>4</sup>	500,000	1,000,000	1,200,000
<b>TOTAL</b>	<b>27,370,267</b>	<b>46,000,000</b>	<b>30,950,000</b>

<sup>1</sup>Projection of annual budgets of State agencies for habitat management, enforcement, research, etc., for wildlife. Pittman-Robertson funds are included and are 17.5 percent of budget.

<sup>2</sup>Includes State recreational bonding funds.

<sup>3</sup>Items recommended in the plan that cannot be funded through existing or foreseeable fund sources.

<sup>4</sup>Wildlife research conducted by State-supported universities; private investments in wildlife management; etc.

"Additional Capital Expenditures" include: acquisition of 12,000 acres of upland habitat; acquisition of 18,000 acres of wetlands; development of 31,000 acres of wetlands; Canada goose release program; development of target shooting facilities; managed waterfowl hunting program; improved law enforcement; management of 15,000 acres of upland habitat; and development of an ecology museum facility.

TABLE 17-63 Estimated State Expenditures, Planning Subarea 4.1, Michigan

ITEMS	1971-1980	1981-2000	2001-2020
On-going Budgets <sup>1</sup>	\$ 4,790,490 <sup>2</sup>	8,200,000	8,900,000
Additional Capital Expenditures <sup>3</sup>	18,800,000	15,200,000	15,500,000
Other <sup>4</sup>	850,000	1,000,000	1,750,000
<b>TOTAL</b>	<b>24,440,490</b>	<b>24,400,000</b>	<b>26,150,000</b>

<sup>1</sup>Projection of annual budgets of State agencies for habitat management, enforcement, research, etc., for wildlife. Pittman-Robertson funds are included and are 17.5 percent of budget.

<sup>2</sup>Includes State recreational bonding funds.

<sup>3</sup>Items recommended in the plan that cannot be funded through existing or foreseeable fund sources.

<sup>4</sup>Wildlife research conducted by State-supported universities; private investments in wildlife management; etc.

"Additional Capital Expenditures" items include: acquisition of 10,000 acres of small game habitat; acquisition of 10,000 acres of wetlands; development of 18,600 acres of wetlands; a waterfowl hunting museum and ecology training center; improved law enforcement; waterfowl identification training; development of target shooting facilities; and treatment of at least 80,000 acres of upland game habitat.

**TABLE 17-64 Estimated State Expenditures, Planning Subarea 2.4, Michigan**

ITEM	1971-1980	1981-2000	2001-2020
On-going Budgets <sup>1</sup>	\$ 7,955,071 <sup>2</sup>	4,756,000	4,895,170
Additional Capital Expenditures <sup>3</sup>	4,600,000	6,500,000	6,200,000
Other <sup>4</sup>	100,000	250,000	250,000
<b>TOTAL</b>	<b>12,695,071</b>	<b>11,506,000</b>	<b>11,345,170</b>

<sup>1</sup>Projection of annual budgets of State agencies for habitat management, enforcement, research, etc., for wildlife. Pittman-Robertson funds are included and are 17.5 percent of budget.

<sup>2</sup>Includes State recreational bonding funds.

<sup>3</sup>Items recommended in the plan that cannot be funded through existing or foreseeable fund sources.

<sup>4</sup>Wildlife research conducted by State-supported universities; private investments in wildlife management; etc.

"Additional Capital Expenditures" include: acquisition of 38,000 acres of deer and upland habitat; acquisition of 16,500 acres of wetlands; Canada goose introduction; development of 18,500 acres of wetlands habitat; improved law enforcement; managed waterfowl hunting programs; waterfowl identification training; and protection of 1,000 acres of scarce habitat.

**TABLE 17-65 Estimated State Expenditures, Planning Subarea 2.1, Michigan**

ITEM	1971-1980	1981-2000	2001-2020
On-going Budget <sup>1</sup>	\$ 2,093,000 <sup>2</sup>	3,786,000	3,809,000
Additional Capital Expenditures <sup>3</sup>	3,100,000	4,025,000	1,750,000
Other <sup>4</sup>	100,000	100,000	100,000
<b>TOTAL</b>	<b>5,293,000</b>	<b>7,911,000</b>	<b>5,659,000</b>

<sup>1</sup>Projection of annual budgets of State agencies for habitat management, enforcement, research, etc., for wildlife. Pittman-Robertson funds are included and are 17.5 percent of budget.

<sup>2</sup>Includes State recreational bonding funds.

<sup>3</sup>Items recommended in the plan that cannot be funded through existing or foreseeable fund sources.

<sup>4</sup>Wildlife research conducted by State-supported universities; private investments in wildlife management; etc.

"Additional Capital Expenditures" include: acquisition of 7,000 acres of deeryard; acquisition of 15,500 acres of wetlands; development of 8,400 acres of wetland; improved law enforcement.

TABLE 17-66 Estimated State Expenditures, Planning Subarea 1.2, Michigan

ITEM	1971-1980	1981-2000	2001-2020
On-going Budgets <sup>1</sup>	\$ 6,968,000 <sup>2</sup>	7,321,000	7,664,600
Additional Capital Expenditures <sup>3</sup>	2,429,000	4,000,000	3,500,000
Other <sup>4</sup>	75,000	100,000	100,000
TOTAL	9,472,000	11,421,000	11,264,600

<sup>1</sup>Projection of annual budgets of State agencies for habitat management, enforcement, research, etc., for wildlife. Pittman-Robertson funds are included and are 17.5 percent of budget.

<sup>2</sup>Includes State recreational bonding funds.

<sup>3</sup>Items recommended in the plan that cannot be funded through existing investments in wildlife management; etc.

<sup>4</sup>Wildlife research conducted by State-supported universities; private investments in wildlife management; etc.

"Additional Capital Expenditures" include: acquisition of 15,500 acres of deer yards; acquisition of 46,000 acres of wetlands habitat; development of 13,000 acres of wetland; information and education programs and improved law enforcement programs.

TABLE 17-67 Estimated State Expenditures, Planning Subarea 3.1, Michigan

ITEM	1971-1980	1981-2000	2001-2020
On-going Budgets <sup>1</sup>	\$ 4,867,150 <sup>2</sup>	10,600,000	11,200,000
Additional Capital Expenditures <sup>3</sup>	6,210,000	15,500,000	14,500,000
Other <sup>4</sup>	150,000	300,000	375,000
TOTAL	11,227,150	26,400,000	26,075,000

<sup>1</sup>Projection of annual budgets of State agencies for habitat management, enforcement, research, etc., for wildlife. Pittman-Robertson funds are included and are 17.5 percent of budget.

<sup>2</sup>Includes State recreational bonding funds.

<sup>3</sup>Items recommended in the plan that cannot be funded through existing or foreseeable fund sources.

<sup>4</sup>Wildlife research conducted by State-supported universities; private investments in wildlife management; etc.

"Additional Capital Expenditures" include: acquisition of 30,000 acres of deer and upland game habitat; acquisition of 8,000 acres of wetlands; development of 12,000 acres of wetlands; 70,000 acres of upland habitat management; improvement of a conservation training school; and management of Kirtland's warbler habitat.

