ACKNOWLEDGEMENTS

Wisconsin Department of Natural Resources Board

Stanton P. Helland, Chair

Herbert F. Behnke, Vice-Chair

Constance A. Pukaite, Secretary

Helen M. Jacobs

Thomas D. Lawin

Neal W. Schneider

Trygve A. Solberg

Department of Natural Resources

Carroll D. Besadny, Secretary

Bruce B. Braun, Deputy Secretary

James T. Addis, Administrator
Division of Resource Management

David L. Weizenicker, Director
Bureau of Parks and Recreation

H. Stan Druckenmiller, Director
Bureau of Property Management

Gloria L. McCutcheon, District Director
Southeast District

Donald W. Tills, Assistant District Director
Division of Resource Management, Southeast District

Edgar W. Trecker, Jr., District Parks Supervisor
Southeast District

Citizen's Advisory Committee

Michael McFadzen, Co-chair - Plymouth

Joseph Vitale, Co-chair - Waukesha

Louis Milsted, Secretary - Sheboygan

Bob Bergstrom - West Bend

Jim Boyd - Elkhorn

Jack Cummings - Whitewater

Marilyn Edwards - Campbellsport

Joanna Fay - Fond du Lac

Judy Harlow - Kewaskum

Mark Houk - Eagle

Tammy Kazmierski - Palmyra

Lynn Lance - Wales

Frances Land - Kenosha

George Lendved - Kewaskum

Sue Lodl - Cascade

Lois Lovejoy - Milwaukee

Jack Murray - West Bend

Karen Scharinger - West Bend

Roy Sebald - Sheboygan

Carol Smith - Campbellsport

John Stratte - Milwaukee

Reginald Tetting - Oconomowoc

Larry Wirth - Big Bend

Mary Woldt - Greenfield

CONTRIBUTORS

Master Planning Task Force

Walt Adams, Chair - Forest Superintendent
Larry Baer - Forester
Leif Hubbard - Landscape Architect
Dale Katsma - Wildlife Manager
John Nelson - Fisheries Manager
Ron Preder - Warden

Vegetation Management Committee

Larry Baer - Forester
Randy Hoffman - Endangered Resources Specialist
Leif Hubbard - Landscape Architect
Dale Katsma - Wildlife Manager
Roger Reif - Forest Naturalist
Bill Volkert - Naturalist

Map Development and Layout

Heather Gottschalk - Graphic Artist
Therese Gripentrog - Landscape Architect
Susan Oshman - Landscape Architect

Co-Editors

Therese Gripentrog - Landscape Architect
Susan Oshman - Landscape Architect

Department staff from the Bureaus of Parks and Recreation, Forestry, Fisheries, Wildlife, Endangered Resources, and Environmental Analysis and Review, and Southeast District Resource Management and support staff also assisted with plan development.

TABLE OF CONTENTS

		Page
Introduction and Executive Summary		vi
Definitions of Useful Terms		x
Section I	Goal Statement and Objectives	1
Section II	Proposed Management and Development Plans	3
	A. Land Acquisition and Ownership Goals	3
	B. Timber and Vegetation Management	3
	C. Proposed Development and Operations	13
	D. Disabled Access and Use	36
	E. Proposed Land Use Classification	37
Section III	Background Information	39
	A. Regional Context, History of the Kettle Moraine, and Cooperative Projects	39
	B. Current Management Programs	44
Section IV	Resource Capabilities and Inventories	46
	A. Soils, Geology, and Hydrology	46
	B. Aquatic Resources	47
	C. Vegetation and Wildlife, and Endangered Resources	50
	D. Historical and Archeological Features	56
	E. Present Land Use Classifications	56
	F. Local and Regional Land Use Analysis	59
Section V	Environmental Impacts of the Proposed Plan	60
	A. Project Summary	60
	B. Evaluation of Project Significance	61
Section VI	Alternatives to the Proposed Plan and Their Impacts	67
Section VII	Compliance With the Wisconsin Environmental Protection Act	69
Section VIII	Boundary Changes	71

TABLE OF CONTENTS (continued)

		Page
Tables	Table 1 - Change in Recreational Opportunities	2
	Table 2 - Vegetation Cover Types -- Present and Proposed	10
	Table 3 - Forest Interior Bird Species	29
	Table 4 - Grassland Bird Species	31
	Table 5 - Distance Between Major Population Centers & Northern Unit	39
	Table 6 - Endangered, Threatened, and Special Concern Species	55
Maps	Map 1 - Forest Locator	73
	Map 2 - Project Ownership	75
	Map 3 - Township Locator	77
	Map 4 - Vegetation Cover Types	79
	Map 5 - Compartment Locator	88
	Map 6 - Development	90
	Map 7 - Land Use Classifications	99
	Map 8 - Project Boundary	108

INTRODUCTION AND EXECUTIVE SUMMARY

The Kettle Moraine State Forest is a unique remnant of glacial topography in southeastern Wisconsin (Map 1). Comprised of four units--Northern, Southern, Loew's Lake, and Lapham Peak--the forest provides a variety of outdoor recreational opportunities. Activities frequently pursued include camping, hiking, fishing, hunting, picnicking, cross-country skiing, horseback riding, wildlife observation, and snowmobiling.

The topography of the Kettle Moraine was formed during the last Ice Age 10,000 to 15,000 years ago. Massive lobes of ice--up to one mile thick--collided, causing tremendous pressure, friction, and buckling of the land surface. As the glacier melted, moraines, drumlins, kames, and eskers were formed. Many lakes, bogs, wetlands, and potholes are also a direct result of glacial activity.

The National Park Service recognized the significance of the Northern Unit's glacial features and designated 20,000 acres as part of the Ice Age National Scenic Reserve. This is one of nine reserves statewide. The forest-long Ice Age Trail was designated as part of the Ice Age National Scenic Trail System. The 1,000 mile-long trail traverses the state following the terminal moraine left by the glacier during the last Ice Age.

Purchase of the Kettle Moraine State Forest - Northern Unit

In 1936 the State of Wisconsin purchased the first parcel of land for what was to become the Northern Unit. That year, 850 acres surrounding Mauthe Lake was purchased from the Isaac Walton League for $10,000. Today the Northern Unit encompasses 29,600 acres, of which 28,021 is in public ownership. The project boundary proposed in this plan has an acreage goal of 36,391 acres. This figure includes 1,187 acres of other state-owned land.

Management of the Forest

Outdoor recreation is the primary use and management focus of the Northern Unit with approximately 650,000 visitors annually. The integration of other program activities such as wildlife, fisheries, and forestry, and the proper management of endangered and cultural resources is also important to achieving the goals and objectives of the forest.

Development of the Plan

The master plan is the result of the work of several groups including a Department task force, a vegetation management committee, a citizen's advisory committee, various resource management specialists, citizens, and organized groups.

The master plan serves as a guide to the management of the Kettle Moraine State Forest. Modifications to the master plan may be necessary due to changes in environmental or resource conditions, changes in legislation, or additional information and other unforseen circumstances.

Goal Statement and Management Proposals

The goal for the Forest is: "To preserve a unique geological feature of state and national significance; to provide a variety of outdoor educational and recreational opportunities that are in harmony with each other and the environment; to be a place to escape the sights and sounds of urban life; to protect the natural landscape; and to protect rare species, communities, and ecosystems, while retaining and enhancing the high quality experience of current forest users and demonstrating sound resource management practices."

The major proposals in the plan include:

Land Acquisition

* Expand the project boundary by 6,849 acres to a total of 36,391 acres.

  - Add 5,662 acres of privately-owned lands to the expanded boundary.

  - Incorporate 1,187 acres of other state-owned lands into the expanded boundary.

Timber and Vegetation Management

* Base vegetation management decisions on integrated resource management principles with priority on wildlife habitat, recreation, restoration of native plant communities, and education and interpretation.

* Encourage and supplement natural regeneration of the forest using artificial regeneration techniques that imitate a natural appearing forest.

* Recognize outdoor recreation, wildlife habitat, and aesthetics as key objectives in making timber harvesting and other vegetation management decisions.

* Reinstate a tree planting program which matches the species to the site characteristics.

Parks and Recreation

* Concentrate recreational development in areas of existing intensive development.

* Prohibit the use of motorized all terrain vehicles (ATVs) on the forest except possibly for disabled persons by permit only. A disabled access policy has not been approved and is subject to the Department developing a manual code. If ATVs are permitted on the county snowmobile trails in the future, the Department may review the policy banning them from the forest. ATVs would only be permitted on designated snowmobile trails during periods of adequate snow cover.

* Construct a variety of facilities including picnic shelters, playground equipment, scenic overlooks, and wildlife observation structures.

* Upgrade and improve the energy efficiency of existing facilities.

* Designate specific trails for mountain bike use.

* Establish an archery hunting- and trapping-only zone around the Zillmer trail. Deer and spring turkey hunting with firearms will be allowed in this zone during established hunting seasons.

Interpretation and Education

* Continue cooperative efforts with the National Park Service to promote the geological features of the area.

* Expand the naturalist program to include the principles of integrated resource management.

Wildlife

* Restore 48 wildlife impoundments/wetlands.

* Develop a cooperative agreement with the Ruffed Grouse Society to improve ruffed grouse and woodcock habitat in portions of the forest.

* Continue the sharecropping program on at least 2% of the forest land.

* Continue the pheasant stocking program.

* Develop and maintain grassland areas.

* Incorporate information on wildlife observation areas into forest literature.

Endangered Resources

* Designate the following as State Natural Areas:

- Milwaukee River Floodplain Forest
- Milwaukee River and Swamp
- Kettle Hole Woods
- Crooked Lake Wetlands
- Milwaukee River Tamarack Lowlands and Dundee Kame
- Butler Lake and Flynns Springs
- Johnson Hill Kame
- Kettle Moraine Red Oak.

* Designate Kettle Moraine Red Oak and Little Mud Lake as Habitat Preservation areas.

* Implement management programs to inventory forest habitats for rare plant and animal species.

* Implement management programs to protect and restore state endangered, threatened, and special concern species.

Fisheries

* Formulate a task force to develop a lake use and access plan for Long Lake.

* Dredge the spring pond at Glenbeulah Springs.

* Construct disabled accessible fishing piers at Auburn and Long lakes.

* Construct a carry-in access facility at Forest Lake.

* Provide motorboat access to Auburn Lake.

* Discontinue rainbow trout stocking at Butler Lake.

Cultural Resource Management

* Develop long-term management plans for sites listed on or eligible for the State or National Register of Historic Places.

* Consider cultural resource protection and preservation in any land use changes or development projects.

DEFINITIONS OF USEFUL TERMS

Access: The opportunity for the public to launch watercraft such as boats and canoes, enter the water to swim or wade, fish from the bank while wading, or engage in recreational activities on the banks of the river or lake.

Aesthetic Management: Emphasizes the management of timber harvests toward the creation of more visually diverse landscapes.

Biodiversity: Biodiversity is a variety and variability among living organisms and the ecological systems in which they occur on the local and regional landscape.

Cultural Resources: Buildings or other structures, or other cultural remains that have architectural, archeological, or other historic, or cultural significance. Cultural resource sites have educational, recreational, scientific research, and historic value.

Drumlins: Oval-shaped hills formed under the glacial ice in the back of the marginal moraine.

Endangered Species: A species on the Wisconsin Endangered Species list is andy whose continued existence as a viable component of the state's wild animals or wild plants is determined by the Department to be in jeopardy on the basis of scientific evidence.

Esker: A long, narrow ridge of course gravel deposited by a stream flowing in an ice-walled valley or tunnel in a melting glacier.

Extirpation: The elimination of a species.

Fragmentation: The result dividing large and continuous tracts of natural habitat into smaller habitats surrounded by altered or disturbed areas.

Habitat Preservation Area: Habitat Preservation Areas are those lands and waters containing excellent natural habitat and characteristics that are conducive to the perpetuation and production of fish and wildlife.

Integrated Resource Management: A process to increase the effectiveness and efficiency of protecting and managing natural resources in the Milwaukee River Basin. It applies the concept of cooperative decision making among resource management and environmental protection personnel, the public, and other local, state, and federal government representatives.

Interlobate Moraine: A geological feature formed by the opposing movements of two lobes of a glacier at their junction.

Kame: A conical-shaped hill formed at the bottom of a vertical shaft by glacial debris deposited by meltwater flowing into a funnel-shaped shaft.

Kettle: A depression formed by buried glacial ice. Some kettle holes hold water.

Natural Areas: Tracts of land or water which exhibit pre-settlement conditions and contain significant native plant and animal communities or unique geological features. Natural Areas have been identified statewide by the Wisconsin Scientific Areas Preservation Council and the Department's Bureau of Endangered Species.

Neo-tropical Migrants: Bird species that summer in North America and migrate to and winter in Central and South America.

Prescribed Burn: The use of regulated fire to reduce or eliminate undesirable vegetation.

Preservation: Maintaining the integrity of a site, such as a woodland, in its natural or existing state.

Protection: Guarding against the disruption of a functioning ecological system.

Restoration: Bringing a site to its former or original condition, which includes encouraging the biological diversity of a site.

Silviculture: The theory and practice of controlling forest establishment, composition, and growth as a biological unit.

Special Concern Species: Some species about which a problem of abundance or distribution is suspected but not yet proven scientifically. The classification is to focus attention on species before they become threatened or endangered.

Stewardship Program: A 10-year $250 million fund (bonding program) that will make the 1990s a landmark decade for conservation. Stewardship is rooted in recommendations for protecting environmentally sensitive areas, acquiring recreational lands, and maintaining state recreational opportunities.

Threatened Species: A species on the Wisconsin Threatened Species list is one which appears likely, within the foreseeable future, on the basis of scientific evidence, to become endangered.

SECTION I - GOAL AND OBJECTIVES

Goal Statement

To preserve a unique geological formation of state and national significance; to provide a variety of outdoor educational and recreational opportunities that are in harmony with each other and the environment; to be a place to escape the sights and sounds of urban life; to protect the natural landscape; and to protect rare species, communities, and ecosystems while retaining and enhancing the high quality experiences of current forest users and demonstrating sound resource management practices.

Objectives

1. Provide multiple natural resource benefits with resource-based outdoor recreation opportunities (including hunting and fishing) recognized as the major use while protecting the diverse native species and ecosystems of the Kettle Moraine region.

2. Provide a balance of outdoor recreation opportunities that will still protect sensitive resources, both natural and cultural, on the forest.

3. Provide opportunities for changes to the present level of recreational participation as found in Table 1.

4. Provide opportunities for high quality user experiences using regulatory techniques including zoning, spatial and time separation, permits, reservations, and density limits.

5. Concentrate any needed additional facilities for providing general recreational activities in areas of existing intensive development. The quality of existing facilities will be maintained or improved and comply with environmental regulations.

6. Provide recreational opportunities and facilities for individuals with physical or sensory disabilities.

7. Develop forest-specific interpretive, educational, and demonstration programs which provide the public with an appreciation of the natural and historical environment of the forest, and associated resource management activities, while enhancing the public's understanding of broader environmental and resource management concerns.

8. Prescribe resource management activities which enhance the setting for outdoor recreation, maintain aesthetics, and protect the natural communities and ecosystem functions and processes.

9. Implement integrated silvicultural and other vegetation management practices to promote a balance between recreational goals, aesthetic values, wildlife habitat, and educational activities, and the continued production of forest products.

10. Preserve and maintain State Natural Areas and Habitat Preservation Areas and designate additional sites where appropriate.

11. Demonstrate proper methods of dealing with environmental concerns (recycling, wastewater treatment, pesticide usage, water quality, and erosion control) by using acceptable management practices.

Table 1 reflects the change in the level of recreational opportunities available in the Northern Unit.

Table 1

Change in Recreational Opportunities*

Activity	Change
Deer hunting	Moderate increase
Turkey hunting	Significant increase
Pheasant hunting	Slight decrease
Waterfowl hunting	Slight increase
Rabbit hunting	Slight increase
Squirrel hunting	Slight increase
Grouse hunting	Slight decrease
Other game hunting	No change
Trapping	Slight increase
Warmwater fishing	Moderate increase
Coldwater fishing	No change
Boating & canoeing	Slight change
General camping	No change
Group camping - outdoor	Slight increase
Group camping - indoor	No change
Trailside camping	No change
Equestrian camping	Slight increase
Picnicking	No change
Outdoor education/skills	Moderate increase
Swimming	No change
Hiking	No change
Equestrian riding	No change
Cross country skiing	No change
Snowmobiling	No change
Mountain Biking	Significant decrease
Biking	Slight increase
Dog trials and training	Slight increase
Sightseeing	Slight increase
Wildlife observation	Moderate increase
Gathering	No change
Viewing from observation towers	No change

* All new recreational uses and opportunities will be measured against their impact upon uses existing at the time, with greater value placed on non-mechanized activities.

SECTION II - PROPOSED MANAGEMENT AND DEVELOPMENT PLANS

A. Land Acquisition and Ownership Goals

The Kettle Moraine State Forest - Northern Unit project boundary encompasses 29,600 acres, of which 28,021 acres (96%) is in state ownership as of December 1990 (Maps 2 and 3). The proposed project boundary encompasses an additional 6,849 acres including 5,662 in private and 1,187 in public ownership. This brings the proposed project boundary to 36,391 acres. Fifty eight acres now occupied by incorporated towns will be deleted from the current project boundary. It is the policy of the Natural Resources Board to acquire land through purchases from willing sellers or donations. In addition, easements which include scenic and land use restrictions can be used to protect critical habitat and aesthetics, or to discourage unwanted development.

This property is a major Department land holding in heavily urbanized southeastern Wisconsin. There are no other public or private lands in this area that can provide a similar level of outdoor recreational opportunities. The forest offers large public hunting areas and an extensive trail system including 31 miles of the Ice Age Trail.

When the land acquisition program was developed for the forest, environmental protection, resource management, and visitor management were considered. Some lands were added for the benefit of wildlife habitat, wetland restoration, and erosion control. Other lands were added to protect geological features. The Department will focus its real estate acquisition activities on land within the proposed project boundary that has a high probability of a change in use, land now used for or suitable for intensive outdoor recreation, land needed for habitat management, land needed for public facility development, and scenic land with a high potential for incompatible land use.

There is no specific timetable for land acquisition; however, the goal is to acquire land or easements over the next ten years. Funding will be secured through the Stewardship Program (1989 Wisconsin Act 31) and the Natural Resource Foundation whenever possible. Cooperative relationships with local units of government, and conservation organizations such as The Nature Conservancy, Ice Age Foundation, and Trust for Public Lands will continue to be developed as a means to acquire lands. Scenic and conservation easements, and short-term arrangements such as hunting leases and land use agreements will also be used.

B. Timber and Vegetation Management

Vegetation management provides many forest benefits. It enhances outdoor recreational opportunities, improves habitat for wildlife species, protects natural areas, perpetuates native forest cover types, and produces a sustained yield of forest products. The objectives for the forest guide the specific vegetation management activities. They are further modified by specific timber type, habitat, or other local management needs. Specific vegetation management recommendations are further discussed on page 15.

Vegetation Description and Management Prescription

The Northern Unit has a variety of plant communities including mixed hardwood forest, conifer plantations, wetlands, restored native prairies, and agricultural fields. A vegetation management committee established management recommendations for the forest vegetation cover types. The committee used the existing vegetation base from which to establish recommendations. The planned vegetation cover types, for all lands within the proposed project boundary are shown on Map 4. A comparison of the existing and planned cover type acreage, by compartment, is in Table 2. The total acreage in the planned cover type categories is greater than the total existing acreage to account for the expanded project boundary.

Long-range (100+ years) cover type goals have been established for all acreage in the forest, except those in the oak/central hardwoods category. The Department will address this category after a vegetative reconnaissance (survey) is completed.

The long-range cover type goals established for the forest are based on two principles--biodiversity and aesthetic management. Biodiversity is the variety and variability among living organisms and the ecological systems in which they occur on the local and regional landscape. To protect and restore the natural diversity originally found in the presettlement Kettle Moraine area, the location of various cover types was changed and consolidated. Cover type goals for acreage along roadways and in high use areas were established to be consistent with aesthetic management goals. A brief discussion of the general management prescriptions for various vegetation types in the forest is presented below.

Old Field. An old field is a disturbed grassland, usually an old pasture, that has been in this state for a number of years. Usually the sod is very dense and thick. Common species include brome grass and kentucky bluegrass. The management recommendation is to burn once every five years.

Dry-Mesic Prairie. A dry-mesic prairie is a grassland area of native plants located in flat areas that are dry to moist. Common species include silky aster, little bluestem, big bluestem and needle grass. The management recommendation is to girdle problem woody species and allow them to dry, and to burn once every three to six years.

Sedge Meadow. A sedge meadow is dominated by native sedges, grasses, and forbs. The management recommendation is to girdle problem woody species and allow them to dry, and to burn once every three to five years.

Wet Lowland. A shallow wetland densely covered by low growing grasses and forbs is classified as a wet lowland. The management recommendation is to burn once every five years.

Agricultural Fields. Agricultural fields are open areas that were recently or are still being cultivated.

Brush Field. A brush field is an area where the brush is co-dominant with the grasses, and at least fifty percent of the field is in brush. The management recommendation is to cut or girdle problem woody species and allow them to dry, and to burn once every five years.

Oak/Central Hardwoods. This community consists of red, black, white, and bur oak associated with other hardwoods or dominated by cherry, elm, and walnut and associated with oak and hickory. The oak is favored on many sites to produce habitat and food resources for deer, wild turkeys, squirrels, rodents, birds, and many other species of wildlife. The primary management recommendation is to perpetuate the oak type. Much of the oak timber in the forest is mature or over-mature and needs to be regenerated. Because oak does not reproduce well in heavy shade, clearcutting, shelterwood harvesting, and prescribed burning are accepted silvicultural methods for regeneration. Control of understory competition and supplemental planting of oak seedlings may be required to ensure successful regeneration. The final harvest in the shelterwood area is not completed until adequate regeneration is established. Timber sales in this cover type will be designed to retain three to four den trees per acre. Oak wilt exists in the forest and control measures will be implemented as necessary. On some sites, succession from the oak to a central hardwood forest will be allowed to occur.

Northern Hardwoods. This community consists of maple, basswood, and beech trees. The management recommendation for northern hardwoods is to restore productivity and to upgrade the wildlife habitat and quality of timber produced. Selection, group selection, and shelterwood cutting will be the primary methods of regeneration. Timber sales in this type will be designed to retain at least eight to ten nut-producing trees (oak and hickory) and three to four den trees per acre. Supplemental planting of desirable species will enhance wildlife production.

Aspen. There are no large stands of aspen on the forest. The primary management prescription is regeneration or expansion of aspen stands through clearcutting. The standard rotation or harvest age of aspen is 35 to 50 years depending on site quality and the size of the harvest area. Rotation age will be varied to maintain age class diversity while ensuring reproduction.

Conifer Plantations. A conifer plantation can consist of red pine, white pine, norway spruce, and white spruce. The management activities prescribed for this timber type include thinning to maintain vigor, and pruning to improve stand quality, reduce fire hazard and prevent insect or disease infestations. Openings and small patches of vegetation within the plantation will be maintained. Plantations will be harvested at rotation age (from 90-120 years) and the site evaluated for continued pine plantation or conversion. Some new pine plantations will be considered in old field situations and be used as accents to hardwood associations. Small plantings of spruce will be considered for winter wildlife cover and for screening road sights and sounds from natural settings.

Red Cedar Glade. A red cedar glade is an area dominated by red cedar. The management recommendation is to cut brush, girdle problem woody species and allow them to dry, and to burn once every three years.

Of the total acreage in the Northern Unit approximately 64% is forested. Of the 64%, approximately 6,000 acres is oak, 2,300 acres is hardwood, and 3,500 acres is red and white pine plantation. In addition, 2,170 acres are agricultural. The agricultural land primarily is sharecropped or grassland.

Compartment Descriptions

Compartment vegetation surveys, obtained through the systematic collection of basic cover type data, is used as the data base for forest management plans and activities. Basic cover type information for each of the 41 compartments in the Northern Unit is outlined below. The compartments are shown on Map 5.

Compartment 1. This compartment is in the south end of the forest. It contains several oak stands with an average of 8,000 board feet per acre. This type is important for wildlife management since turkeys released in this compartment depend on them for food and habitat. It also contains several pine stands that are over 30 years old. The Ice Age and an equestrian trail pass through this compartment.

Compartment 2. This compartment has 338 acres of which 43 are part of a Natural Area. The East Branch of the Milwaukee River flows through the eastern portion of the compartment. There is very little potential for hardwood management but the compartment is well suited to the white and red pine plantations found here.

Compartment 3. Compartment 3 contains 578 acres of a variety of timber types, including a 28-acre oak stand. A trail transects the stand and topography is steep. The compartment also contains a white pine stand that is 38 years old.

Compartment 4. This 360-acre compartment consists of several stands of large oak trees.

Compartment 5. This small compartment contains 323 acres. It has excellent access from four sides. The compartment has white and 25 year-old red pine plantations, several good red and white oak sawlogs in this compartment.

Compartment 6. This is the smallest compartment in the forest consisting of 242 acres. A portion of this compartment is being sharecropped. A stand of 100-year old oak is present in this compartment.

Compartment 7. This compartment contains 249 acres containing several red pine plantations and some stands of oak.

Compartment 8. Compartment 8 is a somewhat small compartment surrounding the community of New Fane. The dominating feature is the East Branch of the Milwaukee River. Presently, 30% of the vegetation is hardwood stands, 30% grass field and 30% conifer plantation.

Compartment 9. This compartment is dominated by conifer stands and old fields.

Compartment 10. Compartment 10 is dominated by a 120-year old tract of red oak and northern hardwoods. Endangered Resources has named this area the Kettle Hole Woods State Natural Area. The compartment also contains several stands of old growth northern hardwoods.

Compartment 11. This compartment is located near the Mauthe Lake Recreation Area. It contains a 36-acre natural stand of white cedar and a large area of native grass.

Compartment 12. Mauthe Lake is on the north end of compartment 12. The East Branch of the Milwaukee River forms the west border of the compartment and the youth camp is on the south end. The area bordering the Milwaukee River is designated as the Milwaukee River Swamp Natural Area.

Compartment 13. The Kettle Moraine Forest headquarters and Group youth camp is located in compartment 13. One of the older conifer stands in the forest is located near the headquarters buildings, and is a showcase for pine management in the forest. There are scattered stands of swamp hardwoods and tamarack in this compartment.

Compartment 14. This is a somewhat isolated compartment that is surrounded by private ownership.

Compartment 15. This is a very visible compartment because County Trunk Highway G follows its eastern border. The compartment contains deciduous and conifer plantations. A bridle trail crosses most of the compartment.

Compartment 16. The Mauthe Lake Recreation Area and Haskell Noyes Natural Area are located in compartment 16. Recreational use dominates this compartment and timber harvesting is limited.

Compartment 17. Focal points of compartment 17 are Forest Lake, Mud Lake and Lake Seven. Conifer stands in the compartment are small and scattered. Aesthetic zones have been established around Lake Seven and Forest Lake.

Compartment 18. This is a 991-acre compartment that straddles the Sheboygan and Fond du Lac County line with Crooked Lake in the center. It contains several 100-acre conifer plantations, sharecropped areas, and mature oak stands.

Compartment 19. The Jersey Flats prairie dominate compartment 19. Little vegetative diversity exists and much of the compartment is sharecropped.

Compartment 20. This 1010-acre compartment contains the Dundee Timber Harvest Forest. The Ice Age Center and one of the oldest spruce stands in the forest are located here.

Compartment 21. This compartment contains several pine stands.

Compartment 22. Compartment 22 contains several mature oak stands.

Compartment 23. Compartment 23 contains large open grassy areas and a significant amount of sharecropped acres.

Compartment 24. The focal point of compartment 24 is the Long Lake Recreation Area. There has been little timber management activity in this compartment.

Compartment 25. This compartment contains several conifer stands.

Compartment 26. The Ice Age Trail crosses compartment 26 which consists of several stands of oak.

Compartment 27. Compartment 27 is 1047 acres in size, with large stands of oak.

Compartment 28. This compartment contains predominately low quality tamarack and swamp hardwood. A large kame dominated by oak and maple is also located here.

Compartment 29. Compartment 29 is dominated by northern and central hardwoods.

Compartment 30. The largest stand in compartment 30 contains 324 acres of oak. The stand is about 90 years old and much of the oak is dying. There are few conifer plantings in this compartment.

Compartment 31. Parnell tower is on the south end of compartment 31 which contains aspen and pine.

Compartment 32. Compartment 32 is dominated by sharecropping and the Watercress Creek watershed. There are no conifer plantations.

Compartment 33. This compartment is characterized by 17 conifer plantations. The oldest plantation is 52 years old, and the youngest 28. It contains several hundred acres of oak type in the 60 to 70 year old age bracket. The Kettle Moraine Drive borders the compartment on the east.

Compartment 34. This compartment is 1,239 acres in size with almost half being small saw- and pole-sized oak. Within this type are two- to three-acre pockets of aspen. There are also 103 acres of oak over 100 years old, and 97 acres of agricultural land. The group camp facility is located here, and Kettle Moraine Drive borders the compartment on the east.

Compartment 35. Compartment 35 is 95% forested and contains 533 acres of small saw oak. In addition, there are scattered spruce and pine plantations.

Compartment 36. There are 390 acres of oak and some pockets of aspen over five acres in size contained in this compartment.

Compartment 37. This is a small compartment of only 444 acres. It is dominated by 118 acres of pole-sized northern hardwoods.

Compartment 38. This compartment contains 314 acres of 80-year-old oak and scattered conifer plantations.

Compartment 39. Compartment 39 contains 188 acres of oak and 78 acres of open grassland.

Compartment 40. This compartment is small and fragmented. There are no conifer plantations and 151 acres are sharecropped.

Compartment 41. A high percentage of compartment 41 is sharecropped.

Table 2

Vegetation Cover Types By Compartment

Existing Vegetation Cover Types — Compartment Number*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Grass	120	87		29	14		68	144	27		152	81		84	59	124	138	71	
Upland, Lowland Brush	62	41	125	31	16	24	38	13	20	74		95	133	45	21	100	97	185	74
Lowland	128	85	101	55	47	13	11	28	94	75	113	235	291	74	191	122	157	166	51
Agricultural Field						110		82			64	122	108		13				310
Aspen																			
Oak/Central Hardwoods	298		57	59	54	50	58	32	55	41	11	109	85	37	55	255	179	168	
Northern Hardwoods	73	54	124	32	49	17	88	52	113	61			12	22	57		36	71	8
Conifer Plantations	365	94	164	130	143	28	54	112	187	115	96	54	248	59	108	47	128	248	
Water Body								5		5				10	27	71	54	15	
Total Acres Existing	1046	361	578	336	323	242	249	392	613	398	284	767	958	247	556	654	775	991	514

Planned Vegetation Cover Types — Compartment Number

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Old Field-Brome Grass	159	174		28	28	18	45	8		60	193	22	8	55	32	288	82	540	
Dry-Mesic Prairie			8					248						20		19			
Sedge Meadow	46				21			34		31		27		104				43	
Wet Lowland	159	85	76	80	75	11		98	84	103	116	344	136	64	122	258	168	74	
Agricultural Fields	20		20		7	60		58	46			40		5	10			17	
Brush Field								38								39			
Oak/Central Hardwoods	603	62	71	69	188	88	85	90	108	41	51	159	85	56	155	236	303	273	
Northern Hardwoods	218	180	265	54	59	110	172	75	143	169	101	462	566	52	405	182	359	459	397
Aspen	3								15						13				
Conifer Plantations	374	24	120	105	143		63	108	163	96	73	77	233		108	47	128	248	
Red Cedar Glade																			
Water Bodies	20	30	38		15			58		8	20			10	82	71	54	15	
Total Acres Planned	1556	601	598	336	487	307	349	434	901	398	439	1047	1277	267	1016	690	1448	1262	1054

Table 2 (cont.)

Existing Vegetation Cover Types	Compartment Number																		
	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Grass	272	161	47	40	378	59	46	15	24		153	41	151	131	141	116	32	100	
Upland, Lowland Brush	193	164	66	214	21	91	48	22		111	28	30	33	35	41	44	53	52	51
Lowland	41	155	126	264	49	156	31			81			12	58	8				
Agricultural Fields	83	10		62		33	52	110	11		139	48	267	97	19		85		43
Aspen	9									12		132		23	15	18	10		
Oak/Central Hardwoods	272	4	170	156	38	40	94	454	33	89	493	360	19	302	742	547	416		347
Northern Hardwoods	43	49	73	59	118	22	156			163	64	39	12	48	101	21	68	135	21
Conifer Plantations	97					54	76	116		150	11	301		300	122	271	71		167
Water Bodies	97	263	134	51	36	225		196	56		33	16		26	11		86		
Total Acres Existing	1010	640	745	929	655	491	728	744	264	662	888	984	510	907	1293	1047	664	444	629

Planned Vegetation Cover Types	Compartment Number																		
	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Old Field-Brome Grass	218	80	274	291	159	246	198	183		186	247	215		200	96		32	46	192
Dry-Mesic Prairie										113	22	12	386	54					
Sedge Meadow	20	164	10			112	13			76				38		36			
Wet Lowland	80	39	69	73	49	168	144	48	35	152	16	35	55	121	34	179	53	72	
Agricultural Fields				8						40	58	28			97		85		
Brush Field	198	42	108	128		140				60	73	13						16	67
Oak/Central Hardwoods	361	14	338	376	118	238	257	818	33	139	706	431	26	382	615	458	416		360
Northern Hardwoods	324	254	196	570	195	364	171	127		332	770	487	27	122	221	216	68	177	38
Aspen								18		14	24	106			15	36	10		132
Conifer Plantations	97	47	165	104	68	46	76	86		200	11			383	192	261	162	47	
Red Cedar Glade																19			
Water Bodies	73				125	85	225	27	196	60		33	16		26	11		86	
Total Acres Planned	1371	640	1160	1550	714	1399	1084	1307	264	1372	1927	1360	510	1300	1296	1216	826	444	789

Table 2 (cont.)

Existing Vegetation Cover Types	Compartment Number			
	39	40	41	Total
Grass	92		160	3,382
Upland, Lowland Brush	25	25	44	2,597
Lowland		20	12	3,030
Agricultural Fields		151	112	2,161
Aspen	16			248
Oak/Central Hardwoods		14	6	6,199
Northern Hardwoods	200		37	2,298
Conifer Plantation	38			4,649
Water Bodies	57	44	71	1,078
Total Acres Existing	428	254	442	25,642

Planned Vegetation Cover Types	Compartment Number			
	39	40	41	Total
Old Field-Brome Grass		300	160	5,063
Dry-Mesic Prairie				882
Sedge Meadow				775
Wet Lowland			12	3,487
Agricultural Fields	37		38	674
Brush Field	80	113	44	1,159
Oak/Central Hardwoods	38		6	8,853
Northern Hardwoods	200		111	9,398
Aspen	16	30		432
Conifer Plantations	38			4,093
Red Cedar Glade				19
Water Bodies	57	44	71	1,556
Total Acres Planned	428	525	442	36,391

* See Map 5 for compartment location.

C. Proposed Development and Operations

Coordination and integration of various program activities is essential to management of the forest. The result is a balance between use and protection of the natural resources, forest development, and operations. During the development of each biennial budget, the Bureau of Parks and Recreation, Fisheries Management, Wildlife Management, Forestry, and Endangered Resources will review proposed projects that are specific to the forest. Projects written by other functions that are related to the forest will receive a similar review.

Development and operations recommendations, by program, are presented below in priority order.

Parks and Recreation

Providing opportunities for a high quality recreational experience is a primary objective of forest management and development. Recreational development will generally be concentrated in existing intensive development areas.

Development

1. Expand the New Prospect Horseriders Campground to include ten additional camp sites, and additional water and restroom facilities.

Cost $65,000 Biennium 1993-95

The present campground is not large enough to handle large events such as endurance rides.

2. Remodel or replace six sets of four-unit pit toilets--three at the Mauthe Lake Recreational Area, one at the Horseriders Campground, one at the Long Lake picnic area, and one at the Parnell Tower picnic area.

Cost $120,000 Biennium 1993-95

3. Construct two restroom/shower buildings at Mauthe Lake Campground.

Cost $240,000 Biennium 1993-95

The 138-unit Mauthe Lake campground is heavily used during the spring, summer, and fall seasons. Many campers have requested flush/shower facilities.

4. Develop a parking lot for the Dundee Mountain Trail.

Cost $2,500 Biennium 1993-95

Hikers using the Dundee Mountain Trail park either along County Highway F or in the Long Lake campground. Both create a lot of congestion. A parking lot will alleviate this situation.

5. Construct an addition to the Ice Age Interpretive Center and transfer most of the administrative operations to that facility.

Cost $56,000 Biennium 1993-95

When the forest headquarters is closed on weekends, the Ice Age Center serves as the headquarters. By combining offices, services will be improved, confusion eliminated, and budget overlap reduced. The combined office will serve as a forest orientation, information, and interpretive center and will stimulate more use of the Ice Age Center.

6. Develop a bike trail between Mauthe and Long Lakes.

Cost $60,000 Biennium 1993-95

The eight-mile bike trail will connect the Mauthe and Long Lake Recreation Areas.

