Volume 5-Chapter 9

OUTDOOR RECREATION

Minnesota Environmental Quality Board
Regional Copper-Nickel Study
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9.1 INTRODUCTION AND SUMMARY OF FINDINGS

Recreation is an important element in the human environment. A region's capacity to support recreation, both for local residents and tourists, is an important resource that should be periodically evaluated in order to determine if impacts to this resource will result in unmitigatable changes in either the quality of the human environment or the economy of the region. The ability of the Regional Copper-Nickel Study Area (Study Area) to support a great deal of outdoor recreation and the popularity of the region for activities such as resort vacations, fishing, hunting, snowmobiling, camping, and canoeing, among others, indicates the value of the recreational resource base in the area.

This chapter characterizes the nature of outdoor recreation in the Study Area and describes the possible impacts to this resource which may result from development of a copper-nickel mining industry in the area. Generally speaking, these impacts will be of two types. First, mine development may decrease the size of the resource base by either directly consuming land used for recreational purposes or by altering the environment through changes in air and water quality or audible noise levels. Second, mine development will increase the number of users of the resource base by stimulating population growth in the Study Area.

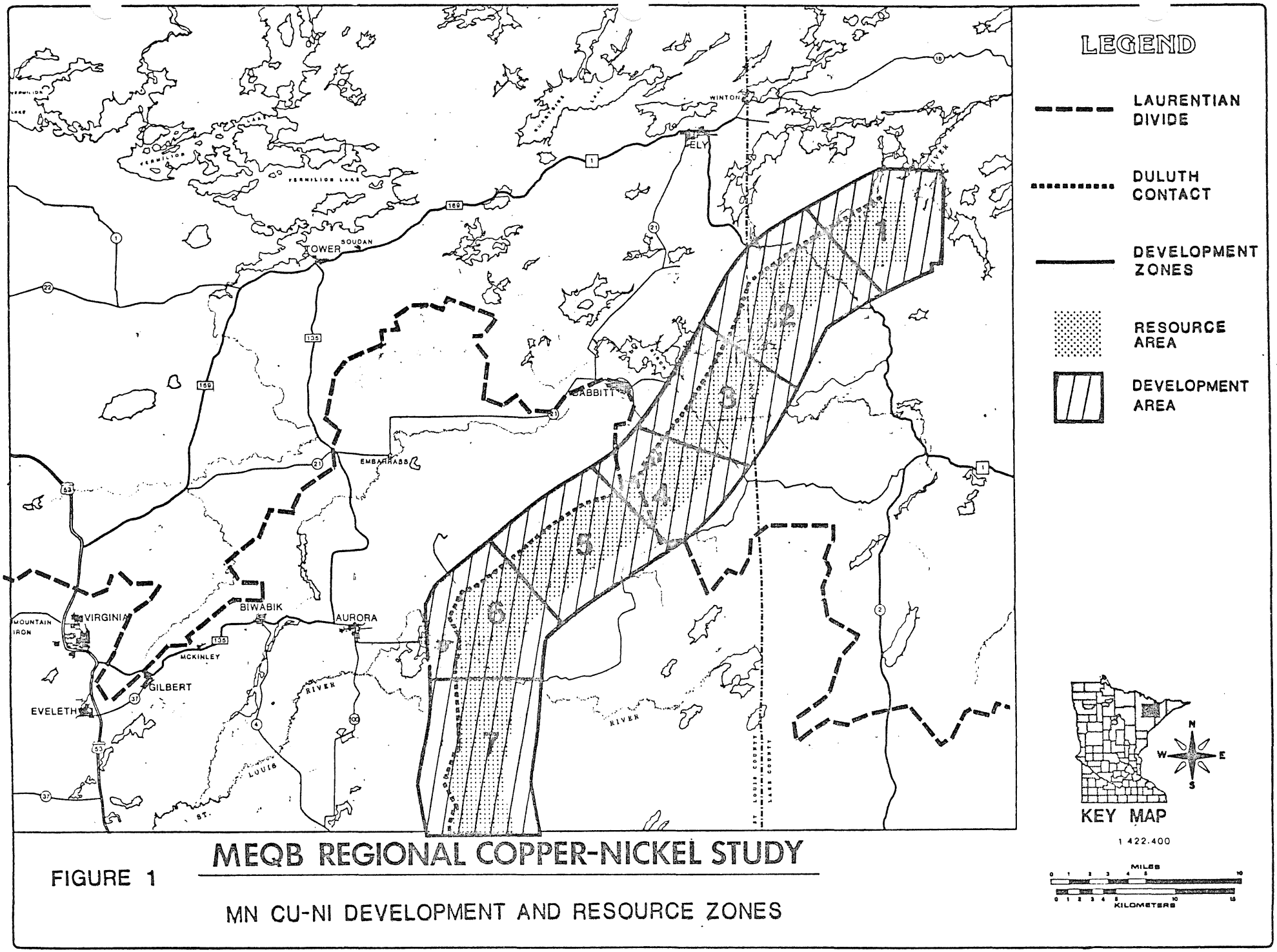
The chief difficulty in discussing impacts to the Study Area recreational resource base is the lack of sufficient quantitative data indicating either present or historic use within the areas which will potentially be liable to impact, the contribution of recreation to the area's economy (see Volume 5-Chapter 16 for information on the impact of tourism on Ely's economy), or the

exact locations and sizes of areas used for activities such as hunting or snowmobiling. Outdoors recreation is generally land extensive and requires large tracts of land to support a given activity. As a result, the boundaries of recreational land use (other than officially designated lands) shift constantly and defy quantification. Therefore, this chapter describes recreational use in terms of general regional patterns and describes impacts in terms of potential effects to regional recreational resources.

Figure 1 shows the zones which have been created for the purpose of assessing impacts in the area where future copper-nickel mining will most likely occur. Copper-nickel mineral deposits are located in a corridor roughly one and one-half miles wide (the Resource Zone) paralleling the basal contact of the Duluth Complex which runs from a point south of Hoyt Lakes north-northeast to a point along the South Kawishiwi River. This is the zone in which the actual extractive operations will take place in the forseeable future. The remainder of the Development Area extends a mile and one-half on either side of the Resource Zone and represents the estimated area in which it would be economically feasible to transport waste rock and lean ore for dumping and stockpiling. While it may be feasible to transport and dispose of tailings up to ten miles from the processing plant, it is assumed that these facilities will be located as close to the other mine components as possible with the resultant expectation that most direct land consumption impacts will occur in the Development Area. The overall area encompassed by the Development Area is further divided into seven zones from north to south referred to as Development Zones.

9.1.1 Characterization Summary

1) There are 264 designated outdoor recreation facilities in the Study Area including:



MEQB REGIONAL COPPER-NICKEL STUDY

FIGURE 1

MN CU-NI DEVELOPMENT AND RESOURCE ZONES

102 resorts

36 campgrounds (including public, private, and group camps)

58 public boat accesses

20 public swimming beaches

41 picnic spots

5 public or semi-public golf courses

2 ski areas

2) 73% of all Study Area recreational facilities are located in the northern one half of the Study Area. This includes 97% of all resorts and 69% of all campgrounds.

3) Fourteen facilities are located in the Resource Zone and 8 in the remainder of the Development Area.

4) Recreational activities such as hunting, fishing, snowmobiling, boating, canoeing, wild food gathering, hiking and sightseeing occur over wide-ranging portions of the Study Area.

5) Large amounts of public land and private land managed by wood products and mining companies are open for recreational activity.

6) A major factor affecting the amount of recreational use an area receives is the ease of accessability to that area, whether by road, trail, or water.

7) Features which inhibit recreational activities include residential settlement, industrial development, bog and marshlands, and low water levels in rivers and streams.

9.1.2 Impacts Summary

1) Impacts will be dependent on the actual siting and type of the mine facilities.

2) Potential direct impacts (actual displacement of recreational lands) would be greatest in development zone 2 followed by zones 1, 3, 7 and 6.

3) Potential direct impacts would be lightest when development is located in zones 4 and 5.

4) The maximum number of facilities which would be displaced if all lands in the Copper-Nickel Development Area were consumed by mining development is 22 (8% of all Study Area facilities).

5) Air quality changes resulting from copper-nickel mining and smelting are not expected to significantly impact recreational resources if the development is designed and operated so that it conforms with present state and federal air quality regulations.

6) The relatively low levels of SO_2 emissions expected from a copper-nickel smelting operation will aggravate an already potentially serious acidification of area lakes resulting from the acid rain phenomenon. This acidification could severely disrupt recreational use of Study Area lakes.

7) Water based recreation will be significantly impacted in areas downstream from copper-nickel development by:

a) the effects of toxic trace metals on fish and other aquatic organisms unless sophisticated water treatment or recycling systems are incorporated into development design.

b) the deterioration of the water as a source of high quality drinking water by the introduction of sulfates (SO_4).

8) Significant water quality deterioration is expected to be mitigated downstream from mining developments by natural chemical processes with the result that the water in the BWCA will not be noticeably impacted if development sites are selected carefully.

9) Mine development in any of the seven development zones will expand the area where mining noises are audible. If mining occurs in zones 1 or 2, this will include portions of the BWCA.

10) Population increases and the subsequent residential settlement growth expected to accompany mine development will impact recreation by:

a) increasing the use of existing facilities and recreational lands.

b) altering vegetation cover, topography, water runoff, and other habitat elements by establishing residential settlements in areas currently not used as such. Such growth could "crowd out" of the growth areas recreational uses like hunting, wild food gathering, and sightseeing, as well as many forms of wilderness recreation.

The amount of land under public ownership in the Study Area (57% of the total land area) indicates that at least partial mitigation of recreational resource base decreases could be achieved by improving access to, and opening up for recreational uses lands presently inaccessible to the public. For example, the proposed Giant's Ridge State Park within the Study Area and Voyageur's National Park northwest of the Study Area each represent increases in both the number of recreational facilities as well as recreational land available for use by regional residents and tourists as well.

9.2 OUTDOOR RECREATION FACILITIES AND ACTIVITIES IN THE REGIONAL COPPER-NICKEL STUDY AREA

The inventory of recreation facilities and activities presented in this section lists the major existing forms of recreation in the Study Area according to two broad categories:

1) Recreational Facilities which are designated sites developed to accommodate specific recreational uses.

2) Recreational Activities which do not occur at any designated location and which may require significantly larger amounts of land than facility based recreation.

The principal data referred to in describing recreational facilities was obtained from MDNR and is contained in its State Comprehensive Outdoor Recreation Plan (SCORP) files. Data used in describing the amount and distribution of recreational activity in the Study Area was largely obtained through a series of interviews conducted in 1977 by Copper-Nickel staff with land managers such as conservation officers and foresters from the Study Area. Also interviewed were several individuals who are not land managers in the Study Area but are very knowledgable about recreational use of the area (two canoe outfitters, a former Forest Service ecologist, and an area resident). At least two informants familiar with a particular section of the Study Area were interviewed.

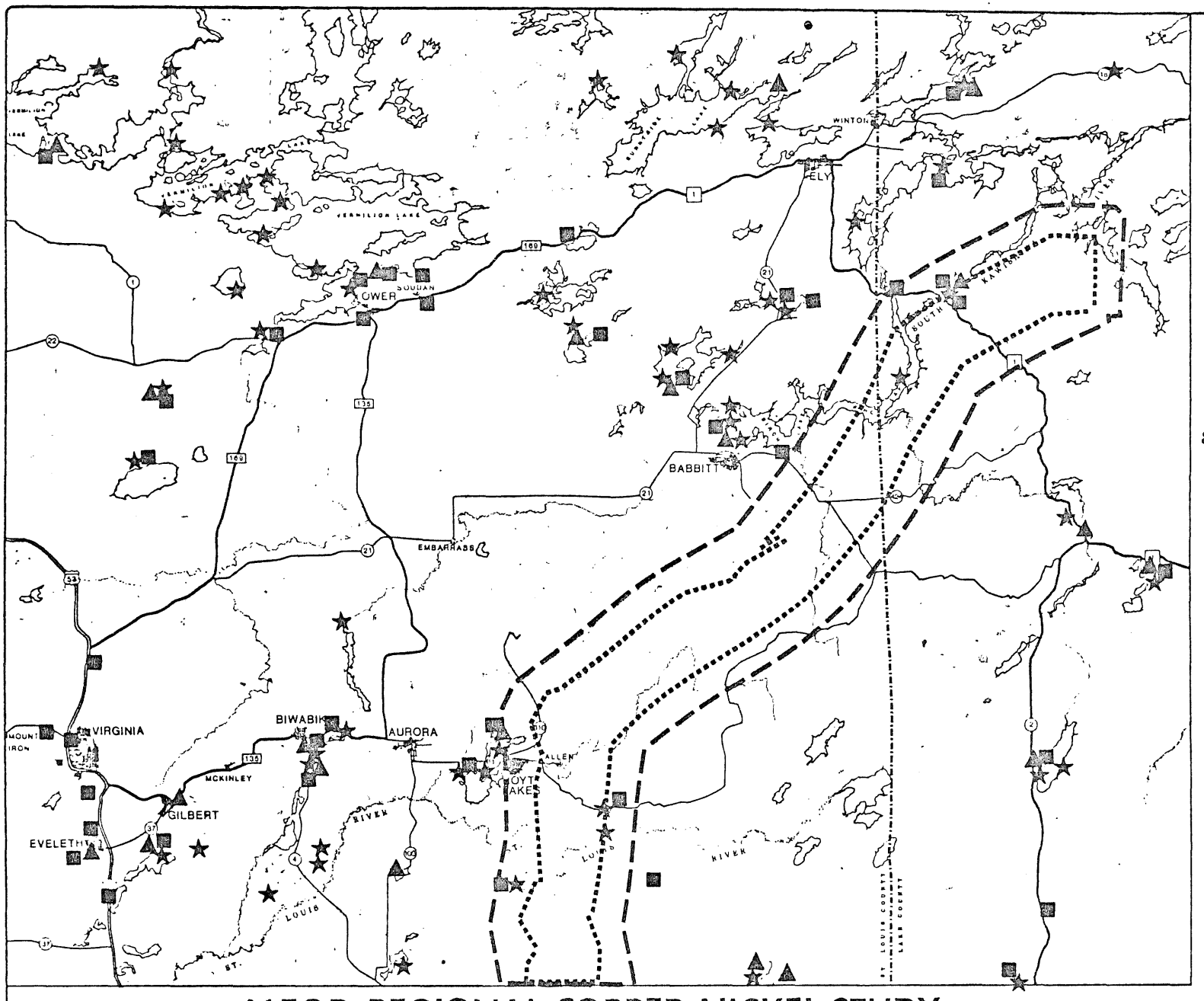
Each informant was asked to describe recreation use patterns in the portion of the Study Area with which he was most familiar. The perceptions of different informants concerning recreation use patterns were found to correspond quite well in most cases. Findings from all interviews were compiled and mapped to form the principal data base for the sections of this chapter involved with recreational activities and their distribution.