**TABLE 17-68 Estimated Annual State Expenditures by Target Years, Planning Subarea 4.2, Ohio**

ITEM	1970	1980	2000	2020
On-going Budgets <sup>1</sup>	\$ 575,000	678,500	929,500	1,273,400
Additional Capital Expenditures <sup>2</sup>	275,000	2,438,000	753,000	1,076,000
Other <sup>3</sup>	143,700	169,200	232,400	318,300
<b>TOTAL</b>	<b>993,700</b>	<b>3,285,700</b>	<b>1,914,900</b>	<b>2,667,700</b>

<sup>1</sup>Projection of annual budgets of State agencies for habitat management, enforcement, research, etc., for wildlife. Pittman-Robertson funds are included and are 40 percent of budget.

<sup>2</sup>Items recommended in the plan that cannot be funded through existing or foreseeable fund sources.

<sup>3</sup>Wildlife research conducted by State-supported universities; private investments in wildlife management; etc.

"Additional Capital Expenditure" items include: acquisition of 12,000 acres of wildlife areas; acquisition of 10,000 acres of Lake Erie marshes; acquisition of 3,000 acres of natural areas; development of the Lake Erie marshes for waterfowl production; private land wildlife management agreements; wildlife surveys and other resource inventories, information and education programs.

Estimated cumulative "On-going Budgets" for the target years are as follows: 1971-1980 = \$6,319,250; 1981-2000 = \$16,605,500; 2001-2020 = \$22,200,950.

**TABLE 17-69 Estimated Annual State Expenditures by Target Years, Planning Subarea 4.3, Ohio**

ITEM	1970	1980	2000	2020
On-going Budgets <sup>1</sup>	\$ 185,000	215,300	286,300	380,800
Additional Capital Expenditures <sup>2</sup>		617,000	641,000	969,000
Other <sup>3</sup>	46,400	53,800	71,600	95,200
<b>TOTAL</b>	<b>231,000</b>	<b>940,100</b>	<b>998,900</b>	<b>1,445,000</b>

<sup>1</sup>Projection of annual budgets of State agencies for habitat management, enforcement, research, etc., for wildlife. Pittman-Robertson funds are included and are 44 percent of budget.

<sup>2</sup>Items recommended in the plan that cannot be funded through existing or foreseeable fund sources.

<sup>3</sup>Wildlife research conducted by State-supported universities; private investments in wildlife management; etc.

"Additional Capital Expenditures" items include: acquisition of 8,000 acres for wildlife areas; acquisition of 6,500 acres of natural areas; private land management programs; wildlife surveys and other resource inventories; information and education programs.

Estimated "On-going Budget" cumulative totals for the target years are as follows: 1971-1980 = \$2,016,650; 1981-2000 = \$5,051,500; 2001-2020 = \$6,718,250.

**TABLE 17-70 Estimated Annual State Expenditures by Target Years, PSA 4.4, Pennsylvania**

ITEM	1970	1980	2000	2020
On-going Budgets <sup>1</sup>	\$ 88,600	477,200	354,400	708,800
Additional Capital Expenditures <sup>2</sup>	8,000	400,000	600,000	1,000,000
Other <sup>3</sup>	5,000	15,000	30,000	60,000
<b>TOTAL</b>	<b>101,600</b>	<b>892,200</b>	<b>984,400</b>	<b>1,768,800</b>

<sup>1</sup>Projection of annual budgets of State agencies for habitat management, enforcement, research, etc., for wildlife. Pittman-Robertson funds are included and are 25 percent of budget.

<sup>2</sup>Items recommended in the plan that cannot be funded through existing or foreseeable fund sources.

<sup>3</sup>Wildlife research conducted by State-supported universities; private investments in wildlife management; etc.

"Additional Capital Expenditures" items include: acquisition of 1,000 acres of wildlife lands; 7,000 acres of farm game cooperative projects; waterfowl development on 700 acres; development of land around Corps of Engineers reservoirs; improved law enforcement; construction of hunter safety visitor centers.

Estimated cumulative "On-going Budgets" include the following: 1971-1980 = \$3,023,300; 1981-2000 = \$8,254,600; 2001-2020 = \$10,809,200.

**TABLE 17-71 Estimated Annual State Expenditures by Target Years, PSA 4.4, New York**

ITEM	1970	1980	2000	2020
On-going Budgets <sup>1</sup>	\$ 60,000	100,000	200,000	300,000
Additional Capital Expenditures <sup>2</sup>	30,000	100,000	150,000	200,000
Other <sup>3</sup>	5,000	15,000	30,000	60,000
<b>TOTAL</b>	<b>95,000</b>	<b>215,000</b>	<b>380,000</b>	<b>560,000</b>

<sup>1</sup>Projection of annual budgets of State agencies for habitat management, enforcement, research, etc., for wildlife. Pittman-Robertson funds are included and are 50 percent of budget.

<sup>2</sup>Items recommended in the plan that cannot be funded through existing or foreseeable fund sources.

<sup>3</sup>Wildlife research conducted by State-supported universities; private investments in wildlife management; etc.

"Additional Capital Expenditures" items include: agreements to provide access to private land on 95,000 acres of public land; agreements to provide for wildlife development of 75,000 acres of State and private lands; lease or purchase of unique and critical wildlife lands; additional legislation for protection of wetlands and other unique lands; enforcement of air, noise and water pollution regulations and enactment of additional regulations as necessary; promotion of better landowner-hunter relationships.

Estimated cumulative "On-going Budget" for the target years are: 1971-1980 = \$820,000; 1981-2000 = \$3,050,000; 2001-2020 = \$7,050,000.

**TABLE 17-72 Estimated Annual State Expenditures by Target Years, PSA 5.1, New York**

ITEM	1970	1980	2000	2020
On-going Budgets <sup>1</sup>	\$ 90,000	150,000	300,000	350,000
Additional Capital Expenditures <sup>2</sup>	--	100,000	150,000	175,000
Other <sup>3</sup>	5,000	200,000	250,000	300,000
<b>TOTAL</b>	<b>95,000</b>	<b>450,000</b>	<b>700,000</b>	<b>825,000</b>

<sup>1</sup>Projection of annual budgets of State agencies for habitat management, enforcement, research, etc., for wildlife. Pittman-Robertson funds are included and are 50-66 percent of budget.

<sup>2</sup>Items recommended in the plan that cannot be funded through existing or foreseeable fund sources.

<sup>3</sup>Wildlife research conducted by State-supported universities; private investments in wildlife management; etc.

"Additional Capital Expenditure" items include: acquisition of 2,000 acres of wetlands; lease or purchase of 50,000 acres of unique and critical wildlife lands; acquisition of 4,400 acres of public hunting lands; management and development of 20,000 acres of State lands; agreement for access to 25,000 acres of private lands for hunting.

Estimated cumulative "On-going Budget" for the target years are as follows: 1971-1980 = \$1,230,000; 1981-2000 = \$4,575,000; 2001-2020 = \$6,525,000.

**TABLE 17-73 Estimated Annual State Expenditures by Target Years, PSA 5.2, New York**

ITEM	1970	1980	2000	2020
On-going Budgets <sup>1</sup>	\$ 255,000	340,000	475,000	610,000
Additional Capital Expenditures <sup>2</sup>	--	500,000	475,000	400,000
Other <sup>3</sup>	55,000	70,000	95,000	120,000
<b>TOTAL</b>	<b>310,000</b>	<b>910,000</b>	<b>1,045,000</b>	<b>1,130,000</b>

<sup>1</sup>Projection of annual budgets of State agencies for habitat management, enforcement, research, etc., for wildlife. Pittman-Robertson funds are included and are 50 percent of budget.

<sup>2</sup>Items recommended in the plan that cannot be funded through existing or foreseeable fund sources.