7. Construct one restroom/shower building at Long Lake Campground.

Cost $140,000 Biennium 1995-97

An additional building is needed to provide adequate distribution of showers and restroom facilities in the campground.

8. Construct one additional picnic shelter each at Mauthe Lake and Long Lake for use during inclement weather.

Cost $20,000 Biennium 1997-99

The north picnic area at Long Lake does not have a shelter and many requests are received for the shelter at Mauthe Lake.

9. Construct two picnic shelters/warming houses at the Greenbush and Zillmer trails for picnickers and skiers.

Cost $40,000 Biennium 1997-99

The indoor shelters will be used as warming shelters for skiers at these heavily used ski trails. In the summer, the Zillmer facility will be used for group picnics and the Greenbush facility will be available to users of the outdoor group camp.

10. Construct a classroom/arts and crafts building at the indoor group camp.

Cost $100,000 Biennium 1997-99

The indoor group camp serves 200 youth during the summer months working on resource management and environmental education projects. The new facility will provide space for arts and crafts programs. The group camp is also heavily used by students from 55 schools in

23 school districts for environmental education. An indoor classroom facility will eliminate use of the dining hall and downstairs activity room for this purpose.

11. Redesign the campsites at the Greenbush outdoor group camp.

Cost $5,000 Biennium 1993-95

The present road system does not allow use by recreational vehicles. The addition of a cul-de-sac and gravel pads will permit use by camping clubs and senior citizen groups.

12. Install playground equipment at Mauthe and Long lakes.

Cost $10,000 Biennium 1995-97

The addition of this equipment will meet requests for playground equipment and enhance recreational opportunities for users with children.

13. Construct a campground road and bridge at Mauthe Lake to bypass the picnic area.

Cost $120,000 Biennium 1995-97

All traffic from the 138-unit campground passes through the picnic area resulting in congestion. The project will bypass the picnic area and permit campers to go from the contact station directly to the campground.

14. Develop a scenic overlook near the top of Dundee Mountain.

Cost $2,000 Biennium 1995-97

The Dundee Mountain is a world class kame and landmark in the area. It is a popular spot to view other glacial features of the area. A scenic overlook will enhance this opportunity.

15. Construct a 20-foot observation structure at the Ice Age Interpretive Center.

Cost $25,000 Biennium 1999-01

The facility will provide Ice Age Center visitors a view of the Lake Michigan Moraine and the Jersey Flats--a glacial outwash plain. The Ice Age Center receives 35,000 to 40,000 visitors annually.

16. Construct a backpacking shelter at the north end of the Ice Age Trail.

Cost $10,000 Biennium 1999-01

The extension of the Ice Age Trail from Greenbush to Glenbeulah has created the need for a shelter. The backpacking shelters are in demand year around.

Operations

1. Manage the Ice Age Trail as a lightly used hiking trail. The equestrian trail is used for horseback riding in the spring, summer and fall, and for snowmobiling in the winter. Portions of both trails presently support multiple use. The management objective is to establish these trails as single use trails. This will be accomplished as additional lands are acquired and trail segments developed.

2. Prohibit the use of motorized all terrain vehicles (ATVs) on the forest except possibly for disabled persons by permit only.

A disabled access policy has not been approved and is subject to the Department developing a manual code. If ATVs are permitted on the county snowmobile trails in the future, the Department may review the policy banning them from the forest. ATVs would only be ok on designated snowmobile trails during periods of adequate snow cover.

3. Designate the New Fane and Greenbush trails for mountain biking. Mountain biking will be prohibited from other trails in the forest. The yellow loop of the Greenbush Trails will be closed to mountain biking from the beginning of small game hunting through the deer gun hunting season. A monitoring program will be developed to document user conflicts and environmental concerns.

4. Schedule special events and management activities to minimize conflicts between user groups and disturbance to nesting wildlife species.

To the greatest extent possible, special events involving large numbers of people will be coordinated to minimize conflicts with other users during peak use periods. Special events that use extensive portions of the forest will not be allowed during the critical nesting period for rare and sensitive raptor species and ground nesting birds. This period generally is from March through July.

5. Encourage citizens to form a friends group with Department assistance.

6. Encourage volunteer help in the forest with programs such as campground hosts, nature programs, ski and mountain bike patrol, trail maintenance and development projects.

7. Establish an archery hunting- and trapping-only zone around Zillmer Trail.
The boundaries of this 642-acre zone is State Highway 67 on the north, County Trunk Highway G on the east, and County Trunk Highway SS on the south. Deer and spring turkey hunting with firearms during the established hunting seasons will be allowed in this zone.

8. Expand the area closed to hunting around Long Lake to include the Dundee Mountain Trail.

The boundaries of this 450-acre area are the Long Lake Campground on the north, Milwaukee River on the west, County Trunk Highway F on the south, and Division Road on the east.

9. Develop and implement a prescribed burn policy across the forest.

Cooperative burning for specific management objectives will be practiced by parks, wildlife, endangered resources, and forestry.

10. Maintain a good distribution of approximately 65 off-road parking lots in the forest.

Small off-road parking lots are maintained throughout the forest to provide safe parking areas and distribute use.

11. Allow multiple use of some snowmobile access trails from nearby communities during the non-winter season. This will provide a connection between the communities and the forest trail networks for hikers and equestrians.

12. Expand the recycling program to be in compliance with state laws. The program is for materials generated by forest users. Composting of lawn or other organic materials will not be a part of this program.

13. Remove underground storage tanks on the forest, where feasible, and replace them with above-ground tanks or alternative energy-powered facilities.

All underground fuel storage tanks may have to be removed and alternative energy solutions, such as solar-, electric- or natural gas-powered facilities investigated.

14. Collaborate with Fisheries Management in developing and maintaining boat ramps and fishing piers. Fishing is a popular recreational activity of many forest visitors.

15. Landscape old building sites, and abandon wells and septic tanks when new properties are acquired.

16. Maintain two dog training areas in the forest.

An upland and a water area will permit dog training and trial activities with minimal disturbance to nesting wildlife.

17. Modify ski trails in the Greenbush area to accommodate diagonal and skating skiers and eliminate skier/snowmobiler conflicts.

18. Upgrade wastewater facilities at the Mauthe and Long Lake Campgrounds to meet present codes and sanitary standards. Examine the need for providing additional shower/restroom facilities at these sites.

19. Upgrade existing facilities to provide adequate service to the public to meet current standards and codes. This includes electrical, plumbing, and structural work, as well as roads and trails.

20. Upgrade the energy efficiency of buildings through insulation, water conservation, electric modification, and other methods.

21. Improve Mauthe Lake boat access to provide easier and safer boat launching. Increase ramp slope and construct a disabled accessible pier.

22. Formulate a task force consisting of Department personnel, resort owners, lakeshore residents, and trailered boat users to develop a lake use and access plan for Long Lake.

23. Provide additional limited-impact concessions at various locations on the forest. A small concession currently is operated at Mauthe Lake beach and picnic area, and firewood is available from a concessioner at the Mauthe and Long Lake campgrounds. Providing additional concessions is something the friends group may want to pursue.

Interpretation and Education

Provide interpretation and education of the natural history of the Northern Unit's flora, fauna, ecology, geology, archeology and history. Focus interpretation and education on ecosystem processes, plant communities, and rare species.

Development

1. Develop the unique features of the Ice Age Reserve through cooperation with the National Park Service and promote use of the Ice Age Center.

Cost $10,000 Biennium 1991-93

The Northern Unit is one of nine units of the Ice Age Reserve. Eleven interpretive signs will identify glacial features in the forest.

2. Create demonstration areas in the forest to show private landowners good timber harvesting techniques and the multiple benefits gained from proper forest management.

Cost $1,500 Biennium 1991-93

3. Expand the naturalist program to include education on:

* Forest management techniques including reforestation, harvest techniques, and species selection.

* Wildlife management practices including population and habitat management.

* Fish management techniques including species selection, habitat management, and water quality management.

* Endangered resource management including habitat management, protection and enhancement of species.

Cost $3,000 Biennium 1991-93

The forest is managed under the principles of multiple use and integrated resource management. The interpretive program will be expanded to include these principles in educational programs, and in demonstration areas.

4. Continue publication of the forest hunter information map.

Cost $5,000 Biennium 1991-93

The maps provide information to hunters on regulations, restricted areas, and the forest boundary.

Forestry

Vegetation management has a direct impact on outdoor recreational areas, wildlife habitat, natural areas, watershed protection, water quality, and the production of a sustained yield of forest products. Management proposals for the forest resource has a considerable impact on the unique scenic qualities of the forest. The forest vegetation compartment boundaries are shown on Map 5.

Management

1. Site preparation

Prescribed burning, mechanical means, and herbicide application will be used to remove competing vegetation to prepare a site for regeneration. These methods could also be used to maintain wildlife openings, and to restore prairie-type conditions. The use of herbicides will be minimal.

2. Reforestation

Natural regeneration is encouraged, but where this is not possible or practical, tree planting will be used. Native species best suited to the site will be planted. Limited herbicide use may be required. Tree shelters, such as protective tubes, may be used to enhance reforestation efforts by minimizing damage to seedlings from mice, rabbits, and deer. Planting will serve one or more of the following purposes:

* To supplement natural regeneration where it is inadequate.

* To improve the specific composition of existing stands.

* To establish forest on desirable open areas.

* To improve or maintain the aesthetics of an area and to provide wildlife habitat.

3. Timber Stand Improvement

Timber stand improvement includes a variety of practices, including thinning, release, salvage, and pruning, designed to improve the growth or species composition of immature forest stands. Aesthetics or wildlife habitat needs will be considered. Aesthetics and wildlife habitat needs will be considered in timber stand improvement projects.

4. Big Tree Silviculture

Big tree silviculture is a management technique that is used to encourage the development of large diameter trees in long-lived species on specific habitats. This management technique produces den trees and nuts for wildlife, and adds to the aesthetics of the forest. Some timber harvesting is also allowed.

5. Timber Harvest

Timber harvest decisions will consider the affect on outdoor recreation, wildlife habitat, and forest aesthetics. Approximately 100 acres each of hardwood and softwood will be harvested annually. The majority of the softwood harvesting will be plantation thinnings. Upon completion of the forest central-hardwood vegetation survey, harvesting guidelines will be written.

Timber sales procedures are established by law and detailed in the Department's timber sale handbook. Timber sales also will be in accordance with the forest objectives and management guidelines established for the stand in which a timber sale would take place. Timber harvesting will occur during the period in which the affected area of a forest is least used by the public. Timber harvesting will also be restricted during the months of March through July to protect wildlife species from disturbance during the nesting season. Silvicultural guidelines used in determining the time, method, and details of harvest in intermediate cuts and salvage cuts have been developed by the U.S. Forest Service and the Wisconsin Department of Natural Resources, and are tempered to meet local conditions.

6. Aesthetics

Aesthetic management techniques are defined in the Department's silviculture and forest aesthetic handbook and are modifications of standard timber management techniques. They are designed to minimize the negative affects on aesthetics and recreational values. In addition, timber harvesting techniques such as reduction of slash visibility, winter logging, and precautionary skidding are practices to minimize logging impact.

<u>Operations</u>

1. Update forest vegetation surveys by 1994, including revised stand prescriptions to implement the integrated management recommended in this plan.

2. Manage hardwood and conifer stands according to accepted silvicultural guidelines as scheduled in the 1994 vegetation survey update.

3. Use integrated pest management methods to minimize or prevent the development of pest problems.

4. Reinstate a tree planting program based on two principles--biodiversity and aesthetic management. Roadside buffer strips will be used at many locations, and 260 acres will be planted on an annual basis over the next ten years. The previously conducted a tree planting program, but suspended it because of the recognized need for a more comprehensive approach.

5. Implement site preparation, planting, and timber stand improvement as scheduled in the 1994 compartment vegetation survey.

6. Continue management activities in the Dundee Timber Harvest Demonstration Forest as outlined in its plan.

Wildlife

The Northern Unit supports a variety of wildlife species that are important to the ecological balance of the forest and for the recreational opportunities they provide. Because this is the only large contiguous forested area remaining in southeastern Wisconsin, the preservation of the forest environment is critical to the continued existence of several game and non-game species in this region of the state.

Wildlife management activities will focus on preserving and enhancing habitat types beneficial to game and non-game, especially rare, species.

Development

1. Restore 48 impoundments/wetlands.

Cost $15,000 Biennium 1991-93

Wetlands are an important habitat component for a variety of wildlife species. Wisconsin has lost over 60% of its wetlands of which over 80% were in southeastern Wisconsin. Wetlands provide many environmental amenities and are the most productive wildlife habitats, both in terms of species diversity and total wildlife abundance.

2. Develop a cooperative agreement and plan with the Ruffed Grouse Society to improve ruffed grouse and woodcock habitat in portions of the forest. This plan will emphasize the retention and expansion of aspen and the retention of alder cover types in the forest.

Cost $3,000 Biennium 1991-ongoing

Aspen is an important habitat component for ruffed grouse, woodcock, deer, and other species. Aspen is not a dominant tree species in the forest but is scattered throughout in small pockets. The Ruffed Grouse Society has an interest in helping the Department maintain this important habitat component in the forest, and to demonstrate aspen management techniques to its members and the public.

3. Increase the amount and distribution of permanent grass cover averaging about 50 acres per year. In addition, complete development of the native grass/prairie area on the Jersey Flats.

Cost $750 Biennium 1991-ongoing

Also improve and increase nesting habitat for grassland birds (non-game and game) to enhance opportunities for observation and hunting.

4. Plant fruit-bearing shrubs to complement pine and hardwood tree plantings, and along selected segments of hiking trails.

Cost $400 Biennium 1991-ongoing

Planting shrubs next to pines and spruce will improve this habitat-type for wildlife. Planting shrubs along hiking trails will improve the potential for hikers and other trail users to see wildlife.

5. Initiate a prescribed burn program in cooperation with forestry in oak forest areas to encourage regeneration of oak and suppression of northern hardwood species.

Cost $300 Biennium 1992-ongoing

Oaks are the most important nut-producing tree species in the forest. As such, this species is a critical habitat type for a variety of wildlife species. Prescribed burning in combination with shelterwood cuts improves chances for oak regeneration.

6. Incorporate information on the wildlife observation areas into forest literature.

Cost $500 Biennium 1991-ongoing

Providing information on wildlife observation opportunities will enhance the experience of forest users.

Operations

1. Maintain artificial nesting structures for wood ducks, bluebirds, swallows, and other cavity nesting species through cooperative efforts with volunteer groups. Maintain at least 50 wood duck boxes and 50 other structures. In many areas of the forest, there is a lack of adequate natural cavities for cavity nesting species. Maintenance of artificial structures can improve production of these wildlife species (e.g. average 50% use rate of wood duck boxes in the forest). This type of activity is labor intensive, but is the type of activity where volunteers can be very effective.

2. Maintain grassland areas (both cool season and native warm season grasses) through prescribed burning. Approximately 150 acres will be burned a year. Grassland wildlife species have declined over most of Wisconsin. The most cost-effective technique for maintaining grassland cover is to conduct prescribed burns on a five- to seven-year schedule.

3. Continue the sharecropping program with local farmers to provide winter food plots, brood cover, and maintain openings; and to help develop nesting cover areas or convert open fields to other permanent cover types. Improve the distribution of sharecropping in the forest and maintain at least 2% of the forest land in the sharecrop program. Develop and maintain erosion control plans in cooperation with the Soil Conservation Service on all sharecropped lands. Sharecropping is the most cost-effective technique for maintaining food plots and brood cover for turkeys, pheasants, and a variety of other wildlife species.

4. Conduct surveys to monitor wildlife populations, evaluate the effectiveness or need for habitat programs, and regulation changes. Surveys are necessary to assess program effectiveness and to monitor wildlife populations. Specifically:

* Expand from one to two routes per year, the annual ruffed grouse drumming survey by Department personnel and volunteers.

* Continue annual woodcock singing ground surveys at one route per year.

* Continue grassland bird survey on Jersey Flats (volunteers).

* Conduct routine hunter surveys as appropriate to assess hunter pressure, distribution, and success.

* Monitor deer and turkey populations through harvest registration.

* Conduct summer deer observations (Department field staff).

* Conduct game bird brood observations (Department field staff).

* Continue sharecropping program questionnaires on wildlife observations.

5. Continue the pheasant stocking program at a rate of 1800 birds per year, but restrict releases to three or four general areas. The program will improve hunter success rates and better control hunting pressure.

6. Improve composition of upland shrub communities through selective brush management techniques including prescribed burning, cutting, and herbicide treatment. This will improve habitat quality on upland brush areas for wildlife.

7. Work with volunteer groups and special interest groups to promote public involvement and cooperative projects in the forest. Groups that have an interest include Wisconsin Waterfowl Association and Ducks Unlimited (wetland projects), the National Wild Turkey Federation (oak maintenance), The Ruffed Grouse Society (aspen maintenance), and The Bluebird Restoration Association of Wisconsin (bluebird boxes).

Endangered Resources

The mission of the Endangered Resource Program is to identify, protect, and manage native plant and animal species, natural communities, and other natural features; enhance and restore populations and habitats of rare and endangered species; and promote knowledge, appreciation, and stewardship of Wisconsin's native species and ecosystems for present and future generations.

Protection of the Northern Unit is imperative to the protection of the natural heritage of Wisconsin since the forest contains one of the last undeveloped landscapes in rapidly urbanizing southeastern Wisconsin. If we do not protect these areas now, we risk losing the

native flora and fauna and their interrelationships with the land that characterize this special property and the region as a whole. Protection of endangered resources will be accomplished by continuing to protect and manage existing State Natural Areas and by implementing the following new designations, management guidelines, and projects.

Designations

Designate the following sites as State Natural Areas or Habitat Preservation areas.

A. Milwaukee River Floodplain Forest State Natural Area

This 119-acre well-structured lowland hardwood forest is dominated by large silver maple, American beech, and green ash. It borders the East Branch Milwaukee River at the southern end of the forest. An intact floodplain forest is rare in southeastern and east central Wisconsin, and protection of it is consistent with the goals of the Milwaukee River Priority Watershed Program. Because there has been little logging in the interior of the stand, its structure is good, and it supports a bird population that is characteristic of this type of forest.

B. Milwaukee River and Swamp State Natural Area

This is an expansion of the present boundary of the Milwaukee River and Swamp Natural Area, from the present 230 acres to a total of 800 acres. The expansion will protect the entire wetland complex which includes an intact sedge meadow; a diverse wet shrub-land with both northern and southern species; a hardwood swamp of black ash, green ash, American elm, and bur oak; tamarack stands with northern herbaceous plants; and a northern wet-mesic forest of white ceder and yellow birch. The southernmost section contains an interesting semi-open meadow with Pedicularis lanceolata (swamp betony), Solidago uliginosa (bog goldenrod), Cirsium muticum (swamp thistle), and scattered medium-sized white cedar. This site contains the state-threatened Buteo lineatus (red-shouldered hawk), Dendroioa cerulea (cerulean warbler), and Lepomis megalotis (longear sunfish) species. It also contains the special concern Mniotilta varia (black-and-white warbler), Spizella pusilla (field sparrow), and Vireo flavifrons (yellow-throated vireo) species. This is a rare opportunity to protect a large, mostly undisturbed, wetland and river system in rapidly developing southeastern and east-central Wisconsin.

C. Kettle Hole Woods State Natural Area

This 88-acre site has nearly undisturbed forested knobs and kettle topography with scattered vernal ponds. The forest canopy has very large trees, primarily red oak and sugar maple, plus white ash, American beech, basswood, white oak, and yellowbud hickory. The sugar maple, beech, and yellowbud are reproducing. Although the area may have been grazed, evidence of this or cutting is scarce. During the summer of 1989 there was an active red-shouldered hawk (state-threatened species) nest. Many of the ponds are used by a large number of amphibians.

D. Crooked Lake Wetlands State Natural Area

This Natural Area encompasses 261 acres of wetlands and shrub carr communities, and two lakes--Cedar and an unnamed lake. The southern part of the system is a shrub carr of diverse structure and composition on the west side of Crooked Lake. Species present include Spiraea alba (meadowsweet), Betula pumila (bob birch), Cornus stolonifera (redosier dogwood), Salix

spp. (willows), Alnus rugosa (speckled alder), Ilex verticillata (winterberry), Viburnum lentago (nannyberry viburnum), and Viburnum trilobum (highbush cranberry). A shallow bay on the northwest side of the lake has healthy stands of aquatic plant communities, including emergent, submergent, and floating-leaved, that support a small black tern colony and a large population of bullfrogs (both of which are special concern species). Cedar Lake--a small undeveloped lake surrounded by swamp hardwood forest of yellow birch, black ash, and red maple--connects to the unnamed lake to the west. Rimmed by a narrow border of quaking mat sedge meadow surrounded by tamaracks, this unnamed lake shows little sign of disturbance.

E. Milwaukee River Tamarack Lowlands and Dundee Kame State Natural Area

This extensive, 468-acre wetland borders the East Branch Milwaukee River, just south of Long Lake. The community is an intact shrub carr of willow, dogwood, and alder with small pockets of tamarack and a semi-open hardwood swamp. This area contains Dundee Kame, a nearly conical moulin kame, known throughout the world by geologists. The kame is often pictured in geology texts because of its nearly perfect form.

F. Butler Lake and Flynns Spring State Natural Area

This 158-acre area encompasses Butler Lake, a seven-acre shallow hard-bottom lake rimmed by a sedge meadow and a tamarack hardwood swamp; the Parnell Esker, a geologic feature known worldwide and used extensively for education; and Flynns Spring, a small spring brook. The lake has a marl bottom dominated substrate covered with Chara sp. The dominant submerged aquatic species is Potamogeton illinoensis (Illinois pondweed). The dominant floating and emergent aquatics are Nymphaea tuberosa (white water lily), Nuphar varigatum (bullhead lily), and Scirpus acutus (hardstem bulrush). The lake has not been chemically treated. Rainbow trout were previously stocked yearly. The lake will be managed for native species rather than the exotic Rainbow trout. The older tamaracks, which surround most of the lake, have died off, but the species is reproducing along the northwestern and southern shores. The Parnell Esker is 5 to 35 feet in height and runs northeast-southwest for about four miles. Of particular interest is the presence at this site of the dragonfly, Arigomnhus villosines. The area is intact except for the unexplained die-off of tamarack, which is occurring throughout southern Wisconsin. There is a boat ramp at Butler Lake, a hiking trail along the ridge of the esker and an interpretive sign at its base.

G. Johnson Hill Kame State Natural Area

This 14-acre geological feature supports different vegetation and growth forms depending on exposure. The southern, and western-facing slopes of this moulin kame contain species that can withstand a more droughty situation, while the vegetation on the northern- and eastern-facing slopes are more mesic and robust.

H. Kettle Moraine Red Oak State Natural Area

This 418-acre mature southern dry-mesic forest is dominated by red oak with smaller amounts of sugar maple, basswood, white ash, bigtooth aspen, white oak, black cherry, and shagbark

hickory. The sub-canopy is made up of ironwood and saplings of sugar maple, basswood, and ash. This acreage is part of the most extensive hardwood forest located in this part of the state and forms the core of a larger proposed Habitat Preservation Area. Protection of this site is vital given the cutting pressure and the loss of red oak forests on private lands. As this site ages, it will become a prime candidate for research on old-growth red oak forests--a situation that will only be accomplished with protection.

I. Kettle Moraine Red Oak Habitat Preservation Area

This 2,742-acre area will be managed to provide habitat for forest interior species. The forest within the Habitat Preservation Area is similar in species composition to the Kettle Moraine Red Oak Forest State Natural Area but is younger with small multiple-trunked trees. It also contains a conifer plantation, some aspen, and old fields. Timber harvesting and grazing have occurred in this area. Bear Lake, a cattail marsh with shrubby areas interspersed with open water, is also part of the site.

Protection of this forest is important for several reasons. There are few of this type in Wisconsin that contain significant acreage of continuous canopy, and it the only one that is presently state-owned. Since significant populations of forest interior bird species nest here, it is one of only a few opportunities the Department has to preserve habitat for those species that require continuous canopies. These species include Acadian flycatcher, cerulean warbler, hooded warbler, veery, ovenbird, and yellow-throated vireo. Preserving this habitat also benefits those species that require old-growth forest. These species are sensitive to forest fragmentation through decreased productivity associated with increased predation and parasitism near forest edges, isolation mechanisms, and reduced viability because of area requirements for individual species.

Oak forests have been the subject of concern by resource professionals for several years. Red oak prices have risen 4.5 percent annually over the past 20 years while prices for other species such as spruce, hemlock, yellow birch, and hard maples have declined from 0.5 to 2.7 percent annually. Inventory statistics for timber cutting and net growth show that the supply of red oak is substantially diminishing. The loss of red oak forest will increase the pressure to cut red oak. This loss of red oaks, combined with the lack of a successful method of red oak forest regeneration, makes protection of this site imperative.

Establishment of the Kettle Moraine Red Oak Forest State Natural Area will complement the Habitat Preservation Area by providing 418 acres of additional habitat for the species that require interior forest conditions. The State Natural Area will also provide a valuable benchmark to which management effects on the Habitat Preservation Area can be compared.

The Habitat Preservation Area will be a demonstration site for protecting habitat for non-game and rare or declining species. Over time, the ratio of edge to interior in the area will decrease, the forest will be composed entirely of hardwoods, and a core area for forest interior species will be assured.

J. Little Mud Lake Habitat Preservation Area

Little Mud Lake is a 126-acre, muck-bottomed lake surrounded by meadow and swamp forest in the lowlands and southern dry forest on the uplands. It was chemically treated and stocked with northern pike in 1963. However, this practice was discontinued because of winterkill. Waterfowl use the lake, and furbearers use the potholes next to the lake. The most interesting animals, however, are the variety of salamanders reported at the site including red-spotted, blue-spotted, spotted, and tiger salamanders.

Management

The management plans for all of the State Natural and Habitat Preservation areas will consist of annual inspections for and removal of problem exotic species such as purple loosestrife, buckthorn, honeysuckle, and garlic mustard, to search for other factors considered detrimental to the natural area.

None of these species have been found in the Milwaukee River Floodplain Forest; however, all are common in this part of the state. Immediate removal is necessary to prevent rapid infestation.

Inspections will be conducted twice annually to assess the trail standards in the Milwaukee River and Swamp and the Kettle Moraine Red Oak Forest Natural areas, and the trails will be properly maintained.

In addition, special management may be conducted on Dundee Kame to maintain its open characteristics.

A management plan will be developed for the Kettle Moraine Red Oak Forest Habitat Preservation Area. The two goals to achieve in managing this area include protecting the integrity and function of the forest itself, and perpetuating the forest interior species. This will include the removal of exotic species when found.

The 126-acre Little Mud Lake site will be managed to protect the salamanders and their habitat. Management will consist of removing any problem exotic species found. The lake, its surrounding wetlands, and timbered lands will be managed with the ecological needs and perpetuation of the amphibians of special concern in mind. These amphibians require a certain amount of dead, downed wood. A no-cut zone will be established around the lake. Future forest management practices on the remaining portion should include consultation with the Bureau of Endangered Resources staff to assess amphibian needs.

Guidelines for the Protection of Forest Interior Birds and Grassland Birds

Protection of forest interior birds, grassland birds, and other bird species endangered, threatened or of special concern is addressed under natural resources law. The preservation of plant and animal communities containing endangered or threatened species is also discussed. The law further states that the Department shall implement programs directed at conserving, protecting, restoring and propagating selected state endangered and threatened species to the

maximum extent practicable. Specific management actions will be taken where endangered and threatened species are found. The action will depend on the species or groups of species, and the site. Decisions on specific management actions will be made with input and direct involvement of the necessary Department bureaus.

Several groups of birds including forest interior birds, grassland birds, and several species of concern are found within the forest. Due to continued habitat losses and fragmentation, several of these species are experiencing population declines. Unless appropriate management action is taken, these species may be candidates for extirpation. The two major bird groups of concern within the Northern Unit are forest interior and grassland species.

A. Forest Interior Birds

Forest interior species are species whose long-term existence depends on large forested tracts. The results of international research show that bird species are affected either positively or negatively by the effects of forest fragmentation and isolation. Local populations without recruits from large intact forested tracts will be extirpated over time. The research clearly shows that some species need the interior of the forest in which to reproduce with enough success to maintain their numbers. These species are generally neo-tropical migrants having open nests, small clutches, and only one brood.

Three different phenomena negatively affect forest interior species: sensitivity to edges, sensitivity to area, and sensitivity to isolation. Edge sensitivity is imposed by at least three forces--increased competition of those species that do best in edges, increased nest predation inflicted by raccoons, skunks, opossums, snakes, blue jays, and crows; and increased nest parasitism by the brown-headed cowbird.

Birds affected by the area sensitivity phenomena require enough area of appropriate habitat to fulfill all life functions. Some species need adequate continuous habitat to maintain a viable population. For example, the sharp-tailed grouse will not sustain itself on anything less than approximately 10,000 acres. Bird species may experience isolation sensitivity when they are distanced from similar habitats. In this case, there is a greater chance of extirpation of isolated populations.

Forest interior bird species found in the Northern Unit are listed in Table 3. Only those species with a special status are annotated.

Table 3

Forest Interior Bird Species

Bird Species	Status*
Red-shouldered hawk	T
Barred owl	
Whip-poor-will	
Hairy woodpecker	
Pileated woodpecker	
Acadian flycatcher	T
Wood thrush	
Yellow-throated vireo	SC
Red-eyed vireo	
Cerulean warbler	T
Black and white warbler	SC
American redstart	
Prothonotary warbler	
Ovenbird	
Kentucky warbler	T
Hooded warbler	E
Scarlet tanager	

* T = State-threatened, SC = Special Concern, E = State-endangered

Management

1. Maintain appropriate forest interior conditions when sensitive forest interior birds are present.

2. Minimize forest fragmentation.

3. Minimize isolation by connecting forest patches with corridors, if feasible.

4. Use selective cutting on a long-term biological rotation in diverse or riparian forests.

5. Convert pine plantations to hardwoods following the gradual thinning and eventual harvesting.

6. Cut areas suitable for oak regeneration in larger blocks using clearcutting or shelterwood techniques on a longer-term biological rotation that will approach old-growth state. Advanced regeneration work may include the removal of shrub and exotics, prescribed burns, or planting.

7. Retain a 70-percent crown closure of the forest canopy, except for oak and aspen regeneration cuts, using selective cutting or timber stand improvement practices.

8. Increase the rotation length of even-aged stands to 100 years or more, except for aspen.

9. Minimize edge by clearcutting areas in circles or squares.

10. Limit aspen management to the peripheries of any large forested block.

11. Retain several uncut trees, or groups of trees and snags, per acre in clearcutting operations.

12. Preserve vegetative buffers along streams, lake shores, and sensitive plant sites.

13. Minimize right-of-way corridors and roads through large forested areas to prevent the creation of more edge.

14. Plan future intensive development away from large forested areas.

15. Discourage daylighting of logging roads.

16. Restrict landings to forest exteriors.

17. Give high priority to reforesting openings within or between larger wooded tracts.

18. Minimize logging during the breeding season.

B. Grassland Birds

The U.S. Fish and Wildlife Service has identified grassland birds as having suffered the most decline of any bird group over the last 25 years. The three species with the most serious declines are dickcissel, grasshopper sparrow, and western meadowlark--all grassland obligate birds. Grassland birds exhibit the same types of problems from fragmentation as forest interior birds, but grasslands are fragmented by trees and shrubs rather than through the removal of vegetation. Changes in land use practices, especially an increase in row-crop agriculture and an earlier cutting of hay, are also contributing to the decline in grassland bird species.

Grassland bird species found in the Northern Unit are listed in Table 4. Only those species with a special status are annotated.

Table 4

Grassland Bird Species

Bird Species	Status*
Northern harrier	SC
Short-eared owl	SC
Sedge wren	
Bobolink	SC
Eastern meadowlark	
Vesper sparrow	SC
Grasshopper sparrow	SC
Henslow's sparrow	SC
Field sparrow	SC
Dickcissel	SC
Savannah Sparrow	

* SC = Special Concern

Management

1. Manage grassland conditions for grassland birds if these sensitive and declining species are present.

2. Minimize grassland fragmentation and isolation.

3. Remove encroaching woody vegetation, primarily along corridors, fence-rows, roads, and ditches.

4. Restore natural hydrological conditions by filling ditches and reestablishing natural stream meanders.

5. Incorporate an appropriate prescribed burn plan to meet the needs of special concerns species. For example, Henslow's sparrow requires dense duff for nesting and does best with a four- or five-year rotation.

6. Burn only a portion of a grassland in any one year to ensure different grassland conditions for the variety of grassland species.

7. Incorporate mowing with controlled burning to eliminate problem shrubs.

8. Reconstruct prairies on units larger than 40 acres. Smaller units are of limited benefit to grassland birds.

9. Establish a mix of forbs and grasses in prairie reconstruction. Plant grasses and forbs in a patchwork pattern. A mosaic of plants causes a wider diversity of birds to use the site.

Development

1. Inventory the Kettle Moraine Red Oak Habitat Preservation Area for rare species, determine their densities, and map their locations.

Cost $500 Biennium 1991-93

This information will be used to develop a long-range management plan for the Habitat Preservation Area.

2. Develop and erect interpretive signs at Little Mud Lake Habitat Preservation Area.

Cost $300 Biennium 1991-93

Interpretive signs are needed at this site to explain the protection of amphibians, their life cycle, life history, and the importance of protecting wetlands.

3. Inventory forestry compartments 26, 27, and 31 for rare species, determine their densities, and map their locations.

Cost $500 Biennium 1991-93

Present information shows a substantial population of forest-interior bird species. Known breeders in these compartments include red-shouldered hawk, Acadian flycatcher, cerulean warbler, and hooded warbler. An inventory is needed to determine the abundance of these populations and the importance of these compartments to their continued existence. Upon completion of the inventory, these compartments will be classified according to their importance in protection of rare species. If designated a Habitat Preservation Area, a management plan will be developed for the site.

4. Inventory the forest for prairie remnants, rank them, and determine appropriate classifications and management plans.

Cost $2000 Biennium 1991-93

5. Develop a long-range management plan for the Kettle Moraine Red Oak Habitat Preservation Area. This plan will identify the ecological needs for perpetuation of the forest-interior species, and protection of the forest and its ecological functions. The results of the inventory (Project Priority 1) will guide the development of this plan.

Cost $5000 Biennium 1993-95

The management plan will involve the input and professional expertise of the forestry, parks and recreation, wildlife, and endangered resources programs as well as specialists outside the

Department. It may include the continuation and modification of some current activities including aspen management, conifer plantation management, and hardwood management. It will continue to permit all existing recreation uses at the Greenbush group camp and trails. Future management actions will be directed at nurturing a dynamic ecosystem that allows elements needed for species and community protection. Information used to make decisions will include species life history, locations of species, forestry compartments and stands, climate, landforms, soils, relationships of larger- and smaller-scale ecosystems, presettlement vegetation, and human impact areas.

6. Develop information and regulation signs on the long-eared sunfish and greater redhorse state-threatened fish species. Erect the signs at public access points on Mauthe Lake and along the Milwaukee River.

Cost $2000 Biennium 1993-95

7. Inventory the forest for locations of rare plant species.

Cost $5000 Biennium 1993-95

This information will be used to protect rare species and make management decisions. Protection of endangered and threatened species occurrences and their habitats will involve habitat protection, as appropriate.

8. Inventory the forest for locations of rare aquatic animal species and reptiles and amphibians.

Cost $6000 Biennium 1993-95

This information will be used to protect rare species and make management decisions. Protection of endangered and threatened species occurrences and their habitats will involve habitat protection as appropriate.

Operations

1. Continue management actions outlined in State Natural Area management plans. Natural Area management, maintains natural conditions by letting natural processes operate with a minimum of human intervention. Management that simulates the natural forces that shaped the community, such as prescribed burning to maintain prairie-type vegetative cover, is acceptable. Management also prevents or improves adverse affects caused directly or indirectly by human activities. The removal of invasive exotic species that would change ecosystem processes is an example of this type of action.

2. Conduct annual inspections on State Natural Areas to assess the facility and land management needs; threats to plant, animal, or community integrity; and use encroachment problems.

3. Continue breeding bird surveys on the forest.

4. Continue gathering locations of and population information on endangered, threatened, and special concern species.

Fisheries

The lakes and streams of the Kettle Moraine State Forest support a diverse fish population and provide anglers with a variety of fishing opportunities.

Development

1. Construct a disabled access fishing pier at Long Lake.

Cost $20,000 Biennium 1993-95

The Long Lake area receives heavy fishing use and the addition of a pier will enhance fishing opportunities. In particular, fishing piers are extremely popular with both the young and senior citizens.

2. Dredge the spring pond at Glenbeulah Springs.

Cost $25,000 Biennium 1993-95

Dredging will improve the habitat for stocking trout, improve water discharge temperature and increase water discharge to downstream areas.

3. Dredge the fishing pond at the indoor group camp to improve habitat quality for rainbow trout.

Cost $10,000 Biennium 1993-95

4. Construct a carry-in boat access facility at Forest Lake. Construct and post informational signs showing access location.

Cost $5,000 Biennium 1995-97

Carry-in access is appropriate at Forest Lake because of the difficult terrain and shore conditions present.