Also consulted for information concerning recreational activities was data obtained from the U.S. Forest Service's Recreation Information Management (RIM) System. This information was available only for lands within the Superior National Forest (SNF) and included data specifically describing use of the BWCA. RIM data was available only for entire ranger districts making it of very limited use in this inventory.

As a result of data limitations, the inventory presented here must be considered a general rather than a detailed overview of recreational activities in the Study Area. It is expected that detailed analyses of individual mine development impacts on local recreation resources will be addressed in site specific environmental impact statements.

9.2.1 Recreational Facilities

Recreational facilities are maintained throughout the Study Area by public agencies and by the private sector (Figures 2 and 3). The U.S. Forest Service, the Minnesota DNR, and municipalities all provide facility-based recreation opportunities. Semi-public facilities are offered by private resorts and campgrounds in the form of beaches and picnic areas for guests, and boat rental and access facilities that may also be available to day users. It can easily be seen that the large majority of Study Area recreational facilities are located on lakes or streams and that, as a result, 73% of all Study Area facilities are found in the northern one-half of the Study Area (78% north of the Laurentian Divide)(Table 1). The southwest portion of the Study Area also contains a certain concentration of recreational facilities, but not of the same magnitude as the northern area.



LEGEND

- PICNIC AREAS
- PUBLIC BEACHES
- PUBLIC WATER ACCESS
- DEVELOPMENT AREA
- RESOURCE AREA

SOURCES:
MDNR, SCORP PROGRAM, 1977.
PERSONAL INTERVIEWS WITH STUDY AREA LAND MANAGERS AND RECREATION SPECIALISTS, 1977.

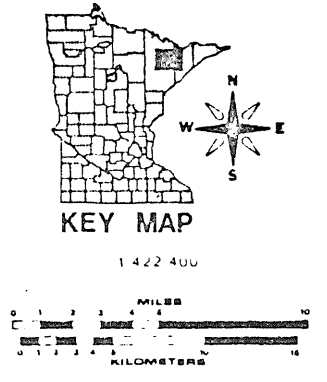


FIGURE 2

MEQB REGIONAL COPPER-NICKEL STUDY

OUTDOOR RECREATION FACILITIES:
PUBLIC WATER ACCESSES, PUBLIC BEACHES, PICNIC AREAS

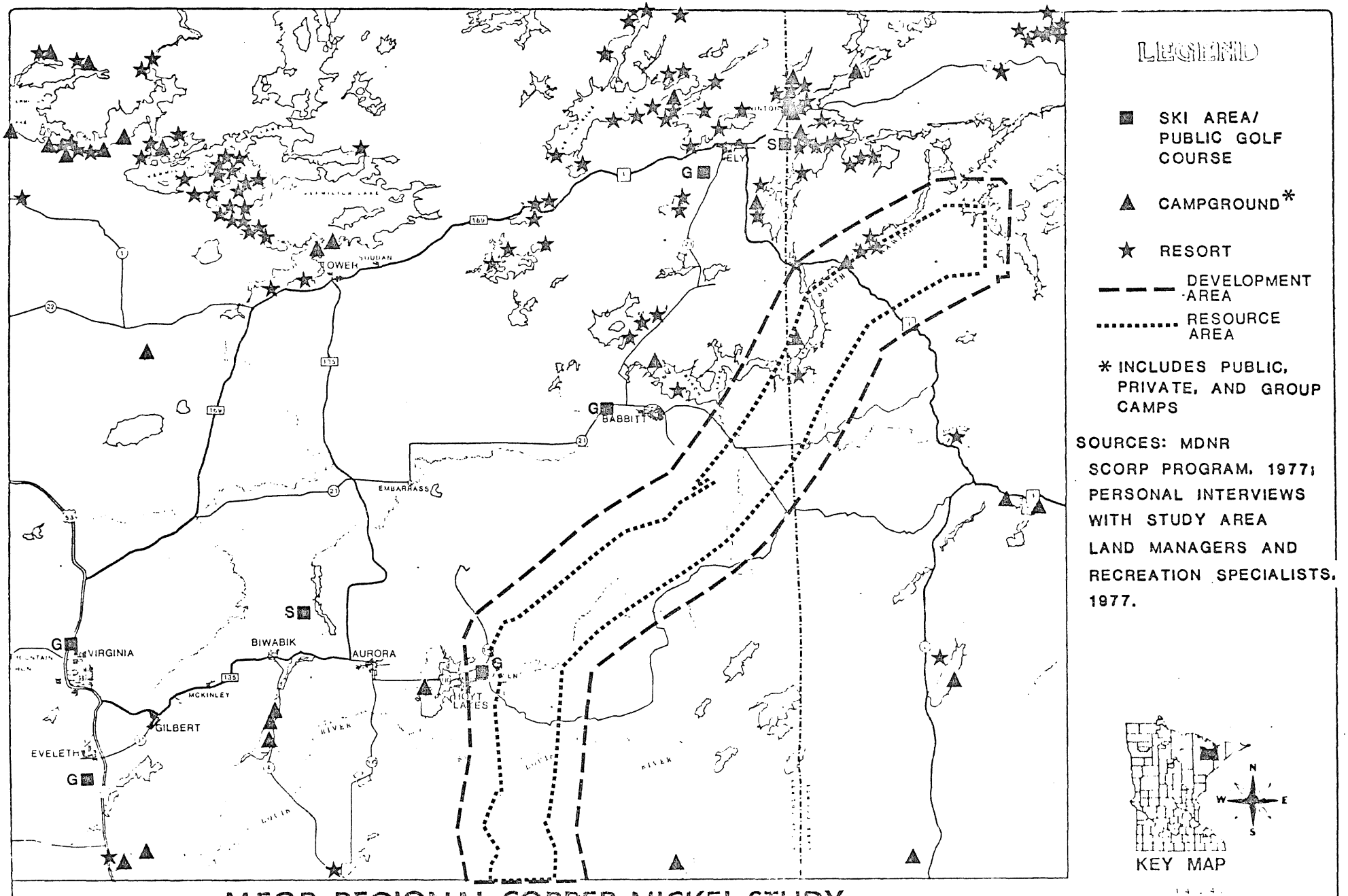


FIGURE 3

MEQB REGIONAL COPPER-NICKEL STUDY

OUTDOOR RECREATION FACILITIES: RESORTS, CAMPGROUNDS, SKI AREAS, PUBLIC GOLF COURSES

Table 1. Study Area outdoor recreation faciilties.

FACILITY	NUMBER OF STUDY AREA	NUMBER IN NORTHERN HALF OF STUDY AREA	PERCENT IN NORTHERN HALF OF STUDY AREA
Picnic areas	41	21	51
Public beaches	20	9	45
Public water access	58	36	62
Ski area	2	1	50
Public golf course	5	2	40
Public campground[a]	14	9	64
Private campground[b]	22	16	73
Resort	102	99	97
TOTAL	264	194	73

SOURCE: Minn. Dept. of Natural Resources, Bureau of Planning, SCORP Program, 1977. Personal interviews with Study Area land managers and recreation specialists, 1977.

[a]Including 2 campgrounds which are water access only.
[b]Including 10 group campgrounds.

Approximately 537,375 acres (217,561 ha) or 39% of Study Area lands are government owned and situated in designated areas managed either fully or in part for outdoors recreation. These areas include 54,560 acres (22,089 ha) in the BWCA, 381,960 acres (154,640 ha) in the Superior National Forest, 95,480 acres (38,656 ha) in the State Forests, 40,920 acres (16,567 ha) in County Memorial Forests, and 5,353 acres (2,167 ha) in Bear Island and Tower Soudan State parks (Figure 4).

9.2.2 Recreational Activities and Their Distribution

Much of the recreational activity in the Study Area does not, in fact cannot, take place at developed facilities. Hunting, fishing, snowmobiling, hiking, pleasure boating, canoeing, driving for pleasure, and simple sightseeing are some of the recreational activities which occur over wide-ranging portions of the Study Area. Generally, these activities require only that land and water be accessible, whether by car, off-the-road vehicle, snowmobile, skis, boat, or canoe.

Recreational activities can be thought of as being either land based (hunting, hiking, sightseeing) or water based (fishing, canoeing, wild rice harvesting). This distinction not only helps to characterize the nature of the activity itself, but has direct implications as to the geographical distribution of a particular activity and the types of impacts that a given activity may be subject to.

Most public lands (including public waters) and some lands under wood products and mining company management are open for recreation of this type. Areas of rural residential settlement are also used for land-extensive recreational activities, particularly where the residential settlement is of a low density such as in the Embarrass area.

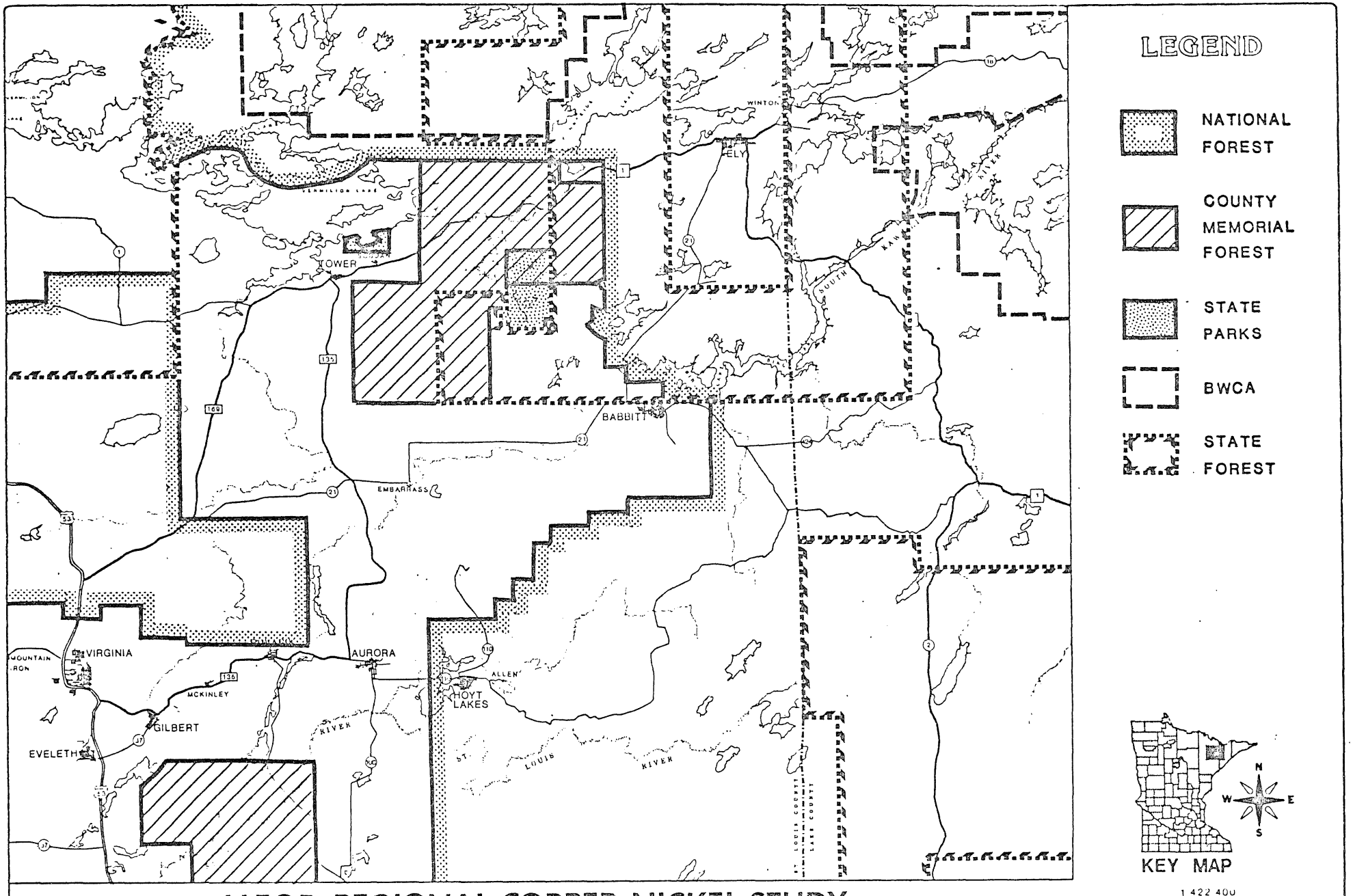


FIGURE 4

MEQB REGIONAL COPPER-NICKEL STUDY

PUBLIC FORESTS AND STATE PARKS

9.2.2.1 Land Based Recreational Activities--Land based recreational activities occur over wide-ranging portions of the Study Area (Figures 5-8). These activities include hunting, trapping, hiking, backpacking, primitive camping, pleasure driving, sightseeing, gathering of certain wild foods (e.g. wild rice), and various winter sports, such as snowmobiling, cross-country skiing, and sled dog racing.