<sup>3</sup>Wildlife research conducted by State-supported universities; private investments in wildlife management; etc.

"Additional Capital Expenditure" items include: acquisition of approximately 20,000 acres of wetlands; management and development of 15,000 acres of wetlands; purchase of access and hunting easements on 80,000 acres of private land; technical assistance provided for developing wildlife potential on 90,000 acres of private land; acquisition of 15,000 acres of game management lands; construction of trails, parking areas and related facilities on state lands.

Estimated cumulative "On-going Budget" for the target years are as follows: 1971-1980 = \$3,017,500; 1981-2000 = \$8,217,500; 2001-2020 = \$10,917,500.

TABLE 17-74 Estimated Annual State Expenditures by Target Years, PSA 5.3, New York

ITEM	1970	1980	2000	2020
On-going Budgets <sup>1</sup>	\$ 75,000	100,000	400,000	500,000
Additional Capital Expenditures <sup>2</sup>	--	1,000,000	600,000	300,000
Other <sup>3</sup>	5,000	10,000	15,000	20,000
<b>TOTAL</b>	<b>80,000</b>	<b>1,110,000</b>	<b>1,015,000</b>	<b>820,000</b>

<sup>1</sup>Projection of annual budgets of State agencies for habitat management, enforcement, research, etc., for wildlife. Pittman-Robertson funds are included and are 40 percent of budget.

<sup>2</sup>Items recommended in the plan that cannot be funded through existing or foreseeable fund sources.

<sup>3</sup>Wildlife research conducted by State-supported universities; private investments in wildlife management; etc.

"Additional Capital Expenditure" items include: public land acquisition and leasing programs emphasizing wetlands preservation totaling 45,500 acres; development and rehabilitation of wetlands to realize their fish and wildlife production potential.

Estimated cumulative "On-going Budgets" for the target years are as follows: 1971-1980 = \$887,500; 1981-2000 = \$5,150,000; 2001-2020 = \$9,050,000.

## SUMMARY

There is a growing concern among natural resource managers about the effects of projected population increases. The future of wildlife in particular is very dim if population projections for the next 50 years materialize. Planning procedures intended to provide for wildlife will be paper exercises if the population of the Great Lakes Basin doubles. In terms of environmental quality and the basic human needs for water, air and food, optimal human population levels have been reached in some areas and far exceeded in many urban areas.

The problem of wildlife now and in the future is people. Unless the planning effort is directed toward methods of retarding population growth (such as tax incentives, limits on the number of persons per square mile, and strict zoning), rather than attempting to accommodate and thereby encourage increased population, attempts to provide for wildlife resources are utterly futile. Most important is the problem of trying to provide environmental quality.

All wildlife problems are directly or indirectly related to the population problem and will become more complicated and more serious as the population increases. In nearly all of the Great Lakes planning subareas, demands for consumptive and nonconsumptive wildlife uses are projected to be at least double the current demand. Considering the fact that total Basin wildlife demand already exceeds the supply (if quantified in acres of wildlife habitat), and that the supply will be greatly diminished in the future, expecting to accommodate any multiple of the current demand is absurd. All available wildlife habitat is needed now, and it will not be greatly expanded short of catastrophic geologic change such as drastic changes in lake levels and their related effects on lakeshore marshes.

### Status of Wildlife Resources (1970)

Accelerated attrition of habitat is occurring over most of the Basin. It is worse in the southern tier of Basin States where urbaniza-

tion is most intense. The highest value habitat, wetlands, is most affected because destruction of shore wetlands is proceeding at an alarming rate.

Some trends in wildlife habitat and species levels are indirectly related to man's presence. Maturing forest succession in the northern planning subareas of the Basin is a result of fewer forest fires and low demand for timber in remote areas. As the forest matures and progresses toward a greater homogeneity, its value to wildlife declines. Deer populations are declining in many northern areas for these reasons.

Other trends that reduce the value of habitat are not the result of structural modification or degradation, but are changes in land-use practices. Clean farming is one of these, a practice that diminishes the basic habitat requirement of farm-game species by removal of fence rows, trees, and odd areas to facilitate the operation of larger, more efficient farm equipment.

The total 75 million acres of 1970 wildlife habitat were composed of 50 percent farm-game habitat, 49 percent forest-game habitat, and one percent waterfowl habitat.

The white-tailed deer is the Basin's most important game species. Deer are found in all of the planning subareas and are at high population levels in five planning subareas.

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 Upper Michigan Peninsula marshes and southwestern Michigan marshes.

The ring-necked pheasant is an important, but declining game bird in the Basin. Its decline is closely tied to land-use changes.

The eastern timber wolf, the Basin's most colorful wildlife species, is considered rare and endangered. Other rare and endangered species include the greater sandhill crane, bald eagle, Kirtland's warbler, and the northern greater prairie chicken.

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, woodcock and the cottontail rabbit. It should be pointed out that the game and furbearer population trends and influencing environmental factors were felt to be generally indicative of those for non-game species associated with similar habitat types. The use of game and furbearers data throughout the report reflects readily available data and is not intended to emphasize this relatively small group of wildlife species.

Many facets of the Basin wildlife picture give reason for hope that things can be better. In spite of rising land costs, fish and game agencies are continuing impressive land acquisition programs, and unique and scenic areas are being purchased and protected in a number of ways. Some wildlife species are at stable levels, some are more numerous than ever before. Wildlife research and management information is becoming more available, and a great public concern for improving environmental quality has developed. The first sign of a trend away from more and bigger structural projects by public works agencies is the interest in green belts and environmental corridors. If these should become important, the benefits will be a reduction of river habitat destruction as well as preservation of open space.

#### **Future Use of Wildlife Resources (1980 to 2020)**

Section 3 presented procedures for projecting future Basin hunting gross demands, net demands, and needed acres in the Basin, as well as procedures for estimating nonconsumptive use. Projected license sales are considered the best indication of future demands. Present license sales in the Basin are closely related to the population density and to acres of opportunity per person in each of the 15 planning subareas. License sales projections were therefore based on these two factors.

A problem in the development of user projections that was not resolved was assessment of Basin and inter-Basin ingress and egress. Separate projections were made for each of the 15 planning subareas. A significant percentage of projected demands for one planning subarea will actually be satisfied in another, but development of a sound method

of assessing this percentage Basinwide would require a tremendous additional amount of work. It was estimated that these shifts in demand are self-balancing (particularly within the Basin) and that user projections will not be adversely affected.

Throughout the appendix, heavy emphasis has been placed on consumptive use of wildlife, while it has been recognized that nonconsumptive use is of equal or greater importance. Current information-gathering methodology is attuned to hunter days and harvest. Therefore nonconsumptive wildlife use information is difficult to obtain, and the best available index of this use is hunter information.

In 1970 there were 5,048,600 wildlife users (consumptive and nonconsumptive combined) in the Basin. Huntable habitat base was 46,469,100 acres, 11,361,750 of which were publicly owned, providing 9.2 acres per user. During the 50-year study period, 4,138,700 acres of huntable habitat will be lost to urban expansion. During this period, wildlife users are projected to increase to 6,655,200. Public lands will increase by at least 600,000 acres during the same period. Acres per user at the end of the study period (2020) are projected to be 6.4.

#### **General Basinwide Recommendations**

Recommended methods of solving Basin problems and meeting demands vary widely with the planning subareas. Management recommendations for the northern, sparsely-settled planning subareas are closely related to habitat management plans, while the southern area recommendations are related to human problems.