5. Construct disabled access fishing pier at Auburn Lake.

Cost $30,000 Biennium 1997-99

These 75-foot long piers will provide more forest users with fishing opportunities. Placing fishing attractant structures within easy casting distance of each pier will improve fishing success.

6. Construct a boat ramp and associated roadway for Auburn Lake. Construct improvements to the bridge crossing at Lake Fifteen Creek and on the road leading to access.

Cost $53,300 Biennium 1999-01

The current carry-in access to Auburn Lake is not adequate and prevents some users access to the lake. The bridge crossing at Lake Fifteen Creek needs improvement.

Operations

1. Formulate a task force consisting of Department personnel, resort owners, lake shore residents, and trailered boat users to develop a lake use and access plan for Long Lake. The lake use and access plan is needed to improve safety and the quality of boating on Long Lake.

2. Continue fish stocking at Long Lake, Forest Lake, Crooked Lake, Glenbeulah Springs Lake, Fifteen Creek Watercress Creek and the Mullet River.

3. Use Mauthe Lake as a research site to evaluate the impact of aquatic vegetation management on fish communities. Remove brazon milfoil. Discontinue stocking Rainbow trout in Butler Lake and manage for native species.

4. Conduct comprehensive fishery surveys for Butler Lake, Butzke Lake, Cedar Lake, Mauthe Lake, and Little Mud Lake.

These surveys collect information on the relative abundance and condition of major fish species.

Cultural Resource Management

Wisconsin has been inhabited by humans since the end of the last glacial period approximately 10,000 years ago. The chronicle of their lives, adaptation to changing environments, and use of the resources available in southeastern Wisconsin recorded in archaeological and historic sites. Intensive land use development and urbanization obliterated much of this record, leaving only a small number of sites intact. Once sites are damaged or destroyed, they cannot be reintroduced into the landscape.

Over the past three decades, growing public concern over the loss of human history prompted the enactment of federal and state historical preservation laws. In Wisconsin, recently enacted statutes place responsibility on the Department to manage the cultural resources on it's holdings, including those within the forest.

Management

1. Develop long-term management plans for properties listed on or eligible for the National or State Register of Historic Places (Wisconsin Statutes s. 44.41).

2. Consider cultural resource protection and preservation in any land use changes or development projects.

3. Plant sensitive site areas in grasslands to protect them from future disturbance and looting.

4. Negotiate with the State Historical Society to mitigate adverse affects on cultural resources before any land disturbance activities, in accordance with Section 106 of the Federal Historic Preservation Act of 1966 as amended and Wisconsin Statutes s. 44.40.

5. Consider alternate uses, intact sale, or donation of historic structures before demolition. If If this is not possible, fully document these structures before removal.

6. Provide interpretive and educational programs on cultural resources.

7. Provide educational literature on the preservation and protection of archeological and historic sites.

8. Prohibit collection of artifacts on cropped land and other exposed areas controlled by the Department.

9. Develop friends groups to aid in the preservation of known sites and the discovery of new ones.

10. Work with special interest groups to protect burial mounds, cemeteries, and other culturally sensitive on state holdings within the forest.

11. Prohibit disturbance of burial mounds or cemeteries, marked or unmarked, on the state holdings within the forest.

D. Disabled Access and Use

The Department recognizes its obligation to provide facilities and programs that are accessible to and usable by all segments of the visitor population. Facilities for people with disabilities will be provided on the forest in conformance with applicable laws and regulations. Sensitive design will facilitate this goal. Consultation and coordination regarding accessibility considerations will be developed with local clubs and organizations whose members are disabled.

Existing Facilities

There are designated campsites and restrooms facilities for people with disabilities at the Mauthe Lake and Long Lake campgrounds. Both the indoor and outdoor group camps are accessible. The Mauthe Lake, Long Lake South, Zillmer Trail, and New Fane Trail picnic areas have accessible picnic tables. The Ice Age Visitor Center is also barrier-free.
Extensive recreation areas such as horse, snowmobile and hiking/ski trails and the Parnell Tower, and those areas used for off-road hunting are examples of places not accessible to the disabled.

Planned Facilities

The Department is committed to making existing facilities, where possible, and all new facilities, accessible to people with disabilities. Between 1991 and 1993 the Department will concentrate on updating facilities in primary use areas. These facilities include parking areas, drinking fountains, toilet buildings, contact areas or offices, public telephones, and at least one campsite in each campground. Between 1993 and 1995, the Department will concentrate on updating the forest's ancillary facilities. These include picnic shelters and amphitheaters. Between 1995 and 1997, fishing piers, nature trails, and other forest recreational enhancements will be updated to be accessible to people with disabilities.

1. Build an accessible toilet building at the New Prospect Horse Campground.

2. Construct accessible picnic shelters at the Greenbush and Zillmer picnic areas.

3. Construct an accessible fishing pier at Long Lake.

E. Proposed Land Use Classifications

The forest is divided into five land use classifications--Resource Protection, Resource Management, Intensive Recreation Area, Extensive Recreation Area, and Administrative--each with a set of management guidelines. The guidelines apply only to state-owned land within the forest boundary.

Resource Protection Area

Resource Protection Areas are those tracts of land or water where human influences are minimal, and significant cultural and natural resources are prevalent. Management activities in these areas emphasize the maintenance of natural conditions with a minimum of human intervention and stabilization of natural forces, and limited development. Unique and outstanding geological features of the forest will also be given consideration under this category. Department-owned lands designated as Natural or Habitat Preservation areas are included in this classification.

Natural Areas. Natural Areas are tracts of land or water containing the best remaining examples of native biotic communities or other native features including significant geological or archeological features. There are 2,096 additional acres proposed as State Natural Areas in the forest.

Habitat Preservation Areas. Habitat Preservation Areas are tracts of land where habitat preservation is emphasized. There are 2,868 acres proposed for habitat preservation.

Resource Management Area

Resource Management Areas are those areas whose primary use is for research and the testing of new resource management methods and techniques.

No additional acreage is proposed for inclusion in this designation.

Intensive Recreation Area

Lands under this classification are adaptable to heavy recreational use and are located where active and intensive recreation developments are needed.

No additional acreage is proposed for inclusion in this designation.

Extensive Recreation Area

Lands under this classification contain good examples of native flora and fauna where aesthetics perpetuation or conversion of forest stand management can be carried out, and educational programs, and vegetation management to control insects can be implemented.

There are 1,885 additional acres proposed for inclusion under this classification.

Administrative Area

Administrative areas include headquarters sites, vehicle service and storage buildings, storage yards and associated driveways, and parking areas.

No additional acreage is proposed for inclusion in this designation.

SECTION III - BACKGROUND INFORMATION

A. Regional Context, History of Area and Forest, and Cooperative Projects

Regional context

The Kettle Moraine State Forest-Northern Unit is in southeastern Wisconsin and encompasses portions of Sheboygan, Fond du Lac and Washington counties. The forest is approximately 50 miles north of Milwaukee. There are more than two million people living within 100 miles of the Northern Unit.

The Northern Unit is accessible from Interstate Highway 43 (Green Bay and Milwaukee), U.S. Highway 41 (Fond Du Lac and the Fox River Valley), U.S. Highway 45 (West Bend), and State Highway 23 (Fond Du Lac and Sheboygan).

Major population centers and mileage to the forest are shown in Table 5.

Table 5

Distance Between Major Population Centers and the Northern Unit

Municipality	Population	Miles to Northern Unit
Appleton (Metro Area)	142,000	50
Beaver Dam	14,240	43
Fond Du Lac	37,269	18
Green Bay (Metro Area)	143,000	70
Janesville	52,382	91
Kenosha	77,095	93
Madison (Metro Area)	214,000	84
Manitowoc	32,676	46
Milwaukee (Metro Area)	1,207,000	50
Oshkosh	52,758	45
Racine	81,542	76
Sheboygan	47,836	16
Watertown	18,850	48
West Bend	23,207	18
Whitewater	11,987	73

[1] 1989-90 State of Wisconsin Blue Book
[2] 1988 Wisconsin Road Map

History of the Area

Fifty archaeological and historic sites are recorded in the State Historical Society inventories for the Northern Unit of the Kettle Moraine State Forest.

These sites include sub-surface components of prehistoric and historic Native American occupations as well as historic European structures and cemeteries. Very little systematic archeological survey work has been done within the forest boundary and additional sites may also be present.

The abundant water resources provided an ideal area for human occupation. The lakes, streams, and marshy kettles provided food such as waterfowl, fish, turtles, and wild plants as well as a supply of water for large and small mammals. The upland areas provided nuts and berries for food and habitat for a stable mammal population. The rugged upland terrain and the marshy lowlands did not attract permanent human settlement. Brief trips to the morainal area for food and other resources are suggested by the archaeological remains found to date. The remains show a high potential for small, short-term campsites within the forest boundary, used to gather food and raw material for tool-making. Archaeological sites, found in and around the forest boundary, range in age from Paleo-Indian (ca. 11,000 years ago) to historic Native American. European settlers, primarily immigrants from Scandinavia, Ireland, and Germany, also found the morainal area attractive for its supply of food and timber.

Paleo-Indians

Wisconsin has been inhabited since the end of the last glacial period approximately 10,000 years ago. The first inhabitants, known as Paleo-Indians, were primarily hunters and were organized in small mobile bands consisting of several related families. They followed large mammals such as mammoth, mastodon, bison and ground caribou. Their tool kits included large well-crafted lanceolate spearpoints and butchering tools, made primarily from exotic raw materials.

Most Paleo-Indian sites in Wisconsin consist of isolated artifacts found on upland plowed fields. Few campsites have been found. No Paleo-Indian sites have yet been recorded for the Northern Unit; however, there is a high potential for Paleo-Indian remains to be found on the upland glacial features in the forest.

Archaic Period

Between 8000 and 6500 BC, the glaciers had completely receded from the state and the large mammals dependent on the glacial environment had become extinct. The vegetative species changed with the warmer climate from tundra and spruce forests to a deciduous canopy, alternating with grasslands in drier periods. These environments attracted smaller mammals to the area and people could now take advantage of the wider range of food sources available in the region. This change is reflected in the technology and lifestyle of the people in the Archaic period. The change in lifestyle, however, is not necessarily indicative of a replacement of populations from Paleo-Indian to Archaic times.

Archaic people were organized in small bands, as were Paleo-Indians, but roamed smaller territories than their predecessors. They adapted to the environment in each territory. For example, groups living along the larger lakes appeared to rely on fish and mussel resources while interior groups hunted and collected wild game and available plant species. The tool kits and food remains at these sites reflect food preferences. A variety of tools such as spearpoints for hunting, knives for butchering and plant processing, and axes for wood chopping have been found.

One Archaic culture type is the "Old Copper Culture". These people are believed to have first occurred in Wisconsin around 2000 BC. They used copper from the Lake Superior region for ornaments and tools such as fish hooks, axes, awls, spearpoints and knives. Other artifacts not made of materials found in the region, such as elk antler axe handles and projectile points, swan bone whistles, and marine shell beads, indicate trade with surrounding people.

A second Archaic culture type, known as "Red Ocher Culture" is known to have first occurred in Wisconsin around 1500 BC. This culture is known primarily from mortuary sites, where the human remains were sprinkled with ground hematite. Grave goods are more numerous than in the Old Copper Culture burials and include tools made from stone imported from Indiana and Illinois, copper tools and beads, and necklaces of traded marine shell. The cultural remains of the Red Ocher Culture are primarily found in the southeastern portion of the state, especially in areas bordering the Kettle Moraine.

Although remains from the Archaic period have been found throughout Wisconsin, the greatest concentration has been found in eastern Wisconsin bordering the Kettle Moraine area. An Archaic component was discovered in excavations conducted in the area of the Mauthe Lake Campground. In addition, the morainal area and the adjacent marshy regions hold high potential for finding food processing sites.

Woodland Period

About 1000 BC, overlapping with the Archaic period, significant technological and social changes began to appear. Sometime between 1000 BC and 500 BC, pottery manufacturing in Wisconsin was introduced. The transition from the Archaic period to the Woodland period is characterized by pottery making, human burials placed in mounds and the practice of cultivating native and imported plant species. Since social and economic strategies changed several times during the Woodland period, archeologists divide the period into Early, Middle, and Late Woodland.

Few Early Woodland sites have been found in Wisconsin. Archeological evidence suggests that these people are almost indistinguishable from those in the Archaic period except that pottery is found on Early Woodland sites. The first pottery is crude, with thick walls and grit (crushed stone) temper. Pots were shaped with cord-wrapped paddles. Fingernail impressions, placed on the soft vessels before they are fired, are the first known decorations.

About AD 100, influences from the Hopewell Culture of the Middle Woodland period appear in the southern half of the state. This culture radiated to the region from centers in Illinois and Ohio. Remains of the Hopewell culture contain the first evidence of a structured society

with highly placed individuals and religious centers. During this period, round or conical mounds were built to house the dead. Grave goods include copper axes (some as much as three feet long), earspools, breast plates, headdresses, and platform pipes. Pottery is finer and decorations vary in form and complexity. By 600 AD, many isolated populations had developed, marking the beginning of the Late Woodland.

The Late Woodland in southern Wisconsin contains the first evidence of semi-permanent settlements related to plant cultivation. Although there is evidence of plant cultivation in other portions of the Midwest before 600 AD, no known sites in Wisconsin have produced this data before the Late Woodland period. With the introduction of corn agriculture into the region, the single economic strategy of procuring wild food through hunting, gathering and fishing changed to a dual economy of wild food collection in conjunction with plant cultivation. Local raw materials were used for tools, indicating less contact with outside groups. The most striking feature of Late Woodland in southern Wisconsin is the presence of large mounds representing birds, deer, bears, panthers, turtles and other shapes. Burials have been found in some mounds, but the mounds may have served as territory markers, clan representations, or astronomical alignments. Small triangular projectile points are the sole point type in this period. They persist from the Late Woodland period to historic contact, suggesting that bow and arrow technology was seen as the most efficient hunting method until the introduction of firearms by the Europeans.

Evidence of Woodland activity has been found in the Kettle Moraine region and there is a high probability for additional Woodland sites to be found in the morainal area.

Mississippian Period

The Mississippian period is characterized by a more permanent settlement system due to the increased cultivation of corn, beans and squash, introduction of shell tempering to pottery manufacturing, and the practice of placing the dead in cemetery areas instead of mounds. In southern Wisconsin, it is represented by two different manifestations--Middle Mississippian and Oneota.

No concrete evidence of Middle Mississippian use of the morainal region has yet been found. The Oneota culture had an economic strategy similar to Middle Mississippian, including the cultivation of corn, beans and squash, augmented by wild game, fish, nuts and berries.

A possible Oneota component, as well as evidence of Woodland and possibly Late Woodland activity was excavated during investigations in the area of the Mauthe Lake Campground.

Historic Occupation

It is suggested that prior to contact with Europeans, indigenous people in Wisconsin had contact with eastern groups that were pushed westward by European expansion. These groups brought European made goods to trade with Wisconsin people. The mass migration caused settled groups to move from region to region in response to the threat of disease and the fear of warfare.

Before 1640, two indigenous groups--the Winnebago and Menominee--are believed to have located in southeastern Wisconsin. From 1640 to 1800, the Miami, Sauk, Fox, Potowatomi, Winnebago, Kickapoo, Mascouten and Ottawa were recorded to have settled in or passed through the region. From 1800 to 1833 (the latter date marks the government removal of eastern Indians), the Potowatomi and Winnebago were the primary inhabitants of the region. One historic Native American site has been reported in the Northern Unit. Accounts of early settlers and their descendants tell of many Indian encampments in the morainal area. A high potential for historic Native American campsites exists in the forest, especially along the Milwaukee River.

European immigration to southeastern Wisconsin increased in intensity after 1833. Pockets of primarily Irish, Norwegian, and German settlers appeared by the mid-1800s. Log cabins built by the immigrants are still present within the forest. The National Register of Historic Places lists two properties--a Lutheran church cemetery and a Catholic church and cemetery. Many remaining structures have the potential to provide information about the architectural styles and lives of these early settlers.

History of the Kettle Moraine State Forest

Planning and Acquisition

During the late 1920s and early 1930s conservation leaders in Wisconsin recognized the importance of and need for establishing a state recreational area in proximity to the growing Milwaukee metropolitan area. The additional lands for forestry research and management, and the acquisition of land for flood control were the major considerations in establishing the Northern Unit. The conservationists envisioned a forested area following the line of the hilly and rocky glacial drift from northeastern Walworth County into southern Sheboygan County. The Northern and Southern, Loew's Lake, and Lapham Peak units of the Kettle Moraine State Forest are the result of their foresight.

In the early 1920s, the Milwaukee Chapter of the Izaak Walton League purchased approximately 850 acres of land surrounding Mauthe Lake (then Moon Lake). This property was turned into a game preserve and members of the League stocked pheasants and fish on the property. In 1936 the League offered to deed this land to the State of Wisconsin for $10,000, provided the land remain a wildlife refuge. This transaction, authorized by the Legislature, was the first purchase of land in what is now the Northern Unit of the Kettle Moraine State Forest.

Cooperative Projects

There are three cooperative projects in the Northern Unit including the Ice Age National Scientific Reserve, the Ice Age National Scenic Trail, and the Dundee Timber Harvest Demonstration Forest.

Ice Age National Scientific Reserve. The Reserve is a cooperative project formed between the State of Wisconsin and the National Park Service on October 13, 1964. It encompasses 20,000 acres of forest land north of County Highway SS.

The purpose of the Ice Age Reserve is to assure protection, preservation, and interpretation of the nationally significant values of Wisconsin's continental glaciation. The glacial remnants include moraines, eskers, kames, kettle holes, drumlins, swamps, and lakes.

Ice Age National Scenic Trail. The trail is a cooperative project formed between the State of Wisconsin and the National Park Service on October 3, 1980. A section of this trail also runs through the Southern Unit. The purpose of the 1000-mile long Ice Age National Scenic Trail is to link together the units of the Ice Age National Scientific Reserve. The trail system is an additional way to expose people to both the beauty and geologic remains of the Ice Age.

Dundee Timber Harvest Demonstration Forest. In 1946, a memorandum of understanding between the Department of Natural Resources, the Lake States Forest Experiment Station of the U.S. Forest Service, and the University of Wisconsin Extension Service was signed, creating the Dundee Timber Harvest Demonstration Forest. The demonstration forest was established on 65 acres of state-owned lands in southeastern Fond du Lac County. The effects of periodic harvesting and the maintenance of adequate forest growing stock are demonstrated.

The first hardwood saw-log sale was conducted in 1946 at Dundee, with a harvest equal to the net annual growth. A series of permanent inventory plots were also established to study the effects of different silvicultural systems on the perpetuation of the oak timber type. Since 1946, a series of eight additional harvests have been completed or planned. The last one will be conducted in 1992, but the 1985 management plan recommends management of the forest through 2007.

B. Current Management Programs, Uses and Capabilities

Recreation is the primary use of the Northern Unit. The forest is managed for a variety of recreational activities including camping, picnicking, hunting, fishing, hiking, snowmobiling, horseback riding, nature study, cross-country skiing, automobile touring, bicycling, swimming, and dog trialing and training. Approximately 659,000 people used the forest in 1988.

Recreational Facilities. Locations of the facilities are on Map 6. They include two traditional campgrounds, two group camps, ten picnic areas, three beaches, and trails for a variety of uses during all seasons. Unique facilities include the Ice Age Interpretive Center and 31 miles of the Ice Age National Scenic Trail.

Endangered Resources. Pursuits related to endangered resources include natural area interpretation, individual nature study, educational uses, research, rare species observation, and rare community observation. The protection of endangered resources is ensured in the forest. Major management activities include burning, brush removal, exotic species removal, restoring natural stream flows, rare bird research, rare plant monitoring, and ecosystem management.

Forestry. Forestry is a major land use and management activity in the Northern Unit, with approximately 64% of the acreage forested. In mixed oak stands, management has consisted primarily of harvesting mature timber, and conducting salvage and sanitation harvests, and post harvest treatment. The conifer plantations are managed primarily with pruning and thinning.

Wildlife. Wildlife-related activities include hunting, trapping, bird watching, photography, and education. Wildlife and habitat management techniques used on the forest include wildlife surveys, harvest regulations, controlled burning, cooperative farming agreements, nesting cover creation, vegetation succession management, general forest management, the reintroduction of wild turkeys, annual pheasant stocking, and other habitat creation and management.

Water Bodies. The lakes and streams in the Northern Unit provide year around fishing opportunities for bass, northern pike, trout, and panfish. Management includes stocking desirable species, catch and release regulations, and habitat improvement. Creel surveys are periodically conducted to determine management needs.

SECTION IV - RESOURCE CAPABILITIES AND INVENTORY

A. Soils, Geology, and Hydrology

Soils

The soils of the Northern Unit are generally wind-blown glacial deposits and limey glacial till of a loamy texture. Moderately deep to shallow loams and associated stoney soils are also present. Wet soils occupy the many wetlands in the area.

The predominant upland soils in the forest are the Casco-Rodman association, characteristic of glacial activity. These soils are mainly droughty, shallow and subject to severe erosion. Both oak and central hardwoods as well as red and white pine plantations grow on these soils. The lowland soils are primarily of the Houghton-Palms-Adrian association. They are very poorly drained organic soils found along drainageways, and in depressions and old lake beds.

The topography of the Northern Unit is unique, consisting of kames, eskers and kettle holes or potholes. The slopes average 15 to 40 percent. Erodibility and steepness of the topography may limit some types of land use.

Geology

Three bedrock formations--Galena Dolomite, Maquoketa Shale and Niagara Dolomite--are present beneath the forest. All three formations were created during the Paleozoic Era which covered a time span of 375 million years and ended 225 million years ago.

Galena Dolomite consists of shallow sea deposits and varies in thickness from 125 to 250 feet. The Maquoketa formation also consists of shallow sea deposits and varies in thickness from 165 to 240 feet. Niagara dolomite, like the previous two formations, consists of shallow sea deposits from shells and corals that contain lime, and from lime precipitated by certain plants. This formation ranges from 450 to 800 feet in thickness and is very erosion resistant. An outcropping of Niagara dolomite occurs in the forest.

The most dominant and unique feature left by the Wisconsin glacier is the interlobate moraine. It was formed 15,000 years ago when two lobes of the Wisconsin glacier came together along an irregular line stretching from Richmond in Walworth County, through the Oconomowoc Lake country to the southern part of Kewaunee County. The resulting pressure, friction and buckling as the two massive ice lobes collided, caused the melting ice to deposit tremendous loads of rocks, gravel and sand between the lobes, forming the interlobate moraine.

The interlobate moraine differs from other types of moraines by its sharpness of topography. This moraine varies in width from one mile to ten miles, and in some places rises 100 to 300 feet above the surrounding lands. The surface of the interlobate moraine is generally marked by broad swales, bulky hills, knobs and kettles. Most of the kettles are somewhat shallow, yet a few reach depths of 60 to 80 feet.

Hydrology

Regional groundwater supplies to the Kettle Moraine area are abundant. The aquifers yielding groundwater in the Northern Unit include sand and gravel at 0-400 feet, Silurian Dolomite up to 300 feet, and Deep Sandstone up to 2000 feet. The chemical quality of the water in the underlying aquifers is similar and is generally very hard.

The source of groundwater in the forest is precipitation, which infiltrates the soil and recharges the aquifers. The amount and rate of infiltration is dependent on the materials overlying the aquifer. The major groundwater uses in the area are shallow wells for residences or other low-capacity activities.

B. Aquatic Resources

Rivers

The principal drainage systems in the Northern Unit are the Milwaukee and Sheboygan rivers. Both river basins drain into Lake Michigan.

There are six streams within the forest boundary totalling 30 miles in length. The majority of these are headwater streams that have a stable flow from groundwater input. Water temperatures tend to be cool, gradients low to moderate, and water quality good. In general, the water is hard and highly fertile. There are coldwater streams that support trout species and warmwater streams that support northern pike, bass and panfish.

Watercress Creek. This creek, which originates from a series of springs, is the headwaters of the Milwaukee River. It flows 4.6 miles through privately and publicly owned land to the north end of Long Lake. The downstream 2.1 miles are bordered by extensive cattail marsh and tamarack swamp on both sides and watercress is abundant throughout the stream. Water quality is good except for some agricultural pollution in the upstream reaches.
The creek has been stocked with brook trout. Near Long Lake, the waters in the stream are wide and warmer, and northern pike, largemouth bass and bluegill predominate.

East Branch of the Milwaukee River. This stream originates as the outflow of Long Lake in the Northern Unit. After it combines with a tributary from the east, it flows through the Dundee Marsh before entering Mauthe Lake. Within the forest boundary there are 23.4 miles of shoreline (11.7 miles on each side), of which 17.5 miles is publicly owned. Aquatic vegetation is common to abundant in the river, and the water is clear most of the year. Use along much of the river is limited due to the lowlands and marshes bordering it.

The river supports largemouth bass and northern pike fisheries in the section between Long and Mauthe Lakes. Black crappie and rock bass are commonly caught and walleye, largemouth bass and northern pike are occasionally caught in the stretch of river south of Mauthe Lake. Carp and suckers are present, but do not present a management problem.

Lake Fifteen Creek. This 7.4 mile-long spring-fed creek originates as the outflow of Cedar Lake. The creek flows through Auburn Lake, also known as Lake Fifteen, and then joins the Milwaukee River. Five miles of the stream flow through forest land. One and one quarter miles of the creek are considered a class II trout stream. The stream is regularly stocked with brook trout with some natural reproduction occurring.

Butler Lake Outlet Stream. This 3.6 mile-long stream flows out of Butler Lake. The stream joins a stream joins another stream and forms the East Branch of the Milwaukee River where it merges with the outlet of Long Lake. The stream contains northern pike, largemouth bass, minnows, panfish and bullheads.

The Unnamed Stream. This stream flows west from Lake Seven and Crooked Lake, through the southern end of the Mauthe Lake Use Area into the Milwaukee River. The stream is approximately six miles long, and eight feet wide with a depth of one foot. It has a sluggish to intermittent flow, and a mud bottom.

Mullet River. The Mullet River passes through .6 miles of the forest. The river is 36 miles of hard, warm water that cools as it flows east and picks up spring inflows. The section of the river running through the Northern Unit is a class II trout stream. Besides brown trout, the stream also contains northern pike, panfish, minnows and rough fish.

Lakes

There are 21 lakes within or bordering the Northern Unit. These lakes account for 915 acres, ranging in size from 427 acres to less than one acre. Three of the four hydrological lakes in the Northern Unit were formed by glacial action. Most of the lakes are seepage lakes, having no inlet or outlet. Drainage lakes have an inlet and an outlet, and derive a large part of their volume from inflowing surface waters. Such lakes generally have large drainage areas and are therefore more fertile. Spring fed lakes are least abundant and have outlets reflecting the spring sources. Most waters in the Northern Unit are inherently fertile. The Dolomitic rock causes high calcium and magnesium levels, and runoff from heavy soils contributes additional nutrients.

Auburn Lake. Auburn Lake is a hard water drainage lake with two distinct basins connected by a shallow, narrow channel. Nearly half the shoreline of both basins is a marsh bog, and the lake bottom is primarily marl and muck with some sandy areas. Lake Fifteen Creek is a tributary to the lake. The lake does not winter kill. It lacks serious aquatic vegetation or pollution problems. The Spring Lake Scientific Area borders the southeast shore of the northern basin. Total state ownership is approximately .7 miles of the 2.4 miles of total shoreline. Auburn Lake is 107 acres and has a maximum depth of 29 feet.

The lake supports a small population of largemouth bass and northern pike. There are also several slow growing panfish including bull heads, bluegill and yellow bass present.

Butler Lake. Butler Lake is completely within the property boundary and has one-half mile of shoreline. The lake is seven acres in size with a maximum depth of 13 feet. Flynn Spring drains into the lake and contributes to the high water quality of the lake. A walk-in access site provides non-motorized boating on the lake. The lake bottom is mucky except for some marl in shallow areas on the east shore. A bog surrounds all but the west shore of the lake. There is limited picnic sites and parking for the Butler Lake hiking trails.

Butler Lake has been managed primarily for rainbow trout--an exotic. It had been stocked with 1,000 rainbow trout each spring in recent years. Other species present include largemouth bass, bluegill, yellow perch and bullheads. The largemouth bass population is small and the panfish slow growing.

Crooked Lake One and one-half miles of Crooked Lake's 2.25 miles of shoreline is in state ownership. The lake bottom is primarily soft muck with some areas of sand along the northeast shore where private development has occurred. A small area of marl bottom is near the outlet on the south end of the lake. Aquatic vegetation is very abundant in this 91-acre lake. The maximum depth of Crooked Lake is 32 feet.

The fish population is dominated by northern pike, bluegill, pumpkinseed, sunfish, yellow perch and black crappie. Northern pike are stocked on alternate years to sustain a population in the lake. Largemouth bass populations are small and reproduction success is sporadic.

Forest Lake. This is a kettle lake surrounded by steep wooded hills. The marsh shoreline on the southern end of the lake borders a heavy muck and detritus lake bottom. A gravel bottom is found along the east shore and on offshore shoals. There are 1,600 feet of shoreline in public ownership. The forest maintains a walk-in access on the southwest shore. The shoreline is developed except for those areas that are in public ownership. This 50-acre lake has good water quality and a maximum depth of 27 feet. Aquatic vegetation is abundant, but not in problem densities.

Forest Lake has a history of severely stunted panfish and heavy parasite infestation of fish. Various attempts have been made to stock the lake, beginning in 1933 when the lake was stocked with perch, crappies, rock bass, bullhead, bluegill, northern pike, sunfish, pickerel and largemouth bass. More recently, largemouth bass and walleyes were stocked to provide additional predation of the panfish.

Long Lake. Long Lake is the most important lake in the Northern Unit from the standpoint of water-based recreation. Over 8,000 feet of frontage of this 427-acre lake is in public ownership. Long Lake State Recreation Area occupies most of the shoreline and includes a public boat launch, two beaches and one mile of marsh shoreline. Intensive private development has occurred along the west and northeast shores, including a Boy Scout Camp at the north end of the lake. The water quality of Long Lake has declined in recent years due to increased nutrient input from unidentified sources.

The fish population in Long Lake has historically been in good condition. The lake has been stocked with white bass, largemouth bass and walleye. Recent surveys have found good natural production of both bass species. Walleye reproduction, however, has been poor due to degraded spawning habitat and water quality.

Mauthe Lake. The East Branch of the Milwaukee River forms both the inlet and outlet of Mauthe Lake. A fixed spillway dam at the outlet maintains a head of three feet. The 78-acre lake is somewhat shallow, with a maximum depth of 22 feet. Marsh bogs surround the lake with abundant aquatic vegetation. In recent years increased nutrient loading from unidentified sources has led to more abundant aquatic vegetation to the point of threatening the lake's recreational value.

The bottom of Mauthe Lake has soft sediments of muck, detritus and silt, intermixed with boulders on the west and north shores. Sand is the main material along the east and west shores interspersed with patches of soft sediment. The entire shoreline of the lake is in the

forest. The forest headquarters and maintenance complex occupies the west side of the lake and the Mauthe Lake Recreation Area occupies the east side. A launch ramp, and fishing pier for non-motorized boats are included in the recreation area. A nature trail encircles the lake. The major fish species found in Mauthe Lake include northern pike, largemouth bass, bluegill, yellow perch, black crappie and bullheads. A few large walleyes are occasionally caught, as are a few large bass. Bluegills and crappies are very abundant and exhibit slow to average growth.

Lake Seven. This is a 26-acre lake. It has a muck bottom except along the northern shore where it is sand. The west and south shores are wooded, the east shore is marshy, and a private trailer park exists along the north shore. The maximum depth of the lake is 25 feet. Aquatic vegetation is abundant in areas less than 15 feet deep. There is approximately one mile of shoreline in public ownership. A small public boat landing for non-motorized boats is present at the southeast corner of the lake.

Largemouth bass and bluegill are the major fisheries in Lake Seven. A survey in 1987 found both species to be abundant and growing at an above average rate. Walleye and northern pike were stocked in the 1960s, but are not an important part of the fish community.

C. Vegetation and Wildlife, and Endangered Resources

Vegetation and Wildlife

The Northern Unit is comprised of oak and mixed hardwoods, pine plantations, open marshy wetlands, restored prairies, and agricultural fields. Vegetation manipulation is a widely used management tool. Brushing, sharecropping, and controlled burning are used to maintain forest openings and provide extra food for deer and other species.

A variety of wildlife species, game and non-game, make the forest their home. The species and their habitats by vegetation cover type are described below. A general description of the forest deer herd and other species is also outlined.

Northern Hardwoods (southern mesic forest). This cover type usually lacks nut-producing tree and shrub species and has a low density understory. It has a relatively low value for game species.

White-tailed deer use the northern hardwood type mainly for traveling between feeding and resting areas. Songbirds such as the redstart, scarlet tanager, and cerulean warbler nest in the canopy. Winter foraging species including black-capped chickadees, nuthatches, brown creepers, and woodpeckers use this cover type, especially if older trees and snags are present. Gray squirrels, flying squirrels, ground nesting ovenbirds, and woodland deer mice are also residents. Red-tailed hawks, great horned owls, woodchucks, and chipmunks would be expected near the edge of this cover type.

Upland Brush and Grass. The upland brush and grass cover type is one of the better cover types for wildlife. Its value is enhanced by its irregular configuration on the forest. Ruffed grouse, wild turkey, white-tailed deer, woodchuck, white-footed mice, red fox, striped skunk, song sparrow, catbird, fox sparrow, indigo bunting, myrtle warbler, brown thrasher, and cottontail rabbit are some of the more common inhabitants of this cover type.

Oak and Central Hardwoods (southern xeric forest). This type is one of the most productive forest types for wildlife. It provides browse and mast for white-tailed deer, wild turkeys, wood ducks, ruffed grouse, squirrels, rodents, and songbirds. The more open stands with a lot of underbrush will support the towhee, brown thrasher, blue-jay and phoebe. As the tree species in this type mature, they provide more nesting cavities than most types. Woodpeckers, raccoon, squirrels and screech owls would be expected to inhabit these areas provided other habitat requirements were met within their home range.

The oak and central hardwoods type on the forest is maturing and has a light to moderate understory of shrubs and herbaceous growth. Much of this cover type occurs in stands less than 50 acres in size and is distributed over a large area. This enhances its value to wildlife.

Aspen. Aspen is a good wildlife cover type and is preferred by a variety of wildlife species. Young aspen growth provides excellent brood rearing habitat for ruffed grouse and woodcock. The aspen's succulent shoots and leaves comprise one of the most important summer foods for white-tailed deer. Aspen stands that are approximately ten years old provides little ground cover. This provides ideal cover conditions for drumming male ruffed grouse in the spring. The cover is thin enough at the ground level to let them see mammalian predators. Winter bud production of value to wildlife begins at approximately 15 years and trees 25 years of age provide the best winter bud production for ruffed grouse.

Upland and Lowland Conifer Plantations. The conifer type is valuable for providing cover and some nesting. The best cover is provided during early growth stages or when lower branches are retained. Norway spruce tends to have greater value than other conifers because it retains its lower branches. Upland plantations of red and white pine lose their value with age as they are thinned and pruned, eliminating many of the branches used by small mammals. The conifer plantation type is enhanced somewhat by the fact that they are small and scattered throughout several different cover types of the forest.

Wildlife using this cover type include mourning doves, sharp-shinned and Cooper's hawks, red squirrels and cottontail rabbits. Migratory songbirds and wintering birds, including turkeys and grouse, use this type during inclement weather. Research has found that white pine plantations that are near open water are preferred winter roost sites for turkeys. White-tailed deer use dense conifer plantations as escape cover during cold weather. Also, white cedar browse is present on some of the lowland sites.

Agricultural. The agricultural cover type consists of idle croplands (old fields) and croplands under sharecrop agreements. The total acreage of this type in the Northern Unit is about 2,170 acres. This type has good wildlife value, providing primarily nesting cover and food. Ruffed grouse, woodcock, cottontail rabbits, wild turkeys, squirrels, raccoons, and pheasant use the edge, while meadowlarks, killdeer, bluebirds, bobolinks and vesper sparrows use the interior. Hay and oat fields provide good brood cover for wild turkey and other species. High populations of small mammals such as meadow voles and prairie deer mice would be expected in these areas. Garter snakes and smooth green snakes are other common inhabitants. Birds of prey such as kestrels, harriers, and short-eared owls spend much of their time hunting in this cover type. Skunks and foxes also spend much of their time foraging for food here.

There currently are 314 open fields inventoried in the forest. Information available on each field includes acreage, soil type, soil capacity, hazards (e.g. erosion and wet spots), adjacent cover types, and present cover. The Department currently sharecrops 1100 acres in 143 fields and has hay sales on about 355 acres in 27 fields. The remainder are in the old field classification.

Agricultural cover types are primarily hay, corn, and assorted small grains. In recent years, sharecropping has been used to prepare some fields for establishing native prairie grasses. Agricultural crops or prairie grasses provide some of the following habitat components: winter food plots for wild turkey, deer, pheasants, squirrels, rabbits, song birds, etc; brood cover for gallinaceous birds; nesting cover for waterfowl, songbirds (including some rare grassland species) and pheasants; roosting and displaying areas for woodcock; grazing areas for white-tailed deer; and in some cases act as lure crops to keep deer from damaging adjacent private croplands.