By observing patterns of use presented for the various forms of land based recreational activities in Figures 5-8, it can be seen that, to a large degree, these activities tend to occur along roads or trails. According to area land managers, few recreationists stray more than a quarter-mile from the road or trail. Although many old logging trails penetrate into otherwise inaccessible areas, they frequently are of use only in winter due to the fact that they often traverse swampy or boggy land.

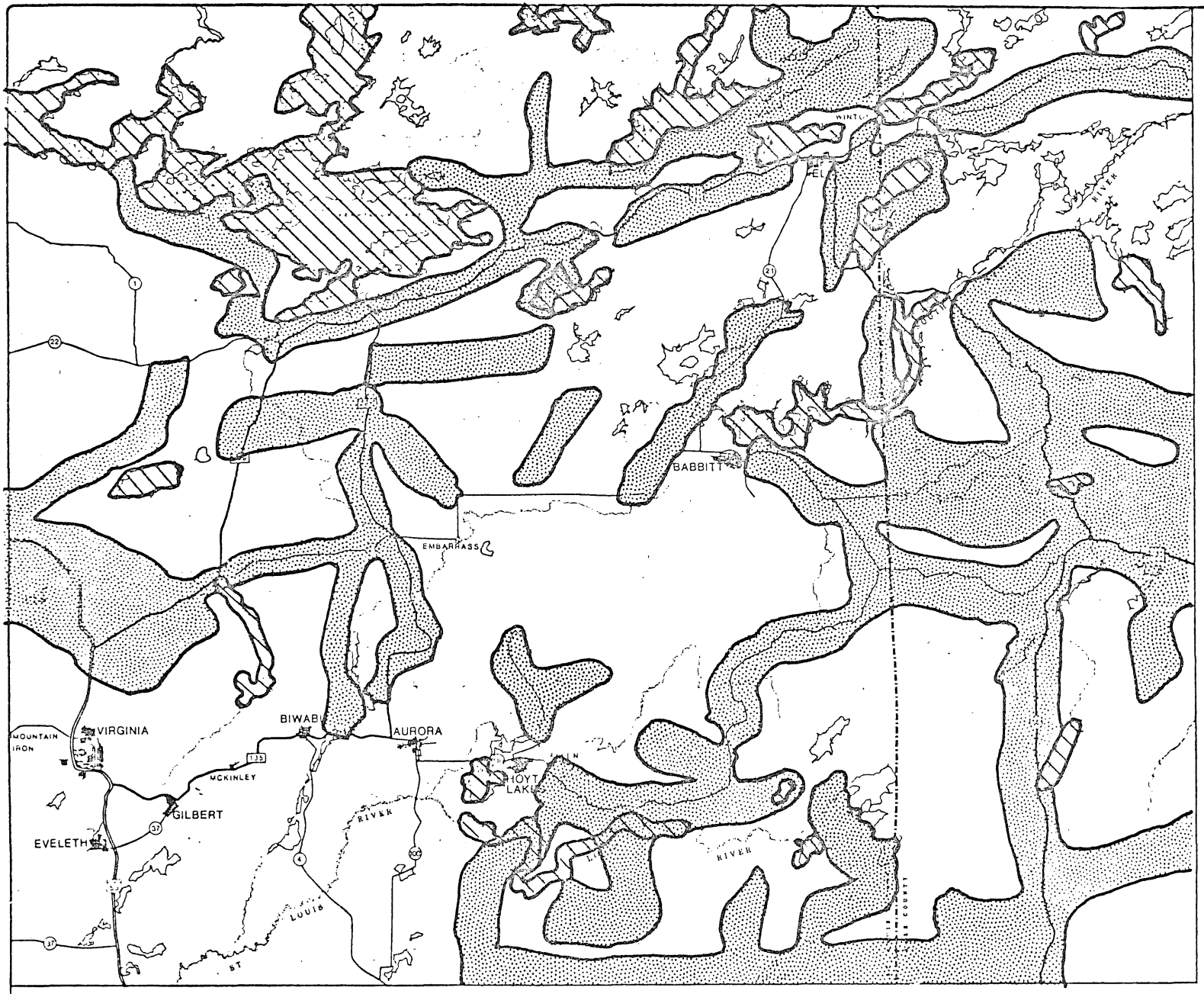
9.2.2.2 Water Based Recreation Activities--Water based recreational activities (Figures 9 and 10) occur on most accessible Study Area lakes and on many rivers and streams as well. For the most part, the largest and most heavily used lakes are located north of the Laurentian Divide in the northern half of the Study Area. Water based recreational activities include fishing, netting, canoeing, pleasure boating, and wild rice harvesting.

9.2.3 Analysis of Recreational Use Patterns

The recreational activities mapped above take place at various times in various parts of the Study Area. The shifting patterns of recreational land use which result combine with recreational land use patterns established by the locations of recreational facilities to form generalized areas which are used for a number of activities. Likewise, there are areas which are used little or not at all.

FIGURE 5 MEQB REGIONAL COPPER-NICKEL STUDY

RECREATIONAL ACTIVITIES:
HUNTING (GROUSE AND MOOSE)

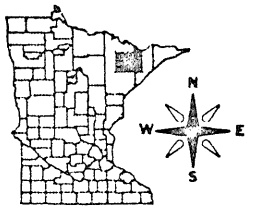


LEGEND

DUCK HUNTING

DEER HUNTING

SOURCE:
PERSONAL INTERVIEWS WITH STUDY AREAS LAND MANAGERS AND RECREATION SPECIALISTS, 1977.



KEY MAP

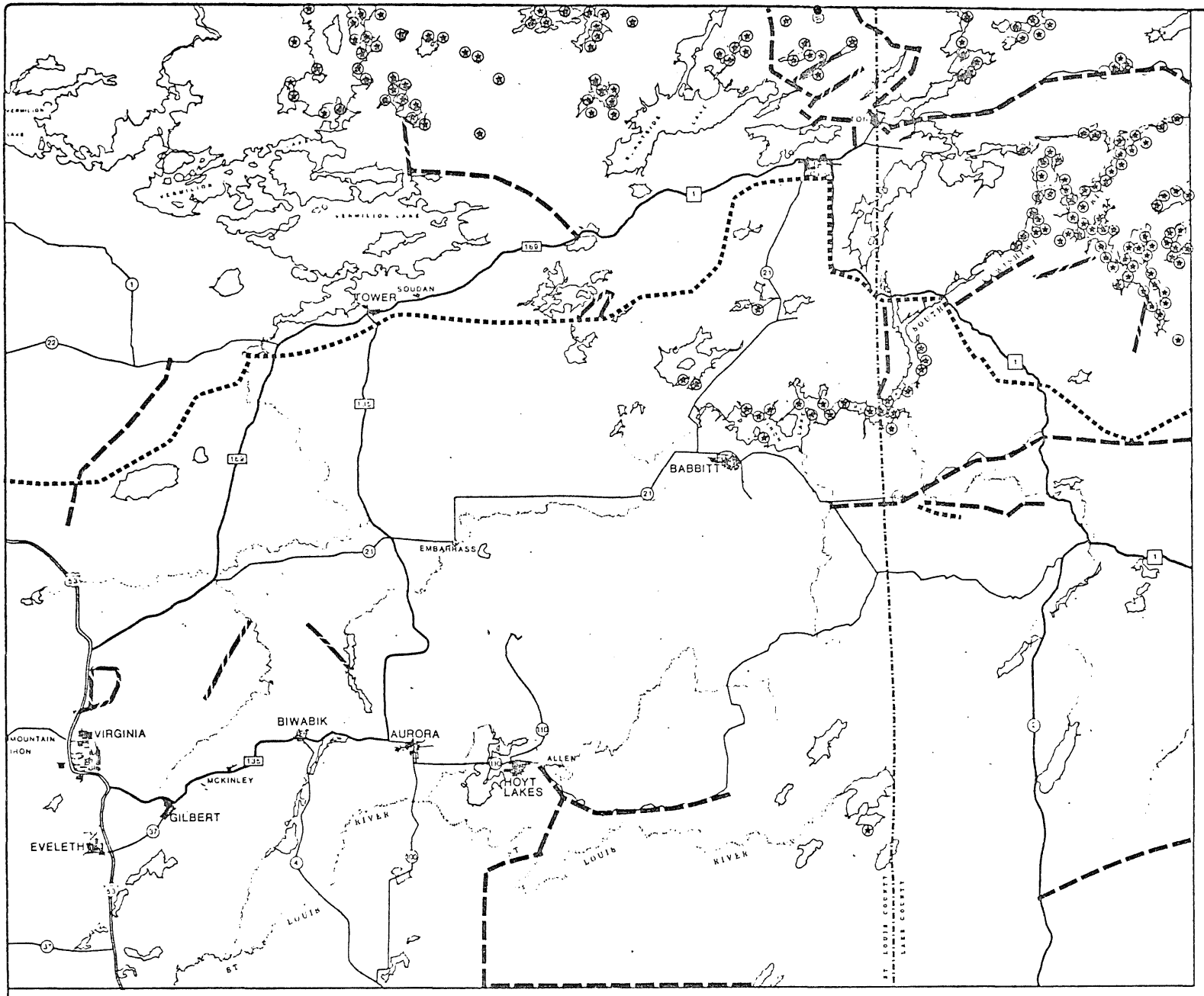
1:422,400

MILES
0 1 2 3 4 5 10

KILOMETERS
0 1 2 3 4 5 10 15

FIGURE 6 MEQB REGIONAL COPPER-NICKEL STUDY

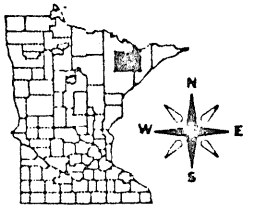
RECREATIONAL ACTIVITIES:
HUNTING (DUCK AND DEER)



LEGEND

- EXISTING HIKING TRAIL
- PROPOSED HIKING TRAIL
- POPULAR SCENIC DRIVE
- U.S.F.S. PRIMITIVE CAMPSITES

SOURCES:
MDNR SCORP PROGRAM, 1977.
PERSONAL INTERVIEWS WITH STUDY AREA LAND MANAGERS AND RECREATION SPECIALISTS, 1977.