The single most important wildlife problem in the Great Lakes Basin is the continuing loss of habitat. Especially critical is the loss of waterfowl habitat (wetlands) to natural causes, through water level changes and wind- and water-caused erosion, and to the progress of civilization through dredging and filling for navigation, dumps, housing, industries, waste treatment facilities, and transportation. It is the opinion of this work group that preservation and restoration of wetlands and their management as viable ecosystems in a manner that is most productive of fish and wildlife is in the mutual interest of both the humans and animals. Therefore, of the recommendations in this report, the one recommending acquisition and management of the

remaining wetlands in the Basin should receive the highest priority by local, regional, State, and Federal agencies.

Some of the major recommendations of this report are:

- (1) habitat management programs in northern planning subareas to retard forest succession
- (2) strict regulation of off-road vehicles to prevent damage to fragile habitats
- (3) intensive management of the timber wolf and reintroduction into suitable habitat
- (4) immediate purchase of all high value wetlands
- (5) protection of wetlands and other unique areas through other means where purchase is not possible
- (6) acquisition or protection of all other critical habitat
- (7) enactment of better water pollution laws and provision of more strict enforcement
- (8) amendment of Public Law 83-566

(Small Watershed Program) to include the cost of additional land rights together with the cost of development for wildlife use for mitigation as a construction cost to be cost-shared at the same rate as the structural measures creating the need for mitigation

(9) continuation and improvement of the Crop Land Adjustment Program (CAP) and the Rural Environmental Assistance Program (REAP) of the U.S. Department of Agriculture

(10) provision of better legislation to prevent stream and lakeshore filling

(11) provision of more public access to private land

(12) improvement of the dissemination of wildlife research information in order to facilitate planning

(13) extension of State or Federal protection to all wildlife species not now protected such as reptiles and amphibians

## GLOSSARY

- actual hunters**—resident, non-resident licensed hunters and unlicensed hunters.
- agriculturalized**—conversion of undeveloped land to crop or livestock production.
- base year**—1970.
- big game**—a general term used for large mammals, such as white-tailed deer, elk, and black bear, declared legal game by State government and regulated by seasons and/or permits.
- bog**—an area of soft, wet, spongy ground consisting chiefly of decayed or decaying moss and other vegetable matter. In the Great Lakes States there are commonly peat bogs that most frequently occur in basins representing sites of former lakes, or as formations partially or completely surrounding existing lakes.
- channelization**—the process of mechanically altering natural stream characteristics to increase the water-carrying capacity by clearing, excavating, enlarging, realigning, lining, and reshaping a channel and its banks; also known as “channel modification.”
- clean farming**—more intensive farming practices which utilize all available crop producing land by removing fence rows, field windbreaks, hedgerows, and “odd” areas to facilitate maneuvering of larger machines.
- climax forest**—the final or stable forest plant-community in a successional series; a self-perpetuating forest community which is in equilibrium with the physical environment; in the northern portion of the Great Lakes Basin, a spruce-fir combination is the climax type, while in the south a beech-maple combination is considered the climax type.
- consumptive use**—the use of a wildlife resource which results in a decrease of the supply (see harvest).
- correlation**—the degree of interdependence of two or more variables.
- cropland**—land currently tilled, including cropland harvested, crop failure, summer fallow, idle cropland, cropland in cover crops or soil improvement crops not harvested or pastured, rotation pasture, and cropland being prepared for crops or newly seeded crops.
- dabbling duck**—habitually feeds off bottom in shallow water by tipping forward and submerging head and part of body; rarely dives for food.
- density**—the number of animals per acre or square mile in a given population as used in Tables 17-2 through 17-23. It is the density of a species relative to conditions in each planning subarea and does not have uniform meaning across the Basin.
- diving duck**—habitually feeds by diving completely under in deep water to obtain food.
- deer yard**—a well-defined area, usually in conifers, where deer concentrate during times of deep snow, forming well-used travel lanes. This condition usually results in overbrowsing of the vegetation.
- demand (wildlife)**—the estimated desire for the use of wildlife resources, usually expressed in man-days.
- densities (wildlife)**—the relationship between wildlife and space, often measured in units per acre or units per square mile.
- environmental corridor**—a strip of land designed to maintain the natural characteristics of an area, usually adjacent to urban areas or bordering streams and rivers.
- farm game**—wildlife species that are principally associated with semi-open land areas with a variety of vegetative cover, such as the cottontail rabbit, ring-necked pheasant and mourning dove.

**farm-game habitat**—land that contains a variety of vegetative types such as cropland, pasture, idle land, and small woodlots.

**fauna**—the animal species of a given region.

**flora**—the plant species of a given region.

**forest game**—wildlife species that are principally associated with wooded areas, such as the ruffed grouse, white-tailed deer and black bear.

**furbearers**—wildlife species that are economically important due to the value of their fur, such as muskrat, mink, fox and beaver.

**green belt**—an area of land around or in a city or town where development is severely restricted to maintain the natural character of the country.

**gross demand**—total demand generated by wildlife users during a given calendar year, usually expressed in man-days.

**habitat**—the natural environment of an animal; the area where it lives.

**harvest**—total annual take of game from a given area.

**hunter day**—any part of a day spent hunting by an individual.

**hunting**—the act of pursuing game for sport or food.

**land-use change**—the conversion of land from one use to another, such as from crops to residential or forest to crops.

**latent demand**—that desire to hunt or enjoy nature which is inherent in the total population, but is not fulfilled because of lack of facilities, leisure time, or other pertinent factors.

**latent hunter**—those persons with an inherent desire to hunt, but prevented from hunting for one or more reasons such as lack of time, money, or available facility.

**linear regression**—the degree to which a dependent variable will increase or decrease with a unit change of an independent variable, resulting in an association which can

be adequately represented by a straight line when plotted.

**man-day**—a unit of use attributed to an individual partaking in an experience during any part of a 24-hour day.

**marsh**—a treeless swamp in which the vegetation is predominantly grassy or reedy and which may or may not have standing water.

**mean**—an average; the sum of a given set of values divided by the number of values.

**median**—a value in a given set of values below and above which there are the same number of values.

**monoculture**—agricultural practice of growing only one crop on large tracts of land year after year.

**multiple regression**—the degree to which one dependent variable increases or decreases with the change in two or more independent variables.

**natural area**—an area which contains unique or representative flora and fauna of a region.

**needs**—unsatisfied demands or deficit in opportunity; also known as net demand.

**net demand**—the difference between projected gross demands and projected opportunity, usually expressed in man-days.

**nonconsumptive use**—use of wildlife habitat which does not involve the act of killing game and furbearing animals. It usually means the observing or photographing of wildlife and its habitat.

**non-resident hunter**—a person who resides outside the State in which he hunts.

**opportunity**—land upon which an individual may gain access to and expect to realize a consumptive or nonconsumptive wildlife experience.

**other land**—farmsteads, farmlanes, idle land, ditchbanks, fencerows, and other areas not classified as cropland, pasture, forest and woodland, and urban and built-up areas.