Fencelines/Hedgerows. Hedgerows can be a very important component of wildlife habitat. They provide traveling lanes, resting areas, and food and nesting sites for wildlife. Species using fencelines include robins, catbirds, song sparrows, ring-necked pheasants, woodcock, white-footed mice, masked shrews, cottontail rabbits and white-tailed deer.

Wetlands. Wetlands are one of the most beneficial and productive cover types for wildlife. Wetland types in the forest range from fresh meadows and cattail marshes to kettle potholes and rivers.

Inland fresh meadow wetlands are typically vegetated by reed canary grass and sedges. This habitat type is especially important to small mammals such as meadow voles, shrews, moles, and mice. Bobolinks can be found in this habitat. Ring-necked pheasants use the wetland type as nesting and resting cover. Blue-winged teal and mallards use this type for feeding and nesting. Marsh hawks are also common visitors.

The vegetation of inland shallow fresh marshes includes grass, bulrushes, spikerushes, and other marsh plants such as cattails, arrowheads, and smartweeds. These wetlands are used extensively by waterfowl for nesting and feeding habitat, and together with deep fresh marshes constitute the principle production areas for waterfowl. Some mammalian inhabitants include muskrat, raccoon, opossum, mink and white-tailed deer. Marsh wrens, swamp sparrows, red-winged blackbirds, waterfowl, and shorebirds are common avian inhabitants. Inland deep fresh marshes have vegetation including cattails, burreeds, bulrushes. spikerushes, and wild rice. In deeper water, pondweeds, naiads, coontail, watermilfoils, duckweeds, and water lilies may occur. Deep fresh marshes provide important brood rearing and feeding areas for waterfowl. Common mammalian visitors include raccoon, opossum, muskrats, and mink. Waterfowl, yellow-headed blackbirds, and marsh wrens can be seen regularly in these areas.

Shallow ponds and lakes are common in the Northern Unit. At water depths less than six feet common vegetation includes stonewart, cattail, softstem bulrush, sago pondweed, and white water lily. These wetlands are used extensively as brood rearing areas during mid- and late-summer when less permanent marshes dry up. The vegetated fringes of these wetlands are used by ducks for feeding and nesting areas. Several species of shorebirds and red-winged blackbirds can be found near shorelines. Raccoon, opossum, mink, and muskrat can also be found near the shoreline.

Typical vegetation of shrub swamps includes alder, willow, and dogwood species. Shrub swamps are primarily found along the rivers and creeks in the Northern Unit. Shrub swamps are used to some extent by waterfowl for nesting, but are most important as woodcock and ruffed grouse habitat. Common mammalian visitors include white-tailed deer, cottontail rabbit, red fox, and small mammals such as white-footed mice, and shrews. Avian inhabitants include myrtle warblers, song sparrows and black- capped chickadees.

Wooded swamps occupy about 3,030 acres of the Northern Unit occurring mainly along rivers and streams, but also occurring on flood plains or in very shallow lake basins. Wooded swamps are often associated with shrub swamps. Common mammalian inhabitants include white-tailed deer, cottontail rabbits, raccoons, white-footed mice, and shrews. Ruffed grouse, woodcock, white-breasted nuthatches, downy and hairy woodpeckers, pileated woodpeckers, and red-shouldered hawks would be expected to use food and cover found in this type. Ring-necked pheasants use this type along with shrub swamps for winter cover and food.

Deer. The white-tailed deer is probably the most popular species in the forest for both hunting and observation. Deer are found throughout the forest during most of the year with winter concentrations in larger swamps, along river bottoms, and near winter food patches. The number of deer in the forest varies from year to year and between seasons, but averages around 1000 in the fall. Population management is necessary on a property of this size to control habitat degradation, damage to agriculture, and car-deer accidents.

Wild Turkey. The eastern wild turkey is native to the Northern Unit. Turkeys disappeared approximately 135 years ago due to complete timber removal, unrestricted hunting, intensive agriculture, and an introduction of domestic fowl as well as their diseases.

The eastern wild turkey was reintroduced in early 1985 after field investigations by several leading turkey biologists. Birds from southwest Wisconsin were live-trapped and released at several locations throughout the forest. In the summer of 1988 surveys showed that the population had flourished throughout the forest.

Game Birds. The ruffed grouse and the American woodcock are also important woodland game birds. These species are present throughout the forest in upland and lowland brush types and in early successional forest types. Ruffed grouse exhibit cyclic population fluctuations. Woodcock numbers increase temporarily during spring and fall migration periods.

Ring-necked Pheasant. Another game bird found in the forest is the ring-necked pheasant. Since the pheasant adapted to more agrarian landscapes, the forest does not provide good habitat and the wild pheasant population is low. Pheasant hunting opportunities are enhanced through stocking of state game farm birds each fall.

Endangered Resources

The Northern Unit contains many species and communities of endangered resource concern. These are the pieces left from the vast dynamic ecosystem that was Wisconsin at the time of settlement. Humans have radically altered these ecosystems, especially the forests in southeastern Wisconsin, to such an extent that nearly all that remain are fragmented, isolated, and changed, and no longer function as an ecosystem. The only area under state ownership in southeastern Wisconsin that retains parts of a functioning forest ecosystem is the Northern Unit. At the time of settlement, what is now the Northern Unit was primarily a dynamic mix of forest (sugar maple, basswood, and beech), wet mesic forest (silver maple, elm, and black ash) and northern swamp relics (black spruce, tamarack and white cedar). There were also areas where oaks and even oak openings were part of the landscape. These forests were used to varying degrees by settlers, but due to the rugged topography and swampy areas, the Northern Unit retained more parts of the forest ecosystem than did the rest of southeastern Wisconsin.

The communities and species of concern, known to occur on the Northern Unit, are outlined in Table 6. These are the remaining parts of the presettlement landscape and the most threatened. Several species have already been lost, including the cougar, wolverine, timber wolf, and passenger pigeon. Without changes in land use, there will be many more species and communities lost from this area. The endangered resources remaining today are primarily concentrated in small fragments that have been the least altered. These fragments are under continued pressure to be fragmented even further and degraded into altered systems with little resemblance to the original communities.

The plant and animal species listed in Table 6 will be lost unless their respective communities are managed as part of a larger ecosystem. This still may not be enough, however, to ensure the continued existence of these species. There will be significant biodiversity losses without restoring the intervening dynamic ecosystems. The Northern Unit offers the best opportunity in southeastern Wisconsin of establishing a large, fairly complete, functioning forest ecosystem.

The species listed represent known occurrences, and require special interim management to assure their existence until the landscape can be managed as an ecosystem. Many species and their habitats are sensitive to disturbance. A complete inventory of the forest will be conducted as soon as funds are available. Appropriate protection and management of state-endangered and threatened species and communities found in the future will be taken.

Table 6

Endangered (E) and Threatened (T) Species
and Special Concern (SC) Species

Scientific Name	Common Name	Status	Number of Occurrences
Plants			
Cypripedium reginae	showy lady's slipper	SC	2
Gentiana alba	yellowish gentian	T	1
Hydrastis canandensis	golden seal	SC	2
Lithospermum latifolulum	American gromwell	SG	1
Popa paludigna	bog bluegrass	T	1
Panax quinquefolia	American ginseng	SC	1
Animals			
Calephelis muticum	swamp metalmark	T	1
Argomphus villosipes	unicorn clubtail (dragonfly)	SC	1
Erimyzon sucetta	lake chubsucker	SC	3
Etheostoma microperca	least darter	SC	2
Lepomis megalotis	longear sunfish	T	3
Notropis anogenus	pugnose shiner	T	4
Rana palustris	pickerel frog	SC	1
Accipter cooperii	Cooper's hawk	SC	2
Ammodramus Henslowii	Henslow's sparrow	SC	1
A. savannarum	grasshopper sparrow	SC	1
Buteo lineatus	red-shouldered hawk	T	9
Childonias niger	black tern	SC	2
Circus cyaneus	northern harrier	SC	1
Dendroica cerulea	cerulean warbler	T	4
Dolichonyx oryzivorus	bobolink	SC	1
Empidonax virescens	Acadian flycatcher	T	4
Mniotilta varia	black and white warbler	SC	5
Spiza americana	dickcissel	SC	1
Wilsonia citrina	hooded warbler	T	2
Spizella pusilla	field sparrow	SC	5
Poocetes gramineus	vesper sparrow	SC	5+
Vireo flavifrons	yellow-throated vireo	SC	10+

D. Historical and Archeological Features

Currently, 50 archeological and historical sites are inventoried with the State Historical Society (SHSW). Of that number, two areas are on the National Register of Historic Places--St. John's Evangelical Lutheran Church and cemetery, and St. Matthias Catholic Church and cemetery, both near the town of New Fane. Other historic sites, some not yet inventoried with SHSW, include the Glenbeulah Cemetery, the Greenbush Cemetery, the Methodist church in Greenbush, the Old Stage Coach Trail, the Spruce Lake Bog, St. Michael's Church and cemetery, and the Dundee Catholic cemetery. Prehistoric archaeological sites, ranging from 10,000 years ago to the time of European contact, also exist in the Northern Unit. See Section III - Background Information for additional descriptions of the cultural resources.

These 50 known sites are a fraction of the cultural resources present on the property. No systematic survey of the property has been conducted as funds for this type of activity are not available. The Department will continue to consider statutory responsibilities toward cultural resources during any land disturbing activities.

Archaeological and historic sites reported to the State Historical Society of Wisconsin (SHSW) are included in four inventories housed there--the Wisconsin Archeological Sites Inventory, the Burial Sites Inventory, the Wisconsin Inventory of Historic Places, and the State and National Register of Historic Places. Specific locations are covered by a legal confidentiality clause and are available at the discretion of SHSW. Cultural affiliation for the sites are described in this section. Additional information on these sites is available at SHSW.

E. Present Land Use Classifications

The following land use classifications presently delineate the primary use of a particular part of the Northern Unit and help establish management and development priorities. Additional discussion of these categories and sites is in Sections II and III. The locations of the land use classification areas are shown on Map 7.

Resource Protection Area

The five State Natural Areas under this category, totalling 511 acres, are outlined below. Management activities in these areas emphasize the maintenance of natural conditions with a minimum of human intervention and stabilization of natural forces, and limited development. Tree and brush removal and prescribed burns will be conducted.

Spruce Lake Bog. Spruce Lake is a 117-acre undisturbed shallow bog lake, fed by seepage and situated in one of the many kettle holes characteristic of the interlobate glacial deposits. Its water is moderately hard and supports a dense, floating-leaved aquatic flora. Surrounding the lake is a bog forest of tamarack and black spruce. An outer zone of swamp hardwoods includes black ash, red maple, yellow birch, and white cedar. Carnivorous plants that are present include pitcher plant, sundews, and bladderworts. The diversity of shrubs in the swamp forest indicates the area's high natural quality and includes speckled alder, purple chokeberry, willows (several species), round-leaved and redosier dogwoods, labrador tea, winterberry, bog birch, leatherleaf, bog rosemary, poison sumac, mountain holly,

meadowsweet, cranberry, and blueberry. Several bird species with northern affinities nest in the forest, including northern waterthrush, Nashville warbler, Canada warbler, and white-throated sparrow.

Access to the site is limited to a boardwalk due to the fragile nature of the bog plants.

Haskell Noyes Memorial Woods. This 67-acre site lies on the interlobate moraine formed between the Green Bay and Lake Michigan lobes of the Wisconsin stage of glaciation. The soils are Casco-Rodman, Fox and Lapeer loams, and silt loams. A high percentage of gravel is found in the soils and therefore steep slopes are subject to erosion. Except for a small area of tamarack and swamp hardwoods on the north end, the forest type is upland hardwood forest dominated by sugar maple and red oak. Next in importance are basswood and ironwood with smaller amounts of black cherry, bitternut hickory, American elm, and paper birch. The forest understory is open with few shrubs, a rich spring flora, and a variety of ferns. Management consists mainly of litter removal near the road.

Spring Lake. Spring Lake is a 47-acre alkaline bog lake of high transparency with a marl bottom. Aquatic vegetation is sparse and consists of yellow water lily, bladderworts, pondweeds, and chara. The shoreline is an undercut bog shelf under which fish find refuge. Northern pike and large mouth bass are present. Mats of vegetation dominated by narrow-leaved cattails and bulrushes surround the lake, and many sedges and forbs characteristic of both acid bogs and calcareous fens occur together. The narrow mat gives way to a tamarack forest on the east. To the south the swamp forest is composed of elm, red maple, yellow birch, and tamarack. Along the northwestern shore is a shrubby region of bog birch, willows, dogwood, and alder.

Breeding bird surveys have shown an abundance of warbler species including blue-winged, golden-winged, black and white, Nashville, mourning, and yellow.

This site does not require community management. Periodic site inspections and monitoring are conducted.

Milwaukee River and Swamp. This 230-acre area of the East Branch of the Milwaukee River and adjacent Swamp features almost one mile of a slow, meandering, warmwater stream of medium size, and the accompanying shrub zone, lowland hardwood forest, conifer swamp, and small bog lake. The river bottom is mucky with sand and gravel areas. There is a good population of northern pike, black crappie, walleye, and several unusual smaller forage species. Aquatic plants include Nymphaea, Myriophyllum, Ceratophyllum, Elodea, Snirodella, Najas and several Potamogeton species. One large spring, 1000 feet long, feeds the river in the northern portion of the tract. Bordering the river is a dense shrub zone that changes abruptly to a yellow birch, white birch, American elm, black ash, and basswood lowland forest. East of the small lowland forest area is a thicker conifer understory. A small bog lake occurs in the eastern portion of the natural area. The diverse lowland forest types produce unusual bird associations, including the nesting of the northern swamp conifer-loving northern waterthrush and the southern hardwood forest-loving cerulean warbler.

Management consists of trail maintenance, exotic species removal, and litter pick-up.

Kewaskum Maple-Oak Woods. The 50-acre Kewaskum Woods is dominated by sugar maple, red oak, white ash, and basswood with some beech. Located just east of the Milwaukee River on undulating morainal topography, the area has two separate pieces. Each area is about 25 acres and they are separated by an old field and pine plantation. The southern tract is hilly with southern, eastern, and western exposures and contains a very rich groundlayer. Uncommon and interesting woodland species present include orchids, golden seal, large-fruited snakeroot, broad-leaved puccoon, dog tooth violet, and smooth bank cress. The northern tract is flatter and generally lower, containing especially large red oak, white oak, sugar maple, and black cherry trees. Both parcels contain kettle depressions, and low areas hold water part of the year. Common nesting birds include black-billed and yellow-billed cuckoos, great-crested flycatcher, eastern wood pewee, wood thrush, blue-gray gnatcatcher, red-eyed vireo, and scarlet tanager.

Ice Age National Scientific Reserve. In addition, within the Resource Protection category there are 20,000 acres located in the Ice Age National Scientific Reserve area that are designated for special preservation, protection and interpretation purposes. Of particular interest are the Parnell Esker at Butler Lake, and the Parnell area where the Parnell Tower is located. The observation tower is on the Parnell Esker, which is at the highest elevation in the forest. Dundee Kame and Dundee Mountain are world famous glacial features. An outstanding example of a kettle hole is located in the northern part of the forest. Also of special interest is the Spruce Lake Bog that was designated a national natural landmark by the National Park Service in 1973. The area is an example of a northern Wisconsin lake found in the southern part of the state. In addition, the Ice Age National Scenic Trail traverses from the southern to northern end of the forest. Thirty one miles of the Kettle Moraine Scenic Drive run through the forest.

Resource Management Area

Dundee Timber Harvest Demonstration Forest. This 65-acre site will continue to be managed as an experimental forest. Management activities will promote the forest's value as an educational tool.

Intensive Recreation Area

There are 450 acres of campgrounds, picnic areas, boat landings and beaches within this category. Additional information regarding these areas is available in Section III - Background

Extensive Recreation Area

There are 26,991 acres under this category in the Northern Unit.

Administrative Area

There are four acres under the Administrative category in the forest.

F. Local and Regional Land Use Analysis

Generally, the management prescriptions presented in the plan for the forest will result in little direct effect on populations in the area.

State land acquisition for example, will not cause a significant shift in populations. This is supported by the policy of the Natural Resources Board to acquire land only from willing sellers or through donations.

The forest will continue to provide a solid core for long-range growth in the region's recreation and tourism business. The forest has and will continue to improve the probability that scenic, natural, and outdoor recreational values will be maintained over the long term. The quality of these values is important in attracting tourists. The proposed project will not have a significant negative economic impact on general agricultural or individual farm operations. Some agricultural lands will potentially be acquired, but much of this is marginal cropland located in scattered parcels.

Specific timber production estimates are not available. A slight increase in annual production in the forest is anticipated but this will not result in significant changes in local forest industry business activity or employment. Over the long-term the proposed forest management activities will improve the quality of the timber resource and help ensure a continuing source of timber for the regional forest products industry.

SECTION V - ENVIRONMENTAL IMPACTS OF THE PROPOSED PLAN

Environmental Analysis and Decision on the Need
for an Environmental Impact Statement (EIS)

Southeast District, Bureau of Parks and Recreation
Type List Designation - NR 150.03 (6) (a) 6.a.

A. Project Summary

The master plan for the 36,391-acre Kettle Moraine State Forest - Northern Unit will direct the management and development of the property for the next 10 years. The plan was developed by:

* a Department Task Force comprised of resource managers from the Bureaus of Parks and Recreation, Forestry, Wildlife Management, Fisheries Management, and Law Enforcement;

* a vegetation management committee comprised of most Task Force members, a biologist, a naturalist, and a specialist in endangered resources;

* a Citizens Advisory Committee comprised of users of the forest; and

* individual members of the public and organized groups.

Some major proposals in the plan include:

* Add an additional 6,849 acres to the present boundary for a total of 36,391 acres.

* Base vegetation management decisions on integrated resource management principles with priority on wildlife habitat, recreation, restoration of native plant communities, and education and interpretation.

* Reinstate a tree planting program that matches the species to the site characteristics.

* Construct a variety of facilities including picnic shelters, playground equipment, scenic overlooks, and wildlife observation structures.

* Prohibit the use of all-terrain vehicles (ATVs) on the forest.

* Designate specific trails for mountain bike use.

* Establish an archery hunting- and trapping-only zone around the Zillmer trail. Deer and spring turkey hunting with firearms will be allowed in this zone during established hunting seasons.

* Develop 48 wildlife impoundments/wetlands.

* Develop long-term management plans for sites listed on or eligible for the State or National Register of Historic Places.

* Consider cultural resource protection and preservation in any land use changes or development projects.

* Formulate a task force to develop a lake use and access plan for Long Lake.

* Dredge the spring pond at Glenbeulah Springs.

* Construct disabled access fishing piers at Auburn and Long lakes, and provide motorboat access to Auburn Lake.

* Continue cooperative efforts with the National Park Service to promote the geological features of the area.

* Designate eight sites as State Natural Areas and two sites as Habitat Preservation Areas.

For further details regarding proposals in the plan, the existing environment, and alternatives to the proposals, please see the Kettle Moraine State Forest - Northern Unit master plan.

B. Evaluation of Project Significance

Environmental Effects and Their Significance

Changes in Land Ownership and Land Use

It is the policy of the Natural Resource Board to acquire land from willing sellers or through donations. As a result, not all lands authorized for acquisition will be purchased. The use of scenic and conservation easements with short-term arrangements, such as hunting leases and land use agreements, (i.e. managed forest law and farmland preservation) are important additions to fee acquisition. There will be very little change from the present land use in the forest as a result of proposed land acquisition. Under the Resource Protection category, 2,096 acres of Natural Areas and 2,868 acres of Habitat Preservation Areas will be added. In addition, 1,885 acres will be added to the Extensive Recreation Area classification.

Natural Areas are tracts of land or water containing the best remaining examples of native biotic communities or other native features including significant geological or archeological features. Habitat Preservation Areas are defined as those lands and waters containing excellent natural habitat and characteristics that are conducive to perpetuation and production of fish and wildlife. Management activities in these areas emphasize the maintenance of natural conditions with a minimum of human intervention and stabilization of natural forces, and limited development.

Extensive Recreation Areas are lightly developed or undeveloped areas that are used for recreation purposes. In addition, the plan will not change existing private land use.

Vegetation Management

A comprehensive vegetation management plan covering the entire forest will guide activities to protect or restore the forest's significant and rare resources. The management activities proposed include reforestation, minimizing grassland fragmentation, and increasingly using fire to maintain and expand native prairies. These activities are aimed, in part, at achieving biodiversity, or a more biologically diverse forest.

Biodiversity is a variety and variability among living organisms and the ecological systems in which they occur on the local and regional landscape. A strong emphasis is also placed on restoring native plant and animal communities to the forest.

Reforestation accomplishes several goals, including the:

* enhancement of habitat and food production for a variety of wildlife species.

* consideration of scenic values, and wildlife production in timber production; the cultivation of native species or presettlement species; improved water quality through the planting of vegetation on steep erodible slopes; and enhanced scenic values through the use of buffer strips or the planting of desired species to attract wildlife or for the species inherent value.

* reintroduction of hardwood species to the forest.

The minimization of grassland and forest fragmentation increases the productivity of selected species of wildlife. Both species and communities are enhanced because variability is increased. In addition, the requirements of individual species have a greater chance of being met, while isolation, predation, and parasitism are reduced.

The use of fire as a vegetation management tool allows the upgrading, restoration, and maintenance of prairie communities and increases their potential to resemble presettlement conditions. In addition, rare and endangered species in those communities can be protected and enhanced.

Recreation

Existing facilities will be upgraded or replaced to ensure that they meet existing building, plumbing, and environmental codes. New development will be constructed in a manner that respects and is sensitive to the natural resources.

ATVs will be prohibited because of the noise, safety, and erosion concerns associated with their use. Specific trails will be designated for mountain bike use because of concerns over conflicts with hikers and horseback riders, and damage to erodible soils and other resources.

Wildlife

The recommendations in the plan increase the scope and intensity of management for game, non-game, and endangered species on the forest. There will not be a major shift in the existing management.

The creation and restoration of small wetland areas will provide many environmental benefits including productive wildlife habitat. There are concerns over the success of restoration projects and the effects on existing resources, particularly rare communities. This concern centers on two factors--the success of environmental restoration cannot be guaranteed and human intervention is necessary to change existing natural conditions.

Fisheries

The proposed fisheries management activities focus on enhancing fish habitat, populations, and water quality while increasing angling and education opportunities. Dredging the spring pond at Glenbeulah Springs will improve water quality and habitat for trout. Developing a lake use and access plan for Long Lake will improve safety and the quality of recreational experiences on the lake.

Endangered Resources

Designation of state natural areas and a habitat preservation area will have a significant, positive impact on the long-term survival of many endangered or threatened species. The sites proposed are large, somewhat undisturbed sites--a rarity in rapidly developing southeastern Wisconsin. The goal is to restore natural ecological systems and their functions to presettlement conditions.

Significance of Cumulative Effects

The cumulative effects of proposals in the plan will be positive. The objective of most actions is the increased diversity of functioning plant and animal communities. Each discipline will have input into projects, undertaken by other disciplines, to ensure an integrated approach to resource management. In addition, the plan recognizes that whenever a resource management decision is made, the natural environment will have the benefit of higher priority.

The effects of the plan on other Department-managed properties in the area of the Northern Unit will also be positive. Master plans for the Kettle Moraine State Forest-Southern Unit and other Department properties include similar objectives for the restoration of wetlands and grasslands, the reintroduction of native species of animals, the protection of endangered or threatened plants and animals, and the management of the landscape to simulate pre-settlement vegetation conditions.

These cumulative effects will assist in the survival of uncommon or rare plant communities. In addition, high quality habitat will be provided for a variety of animal species. At a minimum this will help balance losses of habitat and other lands occurring in southeastern Wisconsin.

Even with all Department lands in combination, land ownership and management by the Department totals a small amount of the total acreage in southeastern Wisconsin. The net result will be "islands" of biodiversity amid on ocean of urban and rural land uses.

Significance of Risk

The success of environmental restoration projects and species reintroduction is not guaranteed. There are several proposals within the plan to restore ecosystems to their presettlement condition. In addition, there are proposals for wetland restoration and creation. These ecosystems are valuable for future scientific research and education, and often contain rare species. The potential for restoration and preservation of these communities exists on the forest. The benefits of restoration outweigh the risks of possible failure.

The removal of exotic species is a high priority management goal. The success of removal techniques cannot be guaranteed. Failure to attempt removal will result in further degradation of the affected communities with uncertain long-term effects on their component parts.

Although many significant resources have been identified in the plan, i.e. glacial features, cultural resources, and flora and fauna, the complexity and size of the Kettle Moraine may have resulted in other significant resources being overlooked. As funds and staffing allow, continued and additional inventories of resources of the forest will be conducted. Before any large development projects are undertaken, biologists, historians, archaeologists, and endangered resource experts will be consulted to ensure protection of known and unknown significant resources.

Animal reintroduction and habitat expansion also involves potential risks. It is possible for these projects to be too successful. An increase in the population of deer, turkey, and other animals can lead to crop depredation or increased highway accidents. The master plan contains enough flexibility to consider the varied success of habitat improvements.

The Bureau of Endangered Resources and the Bureau of Wildlife have proposed burning additional acres within the forest to enhance rare plant communities such as prairies. With the increased use of prescribed burns and the burning of large areas, the potential for these fires to get out of control increases. The Department maintains a well-trained staff and a full complement of fire fighting equipment at the forest. The Department also has agreements with area towns for supplementary fire suppression, if necessary.

A Department no-burn policy could increase the potential for the loss of rare plant communities, the loss in wildlife production, and the severe invasion of exotic plant species.

The impact of prescribed burns on air quality will be negligible since the fires will be temporary and occur only in the spring and fall.

Significance of Precedent

It is proposed in the plan to establish an archery hunting- and trapping-only zone around the Zillmer Trail. This designation will allow continued, but limited, hunting in the area and continued hiking and other non-consumptive, or passive uses. This proposal addresses safety concerns while maximizing the number of users.

Specific trails within the forest are designated for mountain biking. The trails were chosen to minimize adverse effects of this use on the resource, and to minimize user conflicts.

The plan is in accordance with local, county, and state plans, authorities, and policies.

Significance of Controversy Over Environmental Effects

Citizen Participation

There has been considerable emphasis on gathering citizen input during the master planning process. The Department held 17 open forums between 1988 and June of 1991 throughout southeastern Wisconsin. The initial open forums were held to determine issues the public wanted addressed and to provide information on the plan. Forums were held later in the process to gather feedback on completed portions of the plan.

The Kettle Moraine toll-free hotline was available throughout the planning process to provide the public a convenient way to comment on the plan. Department staff developed an informational program for public access television and appeared on several radio interviews and talk shows. In addition, staff made several presentations to special interest groups.

The Department formed a Citizen's Advisory Committee early in the planning process to evaluate public input and provide feedback on the plan. The committee formally met 15 times.

Several proposals in the plan that created some controversy are outlined below.

* Prohibit all-terrain vehicle (ATV) use on the forest.

ATV enthusiasts feel that the money from the ATV registration fees they pay should be used to provide them with trails in the forest. Horseback riders, hikers, and environmentalists feel that ATV use should be prohibited because of noise, safety, and environmental concerns.

* Restrict mountain bike use on the forest.

Mountain bikers feel they should be allowed to use most of the trails in the forest. Hikers and horseback riders want mountain bikers restricted because of concerns for safety and degradation to the trails.

* Create an archery- and trapping-only hunting zone around the Scuppernong Trail.

Hikers feel threatened and unsafe during the gun hunting seasons. Hunters feel that public lands for hunting are increasingly being restricted.

* Acquire land within the project boundary.

Acquisition of land or easements by the Department is often perceived by landowners or Townships as threatening, detrimental, or resulting in a loss in tax base. Some changes in the forest boundary are proposed, yet state land acquisition will occur only through voluntary sales or donations. Studies suggest that state-owned land is not an economic burden to local governmental units due to state payments in lieu of taxes and increased school aids. In addition, the Department will change from payments in lieu of taxes to property tax payments on all lands purchased after January, 1992.

SECTION VI - ALTERNATIVES TO THE PROPOSED PLAN AND THEIR IMPACTS

This section of the Kettle Moraine Master Plan is intended to present major concept alternatives which could be applied to the management, operation, and development of the property. The Kettle Moraine is well established as a recreation area and affords a good measure of resource protection. This has been incorporated into the discussion of alternatives that follows:

No change - status quo

Under this alternative the property would continue to operate as it is now. No organized attempt would be made to overcome management problems and there would be little change in the degree of resource protection. Major development would occur as established in the Department's six-year capital improvement plan. Minor development and maintenance would occur as it becomes necessary or desirable, and if and when funds become available. Facilities operation under this concept would usually result in adequate performance; however, there is greater potential for problems that may be difficult and costly to solve later, to develop. This alternative would permit only limited adjustment in management to address changing trends in outdoor recreation or resource protection.

Modification to the present management and use

This alternative recognizes the resource management practices that have been developed over the past several years. It also seeks to address management problems and concerns, recreation needs, and public concerns and interests that have been raised during the planning process. No major new developments would occur under this alternative, but improvements to or replacement of existing development would take place.

The current major emphasis on recreation with a secondary, but significant emphasis on resource protection and education would be continued without interruption.

Intense Development

With the implementation of this alternative major development would occur. The development could include additional campgrounds, a resort development, specialized trails for mountain bikes and ATVs, an additional interpretive center, swimming pools at the Indoor Group Camp and an increase in put-and-take fishing and hunting opportunities.

These additions to the Northern Unit probably be met favorably by some user groups. The popularity of the forest would increase significantly for some and decrease for others. The monetary costs and the impact on the resource would be high and environmental standards and awareness would be comprised.

Recommended Alternative

The modified approach to the existing use and management of the forest, or alternative two, is recommended. The Northern Unit does not have the capacity to support all types of outdoor recreation without resource degradation. Whenever a choice has to be made between the natural environment and outdoor recreation, the natural environment will have the benefit of being given a higher priority.

SECTION VII - COMPLIANCE WITH THE WISCONSIN ENVIRONMENTAL POLICY ACT

Decision

In accordance with s. 1.11, Stats., and Ch. NR 150, Adm. Code, the Department is authorized and required to determine whether it has complied with s. 1.11, Stats., and Ch. NR 150, Wis. Adm. Code.

EIS Process Not Required [X]

The attached analysis of the expected impacts of this proposal is of sufficient scope and detail to conclude that this is not a major action which would significantly affect the quality of the human environment. In my opinion, therefore, an environmental impact statement is not required prior to final action by the Department on this project.

Major Action Requiring the Full EIS Process [ ]

The proposal is of such magnitude and complexity with such considerable and important impacts on the quality of the human environment that it constitutes a major action significantly affecting the quality of the human environment.

Leif Mitchell 7/24/91
Signature of Evaluator Date Signed

James L. Treichel for D. Weizenicker 8/22/91
Noted: Bureau Director Date Signed

Number of responses to news release or other notice: 545

Certified to be in Compliance with WEPA

Gary A. Birch 8/23/91
District Director or Date Signed
Director of BEAR (or designee)

Notice of Appeal Rights

This notice is provided pursuant to section 227.48(2), Stats. If you believe that you have a right to challenge this decision, you should know that Wisconsin statutes and administrative rules establish time periods within which requests to review Department decisions must be filed.

For judicial review of a decision pursuant to sections 227.52 and 227.53, Stats., you have 30 days after the decision is mailed, or otherwise served by the Department, to file your petition with the appropriate circuit court and serve the petition on the Department. Such a petition for judicial review shall name the Department of Natural Resources as the respondent.

To request a contested case hearing pursuant to section 227.42, Stats., you have 30 days after the decision is mailed, or otherwise served by the Department, to serve a petition for hearing on the Secretary of the Department of Natural Resources. The filing of a request for a contested case hearing is not a prerequisite for judicial review and does not extend the 30-day period for filing a petition for judicial review.

Note: Not all Department decisions respecting environmental impact, such as those involving solid waste or hazardous waste facilities under sections 144.43 to 144.47 and 144.60 to 144.74, Stats., are subject to the contested case hearing provisions of section 227.42, Stats.

This notice is provided pursuant to section 227.48(2), Stats.

SECTION VIII - BOUNDARY CHANGES

Purpose

The plan includes a boundary expansion of 6,038 acres, of which 5,098 are in private ownership. The private lands included in the expansion are located in 13 different areas. Each area has a specific purpose for being included in the project boundary. Acquisition will provide additional wildlife habitat, protect glacial features, improve water quality and protect wetlands, and provide a buffer to trail systems, campgrounds, and State Natural Areas. The goal statement for the forest states that unique geological formations will be preserved, the natural landscape protected, rare species and communities protected, and the experience provided for the forest user enhanced. The objectives further support these efforts--to maintain aesthetics, to protect ecosystems and Natural and Habitat Preservation Areas, and to provide a balance between the forest uses.

Description and Justification

A description and justification for each area is listed below. The letters correspond with those shown on Map 8 depicting the Project Boundary.

A. The area is upland that contains several glacial remnants. It also provides buffer to the forest. The land in this area is already in state ownership.

B. Area "B" is north and east of Bear Lake. Acquisition will provide a buffer to incompatible uses and reduce siltation to the Bear Lake Marsh, and nesting cover for waterfowl.

C. Area "C" includes 520 acres and eight landowners in the Town of Greenbush, and 2780 acres an 40 landowners in the Town of Mitchell. The area is in the Ice Age National Scenic Reserve and contains several large kames. This acquisition will change the boundary to include some land that is already in state ownership. It will also prevent encroachment by unwanted development, maintain the rural environment, and protect natural and scenic features. It also includes good wetland habitat and lands which contain the headwaters to Watercress Creek--the origination of the East Branch of the Milwaukee River.

D. This area contains a large wetland complex that has been ditched and drained. Improving water quality and restoring wildlife habitat are two objectives for this area.

E. Area "E" is a valuable wetland area with significant wildlife values.

F. This area is located in a fairly narrow part of the forest. Acquisition will provide buffer, and provide opportunities for trail realignments. The uplands have potential for wildlife purposes.

G. Acquisition of area "G" will provide for wetland restoration and protection.

H. Area "H" contains a valuable wetland complex and the potential for restoring a 25-acre wetland.

I. The acquisition of area "I" will ensure all of Bog Lake is included in the forest boundary.

J. Area "J" is included for its value as a wetland and its potential for wetland restoration.

K. This area is part of a wetland complex. Acquisition will place it entirely in public ownership.

L. Acquisition of area "L" will provide the opportunity for restoring wetlands, improving water quality through erosion control , and providing wildlife habitat.

M. Area "M" includes frontage on the East Branch of the Milwaukee River. Acquisition will provide the opportunity for restoring wetlands, improving water quality through erosion control, and providing wildlife habitat.

Cost

A. Number of landowners - There are 125 landowners in the proposed boundary expansion, totalling 5,098 acres.

B. Number of tracts with improvements - There are 95 tracts with improvements on them.

C. Total improvement value - The estimated total improvement value is $5.1 million.

D. Total land value - The estimated total land value is $5.7 million.

E. Relocation assistance (number and value) - Approximately 100 relocations have an estimated value of $800,000.

F. Total associated costs - The estimated costs of engineering, appraisals, surveys, archaeological studies, site reclamation, etc. is $400,000.