KEY MAP

1:422,400

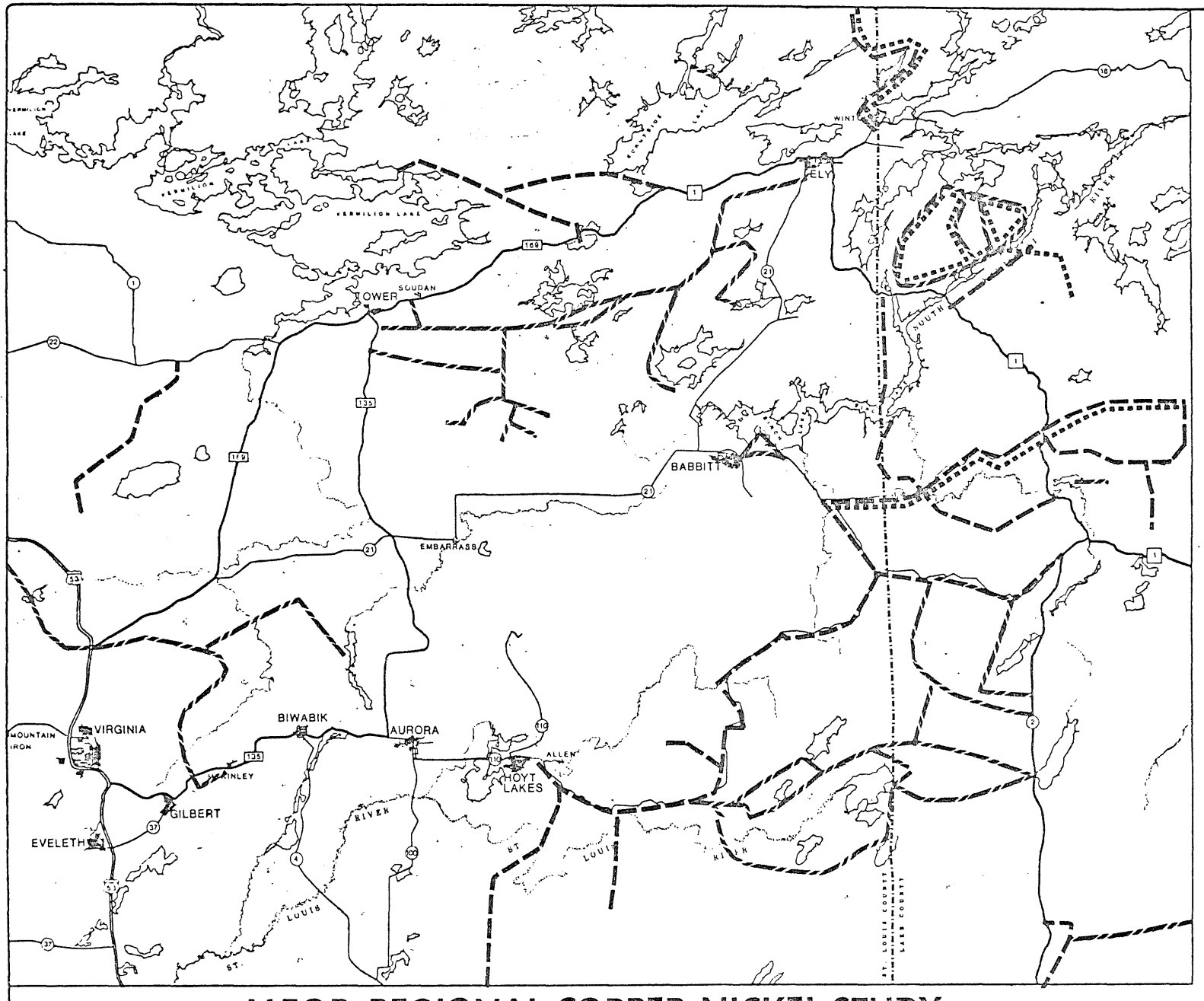
MILES 0 1 2 3 4 5 10

KILOMETERS 0 1 2 3 4 5 10 15

FIGURE 7

MEQB REGIONAL COPPER-NICKEL STUDY

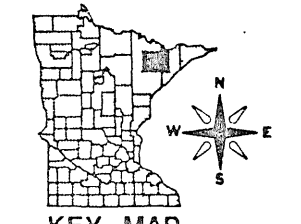
RECREATIONAL ACTIVITIES:
HIKING, BACKPACKING, PRIMITIVE CAMPING, PLEASURE DRIVING



LEGEND

- ESTABLISHED SNOWMOBILE TRAIL
- SNOWMOBILE TRAIL ALONG UNPLOWED ROAD
- DOG SLED RACING TRAIL

SOURCES:
MDNR SCORP PROGRAM, 1977.
PERSONAL INTERVIEWS WITH STUDY AREA LAND MANAGERS AND RECREATION SPECIALISTS, 1977.



KEY MAP

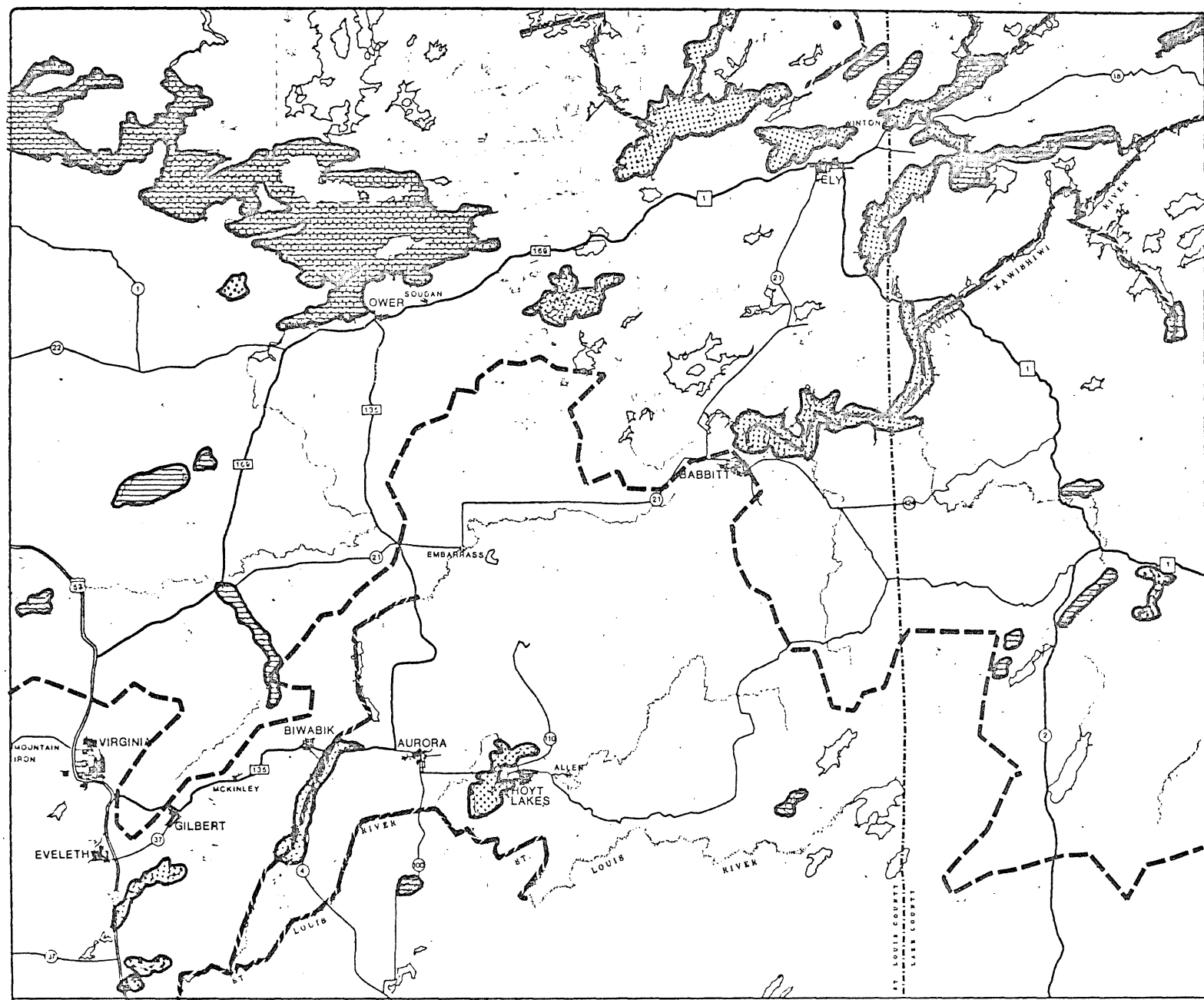
1:422,400

MILES
KILOMETERS

FIGURE 8

MEQB REGIONAL COPPER-NICKEL STUDY

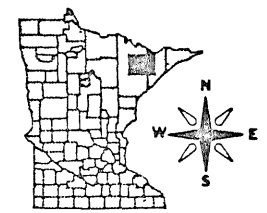
RECREATIONAL ACTIVITIES:
CROSS COUNTRY SKIING, SNOWMOBILING, DOG SLED RACING



LEGEND

- PLEASURE BOATING
- WILD RICE HARVESTING
- CANOE ROUTE
- LAURENTIAN DIVIDE

SOURCES:
MDNR SCORP PROGRAM, 1977.
PERSONAL INTERVIEWS WITH STUDY AREA LAND MANAGERS AND RECREATION SPECIALISTS, 1977.



KEY MAP

1:422,400

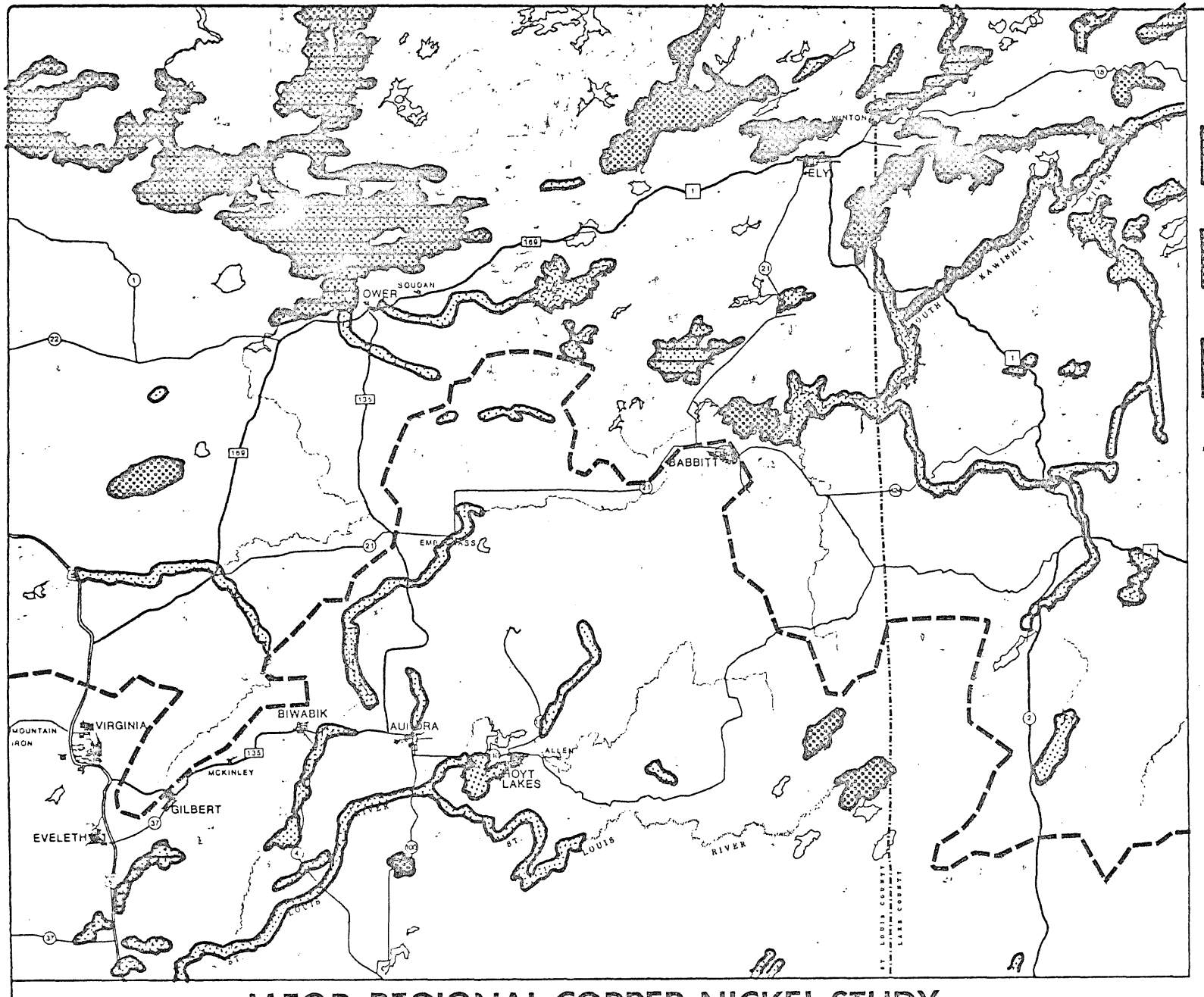
MILES
0 1 2 3 4 5 10

KILOMETERS
0 1 2 3 4 5 10 15

FIGURE 9

MEQB REGIONAL COPPER-NICKEL STUDY

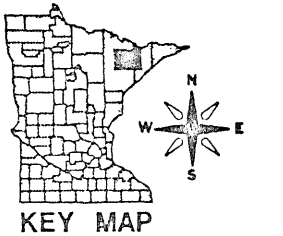
RECREATIONAL ACTIVITIES:
PLEASURE BOATING, CANOEING, WILD RICE HARVESTING



LEGEND

- KNOWN FISHING LAKES AND STREAMS
- KNOWN FISHING AND ICE FISHING LAKES AND STREAMS
- KNOWN LAKES WHERE NETTING OCCURS
- LAURENTIAN DIVIDE

SOURCE:
PERSONAL INTERVIEWS WITH STUDY AREA LAND MANAGERS AND RECREATION SPECIALISTS, 1977.



KEY MAP

1:422,400

MILES 0 1 2 3 4 5 10

KILOMETERS 0 1 2 3 4 5 10 15

FIGURE 10 **MEQB REGIONAL COPPER-NICKEL STUDY**

RECREATIONAL ACTIVITIES:
FISHING, ICE FISHING, NETTING

The major features which seem to promote or attract recreationists are: 1) ease of accessability; and 2) proximity to water. Water access is linked particularly closely to recreational facilities. Virtually all Study Area resorts are located on lakes in the region and the overwhelming majority of these are found on lakes in the northern half of the Study Area.

In areas away from lakes the majority of recreational use occurs along and adjacent to passable roads and trails in upland forest areas. The most frequently used areas are generally within the Superior National Forest, usually in areas that have been harvested for timber at one time. The more frequent use of these areas can be attributed to the existence of old logging roads which provide access to otherwise remote lakes and hunting areas.