- participant**—an individual who engages in the uses of wildlife resources for consumptive or nonconsumptive purposes.
- participant rate**—the number of times per year that an individual actually participates in a hunting or a nonconsumptive wildlife use experience.
- pasture land**—land in grass or other long-term forage that is used primarily for grazing.
- prey species**—animals which serve as food for other animals. They are usually the smaller and more numerous species such as mice and rabbits.
- plant succession (ecological succession)**—the orderly process of plant community change from a pioneer stage to a relatively stable and mature community (climax). Typically, there are five stages: bare field, grassland, grass shrub, intermediate forest, climax forest. On prairie soil, grass is the climax stage and only four successive stages are involved.
- potential hunters**—actual hunters plus latent hunters.
- projections**—a forecast based on certain assumptions.
- raptorial birds**—birds of prey, eagles, hawks and owls.
- resident**—a person who hunts within the State in which he resides.
- scenic area**—a picturesque natural area which is considered pleasing to the eye.
- shorebirds**—any of a number of birds that frequent the shores of bodies of water, such as the sandpipers, woodcock, phalaropes and others.
- significant**—used for stating results in an appropriate statistical test. When the probability of the occurrence of a particular event is 19 in 20 or more ( $P = 0.95$ ), the probability is termed significant. When the probability is 99 in 100 or more ( $P = 0.99$ ), it is termed highly significant.
- small game**—small animals hunted for sport or food, such as cottontail rabbits, gray squirrels and ring-necked pheasants.
- supply**—the amount of wildlife or habitat available for either hunting or nonhunting use.
- swamp**—an area where the soil is saturated with water throughout most of the year, but not actually submerged. It usually has woody as well as herbaceous plants.
- target years**—1980, 2000, 2020.
- unique area**—an unusual, extraordinary, or rare example of a natural occurrence including geologic formations, lakeshores, unique wildlife habitats and unique plant communities.
- unique ecological area**—see unique area.
- unlicensed hunters**—sportsmen who are exempted in some States from license requirements including landowners hunting on their own land, active duty servicemen, and disabled persons.
- wading birds**—any of the long-legged birds that wade the shallows and marshes seeking food, such as herons and egrets.
- waterfowl**—usually confined to the swimming water birds such as ducks, geese and swans.
- wetlands**—lowlands covered with shallow and sometimes temporary or intermittent waters. They are divided into eight types in our region: Type 1—seasonally flooded basins or flats; the soil is covered with water, or is waterlogged, during variable seasonal periods but usually is well-drained during much of the growing season; Type 2—inland fresh meadows; the soil usually is without standing water during most of the growing season, but is waterlogged within at least a few inches of its surface; Type 3—inland shallow fresh marshes; the soil is usually waterlogged during the growing season; often it is covered with as much as six inches or more of water; Type 4—inland deep fresh marshes; the soil is covered with six inches to three feet or more of water during the growing season; Type 5—inland open fresh water; shallow ponds and reservoirs where water is usually less than 10 feet deep and is fringed with a border of emergent vegetation; Type 6—shrub swamps; the soil is usually waterlogged during the growing season, and is often covered with as much as six inches of water; vegetation includes alders,

willows, buttonbush, dogwoods and swamp-privet; Type 7—wooded swamps; the soil is waterlogged at least to within a few inches of its surface during the growing season, and is often covered with as much as one foot of water; trees include tamarack, arborvitae, black spruce, balsam, red maple and black ash; Type 8—bogs; the soil is usu-

ally waterlogged and supports a spongy covering of mosses; bogs occur mostly in shallow lake basins on flat uplands, and along sluggish streams.

**wildlife**—wild game and all other animal life existing in a wild state.

## BIBLIOGRAPHY

- Bechtold, Hilde L., "Waterfowl Relationships on the Great Lakes," United States Department of the Interior, Bureau of Sport Fisheries and Wildlife, Washington, D.C., U.S. Government Printing Office, March 1971.
- Bellrose, Frank C., "Waterfowl Migration Corridors East of the Rocky Mountains in the United States," *Biological Notes* No. 61, Urbana, Illinois, Illinois Natural History Survey, June 1968.
- Boyce, Arlow P., "Results of the Cropland Adjustment Program First Year in Michigan," Lansing, Michigan, Michigan Department of Conservation, Game Division, 1967.
- Dahlgren, R. B., and Linder, R. L., "Eggshell Thickness in Pheasants Given Dieldrin," *Journal of Wildlife Management*, 34 (1), 1970.
- Gillett, James W., (Editor), "The Biological Impact of Pesticides in the Environment," Environmental Health Sciences Center, Corvallis, Ore., Oregon State University, 1970.
- Great Lakes Basin Commission, *Great Lakes Basin Framework Study*, Appendix 16, *Drainage*, Ann Arbor, Michigan.
- \_\_\_\_\_, *Great Lakes Basin Framework Study*, Appendix 19, *Economic and Demographic Studies*, Ann Arbor, Michigan.
- Hamilton, Max and Hyer, Russell, "Wetlands of Northern Indiana," Indiana Department of Natural Resources, Pittman-Robertson Project 2-R, Indianapolis, Indiana.
- Hickey, J. J., and Anderson, D. W., "Chlorinated Hydrocarbons and Eggshell Changes in Raptorial and Fish Eating Birds," *Science*, 162 (3850), 1968.
- Illinois Department of Conservation, "Outdoor Recreation in Illinois," Springfield, Illinois.
- \_\_\_\_\_, "Various Data Concerning Wildlife Resources," Springfield, Illinois.
- Illinois Soil and Water Conservation Needs Committee, "Illinois Soil & Water Conservation Needs Inventory," University of Illinois, College of Agriculture, Champaign-Urbana, Illinois, August 1962.
- Indiana Department of Conservation, "41st Annual Report," Springfield, Illinois, June 1959.
- Indiana Department of Natural Resources, "Master Plan for Acquisition and Development, Supplement Number One," Indianapolis, Indiana, July 1965.
- Indiana Department of Natural Resources, Division of Fish and Game, "Various Data Concerning Wildlife Resources," Indianapolis, Indiana.
- Lindsey, Alton A., Nichols, Stanley A., and Schmelz, Damian V., "Natural Areas in Indiana and Their Preservation," Indiana Natural Areas Survey, Department of Biological Sciences, Lafayette, Indiana, Purdue University, April, 1969.
- Loucks, Orie L., "Scientific Areas In Wisconsin," *Wisconsin Academy Review*, Spring, 1967.
- MacMullan, Ralph A., "The Case Against Hard Pesticides," *Michigan Conservation*, January-February, 1968.
- Mann, Grady E., "Wetlands Inventory of Minnesota," Minneapolis, Minnesota, Office of River Basin Studies, April 1955.
- \_\_\_\_\_, "Wetlands Inventory of Wisconsin," Minneapolis, Minnesota, Office of River Basin Studies, February, 1955.
- Martin, Alexander C., Nelson, Arnold and Zim,

Herbert S., "American Wildlife and Plants, A Guide To Wildlife Food Habits," New York, Dover Publications, Inc. 1951.

McCloskey, John W., "Correlation and Regression Techniques," Analysis Note 67-1, Washington, D.C., Office for Laboratory Management, Office of the Director of Defense Research and Engineering, October 1967.

Mikula, Edward J., "Importance of Celeron Island to Waterfowl," Lansing, Michigan, Michigan Department of Conservation, Game Division, March 13, 1968.

Michigan Conservation Needs Committee, "An Inventory of Michigan Soil and Water Conservation Needs," East Lansing, Michigan, October 1962.

Michigan Department of Conservation, "Returning the Pine Marten to Michigan," Report No. 2199, Lansing, Michigan, September 1958.

\_\_\_\_\_, "20th Biennial Report 1959-1961," Lansing, Michigan, 1961.