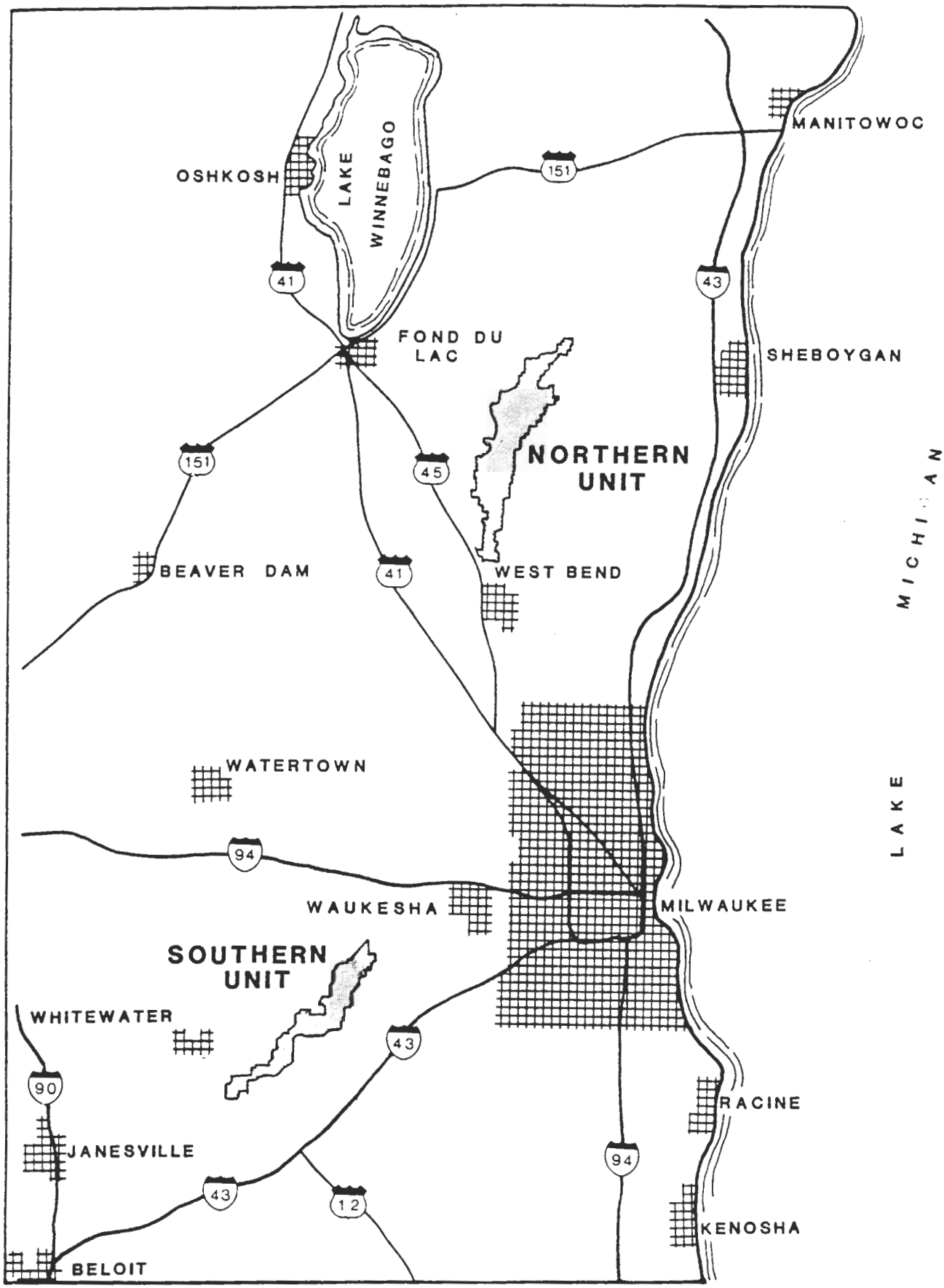
The total estimated cost of the land acquisition program is $12 million.

Impacts If Proposal is Rejected

The acquisition of these lands benefit every program on the forest. The additional wildlife habitat, buffers, and the protection of glacial features are the primary reasons for this land acquisition program. The growing population in southeastern Wisconsin will be ensured the continuation of nearby recreational opportunities. Residential development in the Kettle Moraine area, however, continues to put a strain on the resource. For instance, some bird species, such as the sharp-tailed grouse, will not sustain itself on less than approximately 10,000 acres. As the amount of undeveloped acreage surrounding the forest diminishes, so may some of the species who now call the forest their home.

The Northern Unit is an example of glacial topography not found in other parts of Wisconsin. The National Park Service recognized the significance of the Northern Unit's glacial feature and designated 31 miles of the Ice Age Trail as part of the National Scenic Trail system. Remnants of the glacier are limited in number. It is critical that we protect these features from mining and other development.

MAP 1 - FOREST LOCATOR

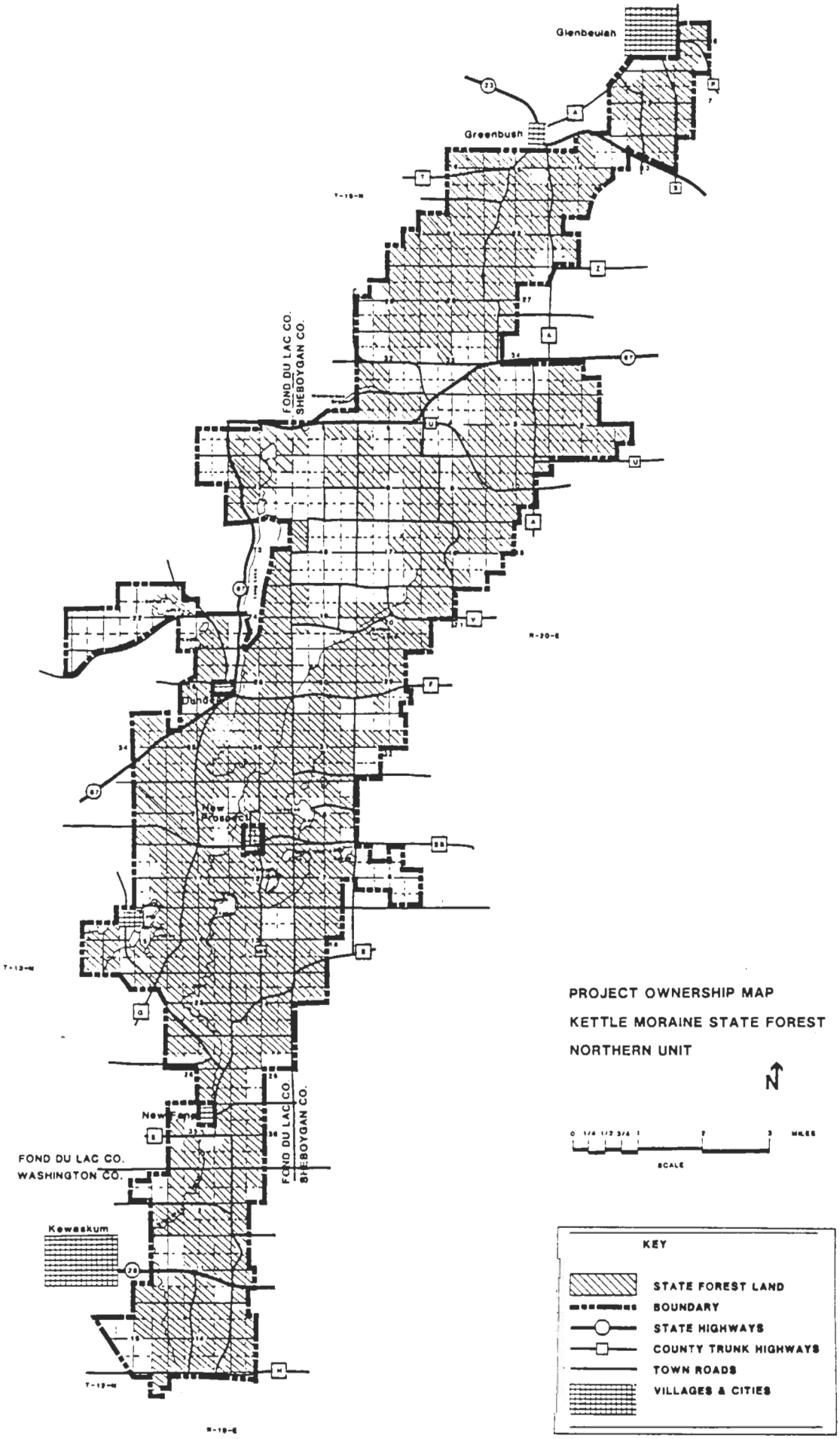


FOREST LOCATOR

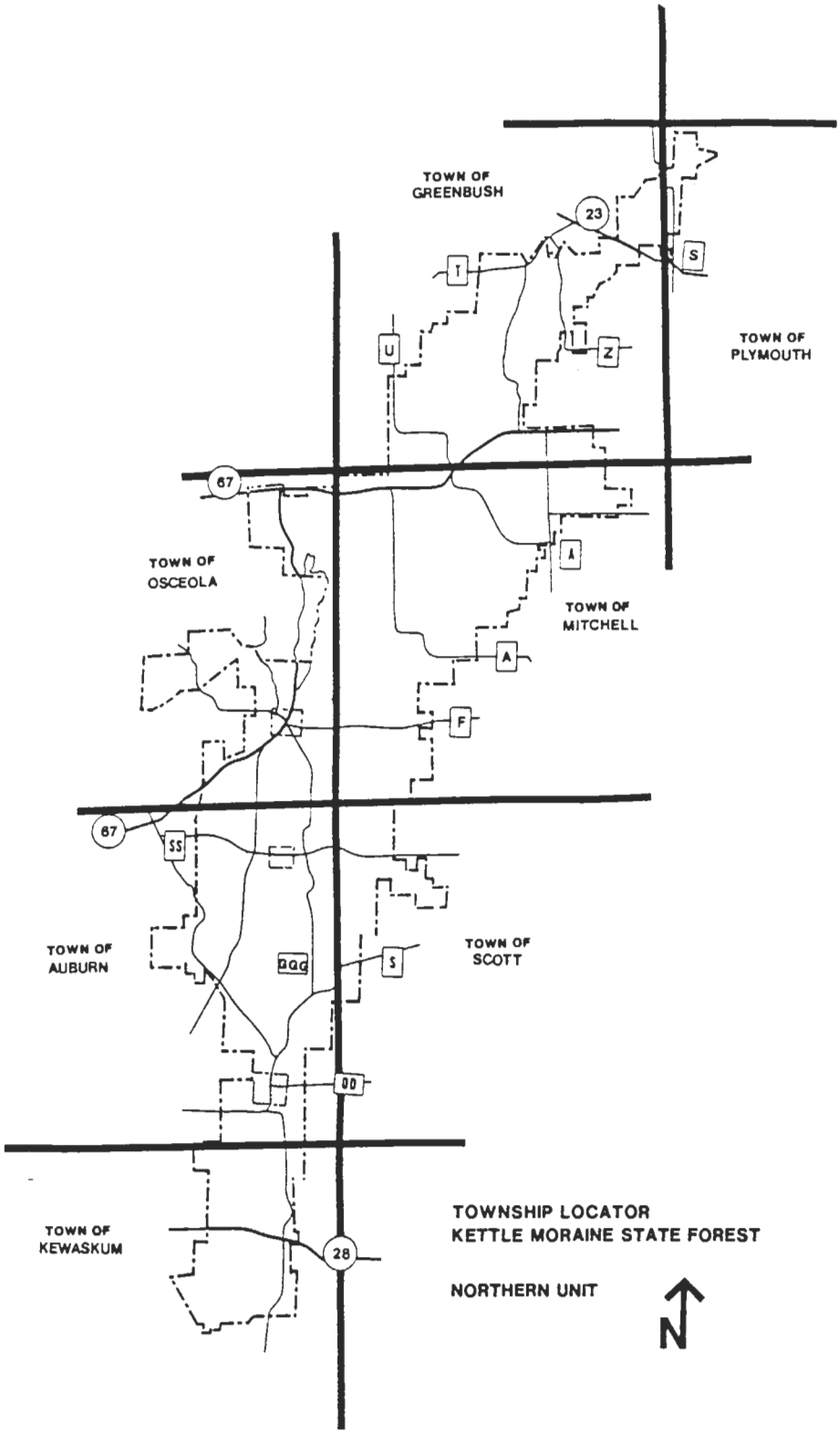
KETTLE MORAINE STATE FOREST

N

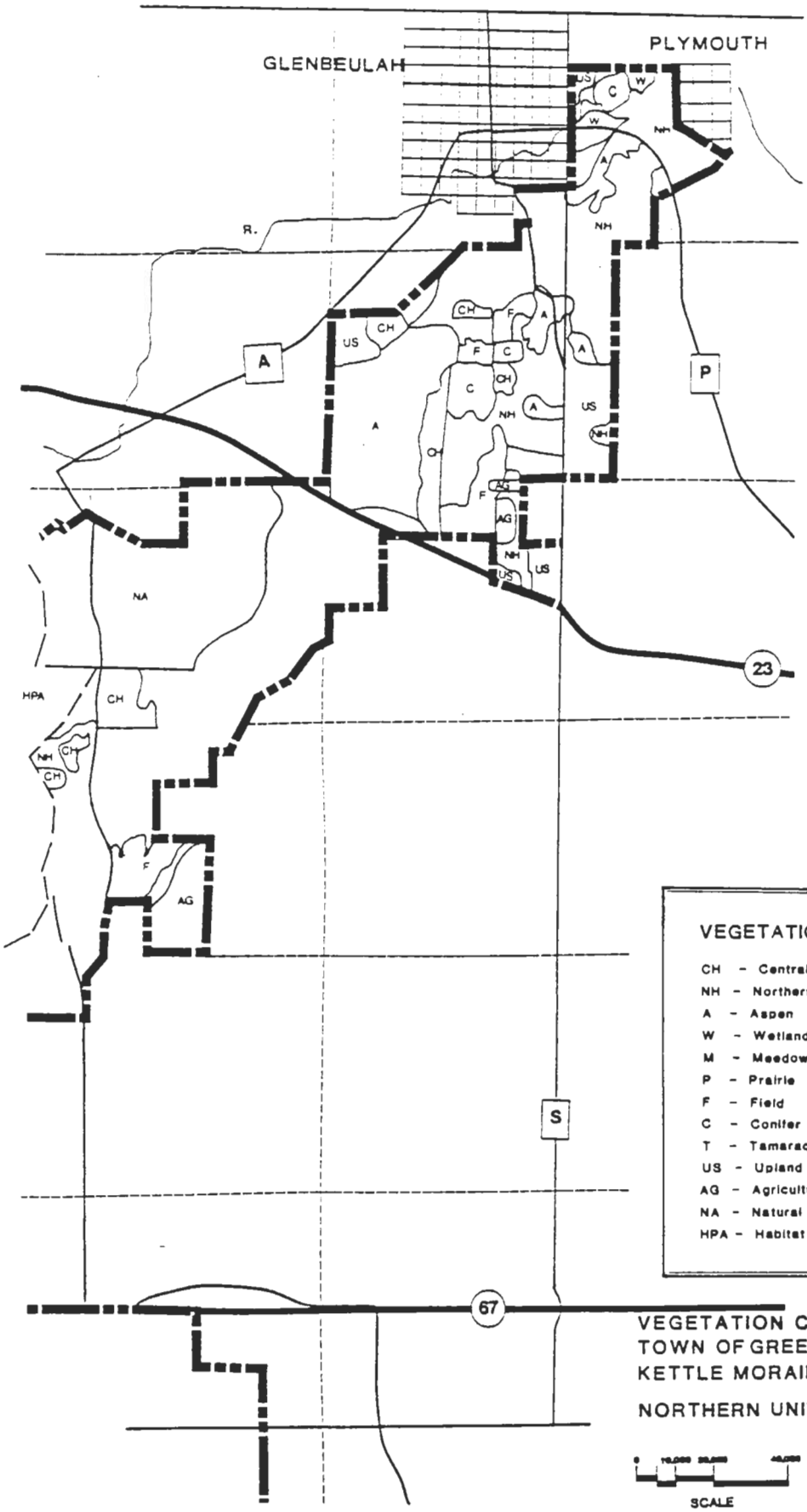
MAP 2 - PROJECT OWNERSHIP


Glenbeulah
Greenbush
FOND DU LAC CO.
SHEBOYGAN CO.
Dundee
New Prospect
New Fane
FOND DU LAC CO.
WASHINGTON CO.
Kewaskum
T-15-N
T-13-N
T-12-N
R-20-E
R-19-E
PROJECT OWNERSHIP MAP
KETTLE MORAINE STATE FOREST
NORTHERN UNIT
N
0 1/4 1/2 3/4 1 2 3 MILES
SCALE
KEY
STATE FOREST LAND
BOUNDARY
STATE HIGHWAYS
COUNTY TRUNK HIGHWAYS
TOWN ROADS
VILLAGES & CITIES

MAP 3 - TOWNSHIP LOCATOR


TOWN OF
GREENBUSH
23
S
T
U
Z
TOWN OF
PLYMOUTH
67
A
TOWN OF
OSCEOLA
TOWN OF
MITCHELL
A
F
67
SS
TOWN OF
AUBURN
QQQ
S
TOWN OF
SCOTT
QQ
TOWN OF
KEWASKUM
28
TOWNSHIP LOCATOR
KETTLE MORAINE STATE FOREST
NORTHERN UNIT
N

MAP 4 - VEGETATION COVER TYPES



VEGETATION KEY

- CH - Central Hardwood
- NH - Northern Hardwood
- A - Aspen
- W - Wetland
- M - Meadow
- P - Prairie
- F - Field
- C - Conifer
- T - Tamarack
- US - Upland Shrub
- AG - Agricultural Land
- NA - Natural Area
- HPA - Habitat Preservation Area

VEGETATION COVER TYPE MAP
TOWN OF GREENBUSH (E. HALF) / PLYMOUTH
KETTLE MORAINE STATE FOREST

NORTHERN UNIT

SCALE

N

KEY

Project Boundary

Section Lines

VEGETATION COVER TYPE MAP
TOWN OF GREENBUSH (W. HALF)
KETTLE MORAINE STATE FOREST

NORTHERN UNIT

0 10,000 20,000 40,000
SCALE

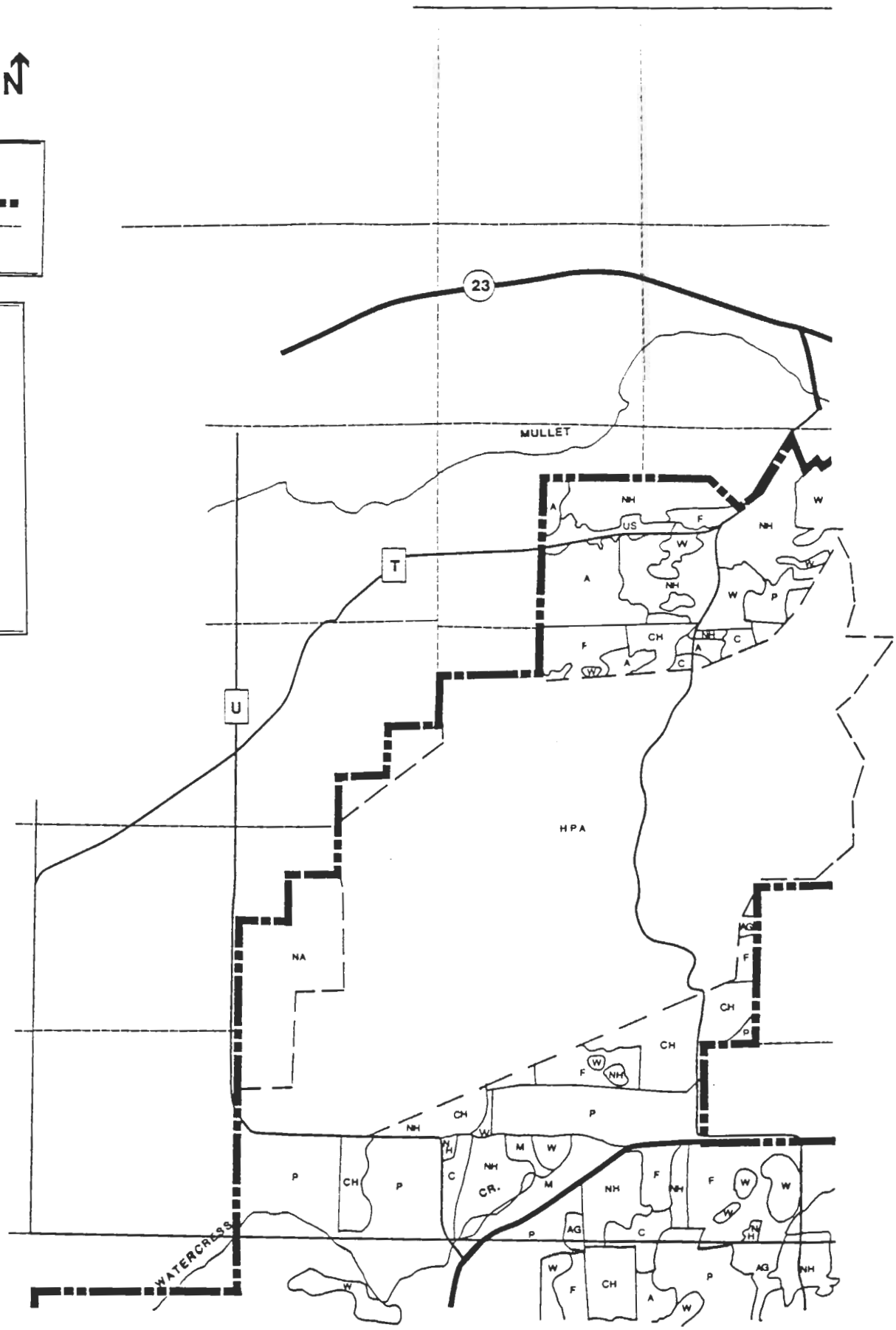
N

KEY

Project Boundary
Section Lines

VEGETATION KEY

CH - Central Hardwood
NH - Northern Hardwood
A - Aspen
W - Wetland
M - Meadow
P - Prairie
F - Field
C - Conifer
T - Tamarack
US - Upland Shrub
AG - Agricultural Land
NA - Natural Area
HPA - Habitat Preservation Area



VEGETATION COVER TYPE MAP
TOWN OF OSCEOLA
KETTLE MORAINE STATE FOREST

NORTHERN UNIT

0 10,000 20,000 40,000
SCALE

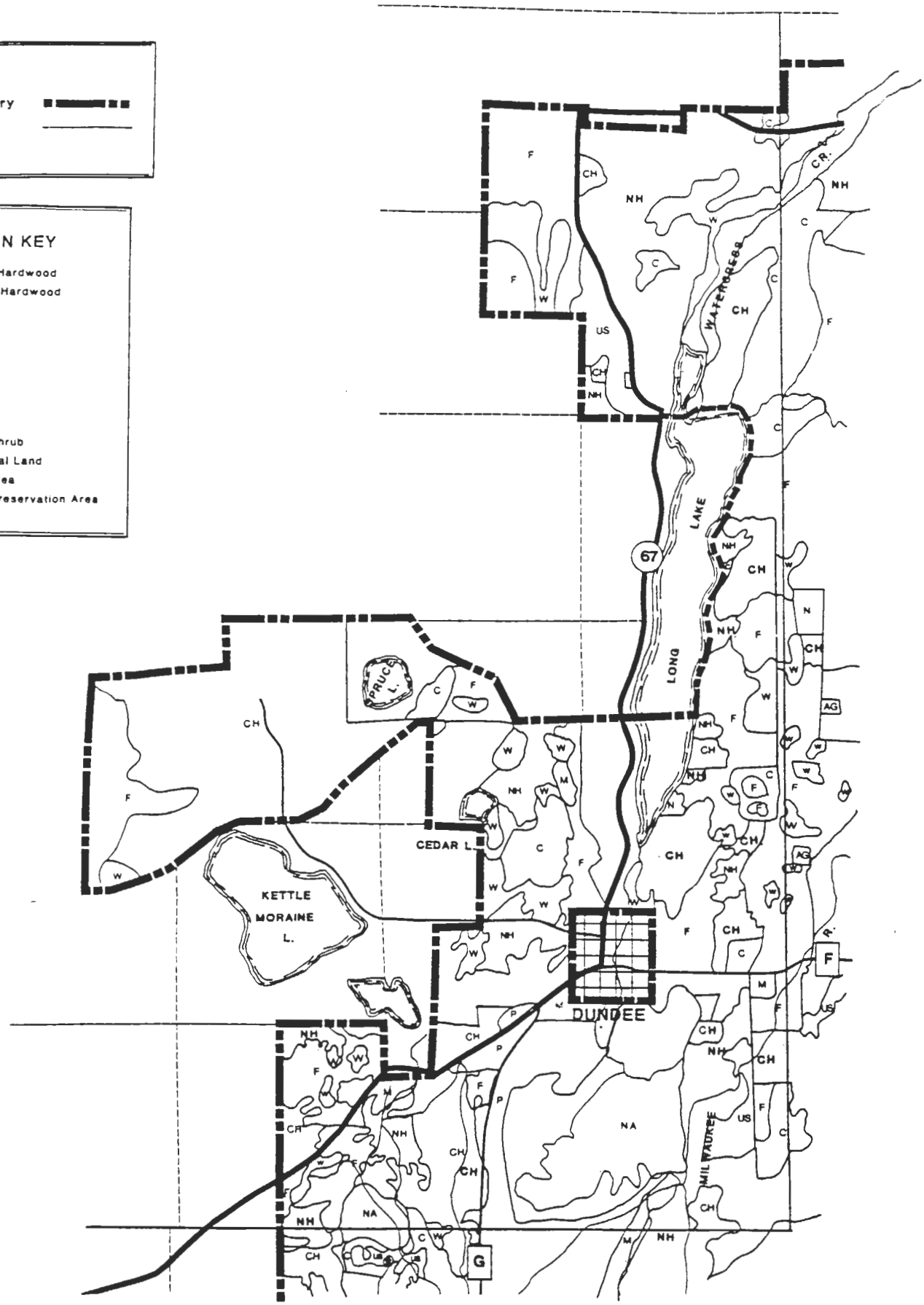
N

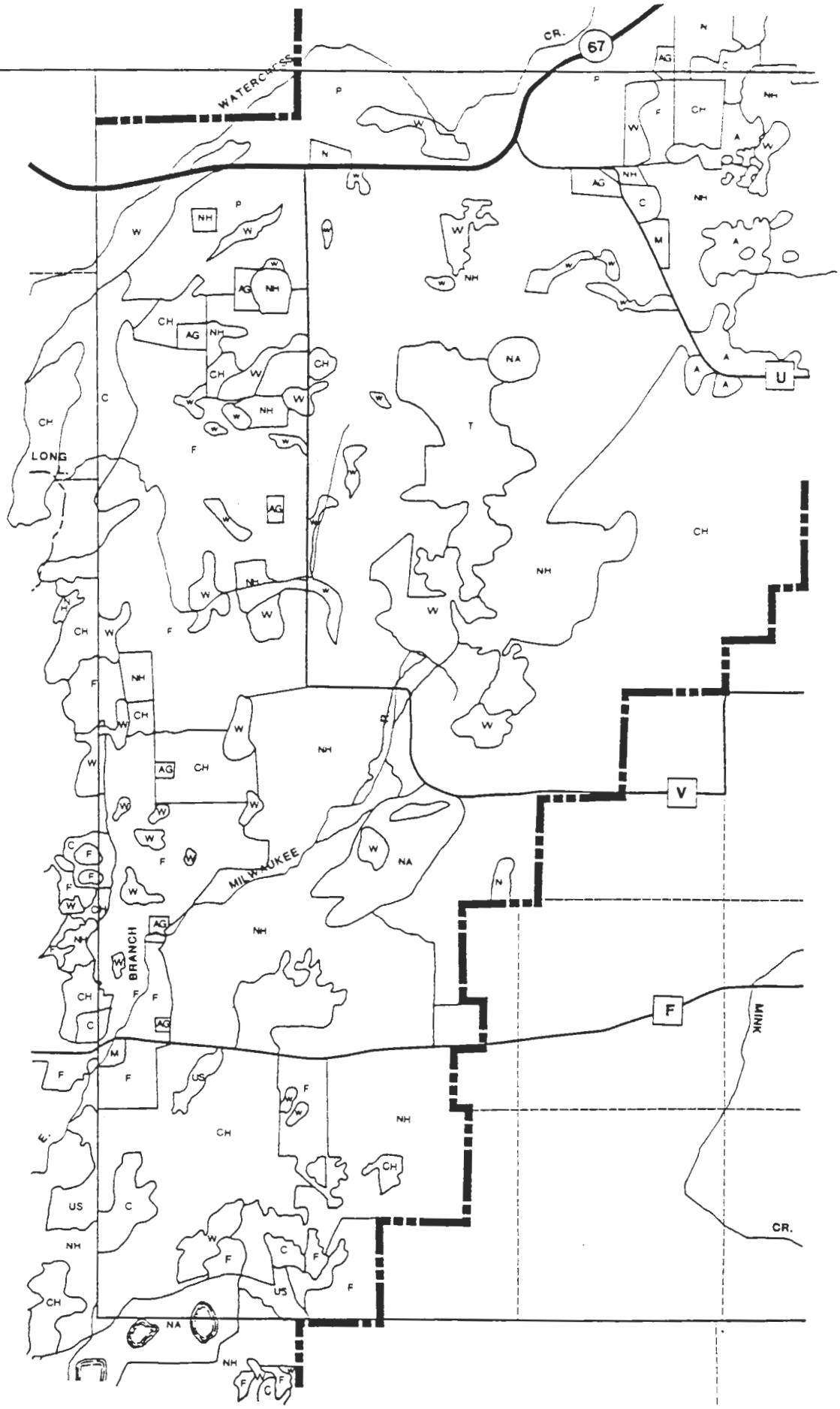
KEY

Project Boundary
Section Lines

VEGETATION KEY

CH - Central Hardwood
NH - Northern Hardwood
A - Aspen
W - Wetland
M - Meadow
P - Prairie
F - Field
C - Conifer
T - Tamarack
US - Upland Shrub
AG - Agricultural Land
NA - Natural Area
HPA - Habitat Preservation Area





VEGETATION KEY

- CH - Central Hardwood
- NH - Northern Hardwood
- A - Aspen
- W - Wetland
- M - Meadow
- P - Prairie
- F - Field
- C - Conifer
- T - Tamarack
- US - Upland Shrub
- AG - Agricultural Land
- NA - Natural Area
- HPA - Habitat Preservation Area

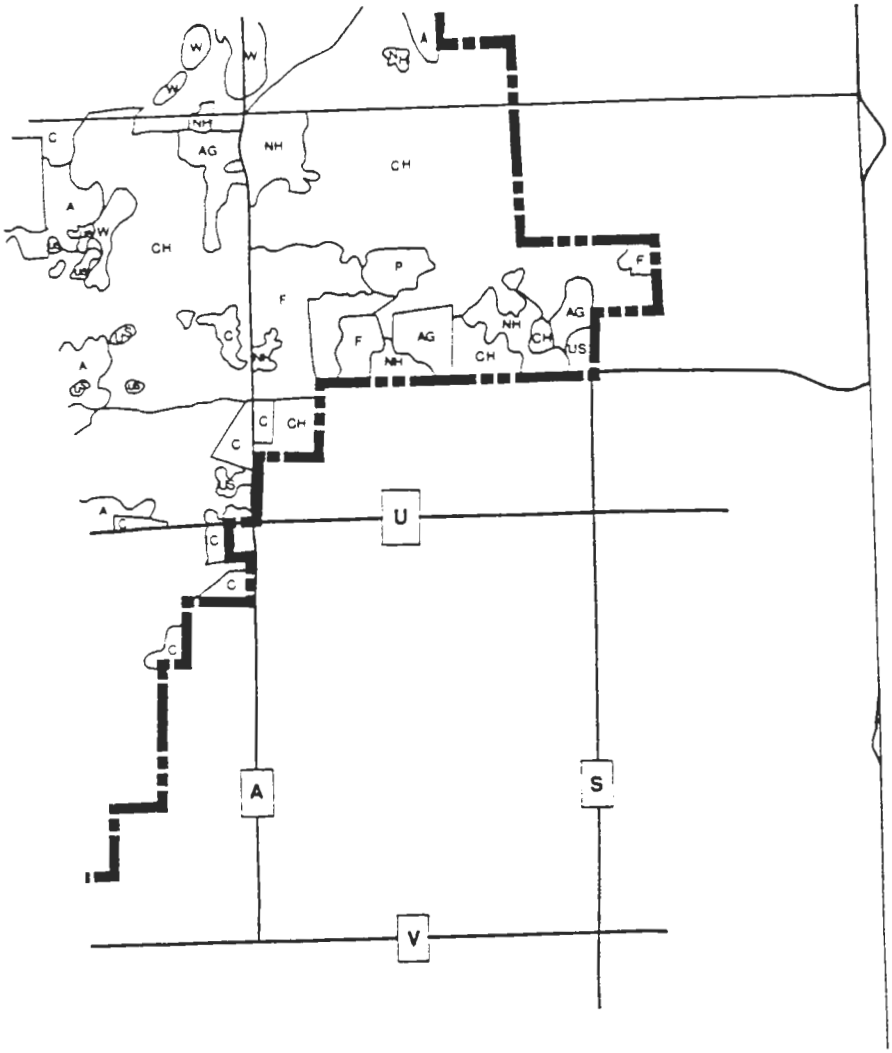
VEGETATION COVER TYPE MAP
TOWN OF MITCHELL (W. HALF)
KETTLE MORAINE STATE FOREST
NORTHERN UNIT

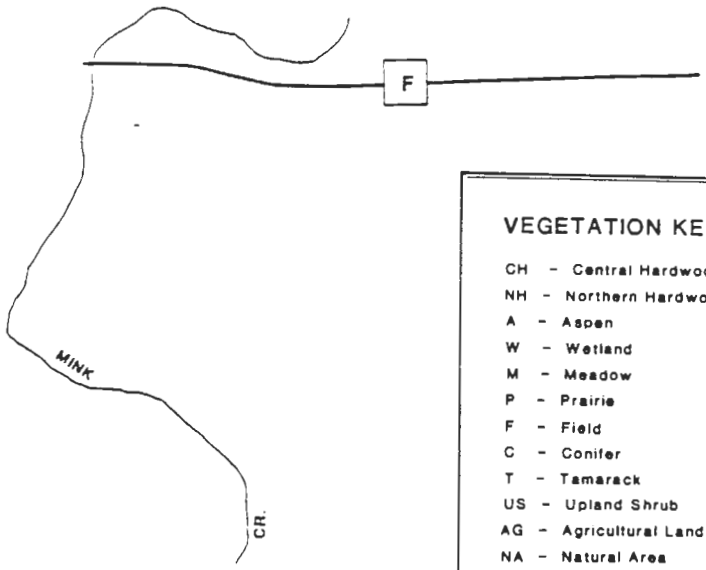
0 10,000 20,000 40,000
SCALE

N

KEY

Project Boundary
Section Lines





VEGETATION KEY

CH - Central Hardwood
NH - Northern Hardwood
A - Aspen
W - Wetland
M - Meadow
P - Prairie
F - Field
C - Conifer
T - Tamarack
US - Upland Shrub
AG - Agricultural Land
NA - Natural Area
HPA - Habitat Preservation Area