Features which inhibit recreational uses include: 1) residential settlement; 2) industrial development; 3) bog and marshland; and 4) low water levels in rivers and streams. Most Study Area rivers and streams are headwaters and are not large enough to support much recreational use. Difficulty of access, except by means of snowmobile in the winter, exclude many of the low-lying bogs in the region from use as recreational areas. A certain amount of land used by industry, most notably the mining industry, is precluded from use by the general public. This includes land for pits, waste rock and lean ore piles, processing facilities, and private mining company roads. Residential settlement inhibits recreational use of the land in proportion to the density of development. In relatively sparsely settled areas, a great deal of activity takes place on adjacent open lands, but as settlement becomes more and more dense recreational use of the land tends to decline.

9.2.4 Economic Aspects of Recreation in Ely

The economic aspects of recreation in Ely have been documented in Volume 5-Chapter 16. While this chapter is primarily concerned with recreation as a land use sensitive to various land management policy changes, recreation is also a large contributor to the economy of the region and land management decisions which impact recreation will impact the region's economic balance as well. Ely was selected for study in part due to its relative isolation from the remainder of the Study Area; in part due to the relative balance in Ely's economy among the resource economics of taconite, timber, and tourism; and, in part, due to its focus as the center of the wilderness use debate in Minnesota.

The Ely area is known for its concentration of resorts and its quality fishing. Also, Ely is very popular as a jump-off point for BWCA canoeists. The importance of these and other recreational contributors to the economy of Ely is demonstrated in Volume 5-Chapter 16. The data show that total 1976 sales for the 264 Ely area firms surveyed was about $57.7 million, with about $31 million in the form of export sales. Tourism sales (sales to non-residents in selected Ely area recreation-oriented economic sectors) measured almost $6 million, or about 20% of total export sales. (An even higher figure may be more representative since 1976 was a year of high fire risk and a strict ban on open fires may have discouraged many tourists from vacationing in the area.) Furthermore, the importance of this business to Ely does not stop with direct sales to tourists. It has been calculated (see Volume 5-Chapter 16) that for every $1 in direct sales to tourists, another $1.22 of sales activity will occur as various Ely economic sectors adjust to meet the indirect demands created by the initial tourist expenditure.

Of the estimated Ely work force of about 1,600 persons, approximately 22% (357 persons) were employed as a direct result of tourism while another 363 were indirectly supported by initial tourist expenditures.

9.3 IMPACTS OF COPPER-NICKEL MINE DEVELOPMENT ON OUTDOOR RECREATION IN THE REGIONAL COPPER-NICKEL STUDY AREA

Because land use patterns, including recreational land use patterns, are not static, various factors may affect the Study Area's future patterns of recreational land use and the region's capacity for supporting recreational activities. These include:

1) Increases in the recreation resource base--that is, opening of new facilities (such as the proposed Giants' Ridge State Park north of Biwabik) or enlarging existing ones. Management decisions can create new recreation opportunities by opening certain areas to new types of activities.

2) Decreases in the recreation resource base--due to management decisions closing off certain areas to a particular type of use, increasing residential settlement in an area, or altering the landscape or habitat of a particular location such that its value as a recreational resource is diminished.

3) Changes in population structure--the size of the population in a region affects its recreational land use patterns by increasing the volume of use in a given area which may in turn determine the types of recreational activity which can occur in that area. Likewise, the age structure of the population can have an effect on the types of recreation demands made on a region since the recreational activities pursued by older residents may differ from those pursued by younger residents.

4) Social trends--types of activities rise and fall in popularity and totally new forms of recreational activity can emerge (e.g. the development of the snowmobile in the early 1960s).

5) Public awareness--publicity, whether in the form of promotion of a region's recreational resources by area businessmen and the government or media coverage of a recreation related controversy such as has occurred in the BWCA dispute, can help increase the volume of use of a particular area by making more people aware of an area's recreational resources.

9.3.1 Introduction to Impacts Analysis

The first section of this chapter inventoried recreational facilities and activities as they existed in 1977. The primary purpose of this section is to analyze the impacts that potential development of copper-nickel resources may have on outdoor recreation in the area. Briefly covered as well are the potential impacts resulting from the projected expansion of the taconite industry from 1977 to 1984 and a brief case study of impacts in the Ely area. The Ely analysis relates to the economic case study of Ely presented in Volume 5-Chapter 16, which features an analysis of the relative importance of tourism/recreation to the area's economy.

Impacts resulting from both taconite expansion and copper-nickel development will mostly be as a result of decreases in recreational lands and changes in the population size and structure which will affect the intensity of use.

9.3.2 Potential Decreases in Recreational Lands Resulting from Copper-Nickel Development

Impacts on recreational lands which would result in a decrease in the number of

facilities available or in the amount of land usable for recreation can be classified into two major types: direct and indirect. Direct impacts refer to those instances where land used for recreation is directly consumed by mine developments. Indirect impacts refer to all other mining related impacts such as air quality changes, water quality changes, and noise level changes.

9.3.2.1 Direct Consumption of Land--Recreational facilities and activities have been inventoried for the seven copper-nickel resource and development area zones (Figure 1) (Table 2) serving as the data base for assessing potential impacts in each zone.

Maximum direct impacts would occur if all the land in a development zone were developed for mining or if that portion of the development zone developed for mining coincided with all land used for recreation. There are, however, certain types of land which are protected by law from mine development. The types of land falling into this category include water covered lands, all publicly managed lands within 400 feet of the shore of a lake or stream (as stipulated in the Shipstead-Nolan Act of 1934), all land within the BWCA and land within the Keeley Creek Research and Natural Area (administered by the USFS). With the possible exception of the Keeley Creek area, recreation is commonly pursued on all of these lands where mining development is presently prohibited. This limits the amount of the recreational land potentially impacted by direct land consumption. For instance, any water-based recreational activity would not be threatened with displacement under present laws and management practices. Likewise for those facilities such as campgrounds and public accesses which are typically located on lands within 400 feet of the waterline which are protected by the Shipstead-Nolan Act.

TABLE 2

RECREATIONAL FACILITIES AND ACTIVITIES IN COPPER-NICKEL DEVELOPMENT ZONES

	FACILITIES	ZONE 1		ZONE 2		ZONE 3		ZONE 4		ZONE 5		ZONE 6		ZONE 7		TOTAL IN R.A.	TOTAL REST OF D.A.	TOTAL IN D.A.	TOTAL IN S.A.	%S.A. FACILITIES IN D.A.
		R.A.	REST OF D.A.	R.A.	REST OF D.A.	R.A.	REST OF D.A.	R.A.	D.A.	R.A.	D.A.	R.A.	REST OF D.A.	R.A.	REST OF D.A.					
PUB.	PICNIC			2	1		1						1		2	2	5	7	41	17%
PUB.	PUB. SWIMMING			1									1			1	1	2	20	10%
PUB.	LAKE ACCESS			2										2	1	4	1	5	58	9%
PUB.	SKI																		2	0%
PUB.	GOLF											1				1		1	5	20%
PUB.	CAMPGROUND*			2												2		2	36	6%
PUB.	RESORT	1		3	1											4	1	5	102	5%
	TOTAL	1		10	2		1					1	2	2	3	14	8	22	264	8%
	ACTIVITIES																			
PRIM.	PRIMITIVE CAMPING	2	21	8		1	3													
	HIKING																			
PLE.	PLEASURE DRIVING																			
	SNOWMOBILING																			
DOG	DOG SLED RACING																			
	DEER HUNTING																			
	GROUSE HUNTING																			
	MOOSE HUNTING																			
	DUCK HUNTING																			
WILD	WILD RICE HARVEST																			
PLE.	PLEASURE BOATING																			
	CANOEING																			
	FISHING																			
	ICE FISHING																			
	NETTING																			
	TOTAL #ACTIVITIES	10	8	10	10	10	10		2		2	3	4	5	6					
	TOTAL #DIFFERENT ACTIVITIES IN ZONE	11		12		10		2		2		4		6						
	TOTAL ACRES	17,280		30,000		23,000		19960		27720		24480		32480						
	ACRES UNAVAILABLE	7370		6510		1860		0		50		180		40						

* INCLUDING PUBLIC AND PRIVATE CAMPGROUNDS

R.A.- RESEARCH AREA

D.A.- DEVELOPMENT AREA

S.A.- STUDY AREA

SOURCES: MINN. DEPT. OF NATURAL RESOURCES. BUREAU OF PLANNING, SCORP PROGRAM, 1977. PERSONAL INTERVIEWS WITH STUDY AREA LAND MANAGERS AND RECREATION SPECIALISTS, 1977.

The zones most sensitive to large appropriations of land for mining are development zones 1, 2, and 3 due to the relatively high level of recreational use. These are also the zones with the most land unavailable for mining development (15,740 acres or 98% of all land in the seven development zones which is considered unavailable is found in zones 1, 2, and 3).

While a mine development in zone 2 would have the greatest potential for direct land use conflicts between mining and recreation, the impact of such conflicts on the recreational use patterns of the Study Area as a whole would be small in terms of the numbers of facilities and the amount of land on which an activity can take place. For example, the twelve facilities in development zone 2 are 55% of the facilities in all seven zones, but only 5% of all facilities in the Study Area.

9.3.2.2 Air Quality Changes--Air quality changes resulting from copper-nickel mining and smelting are not expected to significantly impact recreational resources in the area if the developments are designed and operated so that they conform with present state and federal air quality regulations. The designation of the BWCA as a Class I PSD (Prevent Significant Deterioration) area means that a copper-nickel smelter, even if it was the sole source of SO_2 in the region, would have to be located at least 10 to 20 kilometers away from the BWCA to keep air quality over the BWCA at the presently required level. Considering that there are other existing and planned SO_2 sources in the region, it is unlikely that a smelter could be sited between the BWCA and other major sources along the Iron Range barring a change in the current laws or the granting of a special exemption for copper-nickel mining. In the event that a smelter is located in the Study Area and is designed to meet present emission control requirements, the downwind concentration of ambient SO_2 (outside of the immediate smelter site) would be

significantly below state and federal ambient air quality standards and below levels at which known detectable changes in vegetation occur (Figure 11) (see Volume 4-Chapter 2 for information on air quality impacts on vegetation). Periodical breakdowns of emission control systems could, however, allow the release of amounts of SO_2 large enough to cause visual changes in vegetation within a ten-mile radius of the smelter and produce discomfort to exposed persons.

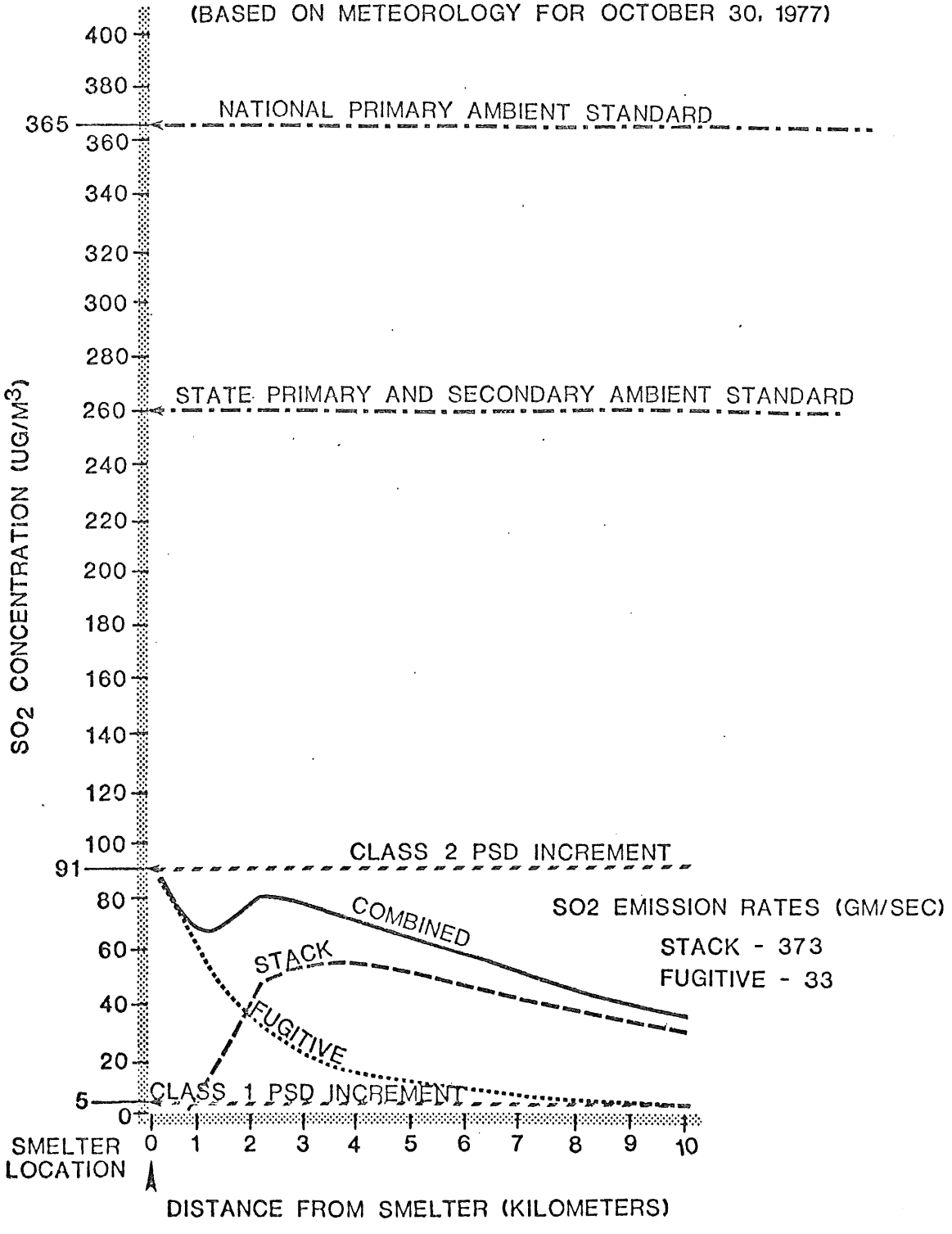
As will be discussed in section 9.3.2.3 on water quality changes, additional SO_2 emissions in the region will aggravate a potentially serious acid rain problem in the region. Air quality changes in the region, irrespective of copper-nickel development, have the potential of significantly reducing the quality of water-based recreational resources in the area. (See Volume 3-Chapters 3 and 4 for more detailed information on the acid rain issue.)