\_\_\_\_\_, "24th Biennial Report 1967-1968," Lansing, Michigan, 1968.

\_\_\_\_\_, "25th Biennial Report 1969-1971," Lansing, Michigan, 1971.

Michigan Department of Natural Resources, "Michigan Recreation Plan: 1970," Lansing, Michigan, Office of Planning Services, 1970.

\_\_\_\_\_, "Various Data Concerning Wildlife Resources," Lansing, Michigan.

Minnesota Conservation Needs Committee, "Minnesota Soil and Water Conservation Needs Inventory," St. Paul, Minnesota, Minnesota Agricultural Extension Service, 1962.

Minnesota Department of Conservation, "A Deer Management Program for Minnesota," St. Paul, Minnesota.

\_\_\_\_\_, "Minnesota Outdoor Recreation Plan 1968," St. Paul, Minnesota, June 1969.

\_\_\_\_\_, "Minnesota Plan— for Emergency Winter Care of Deer and for Deer Yard Improvement," St. Paul, Minnesota, 1965.

\_\_\_\_\_, "Various Data Concerning Wildlife Resources," St. Paul, Minnesota.

New York Conservation Needs Committee, "New York State Soil and Water Conservation Needs Inventory," Albany, New York, 1962.

New York Department of Environmental Conservation, Division of Fish and Game, "Various Data Concerning Wildlife Resources," Avon and Watertown, New York.

New York State Conservation Department, "New York State Fish and Game Law," Albany, New York, 1969.

Ohio Department of Natural Resources, "Ohio Fishing and Hunting Locations," publication 77, Columbus, Ohio, October 1968.

\_\_\_\_\_, Division of Wildlife, "Various Data Concerning Wildlife Resources," Columbus, Ohio.

Ohio River Basin Comprehensive Study Committee, *Ohio River Basin Comprehensive Survey*, Appendix G, *Fish and Wildlife Resources*, Cincinnati, Ohio, U.S. Army Engineer Division, Ohio River, Undated.

Ohio Soil and Water Conservation Needs Committee, "Ohio Soil and Water Conservation Needs Inventory," Columbus, Ohio, December 1961.

Palmer, Walter L., "An Analysis of the Public Use of Southern Michigan Game and Recreation Areas," Research and Development Report No. 102, Lansing, Michigan, Michigan Department of Conservation, March 1967.

Panzner, Robert E., "Wetlands Inventory of Michigan," Minneapolis, Minnesota, Office of River Basin Studies, March 1955.

Pennsylvania Conservation Needs Committee, "Pennsylvania Soil and Water Conservation Needs Inventory," Harrisburg, Pennsylvania, Pennsylvania Association of Soil Conservation Districts Directors.

\_\_\_\_\_, "Various Data Concerning Wildlife Resources," Harrisburg and Franklin, Pennsylvania.

Pennsylvania Game Commission, "Hunting in Northwestern Pennsylvania," reprinted from *Pennsylvania Game News*, 1967.

Porter, R. D. and Wiemeyer, S. N., "Dieldrin and DDT: Effects on Sparrow Hawk Eggshells and Reproduction," *Science*, 165 (3889), 1969.

Radtke, Robert and Byelich, Jon, "Kirtland's Warbler Management," Lansing, Michigan, U.S.D.A. Forest Service and Michigan Department of Conservation, February 1963.

Risebrough, R.W., Florant, G.L., and Berger, D.D., "Organochlorine Pollutants in Peregrines and Merlins Migrating through Wisconsin," *Canadian Field Naturalist*, 84 (3), 1970.

Rounds, Burton W., "Wetlands Inventory of Ohio," Minneapolis, Minnesota, Office of River Basin Studies, April 1955.

Shaw, Samuel P. and Fredine, C. Gordon, "Wetlands of the United States," Circular 39, United States Department of the Interior, Fish and Wildlife Service, Office of River Basin Studies, 1956.

Stickel, L. F., Chura, N. J., Stewart, P. A., Menzie, C.M., Prouty, R.M., and Reichel, W.L., "Bald Eagle Pesticide Relations," *Transactions of the 31st North American Wildlife and Natural Resources Conference*, 1966.

Stuewer, F.W., "Endangered Species Program," Lansing, Michigan, Michigan Department of Conservation, July 1969.

U.S. Bureau of Census, "County and City Data Book, 1967, A Statistical Abstract Supplement," Washington, D.C., U.S. Government Printing Office, 1967.

U.S. Department of Agriculture, Forest Service, "Annual Wildlife Report, Narrative Section, Chequamegon National Forest, Fiscal Year 1969," Milwaukee, Wisconsin.

\_\_\_\_\_, "Annual Wildlife Report, Narrative Section, Eastern Region (9). Fiscal Year 1969," Milwaukee, Wisconsin.

\_\_\_\_\_, "Areas Under Forest Administration, Great Lakes Basin Study, Great Lakes Region, as of June 30, 1969 by Subarea and County," Milwaukee, Wisconsin.

\_\_\_\_\_, "Hiawatha National Forest Narrative Report 1968-1969, Annual Wildlife Report," Milwaukee, Wisconsin.

\_\_\_\_\_, "Narrative Report, Nicolet National Forest," Milwaukee, Wisconsin.

\_\_\_\_\_, "Report for Great Lakes Basin Study, Hector Land Use Area, New York," Milwaukee, Wisconsin.

\_\_\_\_\_, "Superior National Forest Narrative Report, Fiscal Year 1969," Milwaukee, Wisconsin.

U.S. Department of the Interior, Fish and Wildlife Service, "Fish and Wildlife as Related to Water Quality of the Lake Erie Basin," July 1967.

\_\_\_\_\_, "Fish and Wildlife as Related to Water Quality of the Lake Huron Basin," June 1969.

\_\_\_\_\_, "Fish and Wildlife as Related to Water Quality of the Lake Michigan Basin," March 1966.

\_\_\_\_\_, "Fish and Wildlife as Related to Water Quality of the Lake Ontario Basin," December 1969.

\_\_\_\_\_, "Fish and Wildlife as Related to Water Quality of the Lake Superior Basin," June 1970.

\_\_\_\_\_, "Water Levels of the Great Lakes," September 1963.

U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, "National Wildlife Refuges in the North Central Region, Region 3," Refuge Leaflet 96-R2, May 1968.

\_\_\_\_\_, "Fish and Wildlife Resources, Genesee Basin."

United States Department of the Interior, National Park Service, "Our Fourth Shore," Great Lakes Shoreline Recreation Area Survey, 1959.

\_\_\_\_\_, "Remaining Shoreline Opportunities in: Minnesota, Wisconsin, Illinois, Indiana, Ohio, Michigan, Pennsylvania, New York," Great Lakes Shoreline Recreation Area Survey, 1959.

Upper Mississippi River Comprehensive Basin Study Coordinating Committee, *Upper*

*Mississippi River, Comprehensive Basin Study*, Appendix L, *Fish and Wildlife*, 1969.

Wisconsin Department of Natural Resources, "Various Data Concerning Wildlife Resources," Madison, Wisconsin.

\_\_\_\_\_, "Wisconsin Outdoor

Recreation Plan," Madison, Wisconsin 1968.

Wisconsin Scientific Areas Preservation Council, "Wisconsin Scientific Areas," 1968.

Young, Howard, "A Consideration of Insecticide Effects on Hypothetical Avian Populations," *Ecology*, 49 (5), 1968.