VEGETATION COVER TYPE MAP
TOWN OF MITCHELL (E. HALF)
KETTLE MORAINE STATE FOREST

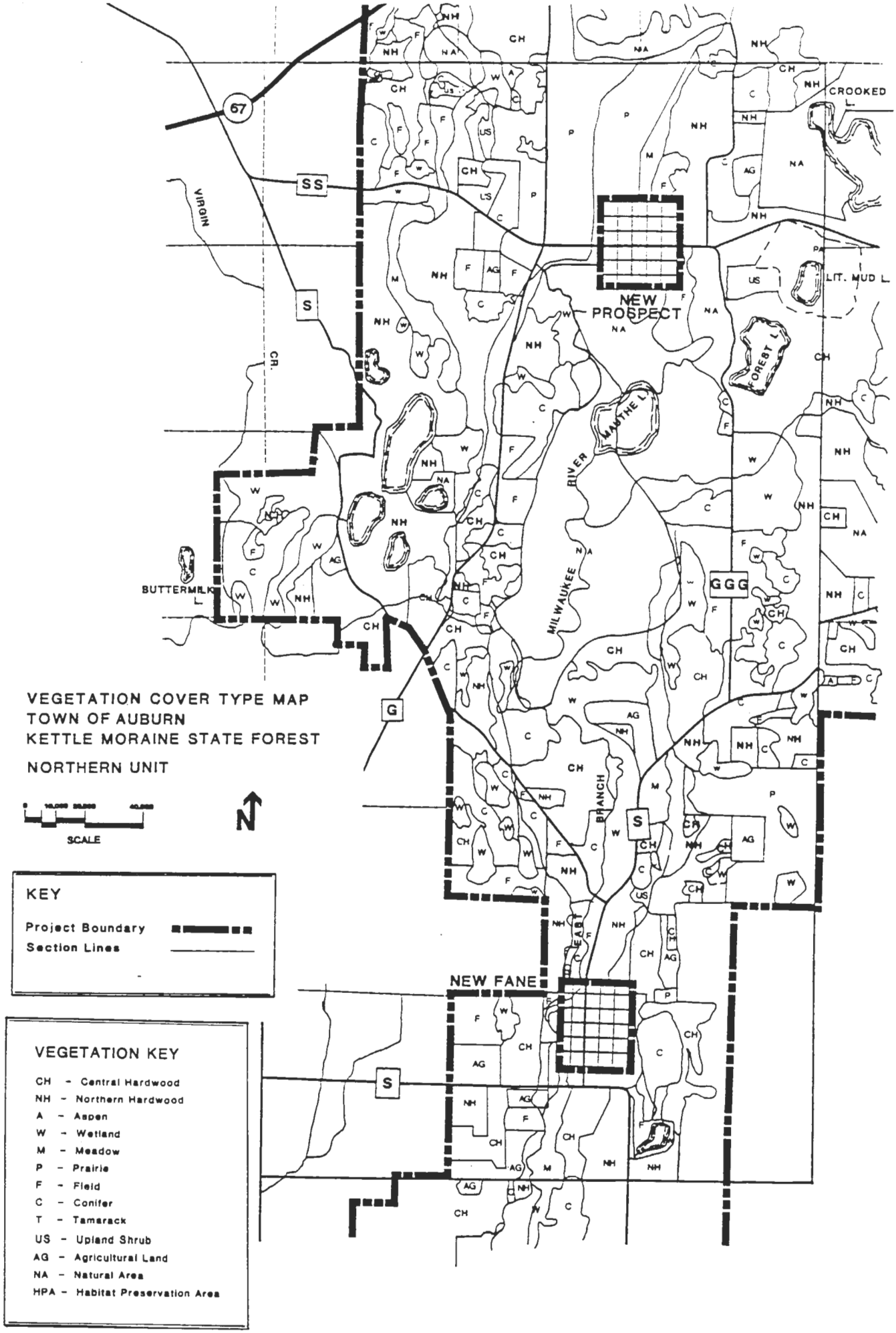
NORTHERN UNIT

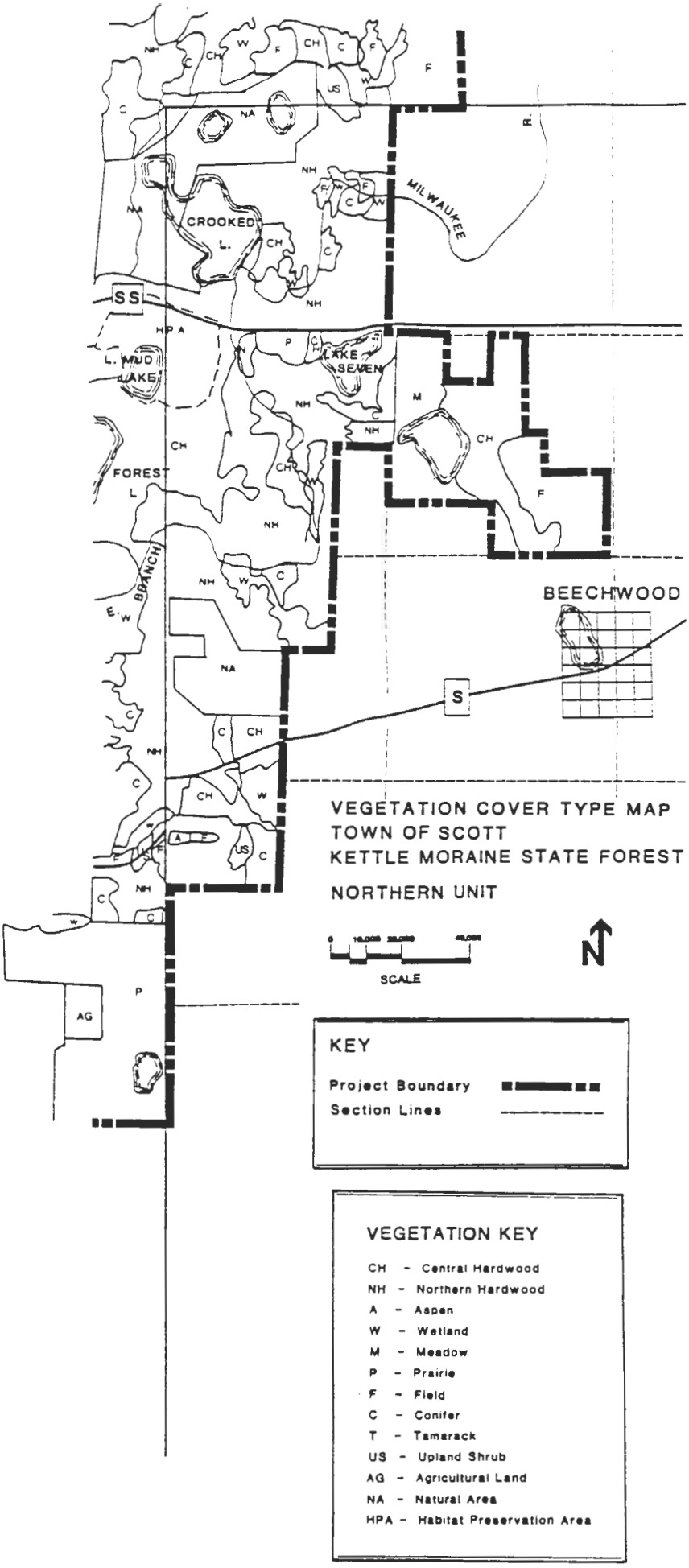
SCALE

N

KEY

Project Boundary
Section Lines


VEGETATION COVER TYPE MAP
TOWN OF AUBURN
KETTLE MORAINE STATE FOREST
NORTHERN UNIT
SCALE
N
KEY
Project Boundary
Section Lines
VEGETATION KEY
CH - Central Hardwood
NH - Northern Hardwood
A - Aspen
W - Wetland
M - Meadow
P - Prairie
F - Field
C - Conifer
T - Tamarack
US - Upland Shrub
AG - Agricultural Land
NA - Natural Area
HPA - Habitat Preservation Area
NEW PROSPECT
NEW FANE
CROOKED L.
LIT. MUD L.
FOREST L.
MAUTHE L.
BUTTERMILK L.
VIRGIN
CR.
MILWAUKEE
RIVER
EAST
BRANCH
67
SS
S
G
GGG


CROOKED L.
MILWAUKEE R.
SS
L. MUD LAKE
LAKE SEVEN
FOREST L.
E. BRANCH
BEECHWOOD
S
AG
VEGETATION COVER TYPE MAP
TOWN OF SCOTT
KETTLE MORAINE STATE FOREST
NORTHERN UNIT
SCALE
N
KEY
Project Boundary
Section Lines
VEGETATION KEY
CH - Central Hardwood
NH - Northern Hardwood
A - Aspen
W - Wetland
M - Meadow
P - Prairie
F - Field
C - Conifer
T - Tamarack
US - Upland Shrub
AG - Agricultural Land
NA - Natural Area
HPA - Habitat Preservation Area

VEGETATION COVER TYPE MAP
TOWN OF KEWASKUM
KETTLE MORAINE STATE FOREST

NORTHERN UNIT

SCALE

N

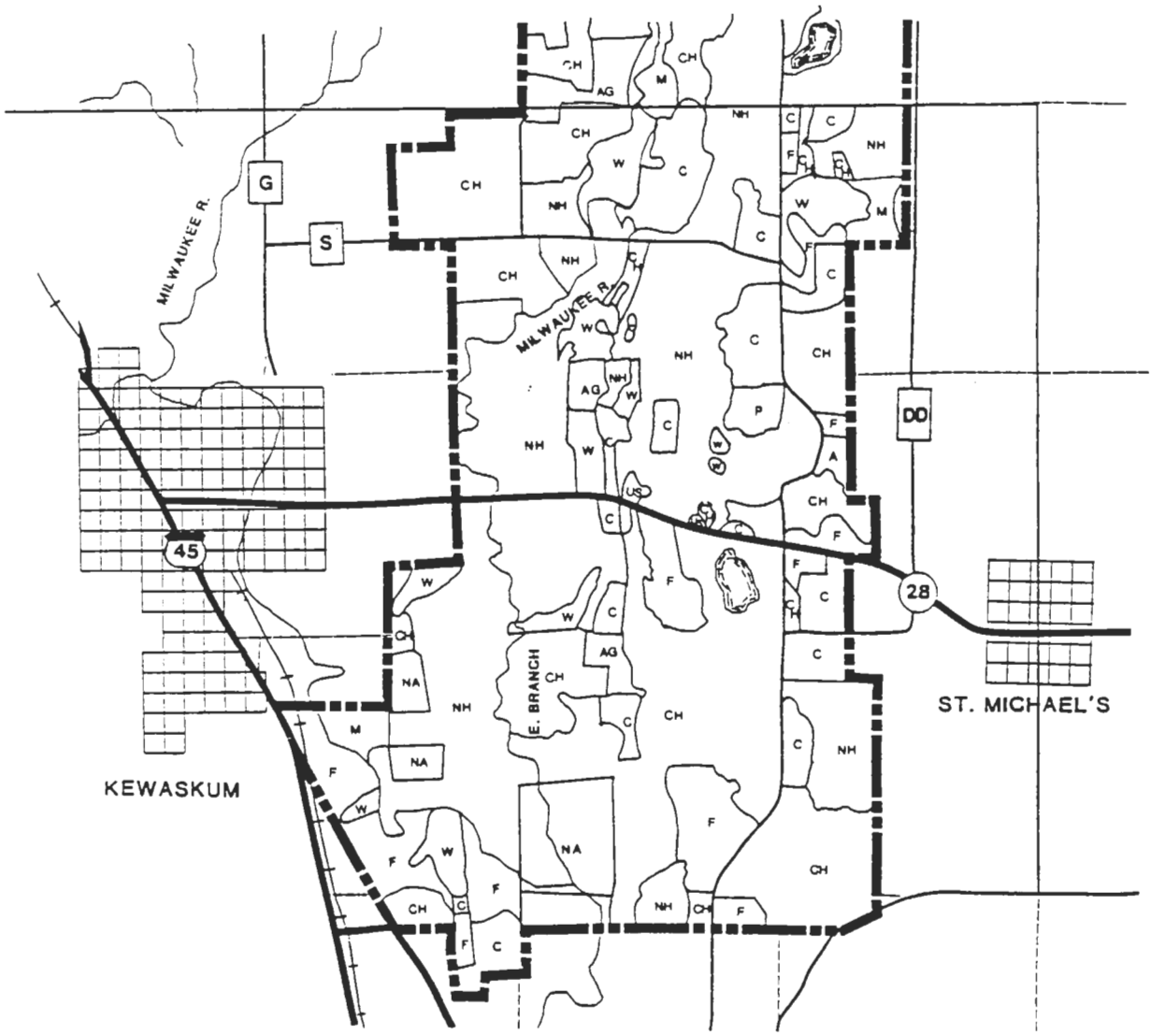
KEY

Project Boundary

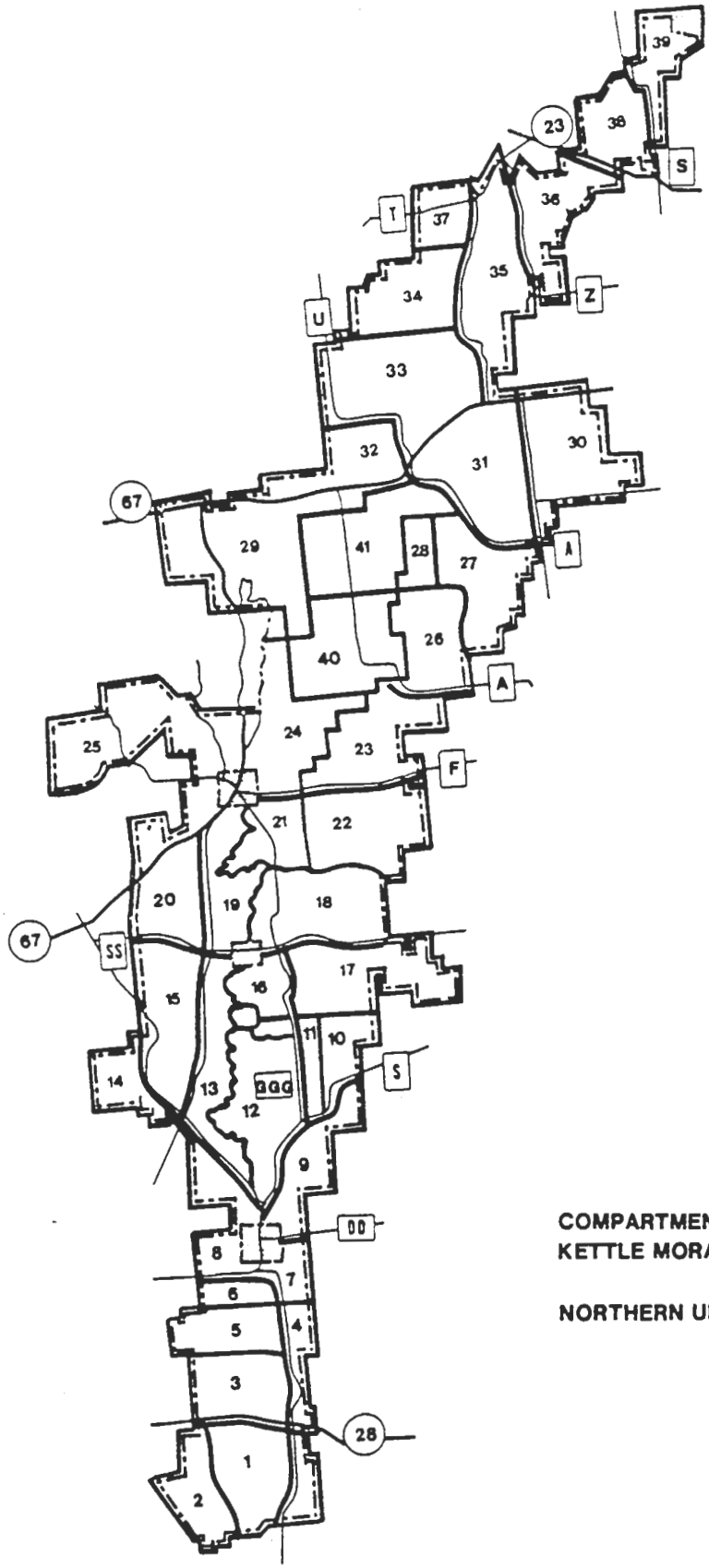
Section Lines

VEGETATION KEY

CH - Central Hardwood
NH - Northern Hardwood
A - Aspen
W - Wetland
M - Meadow
P - Prairie
F - Field
C - Conifer
T - Tamarack
US - Upland Shrub
AG - Agricultural Land
NA - Natural Area
HPA - Habitat Preservation Area



MAP 5 - COMPARTMENT LOCATOR

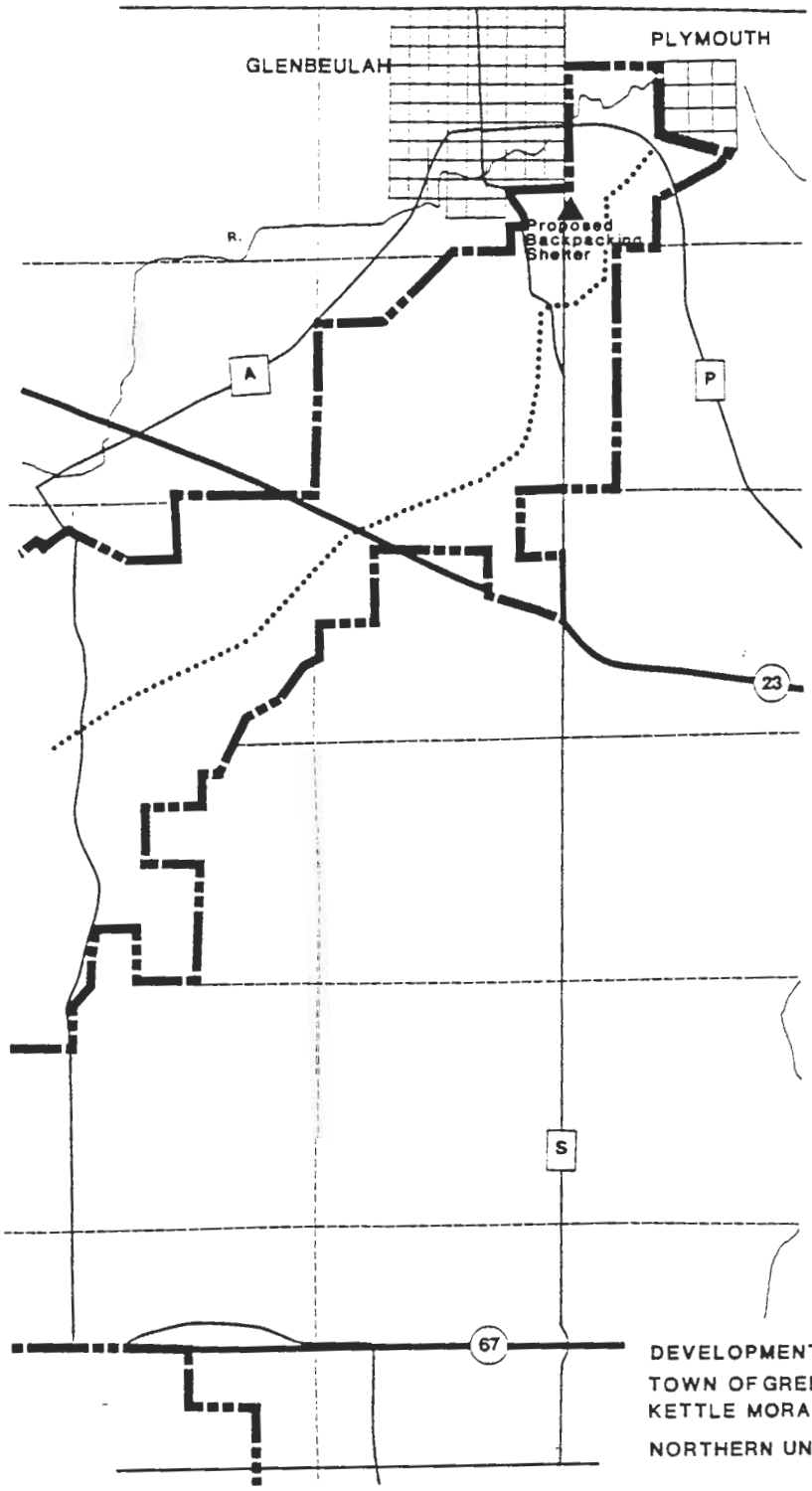


COMPARTMENT LOCATOR
KETTLE MORAINE STATE FOREST

NORTHERN UNIT

N

MAP 6 - DEVELOPMENT



DEVELOPMENT MAP
TOWN OF GREENBUSH (E. HALF) / PLYMOUTH
KETTLE MORAINE STATE FOREST
NORTHERN UNIT

SCALE

N

TRAIL KEY

Hiking & Skiing
Horse & Snowmobile
Ice Age

DEVELOPMENT KEY

Recreation
Wildlife (impoundments)
Fisheries

KEY

Project Boundary
Section Lines

DEVELOPMENT MAP
TOWN OF GREENBUSH (W. HALF)
KETTLE MORAINE STATE FOREST
NORTHERN UNIT

SCALE

N

KEY

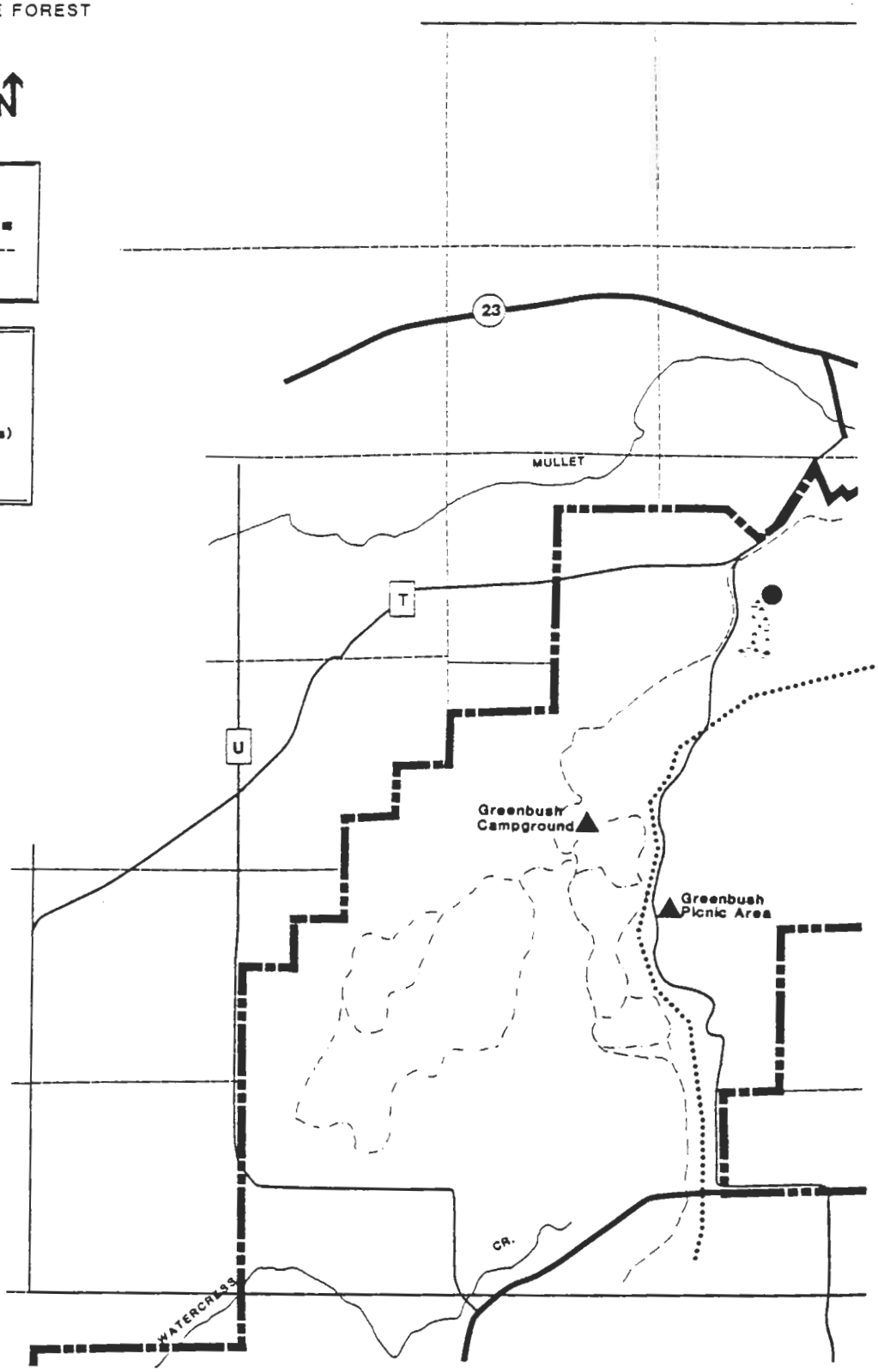
Project Boundary
Section Lines

DEVELOPMENT KEY

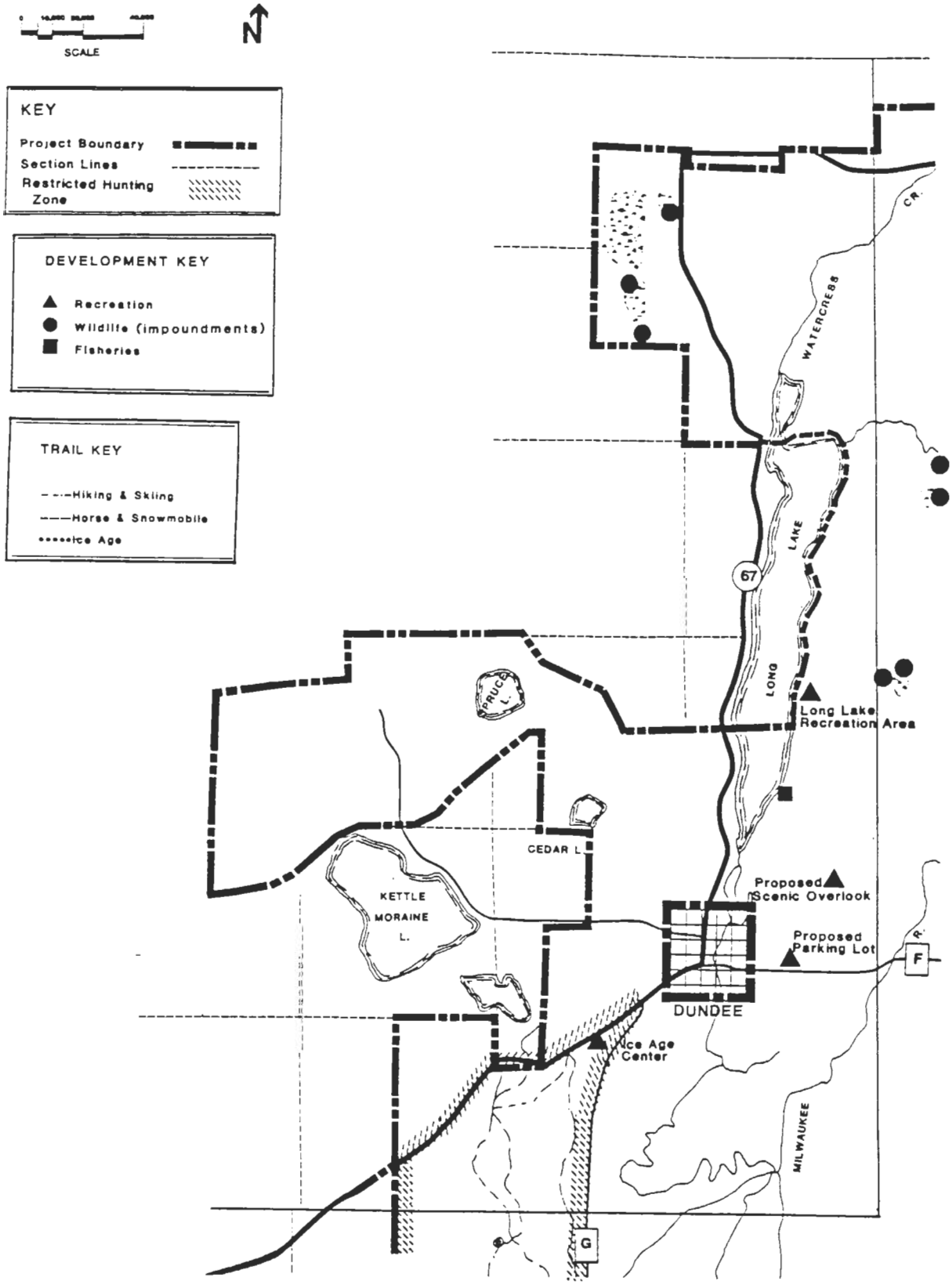
Recreation
Wildlife (Impoundments)
Fisheries

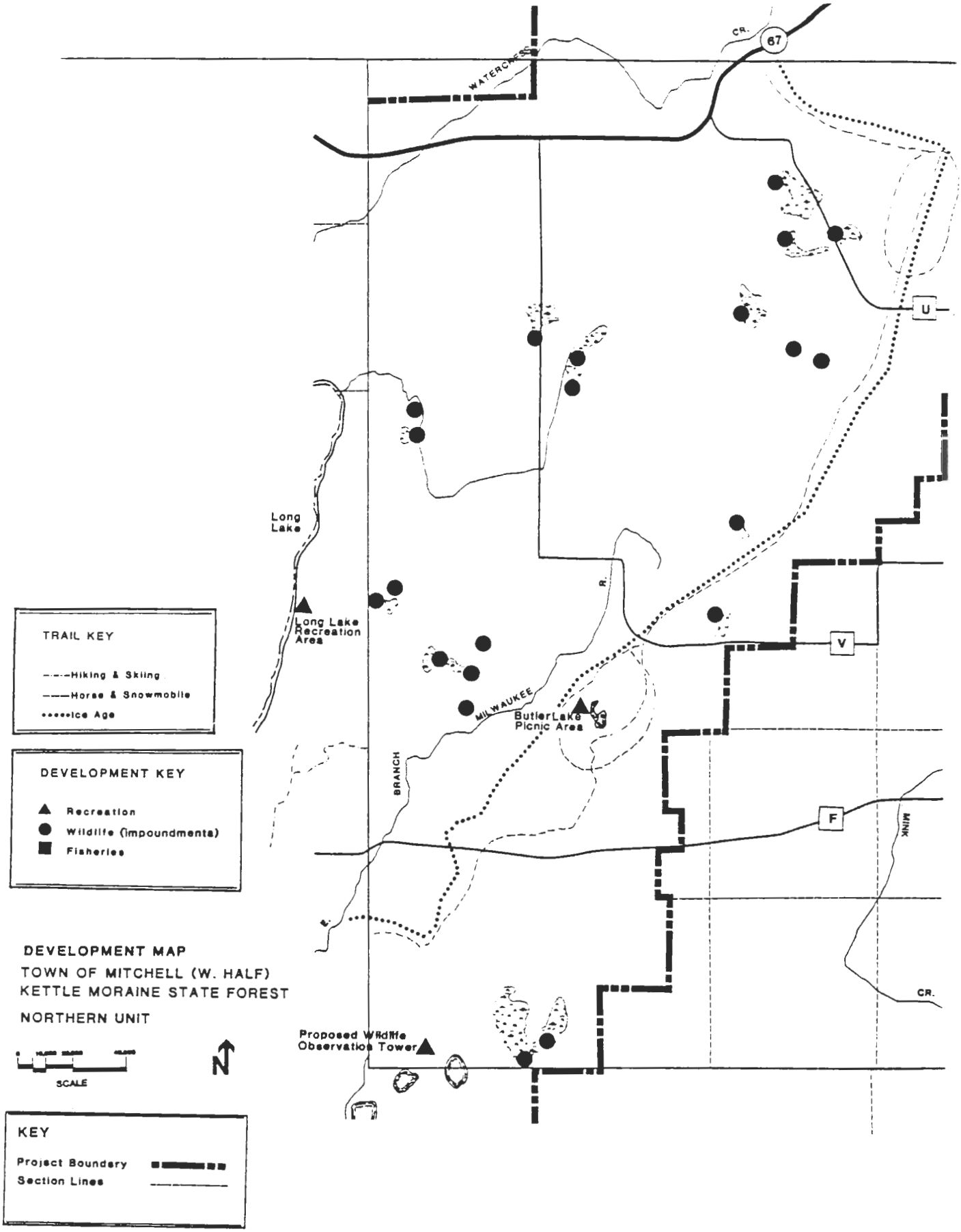
TRAIL KEY

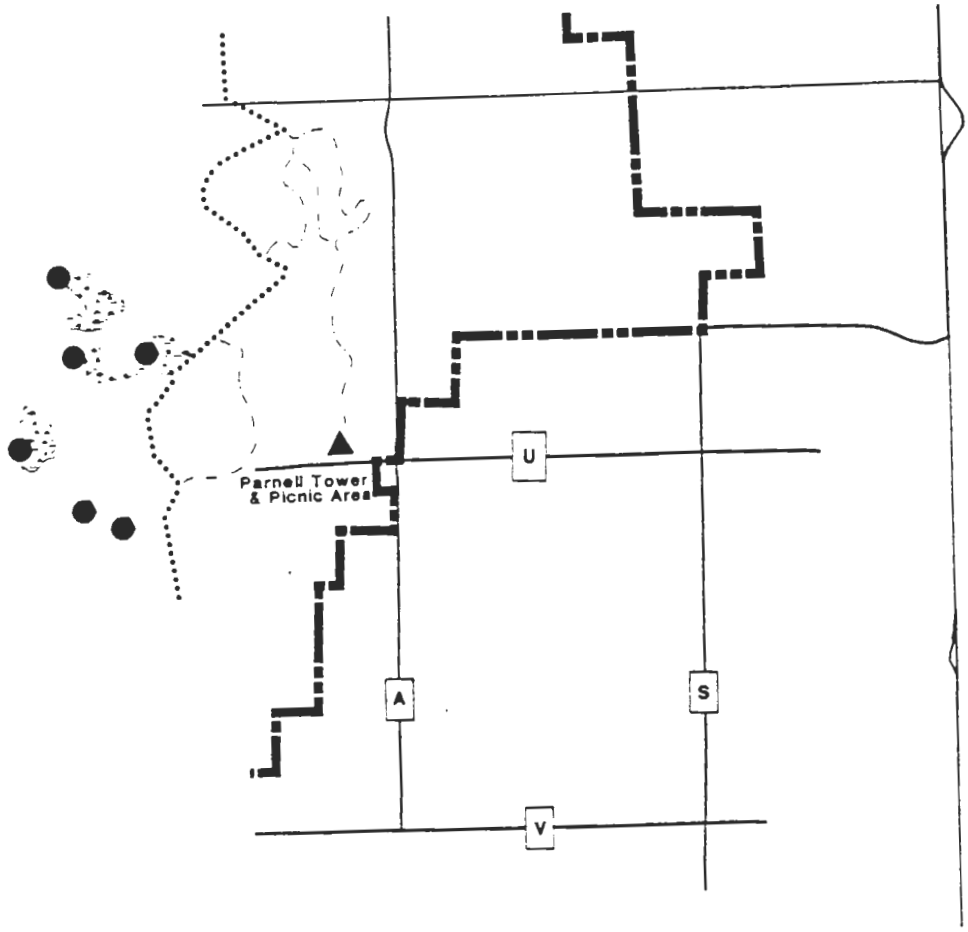
Hiking & Skiing
Horse & Snowmobile
Ice Age

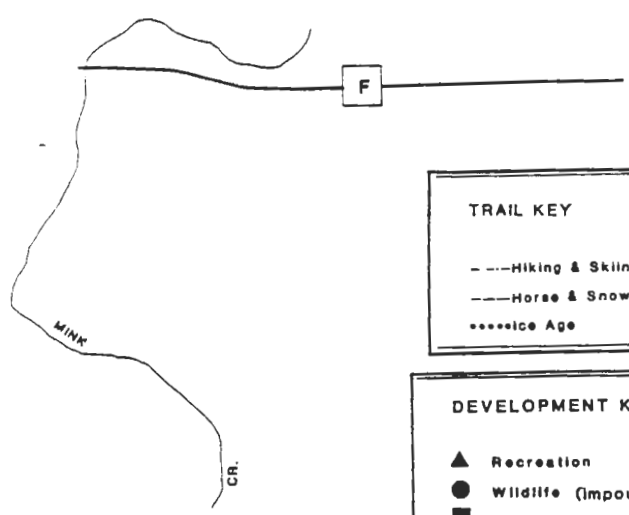


DEVELOPMENT MAP
TOWN OF OSCEOLA
KETTLE MORAINE STATE FOREST
NORTHERN UNIT




WATERCRESS
CR.
67
U
V
F
Long Lake
Long Lake Recreation Area
MILWAUKEE
R.
BRANCH
Butler Lake Picnic Area
WINK
CR.
Proposed Wildlife Observation Tower
TRAIL KEY
Hiking & Skiing
Horse & Snowmobile
Ice Age
DEVELOPMENT KEY
Recreation
Wildlife (Impoundments)
Fisheries
DEVELOPMENT MAP
TOWN OF MITCHELL (W. HALF)
KETTLE MORAINE STATE FOREST
NORTHERN UNIT
SCALE
N
KEY
Project Boundary
Section Lines