Fugitive dust generated by mining activities could also be a problem if inadequately controlled. Only recreational activities within the Development Area would likely be adversely affected since the dust, which will mostly be due to heavy truck movement related to the transportation of ore and wasterock, is only expected to significantly alter air quality within a few miles of the mining operation. In the Development Zones most sensitive to direct impacts (Zones 1 and 2), the impacts of fugitive dust emissions will be further mitigated by the fact that most mining there is likely to be underground which will greatly reduce the amount of dust escaping into the air. Fugitive dust emissions could be further reduced if wasterock and ore are transported using conveyor systems, particularly if covered systems were employed.

Dust emissions from tailings basins pose a possible threat to recreational resources in the area but can be largely controlled through careful basin

FIGURE 11

MAXIMUM PREDICTED 24-HOUR SO_2 CONCENTRATIONS ALONG THE COMBINED PLUME CENTERLINE FOR THE BASE CASE SMELTER MODEL



design coupled with a thorough reclamation program. In addition, sites for the tailings basin can be chosen so that fugitive dust impacts to recreational resources will be minimal.

9.3.2.3 Water Quality Changes--The possibility exists of significant degradation of the water quality in the Study Area as a result of copper-nickel development depending on: 1) the type of mine development, whether open pit or underground; 2) the site characteristics of the development which may either promote or inhibit the effectiveness and economic feasibility of water management; and 3) the types and effectiveness of the water treatment system(s) used. Water based recreation resources could be severely impacted in receiving waters downstream from copper-nickel mining developments depending on the level of contamination of those waters.

Impacts to water based recreation as a result of water quality changes will be a result of contamination by:

1) Toxic trace metals such as copper (Cu), nickel (Ni), cobalt (Co), and zinc (Zn) which may chronically affect various aquatic organisms;

2) Sulfates (SO_4) which will degrade receiving waters as a high-grade drinking water source but are not expected to reach toxic concentrations.

In addition to the contamination expected as a direct result of pollutants contained in water discharged from the mining opertion, the existing problem of acidification of area lakes as a result of acid rains will be somewhat aggravated by increased SO_2 levels in the air if the mine development includes a smelter.

Water inside the BWCA is not expected to show any measurable changes in either the levels of toxic trace metals or sulfates even under "worst case" (see Volume

3-Chapter 4-section 4.7 for a description of this "worst case" discharge) conditions unless mine development is located in the section of Zone 1 which drains directly into the BWCA (Figure 12). This is due to the natural chemical processes such as chemical precipitation and/or absorbtion which would occur in receiving waters upstream from the BWCA and downstream from the mine development. If such natural processes are not effective then measurable concentrations in the BWCA will occur, but not at levels which will reduce the quality of recreational fishing in this area.

Of course, any discharge which drains directly into the BWCA will not be subject to these effects before entering the BWCA. For this reason, and unless the drainage patterns of that area which presently drains directly into the BWCA are changed, the threat to BWCA water quality suggests that mine facilities should not be located in this area.

The natural chemical processes discussed above coupled with the potential dilution of contaminated water by the Kawishiwi River will serve to protect the water quality in the BWCA but unless sophisticated water management systems are incorported into site design such that no discharge of contaminated water occurs (composite toxic trace metal concentrations of 30-100 ug/l CEU--Copper Equivalent Units--should be adequate to protect aquatic ecosystems depending on the chemical properties of the receiving waters), copper-nickel development will have significant impact on water resources presently used for recreational purposes. This includes the heavily used waters north of the Laurentian divide such as Birch and White Iron lakes and the South Kawishiwi River and the less heavily used streams which flow through the Development Area south of the divide such as the Partridge and St. Louis rivers. Present information suggests that only very sophisticated (and expensive) treatment technologies will regularly remove trace

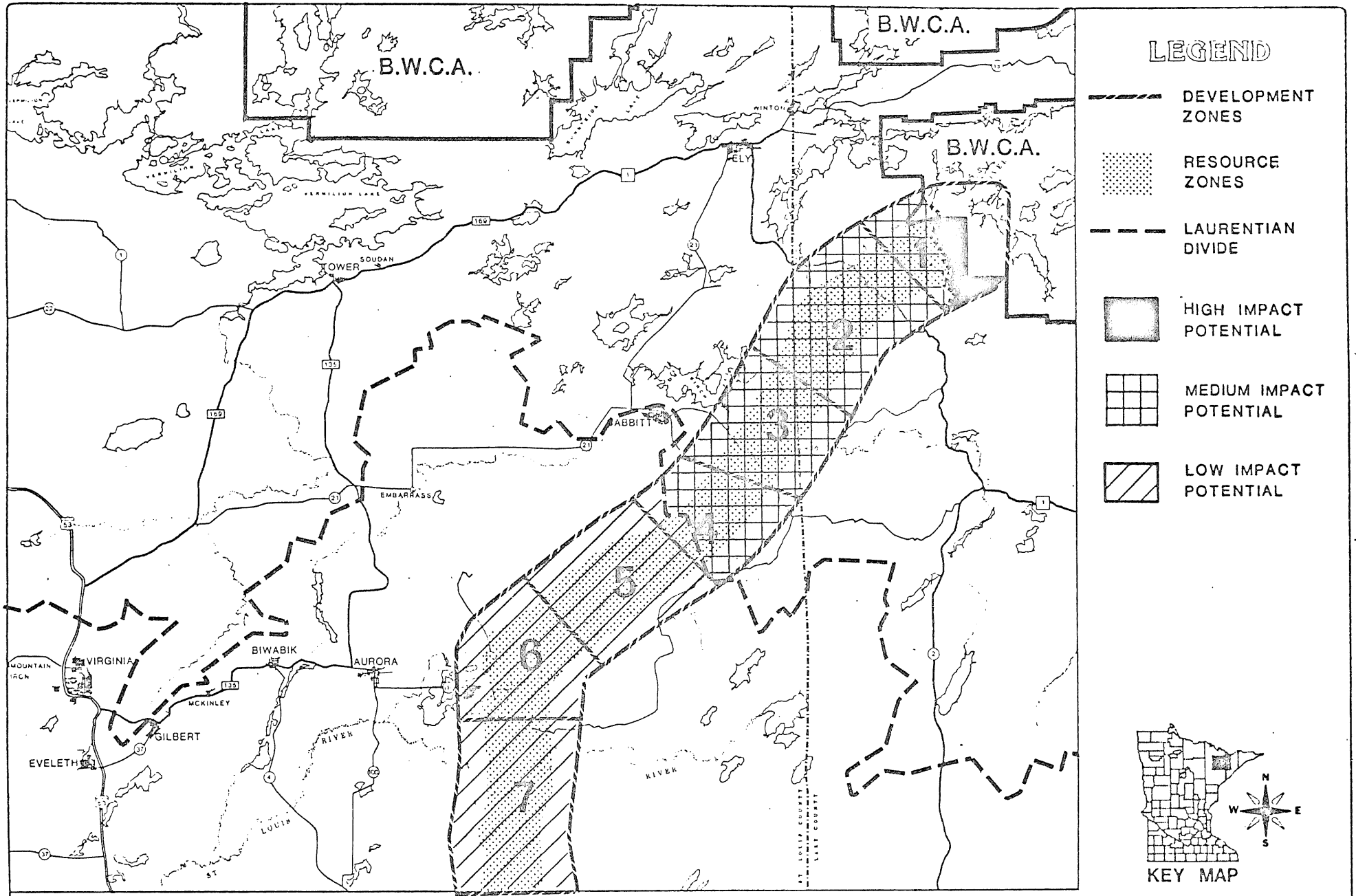


FIGURE 12 **MEQB REGIONAL COPPER-NICKEL STUDY**

B.W.C.A. WATER QUALITY IMPACT POTENTIAL OF DEVELOPMENT ZONES OUTSIDE THE B.W.C.A.

metals to concentrations below 100-150 ug/l CEU and it is unlikely that these technologies would be considered economically feasible.

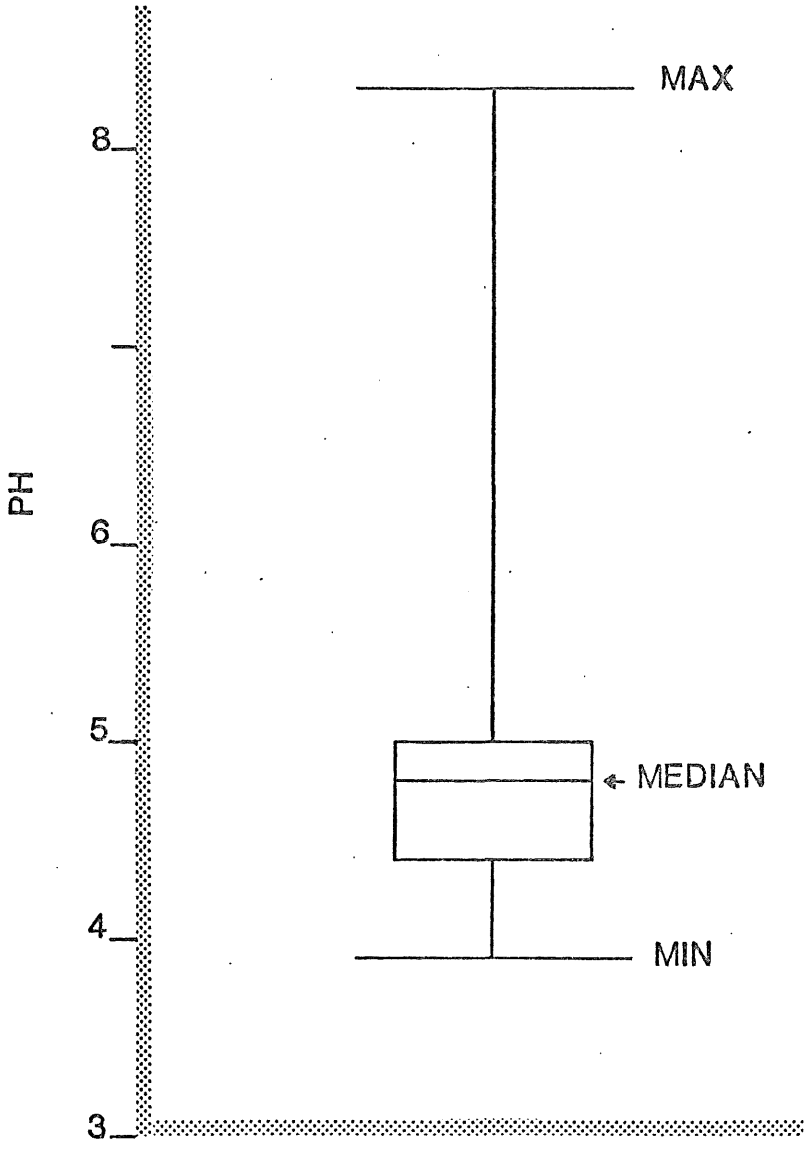
The post-production management of contaminated water (notably leachate from waste rock and lean ore piles) is an area of major concern due to the length of time during which such contamination may occur and the lack of a successfully demonstrated passive treatment method at this time. Demonstrated active treatment methods should be able to limit toxic trace metal concentrations to 100-150 ug/l CEU and could be used for treatment as a last resort if no successful passive methods can be found. Assuming that natural chemical processes are effective in reducing trace metal toxicity, these active treatment methods should adequately protect regional fisheries during the post-production phase.

Treatment methods considered economically feasible--while reasonably effective in reducing toxic trace metal concentrations--have basically no effect on the sulfates which could significantly degrade recreational waters as a high quality drinking water source in areas several kilometers downstream from copper-nickel mining developments. For a more complete picture of the potential direct impacts of copper-nickel development on recreational water resources, the reader is referred to Volume 3-Chapter 4 and Volume 4-Chapter 1.