## ADDENDUM

### Methodology

#### Hunting Demand

Our projections of hunting demand (hunter days) and wildlife land needed (acres) are based on mathematical calculations in which the starting points are human population density and acres of wildlife habitat. Through a process of statistical analysis, an equation was developed for converting inventory data into gross and net hunting demand using a combination of numerical constants and estimated parameters. The following equation,

$$Y = \text{constant} - \text{constant } (X_1) + \text{constant } (X_2)$$
$$Y = .094879 - .0006771 X_1 + .006208 X_2$$

is the result of a computerized multiple regression analysis, based on population density and acres of habitat per capita, where Y = the number of resident licensed hunters per capita; X<sub>1</sub> = the population per square mile; and X<sub>2</sub> = the acres of habitat per capita.

The following outline of data showing how this methodology was applied in Planning Subarea 4.2 will serve as an example for all planning subareas in the Great Lakes Basin Framework Study.

#### Basic Data For Planning Subarea 4.2

Population in 1960	1,566,000	City and County Data Book, 1967
Projected population in 1980	1,963,000	GLBFS Tech. Report No. 19-11-P-2, Preliminary Economic Projections for OBE Economic Areas and Great Lakes Basin Commission Planning Subareas for the Great Lakes Region, May 1969
Projected population in 2000	2,474,000	Ibid.
Projected population in 2020	3,116,000	Ibid.
Area, square miles	8,515	City and County Data Book, 1967
1960 Resident licensed hunters	161,336	Compiled from data supplied by each State in planning subarea
1960 Nonresident licensed hunters	1,182	0.73 percent of the resident licensed hunters in this planning subarea in 1960
1960 Unlicensed hunters	6,453	4 percent of the resident hunters in this planning subarea in 1960
1960 Acres of wildlife habitat	5,777,500	Soil and Water Conservation Needs Inventory (for each State)
Projected acres of wildlife habitat in 1980	5,688,800	Preliminary information provided by Economic Research Service, USDA
Projected acres of wildlife habitat in 2000	5,587,200	Ibid.
Projected acres in wildlife habitat in 2020	5,480,500	Ibid.

Acres of hunting opportunity added 1970-2020	14,649	Preliminary information supplied by representatives of State Depts. of Natural Resources
Acres of hunting opportunity lost 1970-2020	297,000	Preliminary information provided by Economic Research Service, USDA

## Computations

### Computation of projected $X_1$ and $X_2$ factors

	$X_1$ (Pop./sq. mi.)	$X_2$ (Habitat/capita)
Year 1980	$\frac{1,963,000}{8,515} = 230.53$	$\frac{5,688,800}{1,963,000} = 2.898$ acres
Year 2000	$\frac{2,474,000}{8,515} = 290.55$	$\frac{5,587,200}{2,474,000} = 2.258$ acres
Year 2020	$\frac{3,116,000}{8,515} = 365.94$	$\frac{5,480,500}{3,116,000} = 1.759$ acres

### Computation of adjustment factor

Correction of projected 1960 resident licensed hunters based on actual 1960 hunters from Sample License Table.

$$X_1 = \frac{1960 \text{ Population}}{\text{Acres, Sq. Miles}} = \frac{1,566,000}{8,515} = 183.91$$

$$X_2 = \frac{\text{Acres Habitat in 1960}}{\text{Population in 1960}} = \frac{5,777,500}{1,566,000} = 3.689$$

$$Y = .094879 - .00006771 X_1 + .006208 X_2$$

$$Y = .094879 - .00006771 (183.91) + .006208 (3.689)$$

$$Y = .105330$$

$$1960 \text{ actual } Y = .103 \quad \frac{.103}{.105} = .98095$$

### Computation of number of 1980, 2000, and 2020 resident licensed hunters

$$\text{Year 1980 } Y = [.094879 - .00006771 (230.53) + .006208 (2.898)] .98095$$

$$Y = [.094879 - .015607 + .017991] .98095$$

$$Y = .0954101$$

$$Y \times 1980 \text{ projected population} = 1980 \text{ resident licensed hunters}$$

$$.0954101 \times 1,963,000 = 187,290$$

$$\text{Year 2000 } Y = [.094879 - .00006771 (290.55) + .006208 (2.258)] .98095$$

$$Y = [.094879 - .019670 + .014018] .98095$$

$$Y = .087527$$

$$Y \times 2000 \text{ projected population} = \text{resident licensed hunters}$$

$$.087527 \times 2,474,000 = 216,542$$

$$\text{Year 2020 } Y = [.094879 - .00006771 (365.94) + .006208 (1.759)] .98095$$

$$Y = [.094879 - .024774 + .010920] .98095$$

$$Y = .079481$$

$$Y \times 2020 \text{ projected population} = \text{resident licensed hunters}$$

$$.079481 \times 3,116,000 = 247,662$$

**Computation of Latent Demand**

The percent of latent demand in 1960 (15.72%) was considered to be constant for the projection years. To compute this percentage, a factor of .0162 was borrowed from the *Ohio River Basin Comprehensive Survey*.

Year 1960

$$.0162 \times \text{year population} = \text{number of latent demand hunters}$$

$$.0162 \times 1,566,000 = 25,369 \text{ latent demand hunters}$$

$$\frac{25,369 \text{ (latent hunters)}}{161,336 \text{ (resident licensed hunters)}} = 15.72 \text{ percent}$$

Year 1980

$$187,290 \text{ resident licensed hunters}$$

$$\times .1572 \text{ percent latent}$$

$$29,442 \text{ 1980 latent hunters}$$

Year 2000

$$216,542 \text{ resident licensed hunters}$$

$$\times .1572 \text{ percent latent}$$

$$34,040 \text{ 2000 latent hunters}$$

Year 2020

$$247,662 \text{ resident licensed hunters}$$

$$\times .1572 \text{ percent latent}$$

$$38,932 \text{ 2020 latent hunters}$$

**Computation of Unlicensed Hunters (4 percent of resident licensed hunters)**

$$\text{Resident licensed hunters} \times .04 = \text{number of unlicensed hunters}$$

$$1960 \quad 161,336 \times .04 = 6,453$$

$$1980 \quad 187,290 \times .04 = 7,492$$

$$2000 \quad 216,542 \times .04 = 8,662$$

$$2020 \quad 247,662 \times .04 = 9,906$$

**Computation of Nonresident Hunters (.73 percent of resident licensed hunters)**

$$1960 \quad 161,336 \times .0073 = 1,178$$

$$1980 \quad 187,290 \times .0073 = 1,367$$

$$2000 \quad 216,542 \times .0073 = 1,581$$

$$2020 \quad 247,662 \times .0073 = 1,808$$

**Computation of Net Change on Opportunity**

$$[\text{Acres lost per target year} \times \text{use/acre}] - [\text{Acres gained} \times \text{use/acre}] = \text{Net Change}$$

Year 1980

$$88,700 \times .3555 - 4,883 \times 4.13$$

$$31,533 - 20,166 = 11,367 \text{ Net Change (loss)}$$

Year 2000

$$101,600 \times .3555 - 4,883 \times 4.13$$

$$36,119 - 20,166 = 15,953 \text{ Net Change (loss)}$$

Year 2020

$$106,700 \times .3555 - 4,883 \times 4.13$$

$$37,932 - 20,166 = 17,766 \text{ Net Change (loss)}$$

**TABLE 17-75 Sample License Table**

Year	Licensed Hunters	Un-Licensed Hunters	Non-Resident Hunters	Latent Hunters	Actual Hunters <sup>1</sup>	Potential Hunters <sup>2</sup>	Participation Rate <sup>3</sup>	Gross Demand <sup>4</sup>	Net Demand <sup>5</sup>
1960	161,336	6,453	1,182	-----	168,971	-----	10.92	1,844,071	-----
1980	187,286	7,491	1,367	29,441	196,144	225,585	10.70	2,413,760	581,056
2000	216,534	8,661	1,581	34,039	226,776	260,815	10.50	2,738,558	921,807
2020	247,653	9,906	1,809	38,931	259,776	298,299	10.30	3,072,480	1,273,495

<sup>1</sup>Actual hunters = total resident licensed hunters + unlicensed hunters + nonresident hunters.