DEVELOPMENT MAP
TOWN OF MITCHELL (E. HALF)
KETTLE MORAINE STATE FOREST
NORTHERN UNIT

TRAIL KEY

- - -Hiking & Skiing
- - - -Horse & Snowmobile
•••••Ice Age

SCALE

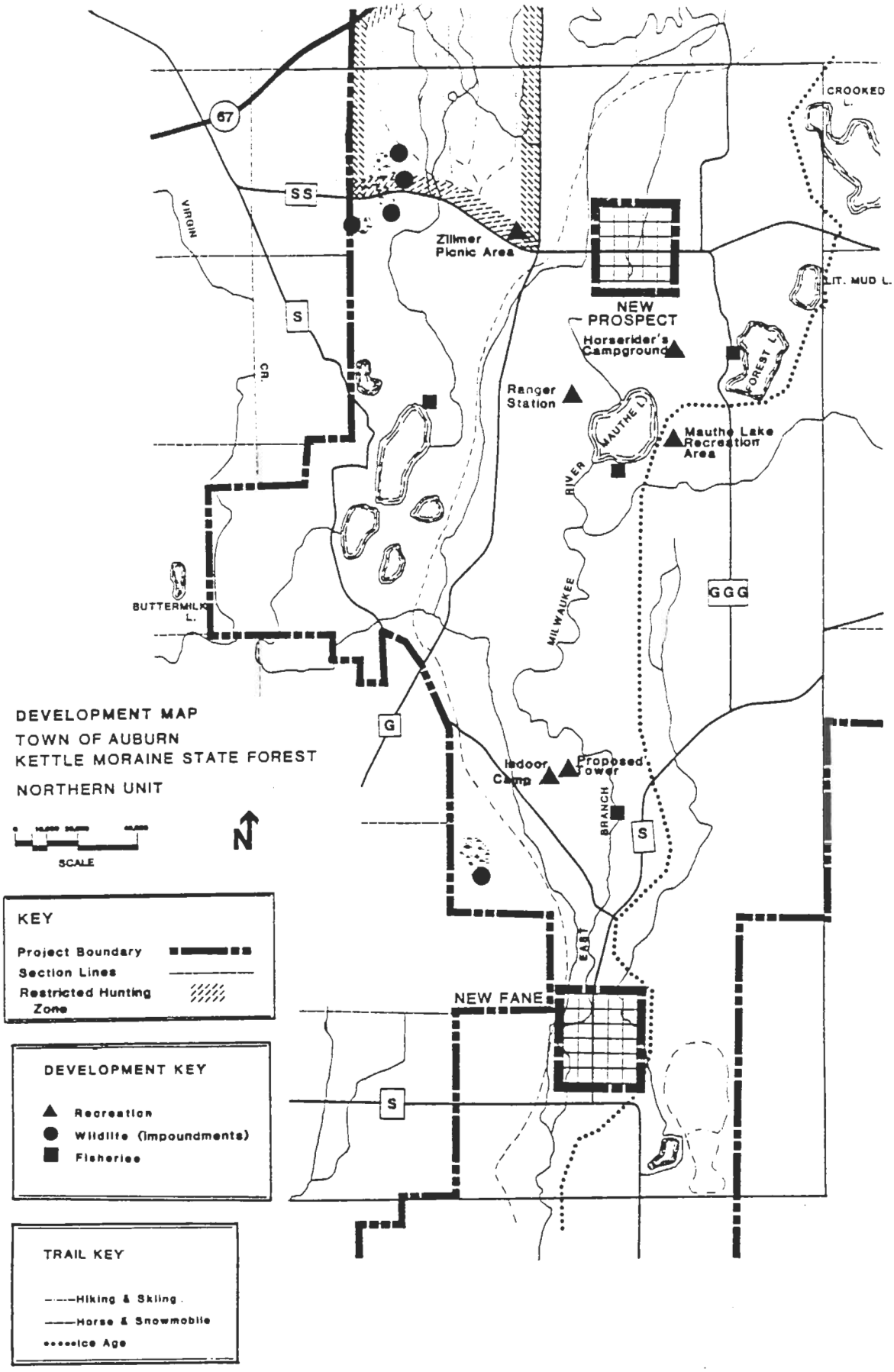
N

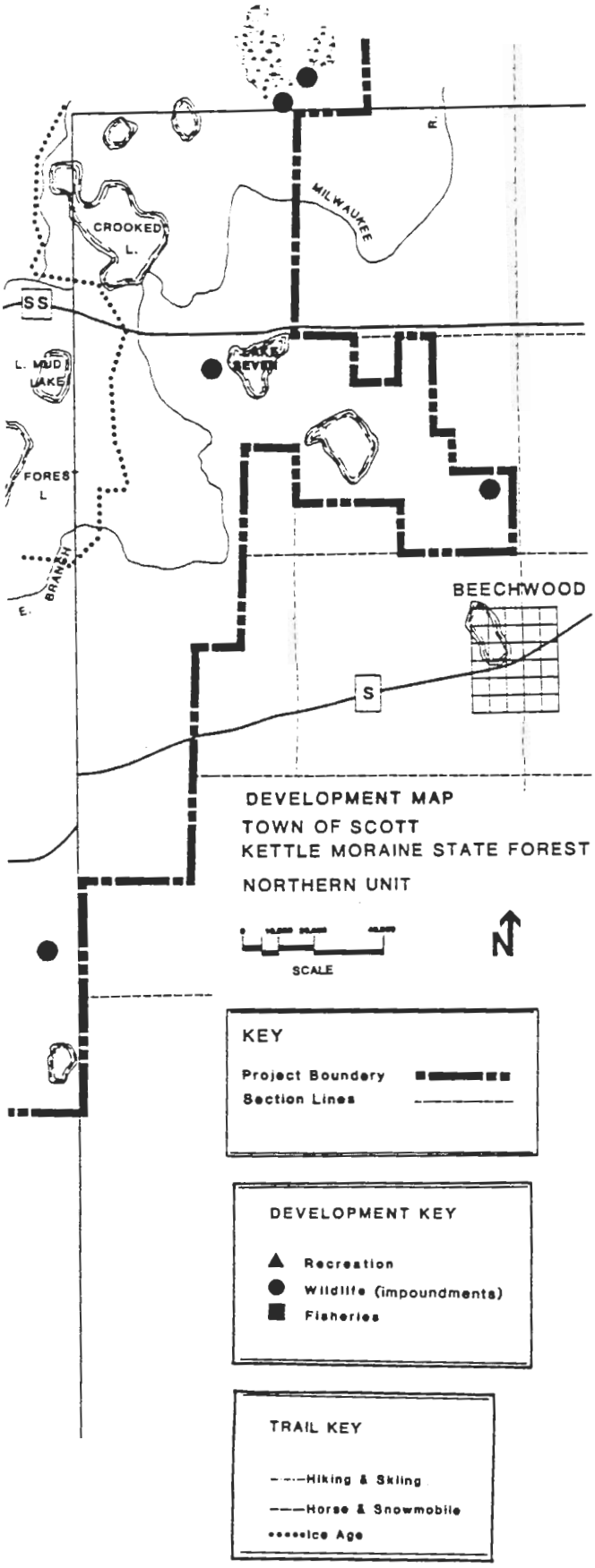
DEVELOPMENT KEY

▲ Recreation
● Wildlife (Impoundments)
■ Fisheries

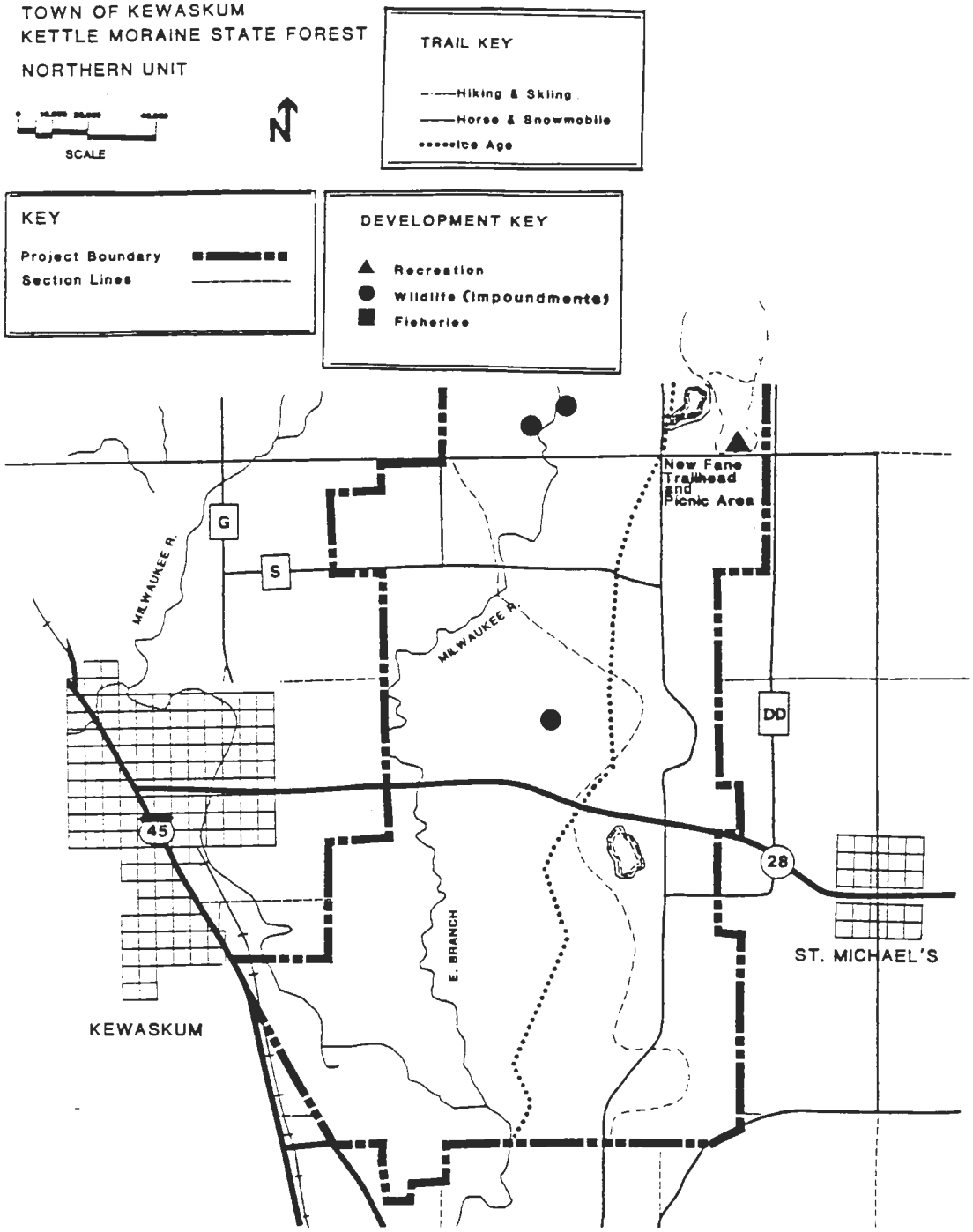
KEY

Project Boundary
Section Lines

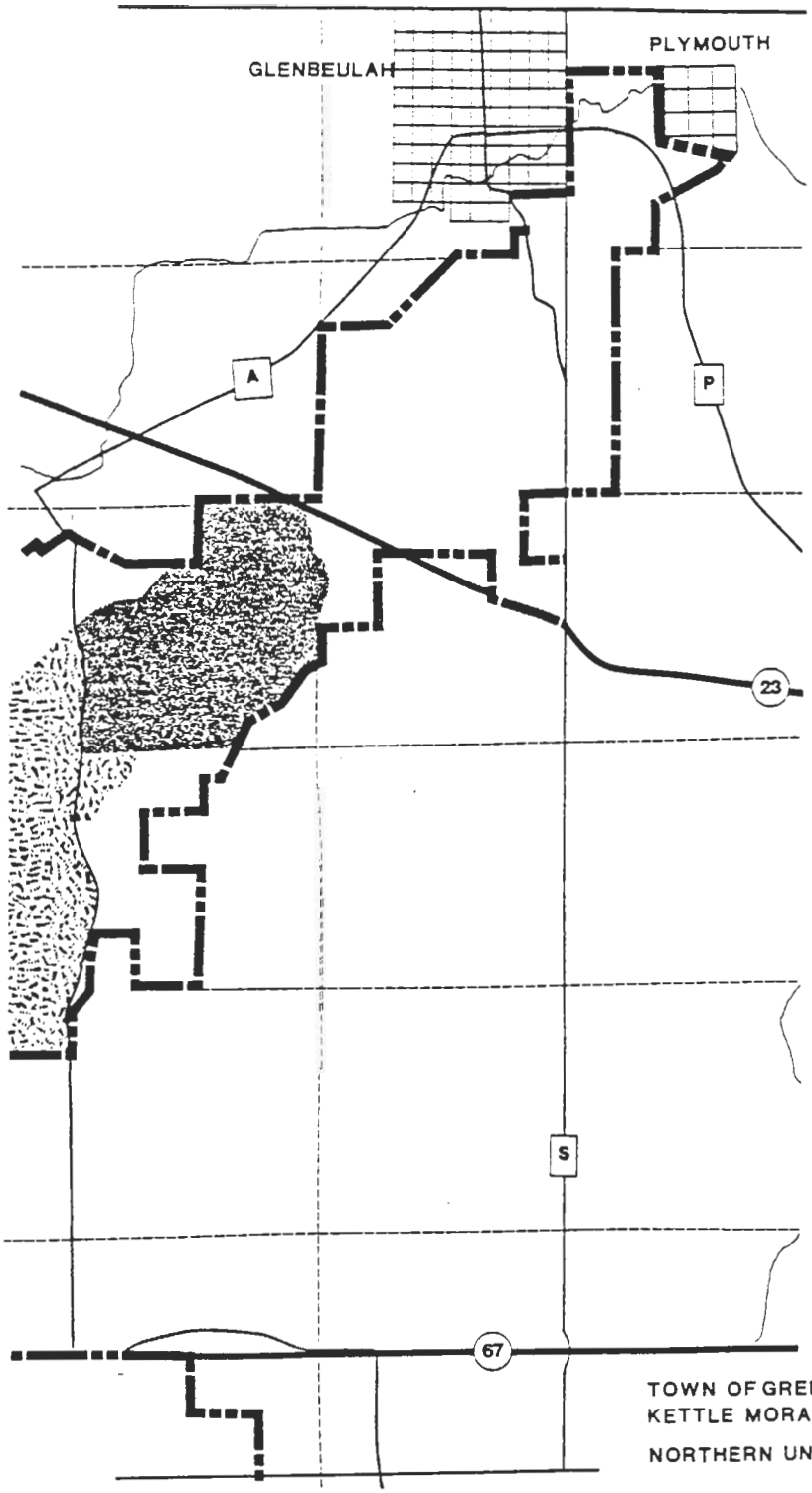

DEVELOPMENT MAP
TOWN OF AUBURN
KETTLE MORAINE STATE FOREST
NORTHERN UNIT
SCALE
N
KEY
Project Boundary
Section Lines
Restricted Hunting Zone
DEVELOPMENT KEY
Recreation
Wildlife (Impoundments)
Fisheries
TRAIL KEY
Hiking & Skiing
Horse & Snowmobile
Ice Age
67
SS
S
G
GGG
VIRGIN
CR.
BUTTERMILK L.
Zillmer Picnic Area
NEW PROSPECT
Horserider's Campground
Ranger Station
MAUTHE L.
Mauthe Lake Recreation Area
RIVER
MILWAUKEE
BRANCH
EAST
Indoor Camp
Proposed Tower
NEW FANE
CROOKED L.
LIT. MUD L.
FOREST L.


CROOKED L.
MILWAUKEE R.
SS
L. MUD LAKE
LAKE SEVEN
FOREST L.
E. BRANCH
BEECHWOOD
S
DEVELOPMENT MAP
TOWN OF SCOTT
KETTLE MORAINE STATE FOREST
NORTHERN UNIT
SCALE
N
KEY
Project Boundary
Section Lines
DEVELOPMENT KEY
Recreation
Wildlife (impoundments)
Fisheries
TRAIL KEY
Hiking & Skiing
Horse & Snowmobile
Ice Age

DEVELOPMENT MAP
TOWN OF KEWASKUM
KETTLE MORAINE STATE FOREST
NORTHERN UNIT



MAP 7 - LAND USE CLASSIFICATIONS



TOWN OF GREENBUSH (E. HALF) / PLYMOUTH
KETTLE MORAINE STATE FOREST

NORTHERN UNIT

SCALE

N

LAND USE CLASSIFICATIONS

- Extensive Recreational Development
- Intensive Recreational Development
- Demonstration Management Areas
- Habitat Preservation Areas
- Natural Areas
- Administrative

KEY

- Project Boundary
- Section Lines
- Existing Land Use Classifications

TOWN OF GREENBUSH (W. HALF)
KETTLE MORAINE STATE FOREST

NORTHERN UNIT

SCALE

N

KEY

Project Boundary

Section Lines

Existing Land Use Classifications

LAND USE CLASSIFICATIONS

Extensive Recreational Development

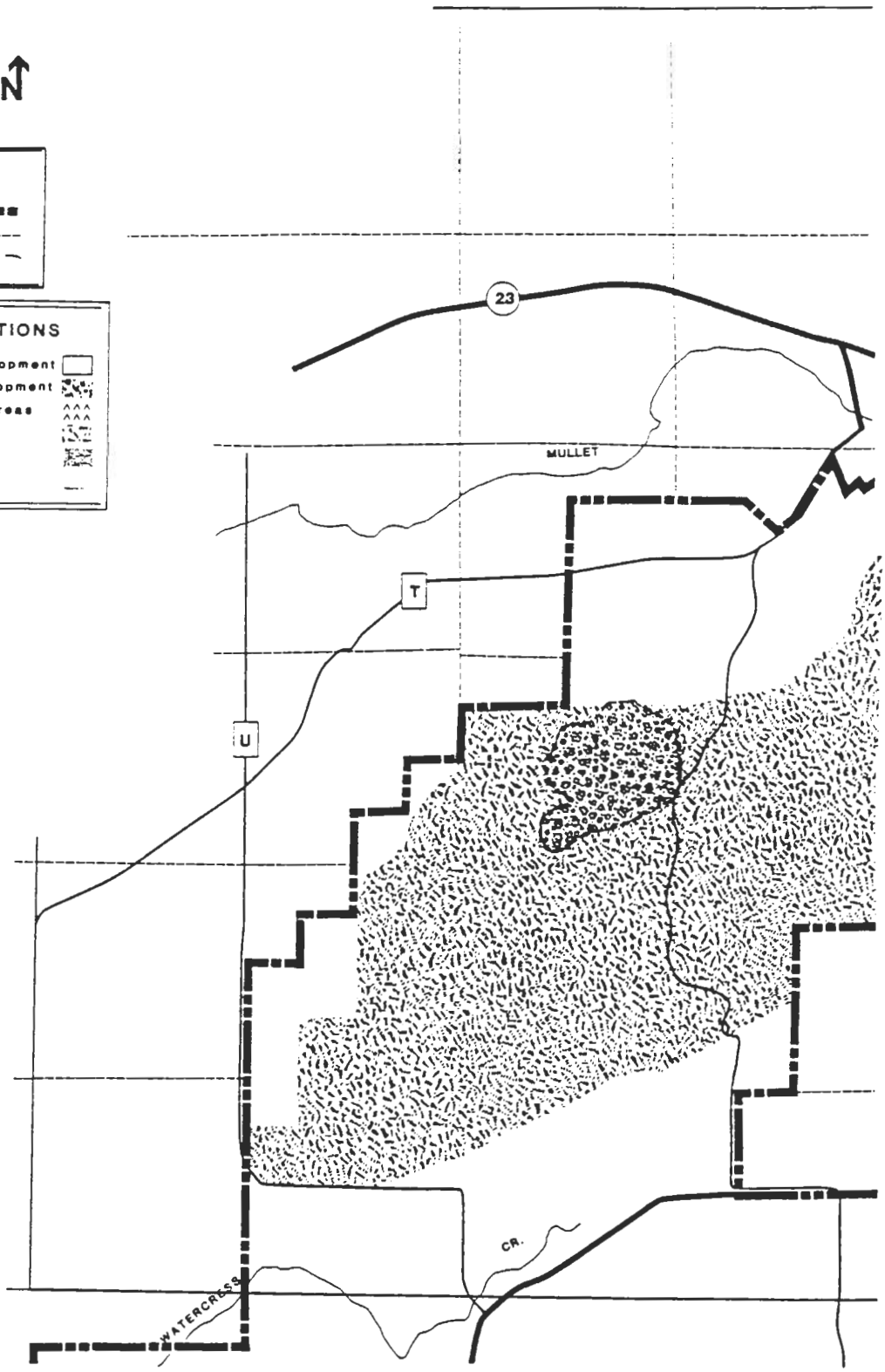
Intensive Recreational Development

Demonstration Management Areas

Habitat Preservation Areas

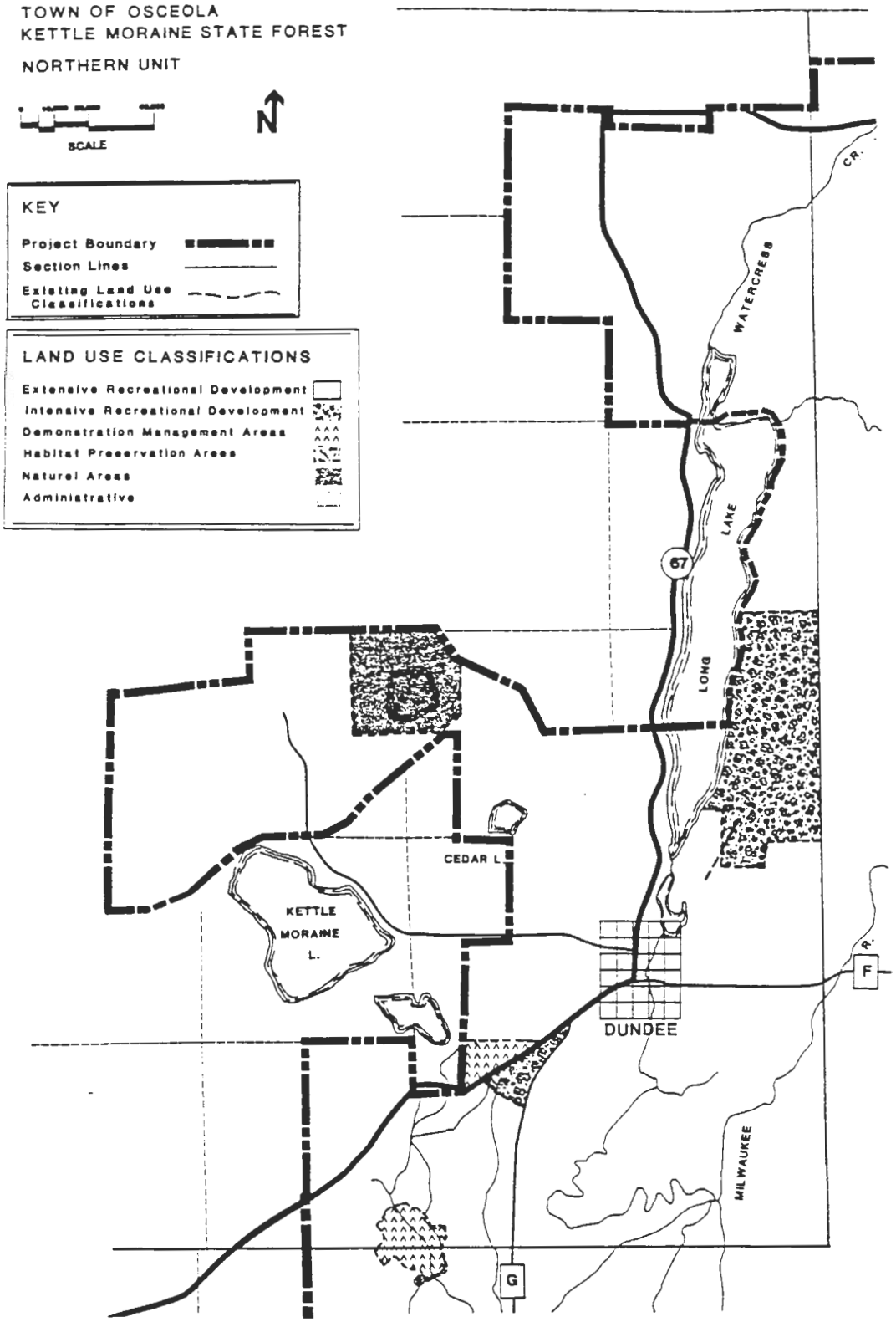
Natural Areas

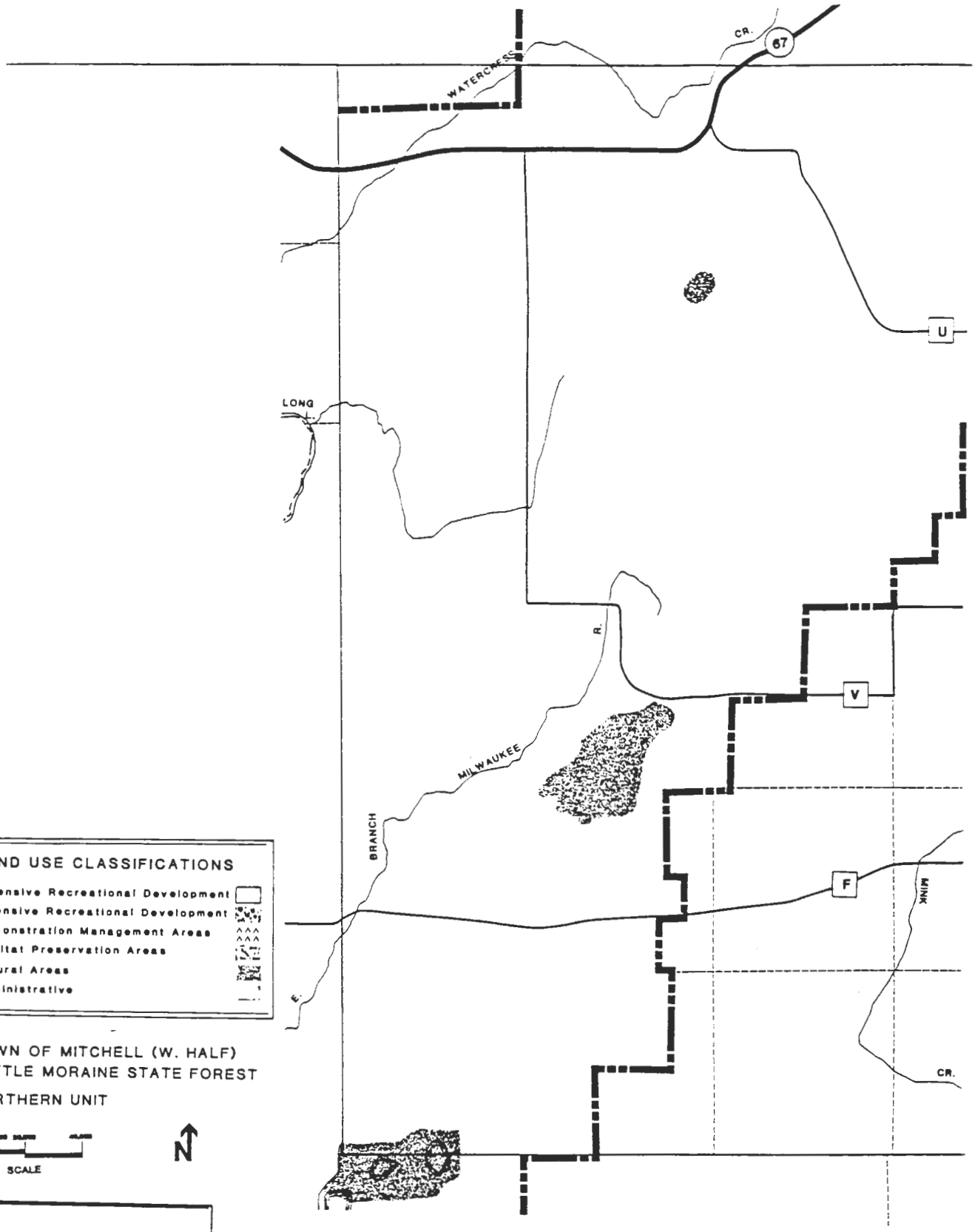
Administrative



TOWN OF OSCEOLA
KETTLE MORAINE STATE FOREST

NORTHERN UNIT





LAND USE CLASSIFICATIONS

- Extensive Recreational Development
- Intensive Recreational Development
- Demonstration Management Areas
- Habitat Preservation Areas
- Natural Areas
- Administrative

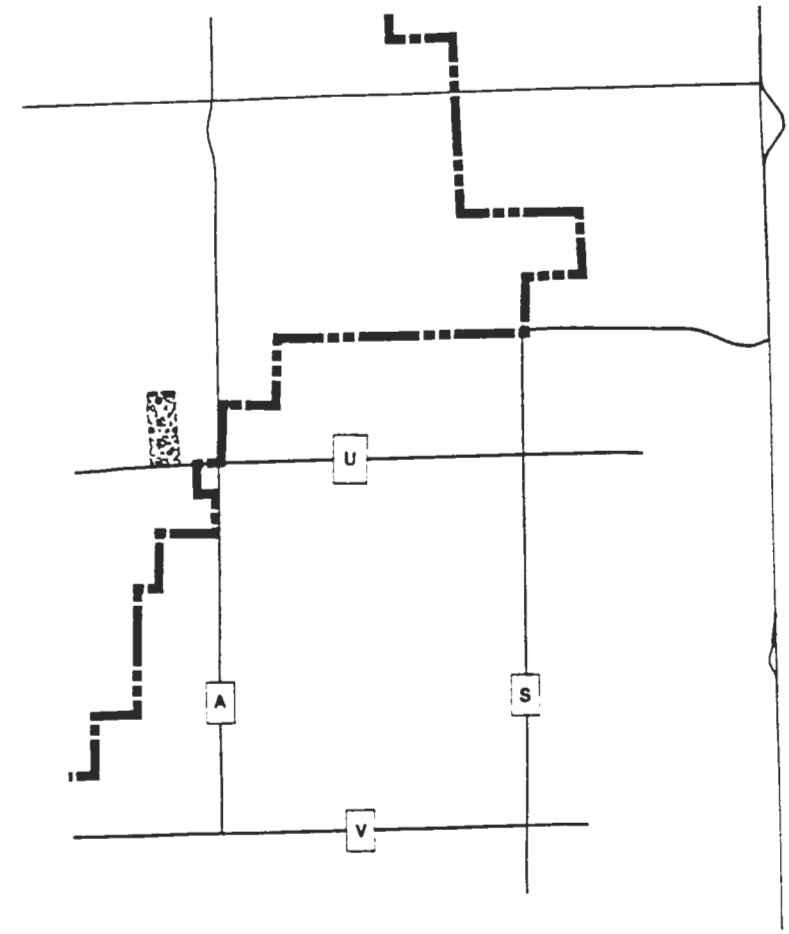
TOWN OF MITCHELL (W. HALF)
KETTLE MORAINE STATE FOREST
NORTHERN UNIT

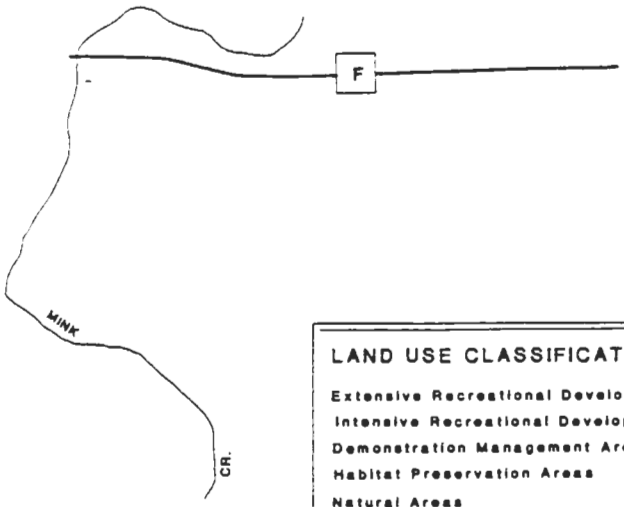
SCALE

N

KEY

- Project Boundary
- Section Lines
- Existing Land Use Classifications





TOWN OF MITCHELL (E. HALF)
KETTLE MORAINE STATE FOREST

NORTHERN UNIT

SCALE

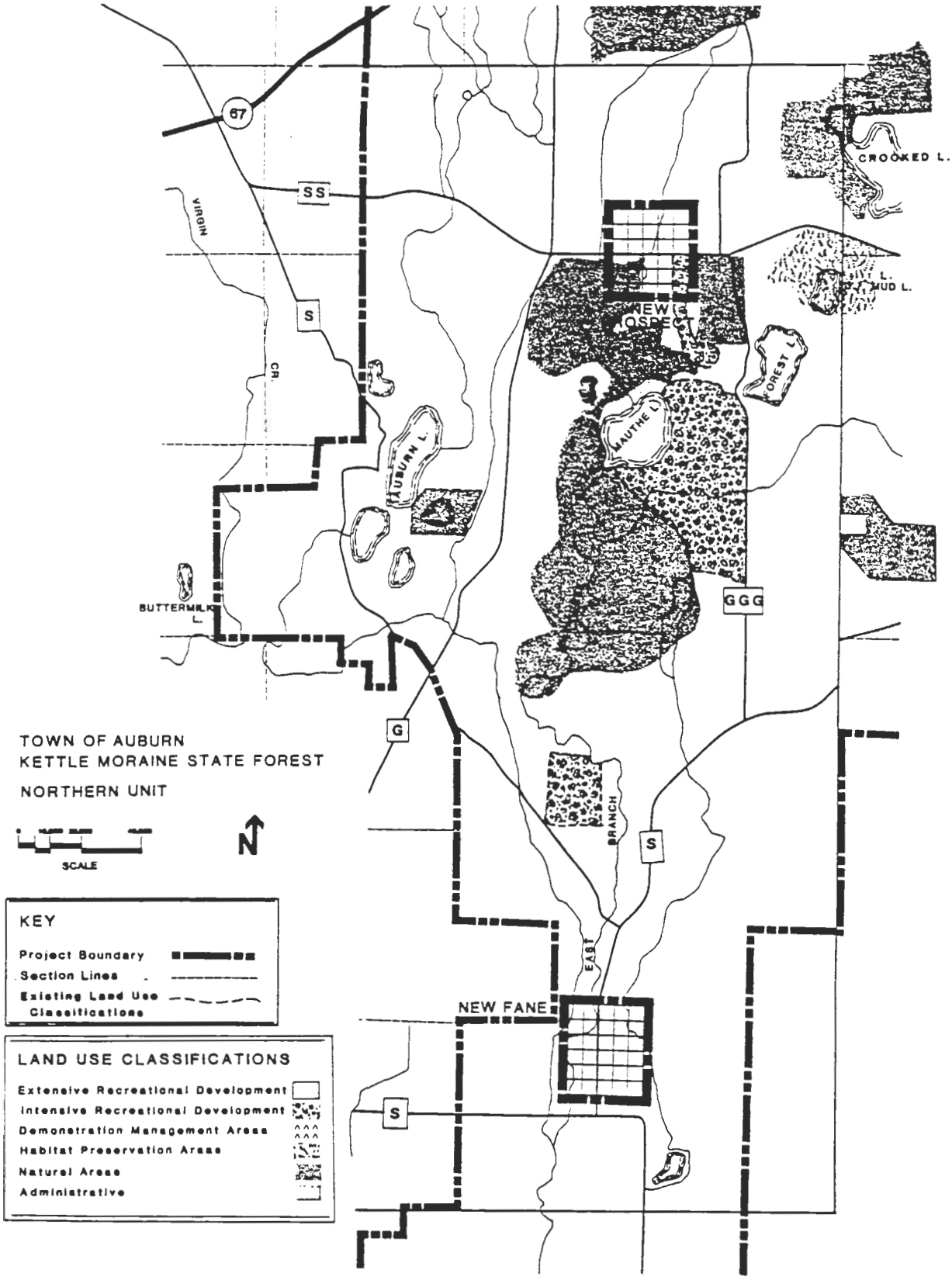
N

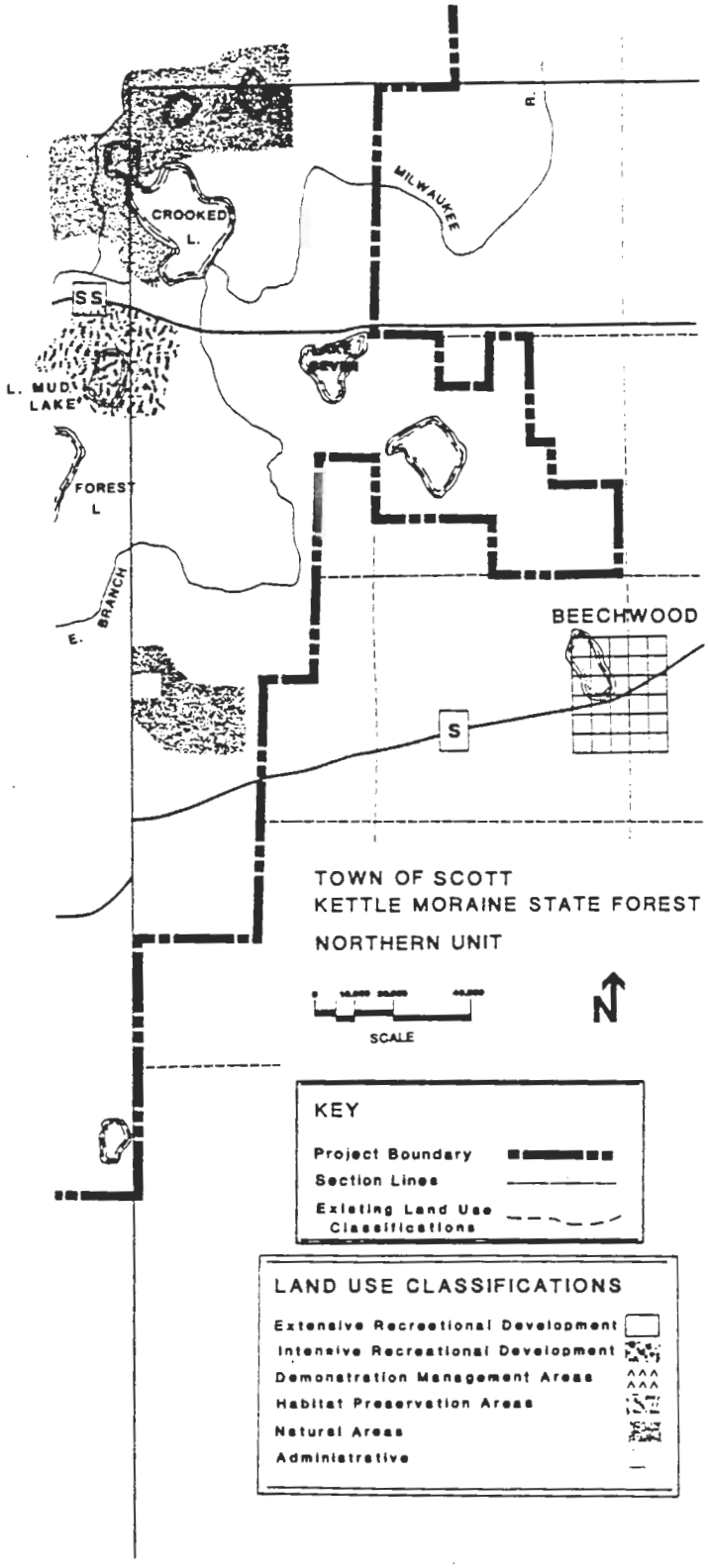
LAND USE CLASSIFICATIONS

- Extensive Recreational Development
- Intensive Recreational Development
- Demonstration Management Areas
- Habitat Preservation Areas
- Natural Areas
- Administrative