In addition to the potential direct copper-nickel impacts to the quality of recreationally used water in the Study Area, water quality is currently being degraded by the increased acidity of regional precipitation. During 1978 the average pH of rainfall tested at one location in the Study Area was 4.9 pH units, a level at which significant ecological damage could occur in lakes and streams having low buffering capacities (Figure 13). Examination of water quality records for area lakes indicates a gradual decline in lake alkalinity while

FIGURE 13

RAINFALL PH, AMAX TEST SITE
1978



SOURCE: MDNR

sources potentially contributing to this problem are increasing in size and number in the region and the midwest. A smelter or similar new source emitting SO_2 into the atmosphere would aggravate the acid rain problem since the SO_2 would be converted to acid sulfates by oxidation in the atmosphere. While SO_2 emissions and resultant sulfate loadings projected for a copper-nickel smelter are small in comparison to total projected regional sulfate loadings, any new SO_2 sources in the area would, nevertheless, aggravate existing problems (see Volume 3-Chapter 3, section 3.7.3).

If the present acidification trend continues unchecked, the quality of the region's fishery resources and the recreational industry they support will be severely affected. Because of the more susceptible nature of the lakes in the BWCA (Glass, 1979), this area could be especially hard hit. Not only are the potential impacts associated with this problem much greater than the water quality impacts resulting from copper-nickel mining alone, but acid rain will also intensify those direct copper-nickel impacts since at lower pH (higher acidity) trace metals are more readily leached from waste material and remain more mobile in the environment. There are also some indications that certain trace metals may be more toxic at lower pHs. Results of trace metal impact studies presented in this report may have to be significantly modified if the acid rain problem becomes more severe.

9.3.2.4 Noise Level Changes--Mine development in any of the seven development zones would increase noise levels in the surrounding area. Ore handling trucks, truck back-up warnings, blast warning sirens, explosions, underground mine ventilation fans, railroads, and railroad horns will generate noise that would be audible in the BWCA wilderness area, for example, if development occurred in zones 1 or 2 (Figure 14).

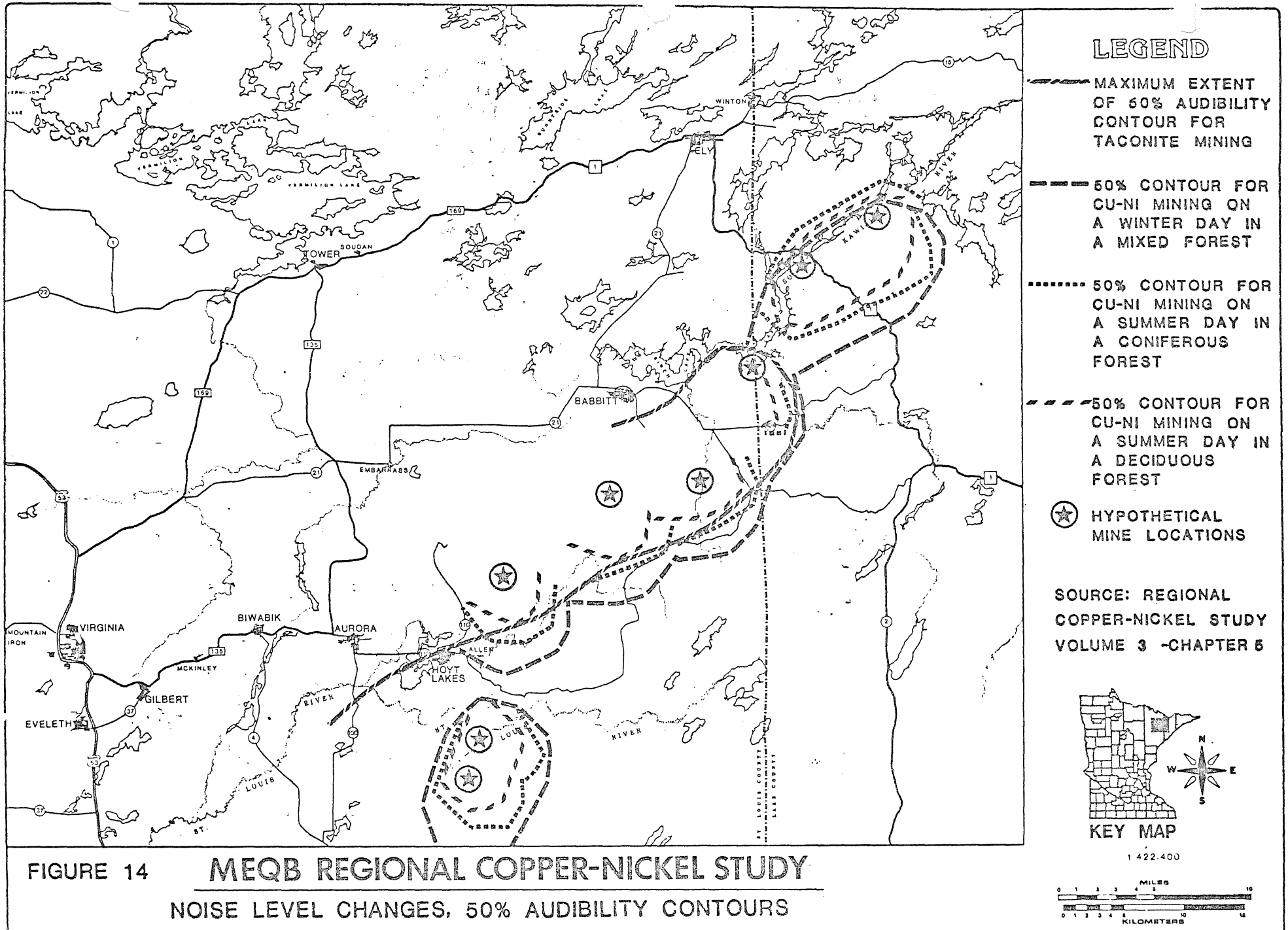


FIGURE 14 MEQB REGIONAL COPPER-NICKEL STUDY

NOISE LEVEL CHANGES, 50% AUDIBILITY CONTOURS

The audibility of mining noise in the region will vary depending on four variables. They are:

1) noise generator (the size of an ore hauling truck, a railroad, etc.)
2) vegetation types surrounding either the noise generator or receptor
3) season (winter or summer)
4) time of day (day or night)

The probability of hearing a particular noise source at various distances from that source (called an audibility contour), can be determined only once the nature of the above variables has been specified. For example, an audibility contour may indicate that a given noise source (when operating) would be audible to a person standing in an area of a particular vegetation cover type within the 50% contour 50% of the time, depending on the season and time of day. Projection of noise level changes are therefore complicated by the necessity of considering all four variables. In addition, actual noise impacts will eventually be dependent on the siting of the mine development.

In general, noise will be heard further away from a noise generator:

1) at night, particularly on a summer evening
2) when the noise generator is situated in an open, cleared area
3) when the receptor is in an open, cleared area, on open water, or in a coniferous forest.

Figure 14 depicts 50% audibility contours generated by an 85 ton ore hauling truck operating at peak noise (on the level) at each of eight hypothetical mine-sites in three circumstances.

1) Summer day with the receptor in a coniferous forest
2) Summer day with the receptor in a deciduous forest

3) Winter day with the receptor in either a deciduous or coniferous forest.

The audibility contours are presented for both existing taconite mining areas and hypothetical mines in each of the seven development zones. It can be seen that areas presently not subject to mine noise will be affected in the event of new mine development. New open-pit mining operations may use 170-180 ton ore hauling trucks in which case the audibility contours would extend even further away from the source or they may use a conveyor system in lieu of trucks which would decrease the area affected.

9.3.3 Impacts of Population and Residential Settlement Growth Generated by Copper-Nickel Development on Recreation

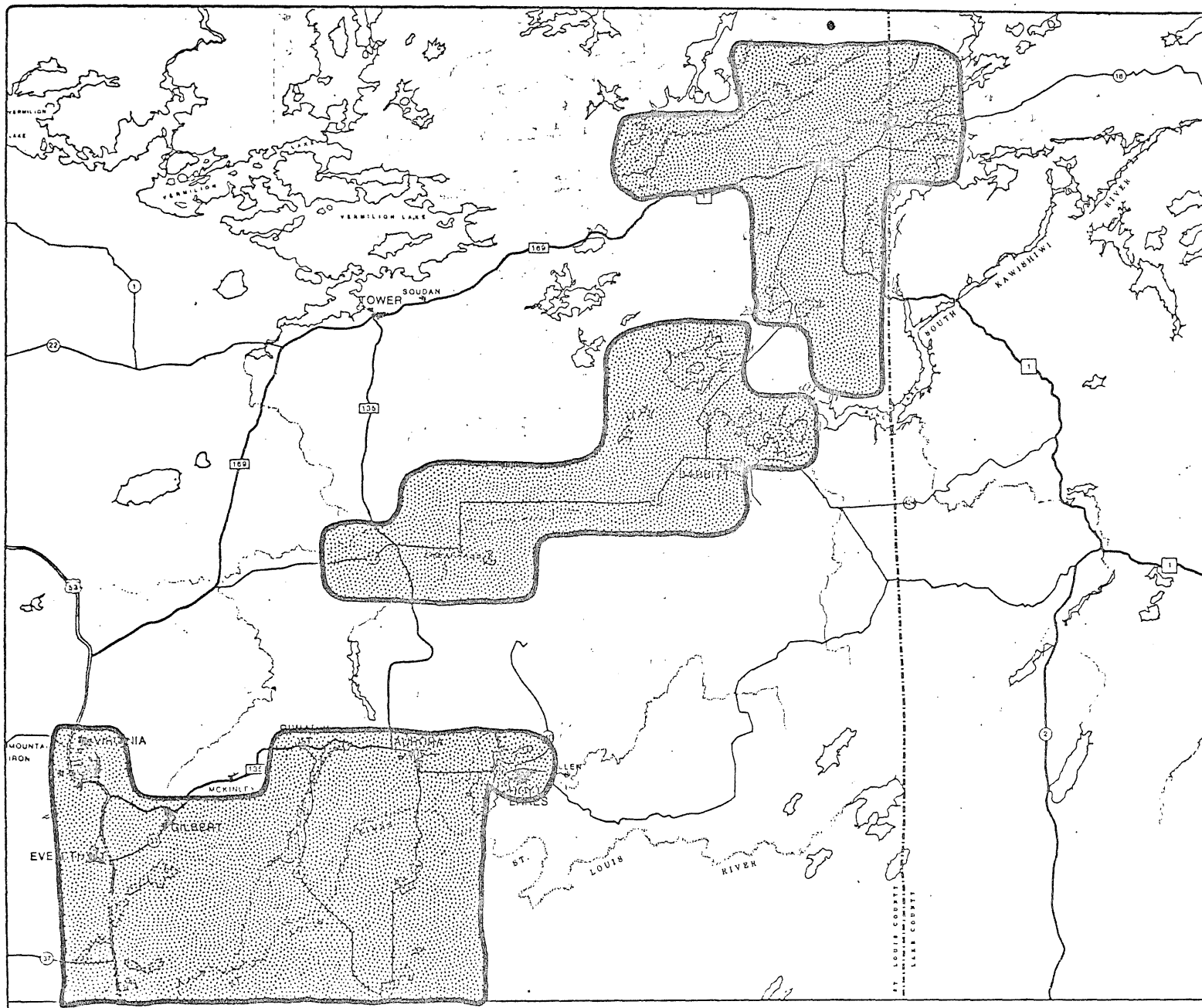
9.3.3.1 Population Increase--New mining development within the Study Area will attract new residents to the region. Forecasts based on the development of a 12.35×10^6 mtpy underground mine in zone 2, a 16.68×10^6 mtpy combination underground and open pit mine in zone 4, a 20.00×10^6 mtpy open pit mine in zone 7, and a 100,000 mtpy smelter/refinery in zone 4 predict a Study Area population increase (at peak production) of approximately 55% over 1976 levels (see Volume 5-Chapter 7 for a more complete discussion of these forecasts) or an increase of approximately 27,750 new residents. This growth will also mean an increase in the use of Study Area recreational facilities and activity areas, particularly those facilities located in or adjacent to areas of dense residential settlement which are used primarily by residents of those areas. Undoubtedly, however, such population growth would also increase the amount of use of lakes, hunting areas, snowmobile trails as well as other recreation areas. Not enough is presently known about the capacity of the Study Area recreational resource base to be able to determine where or even if this increased user pressure will cause overloads. The actual percentage increase in the number of

people using Study Area recreational resources as a result of the projected population increases will probably not match the 55% population increase due to the fact that many recreation resource users are not Study Area residents but tourists or seasonal residents. That is to say, a 55% growth in the number of Study Area residents would stimulate increased user pressure in only one segment of the entire population which uses the Study Area recreational resource base and, as a result, the overall increase in the number of people using that resource base would be less than 55%.

It is also important to note that this increase in use pressure may occur simultaneously with a decrease in the numbers of facilities or the amount of land available for recreation.

9.3.3.2 Residential Settlement Growth--Mine development related population growth of the magnitude projected will mean an increase in the amount of land used for residential purposes. Residential settlement which occurs in presently uninhabited or sparsely settled areas may impact recreational activities by the direct consumption of land or by altering those characteristics of an area (plant and animal habitats, topography, vegetation cover types, etc.) which make that area a valuable recreational resource.