<sup>2</sup>Potential hunters = actual hunters + latent hunters.

<sup>3</sup>Participation rate is taken from The National Survey of Hunting and Fishing and from Appendix K, Fish and Wildlife, Grand River Basin Michigan Comprehensive Water Resources Study.

<sup>4</sup>Gross demands are potential hunters x participation rates.

<sup>5</sup>Net demand is adjusted from gross demand. It represents needed days of hunting opportunity that must be supplied per target year in addition to the expected increases in hunting opportunity and is cumulative over the study period. The following are examples of the years 1980, 2000, and 2020 using Planning Subarea 4.2 computations for arriving at the net demands for hunting opportunity.

Year 1980 (See sample calculation at end of page)

1980 Gross Demand - 1960 Gross Demand + Net Change of Opportunity 1960-1980 = 1980 Net Demand  
 2,413,760 - 1,844,071 + 11,367 = 581,056

Year 2000

2000 Gross Demand - 1980 Gross Demand + 1980 Net Demand + Net Change of Opportunity = 2000 Net Demand  
 2,738,558 - 2,413,760 + 581,056 + 15,953 = 921,807

Year 2020

2020 Gross Demand - 2000 Gross Demand + 2000 Net Demand + Net Change of Opportunity = 2020 Net Demand  
 3,072,480 - 2,738,558 + 921,807 + 17,766 = 1,273,495

Sample Calculation for Year 1980:

The net change in opportunity is the result of the increases plus the decreases in opportunity as follows:

Increases--total acreage gained per target year x use per acre (man-days) on intensively managed hunting areas [4,883 x 4.13 = 20,166]

Decreases--total acreage lost per target year x use per acre (man-days) on unmanaged private land (taken from the Ohio River Basin Comprehensive Survey) [88,700 x .3555 = 31,533]

Thus net change of opportunity 1960-1980 = 31,533 - 20,166 = 11,367

**TABLE 17-76 Sample Supply Areas Table, Planning Subarea 4.2**

Year and Land Use	Resource Base <sup>1</sup>	Potentially Hunttable Land Percent	Potentially Hunttable Land Acres	Year and Land Use	Resource Base <sup>1</sup>	Potentially Hunttable Land Percent	Potentially Hunttable Land Acres
<u>1966-67</u>				<u>2000</u>			
Cropland	4,735,100	15%	710,265	Cropland	4,599,800	15%	689,970
Pasture	213,800	90%	192,265	Pasture	207,700	90%	186,930
Forest	453,400	100%	453,400	Forest	440,500	100%	440,500
Other	349,300	40%	139,720	Other	339,300	40%	135,720
			<u>1,495,805</u>				<u>1,453,120</u>
<u>1980</u>				<u>2020</u>			
Cropland	4,683,400	15%	702,610	Cropland	4,511,900	15%	676,785
Pasture	211,500	90%	190,350	Pasture	203,700	90%	183,330
Forest	448,500	100%	448,500	Forest	432,100	100%	432,100
Other	345,500	40%	138,200	Other	332,800	40%	133,120
			<u>1,479,660</u>				<u>1,425,335</u>

<sup>1</sup>Appendix 13, *Land Use and Management, Great Lakes Basin Framework Study*, first draft

## Determination of the Acreage Needs of the Wildlife User

Traditionally, in comprehensive surveys, wildlife needs have been based on projections of hunter use expressed in hunter days by target years. This approach is useful in showing trends and gives the planner the opportunity to recognize requirements that must be met if needs are to be fulfilled. Quantifying these needs on an acreage basis is considered a difficult task. Nevertheless, an effort has been made in this appendix to determine the acreage of wildlife habitat needed by target years to satisfy hunting opportunity needs.

The rationale used to compute the acreage needs of the wildlife user by planning subarea is as follows. It is recognized that by fixing a figure for acreage needed per hunter and applying it Basinwide, the result may indicate either needs greater than the existing planning subarea wildlife habitat acreage or surplus acreages. Therefore, the Wildlife Work Group feels that an estimate of acres needed per hunter should be applied for each planning subarea, based on its circumstances and acres available in 1970. This judgment should be based on the type of habitat and the type of hunting. For example, it is postulated that farm-game habitat can support a greater density of hunters than can forest-game habitat. The net Basinwide effects are an adjustment of the needed acres between high and low demand areas. In northern planning subareas where forest-game hunting is the dominant wildlife use, a higher acreage per

hunter factor is required even though hunter numbers are low. Each planning subarea deserves individual attention to determine the most logical acreage demands figure.

The base data for determination of the supply of huntable acres available from the resource base were taken from Appendix 13, *Land Use and Management*. In that appendix, all land is classified by target year, 1980, 2000, and 2020, as either cropland, pasture, forest or other. Acres of land in each classification were then multiplied by the percent considered huntable. These data were then totaled to arrive at the acres of supply of huntable land for each target year. Supply represents the acres of wildlife habitat projected to be available for hunting and nonconsumptive use.

Determination of acres of habitat needed for each target year was based on the increase in the number of hunters from one target year to the next. In Planning Subarea 4.2, for example, the increase in the number of hunters between 1970 and 1980, the first target year, was 31,200 (196,000 hunters in 1980 minus 165,000 hunters in 1970). This increase was then multiplied by ten acres, an estimate of the minimum number of acres needed for each hunter in this planning subarea. The number of acres of wildlife habitat required by target year is the sum of the acres of supply and the acres needed (net demand).

Following is an example of how these computations were made in Planning Subarea 4.2.

### Determination of Needed Acres in Planning Subarea 4.2

196,200 Number of hunters in 1980  
 -165,000 Number of hunters in 1970  
 -----  
 31,200 Increase in hunters 1970-1980  
 × 10 Acres needed per hunter  
 -----  
 312,000 Total acres additional needed by 1980

226,800 Number of hunters in 2000  
 -196,200 Number of hunters in 1980  
 -----  
 30,600 Increase in hunters 1980-2000  
 × 10 Acres needed per hunter  
 -----  
 306,000 Total acres additional needed 1980-2000

259,400 Number of hunters in 2020  
 -226,800 Number of hunters in 2000  
 -----  
 32,600 Increase in hunters 2000-2020  
 × 10 Acres needed per hunter  
 -----  
 326,000 Total acres additional needed 2000-2020

Total acres needed by 1980 = 312,000

Total acres needed by 2000 = 618,000

Total acres needed by 2020 = 944,000

Year	Acres of Supply	Additional Acres Needed	Total Acres Needed
1970	1,495,805		1,495,805
1980	1,479,660	312,000	1,791,660
2000	1,452,120	618,000	2,070,120
2020	1,425,335	944,000	2,369,335