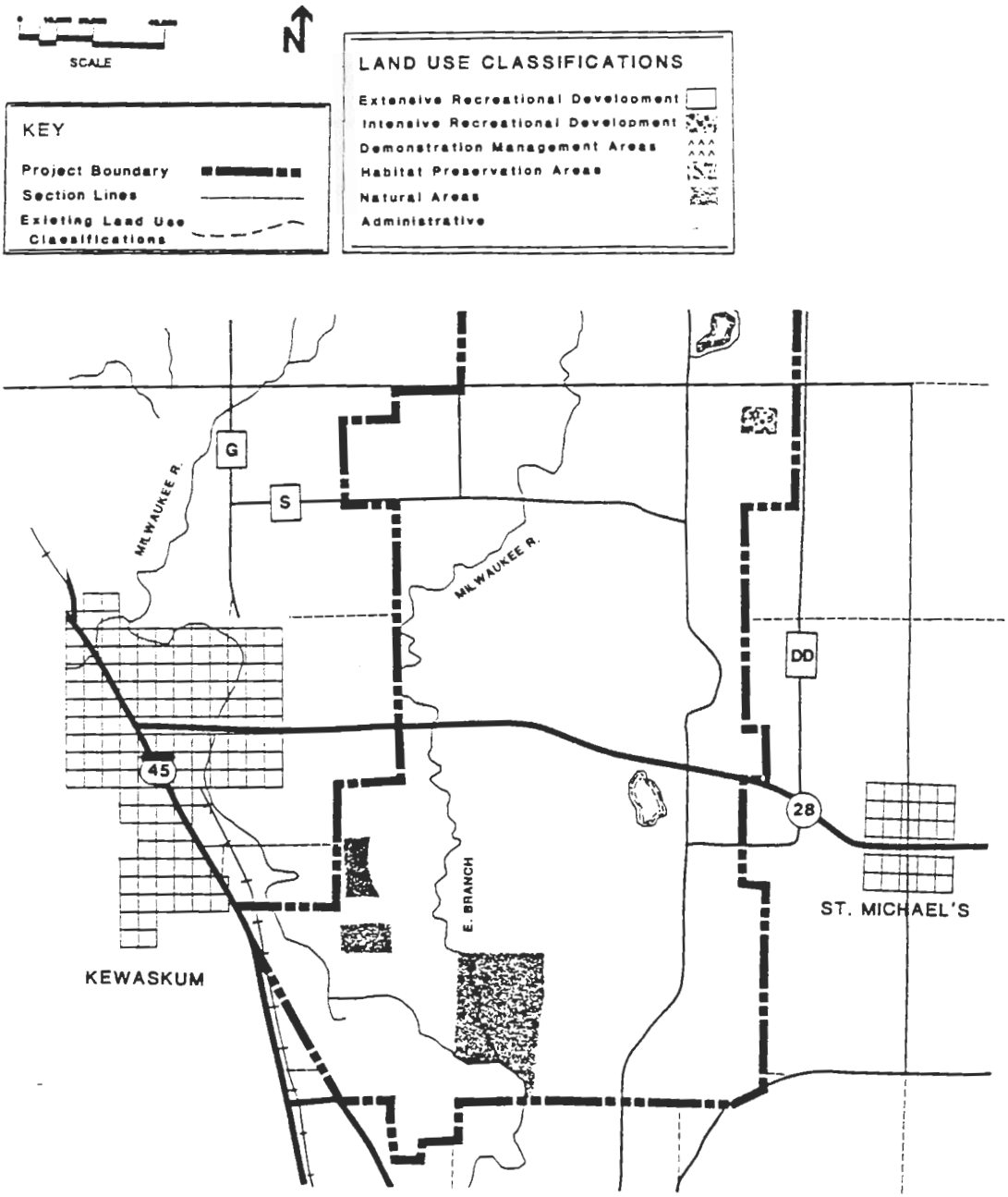
KEY

- Project Boundary
- Section Lines
- Existing Land Use Classifications

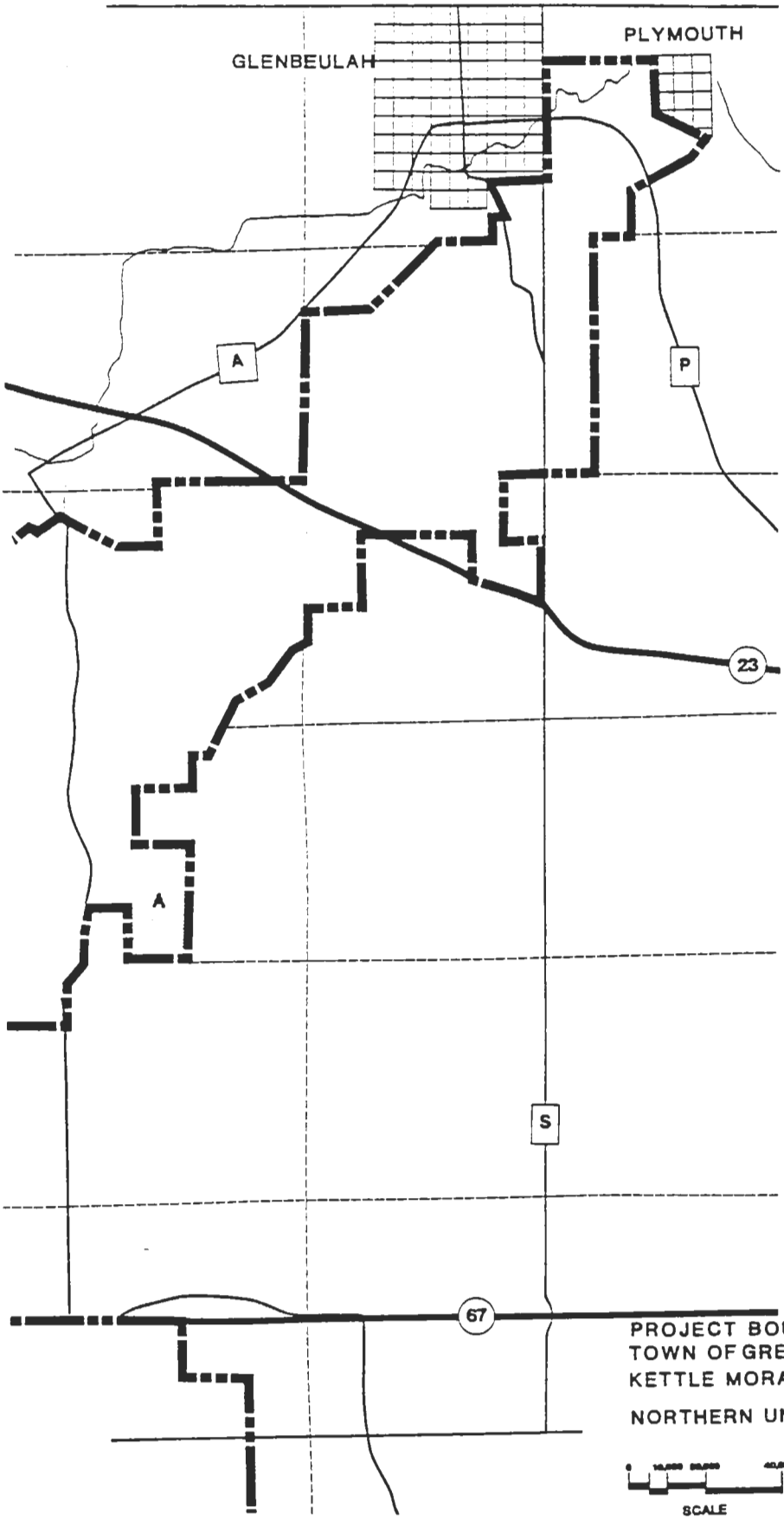

TOWN OF AUBURN
KETTLE MORAINE STATE FOREST
NORTHERN UNIT
SCALE
N
KEY
Project Boundary
Section Lines
Existing Land Use Classifications
LAND USE CLASSIFICATIONS
Extensive Recreational Development
Intensive Recreational Development
Demonstration Management Areas
Habitat Preservation Areas
Natural Areas
Administrative
67
SS
S
G
GGG
VIRGIN
CR.
AUBURN L.
BUTTERMILK L.
MAUTHE L.
FOREST L.
CROOKED L.
MUD L.
NEW ASPECT
BRANCH
EAST
NEW FANE


CROOKED L.
MILWAUKEE R.
SS
L. MUD LAKE
FOREST L
E. BRANCH
BEECHWOOD
S
TOWN OF SCOTT
KETTLE MORAINE STATE FOREST
NORTHERN UNIT
SCALE
N
KEY
Project Boundary
Section Lines
Existing Land Use Classifications
LAND USE CLASSIFICATIONS
Extensive Recreational Development
Intensive Recreational Development
Demonstration Management Areas
Habitat Preservation Areas
Natural Areas
Administrative

TOWN OF KEWASKUM
KETTLE MORAINE STATE FOREST
NORTHERN UNIT



MAP 8 - PROJECT BOUNDARY



PROJECT BOUNDARY MAP
TOWN OF GREENBUSH (E. HALF) / PLYMOUTH
KETTLE MORAINE STATE FOREST

NORTHERN UNIT

SCALE

N

KEY

Project Boundary

Section Lines

Proposed Additions to Project Boundary

LETTERS CORRESPOND WITH DESCRIPTIONS IN SECTION VIII

PROJECT BOUNDARY MAP
TOWN OF GREENBUSH (W. HALF)
KETTLE MORAINE STATE FOREST
NORTHERN UNIT

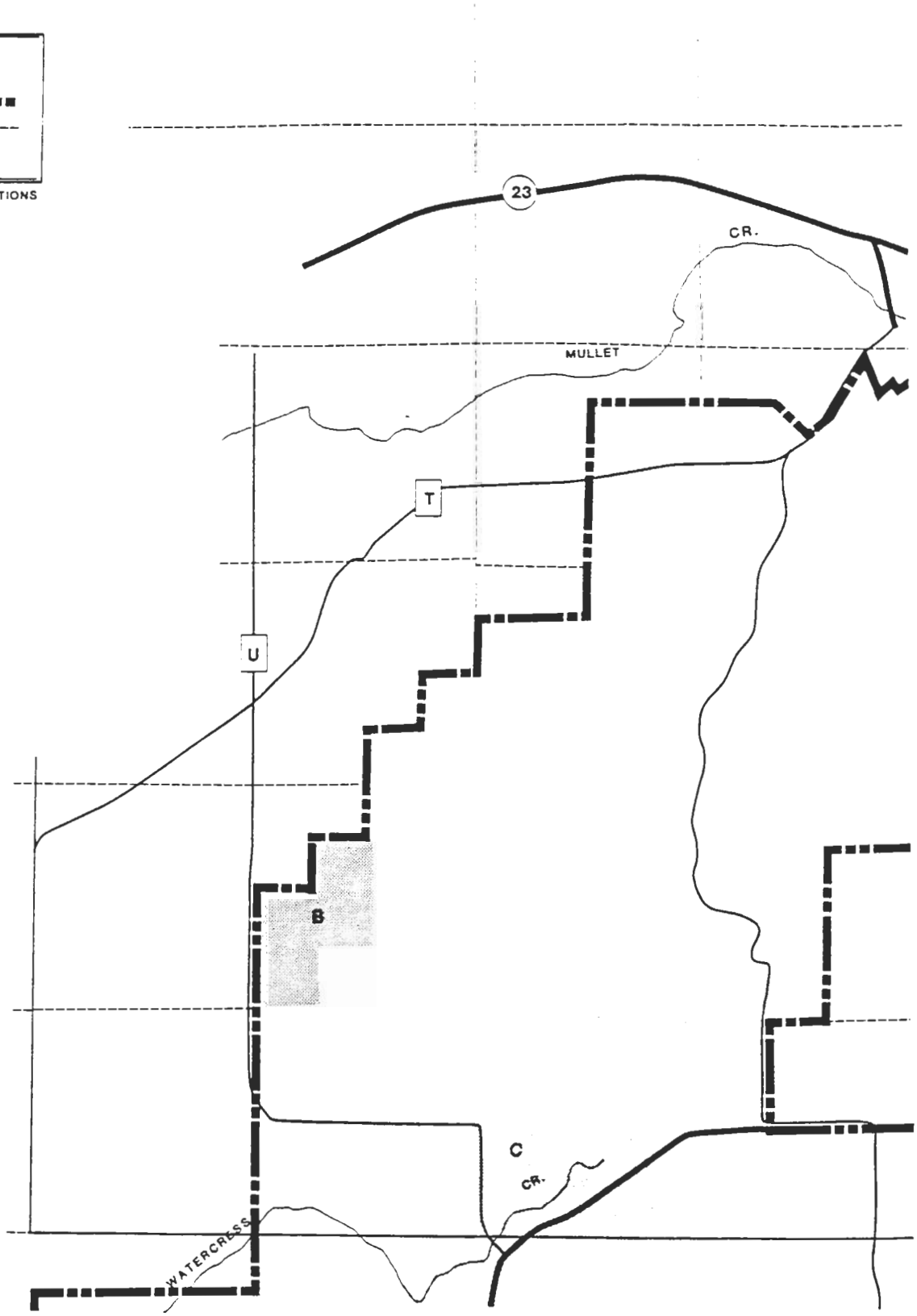
0 10,000 20,000 40,000
SCALE

N

KEY

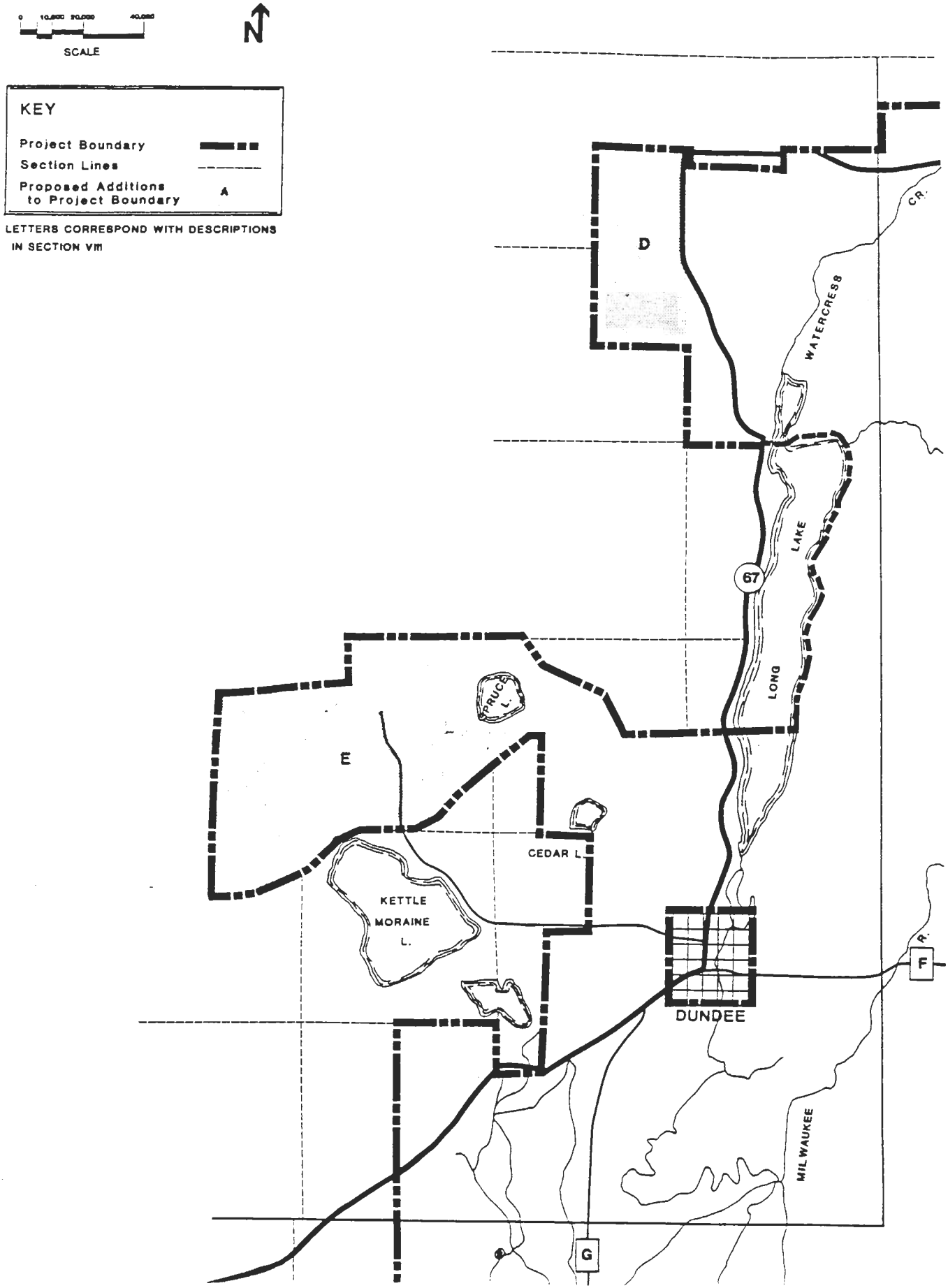
Project Boundary
Section Lines
Proposed Additions to Project Boundary — A

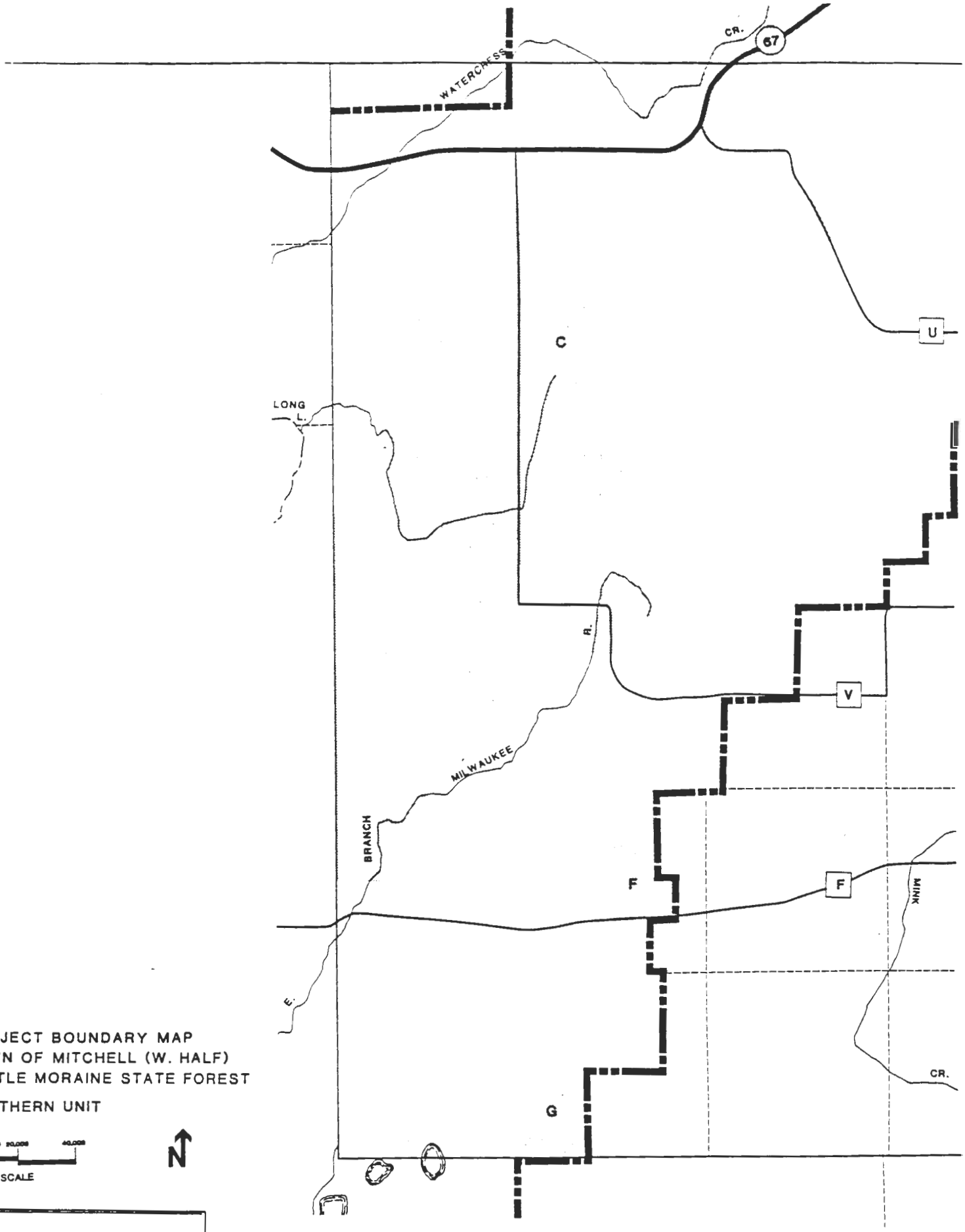
LETTERS CORRESPOND WITH DESCRIPTIONS IN SECTION VIII



PROJECT BOUNDARY MAP
TOWN OF OSCEOLA
KETTLE MORAINE STATE FOREST

NORTHERN UNIT





PROJECT BOUNDARY MAP
TOWN OF MITCHELL (W. HALF)
KETTLE MORAINE STATE FOREST

NORTHERN UNIT

0 10,000 20,000 40,000
SCALE

N

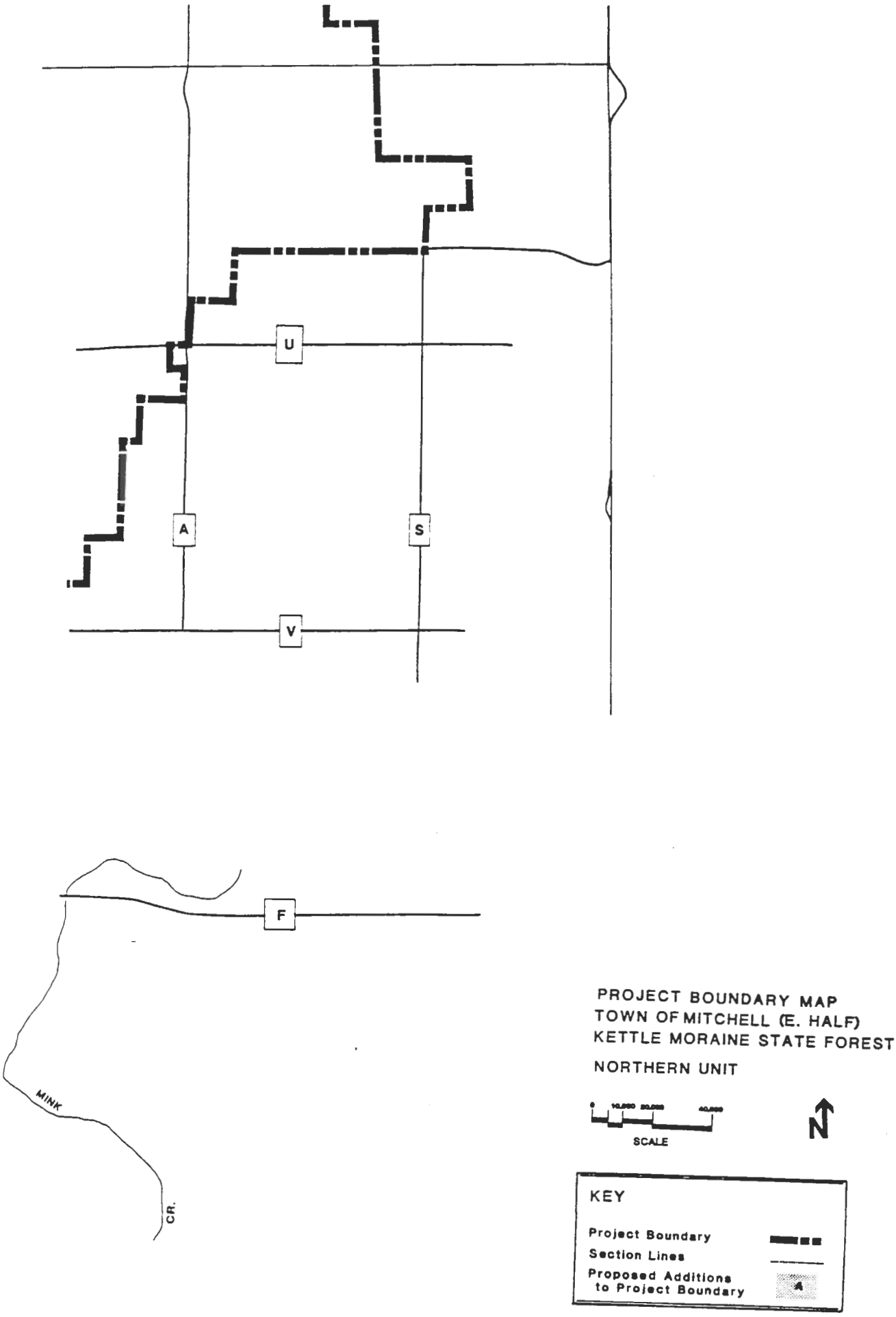
KEY

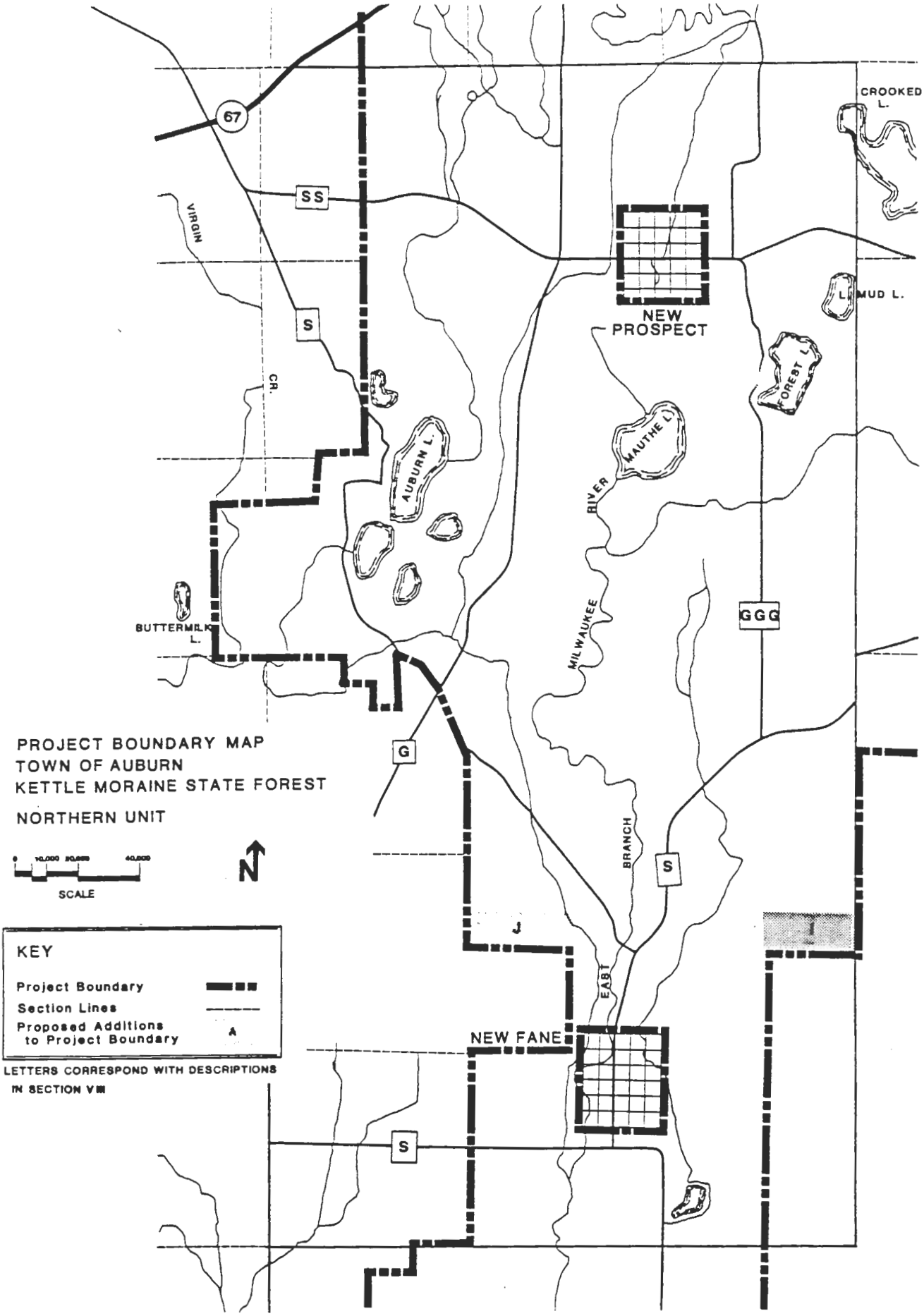
Project Boundary

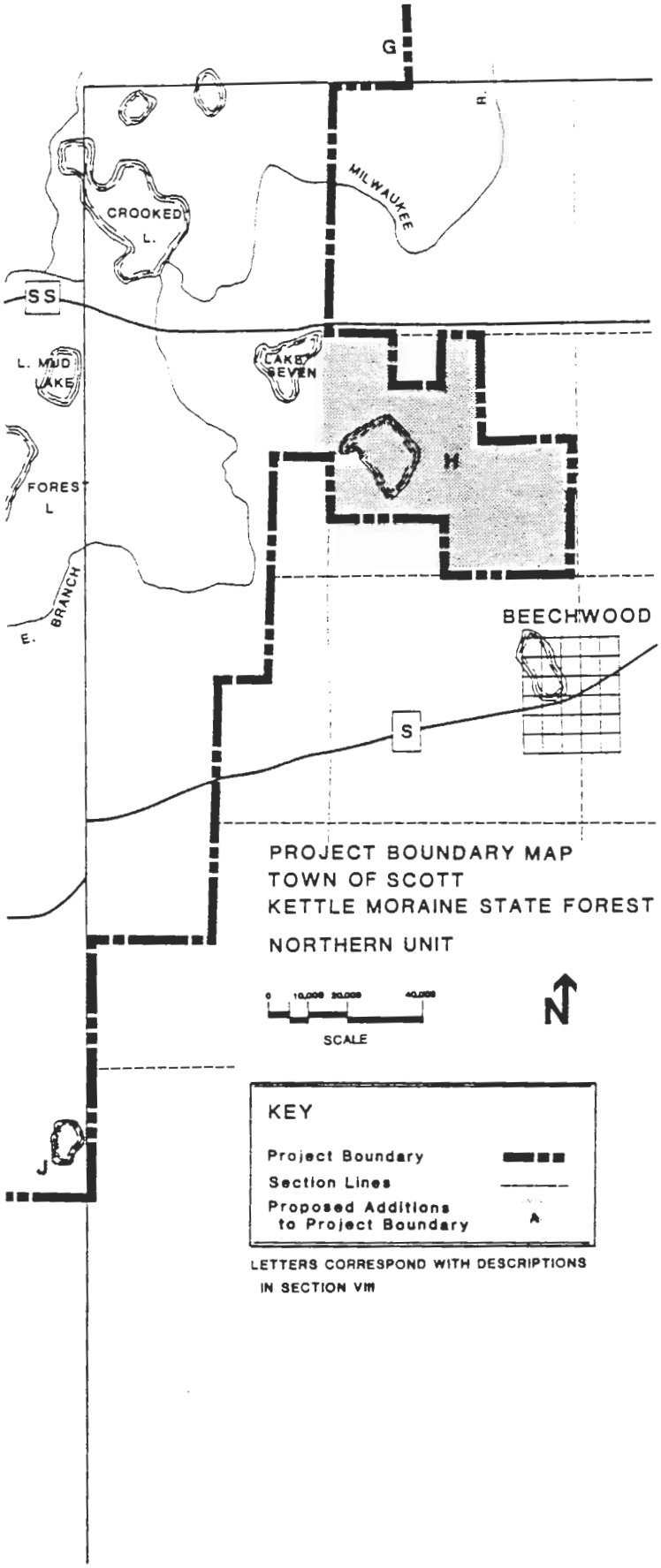
Section Lines

Proposed Additions to Project Boundary A

LETTERS CORRESPOND WITH DESCRIPTIONS IN SECTION VIII


U
A
S
V
F
MINK
CR.
PROJECT BOUNDARY MAP
TOWN OF MITCHELL (E. HALF)
KETTLE MORAINE STATE FOREST
NORTHERN UNIT
SCALE
N
KEY
Project Boundary
Section Lines
Proposed Additions
to Project Boundary
A


PROJECT BOUNDARY MAP
TOWN OF AUBURN
KETTLE MORAINE STATE FOREST
NORTHERN UNIT
SCALE
N
KEY
Project Boundary
Section Lines
Proposed Additions to Project Boundary
A
LETTERS CORRESPOND WITH DESCRIPTIONS IN SECTION VIII
67
SS
S
G
GGG
J
I
VIRGIN
CR.
BUTTERMILK L.
AUBURN L.
NEW PROSPECT
MAUTHE L.
FOREST L.
MUD L.
CROOKED L.
MILWAUKEE
RIVER
BRANCH
EAST
NEW FANE


G
R.
MILWAUKEE
CROOKED
L.
SS
L. MUD
LAKE
LAKE
SEVEN
H
FOREST
L
E. BRANCH
BEECHWOOD
S
J
PROJECT BOUNDARY MAP
TOWN OF SCOTT
KETTLE MORAINE STATE FOREST
NORTHERN UNIT
0 10,000 20,000 40,000
SCALE
N
KEY
Project Boundary
Section Lines
Proposed Additions
to Project Boundary
A
LETTERS CORRESPOND WITH DESCRIPTIONS
IN SECTION VIII

PROJECT BOUNDARY MAP
TOWN OF KEWASKUM
KETTLE MORAINE STATE FOREST

NORTHERN UNIT

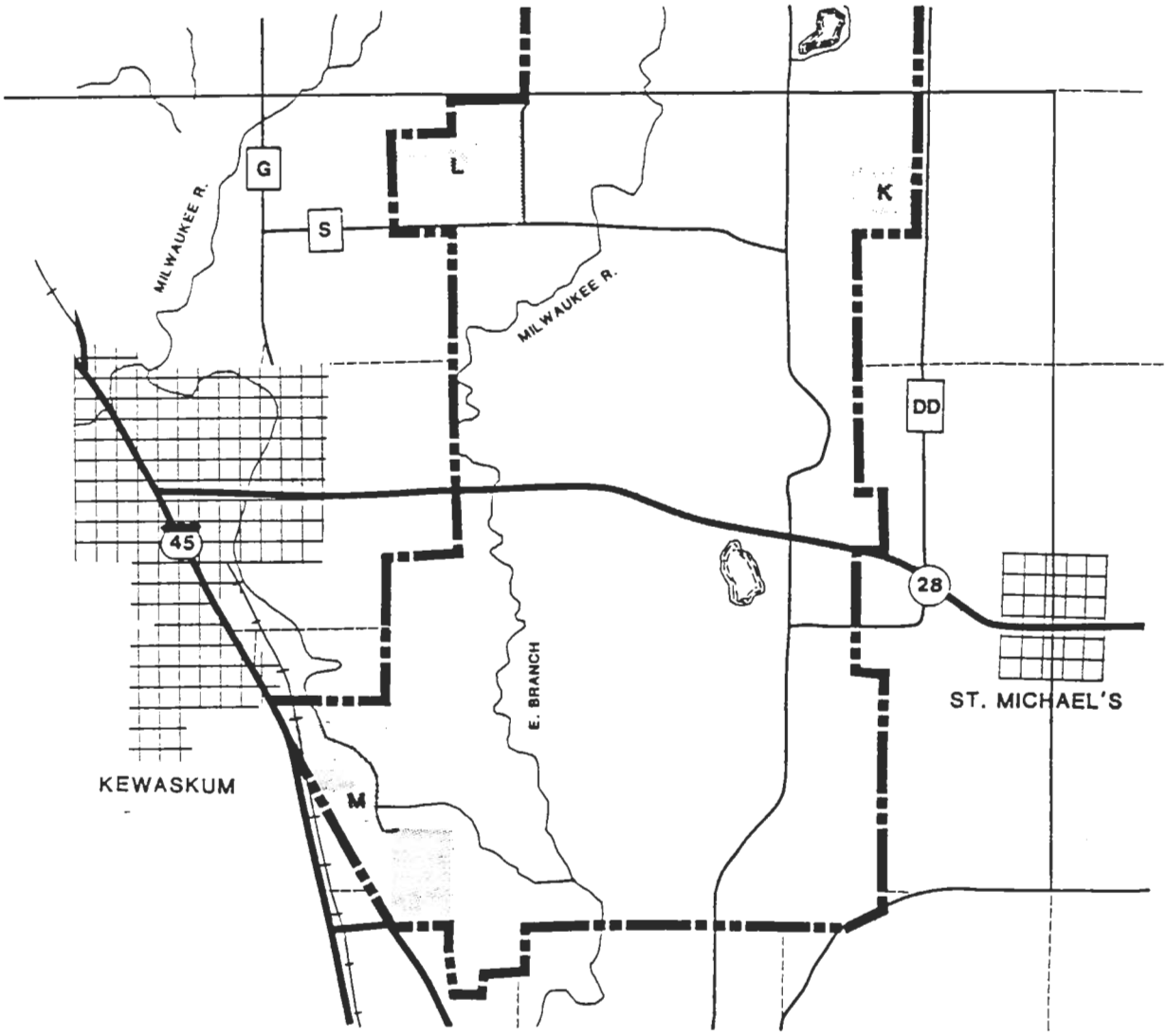
SCALE

N

KEY

Project Boundary

Section Lines

Proposed Additions to Project Boundary — A

LETTERS CORRESPOND WITH DESCRIPTIONS IN SECTION VIII