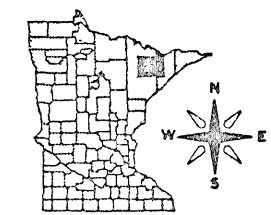
The distribution of new residential settlement in the Study Area is described fully in Volume 5-Chapter 7. In general, depending upon the locations of new mine developments, the rural portions of the Study Area which are expected to experience the greatest increases in residential settlement would be in the vicinity of Ely (extending south to Babbitt), the Embarrass valley region, and the southwest portion of the Study Area from Hoyt lakes to Virginia and Eveleth (Figure 15). Of these general areas, the Ely vicinity supports a larger number



LEGEND

SOURCE:

REGIONAL COPPER-NICKEL STUDY RESIDENTIAL SETTLEMENT MODEL



KEY MAP

1 422 400

MILES

KILOMETERS

FIGURE 15

MEQB REGIONAL COPPER-NICKEL STUDY

AREAS ACCOUNTING FOR 90 % OF NEW SETTLEMENT RESULTING FROM THREE COPPER-NICKEL DEVELOPMENTS

of recreational facilities and activities, and potential impacts resulting from residential settlement growth would be greatest in this area. The relative effects of new residential settlement on recreation in the Embarrass Valley and the southwest section of the Study Area is not as clear. While more recreational facilities are located in the southwest area than in the Embarrass Valley, the Embarrass Valley supports more recreational activities (Figures 2-10).

Accompanying increased industrial activity and population growth in the Study Area would be an increase in auto and truck traffic (Volume 5-Chapter 8). Increased traffic could modify the recreational resource base or the way these resources are used by increasing noise and congestion. On the other hand, increased traffic may prompt road improvements which could enhance the accessability of an area. This would have the effect of actually increasing the resource base.

9.3.4 A Case Study of Potential Impacts to Recreation in the Ely Area Resulting from Copper-Nickel Development

Ely, probably more so than any other Study Area city, has built a reputation on the variety and quality of recreational resources in its immediate area. Tourism is an important part of the economy in the region (Volume 5-Chapter 16) and any impact to the recreational resources in the area will be felt in the local economy.

The two recreational resources most often associated with the Ely area are its large number of quality fishing lakes and its proximity to the BWCA. Of course, recreation of many other types is available in the area, but these two are the largest draws for the tourists which account for about 20% of the export sales in the Ely economy.

Under present law and land management practices, neither of these activities is threatened with direct land appropriation by mine development, but both are sensitive to changes in the water and air quality in the area.

If copper-nickel development utilizes water management practices which minimize the need for water discharges and if the quality of these discharges are such that total trace metal concentrations do not exceed 100 ug/l copper equivalent units, then no significant impact on fishing will result from such development. The high quality of the South Kawishiwi River and Birch and White Iron lakes could be significantly reduced because of sulfate discharges. While toxic conditions are not expected, the present MPCA standard of 250 mg/l could be exceeded for several miles downstream of the discharge with corresponding reductions in the quality of this water for drinking.

The increased acidification of rain in the region is of great concern and could have disasterous affects on fishing in the region. While copper-nickel could contribute to this problem if a smelter is located in the area, the contribution of this source when compared to other sources is small. The acid rain problem and the secondary effects it can cause is a major issue facing northeastern Minnesota and must be addressed irrespective of what happens with copper-nickel development.

In addition to the effects of water quality changes in the area, the value of these recreational resources could be simultaneously reduced by the introduction of mining noise into the area as described in section 9.3.1.4 of this chapter.

Finally, if mine development occurs, the inmigration of up to 7,200 new residents to the Ely area (one of the areas projected to show pronounced growth in population and new residential settlements--Volume 5-Chapter 7) could, by intro-

ducing numbers of new fishermen to area lakes, alter the quality of the fishing experience.

Any of these impacts could cause a drop in the number of tourists who travel to the Ely area each year. The importance of this possible loss of tourist trade can be best understood by recalling that for every dollar of sales direct to tourists in 1976 (and these sales alone accounted for 20% of all Ely area export sales that year), another $1.22 in sales which are an indirect result of tourist trade is lost as well.

See Volume 5-Chapter 16 for a complete discussion of the impacts that tourism and recreation have on the Ely area economy.

9.3.5 Taconite Industry Expansion

Increases in production capacity ranging from 2.5 to 12.0 million mtpy are projected in four of the six Study Area taconite mining operations between 1977 and 2000. This will result in a physical expansion of an unknown number of the mines and processing facilities and an increase in the workforce of an estimated 1290 workers (see Volume 5-Chapter 5, and Chapter 7, section 7.3.1.1 for discussions of taconite industry expansion and associated population growth). Production capacity increases are projected until 2000, but growth in Study Area population as a result of taconite industry expansion is expected to level off by 1985. After 1985, increased taconite production is expected to be a result of gains in labor productivity. Without increases in production, labor needs will decline.

Taconite industry expansion will impact recreation in the Study Area in two ways. First, the physical expansion of mines and facilities may result in the

appropriation of recreational lands, air and water quality changes, noise level changes, and alterations in the topography of the area immediately surrounding mining developments such that areas currently used for recreation might become unsuitable for such purposes. These impacts could have the effect of decreasing the recreational resource base by varying degrees. Secondly, population growth will inevitably increase the amount of recreation occurring in the Study Area.

9.3.5.1 Potential Decreases in the Recreational Resource Base--Since this report does not include a detailed study of the future of the taconite industry, impacts on the recreational resource base as a result of expansion in the industry can be discussed in only a very general way. The effects of expansion on air and water quality, for instance, are unknown. Information currently available indicates the magnitude of the planned expansion and generally suggests the geological and economic limits that partially control which land may be directly appropriated by taconite pits and processing facilities.

Figure 16 presents the area in which direct consumption of land for mining purposes is most likely to occur. This area, extending eastward from Virginia to Hoyt Lakes and then north to the vicinity of Babbitt, is divided into two zones. The land directly above the Biwabik Iron Formation is the zone where the highest probability of land consumption exists since this is the area where it is technically feasible to extract the ore using open pit mining methods. The zone extending one and a half miles north and south of the iron formation is the area in which ore processing, tailings, and waste rock disposal are economically most advantageous. Any eventual impacts on recreational land resulting from land use conflicts with future taconite mining lands will depend entirely on the siting of the mining developments. The inventory of recreational facilities and activities which occur in these zones indicate only potential impacts.

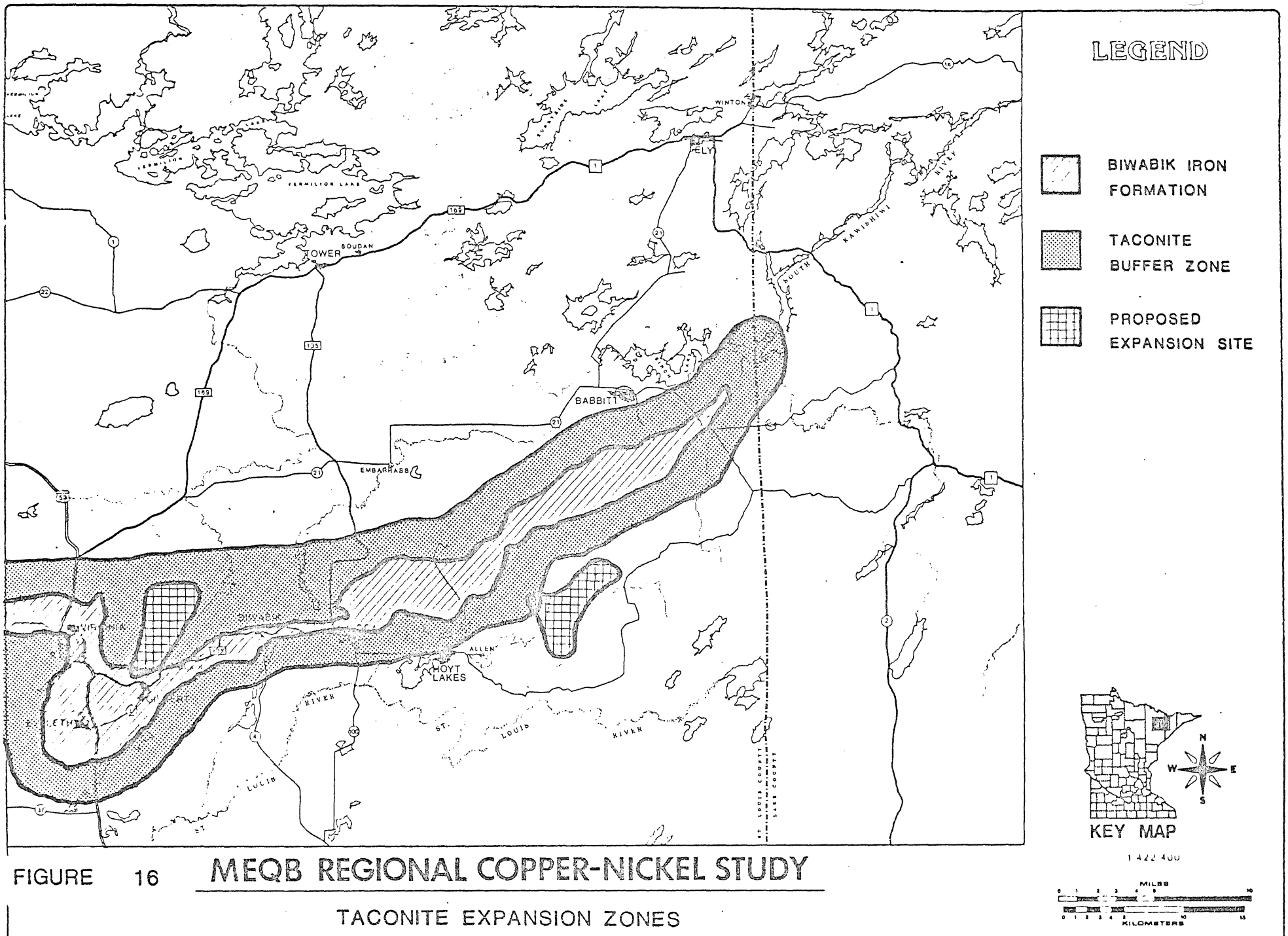


FIGURE 16 MEQB REGIONAL COPPER-NICKEL STUDY

TACONITE EXPANSION ZONES

TABLE 3

RECREATIONAL FACILITIES AND ACTIVITIES IN TACONITE EXPANSION AREAS

FACILITY	# IN BIWABIK IRON FORMATION	# IN TACONITE BUFFER ZONE	# IN PROPOSED ERIE RESERVOIR	# IN PROPOSED JONES & LAUGHLIN SITE	# IN TOTAL STUDY AREA
PICNIC AREA	10	5	0	0	41
PUBLIC BEACH	4	2	0	0	20
PUBLIC WATER ACCESS	3	4	0	0	58
SKI AREA	0	1	0	0	2
PUBLIC GOLF COURSE	2	0	0	0	5
CAMPGROUND*	0	2	0	0	36
RESORT	0	1	0	0	102
TOTAL	19	15	0	0	264

ACTIVITY					
PRIMITIVE CAMPING					
HIKING					
PLEASURE DRIVING					
SNOWMOBILING					
SLED DOG RACING					
DEER HUNTING					
GROUSE HUNTING					
MOOSE HUNTING					
DUCK HUNTING					
WILD RICE HARVEST					
PLEASURE BOATING					
CANOEING					
FISHING					
ICE FISHING					
NETTING					

*INCLUDING PUBLIC AND PRIVATE CAMPGROUNDS

SOURCES: MINN. DEPT. OF NATURAL RESOURCES, BUREAU OF PLANNING, SCORP PROGRAM, 1977.

PERSONAL INTERVIEWS WITH STUDY AREA LAND MANAGERS AND RECREATION SPECIALISTS, 1977.

Table 3 lists the recreational facilities and activities found in each zone. There are thirty-five recreational facilities in the area of potential land use conflict with new taconite lands (15% of all Study Area recreational facilities). Twenty (9% of the Study Area facilities) are located in the area directly above the Biwabik Iron Formation and have a relatively higher chance of being displaced for mining purposes than do the fifteen (6% of Study Area facilities) in the buffer zone.

Sixteen of the twenty facilities in the 63,360 acre Biwabik Iron Formation zone are either located in close proximity to the cities of Virginia, Eveleth, Gilbert or Aurora, or on lakes used for recreation. The facilities found in this zone are primarily picnic grounds, swimming beaches, and public lake access points. Generally speaking, even if these facilities were displaced, they could be replaced at a relatively low cost.

Two land extensive facilities found in this zone (both golf courses) would be considerably more expensive to relocate.

The taconite buffer zone, which at 147,120 acres is more than twice the size of the Biwabik Iron Formation zone, contains four of the land intensive type facilities including two campgrounds, one resort, and one ski area.

An example of the role that siting can play in minimizing conflicts between future minelands and land used for recreation can be found in the extent to which land designated in two preliminary taconite expansion plans is also used for recreation. The 10,800 acre reservoir proposed by Erie Mining Company and the 9,120 acre tailings basin, stockpile, and reservoir development proposed by Jones and Laughlin Mining Company (Figure 16) represent two large mining developments which, as proposed, would have virtually no direct impact on recreational lands.

No facilities would be displaced and only a small amount of land used for grouse and deer hunting would be appropriated by the Erie reservoir. The Jones and Laughlin development proposal, likewise, would not displace any facilities but would disrupt a snowmobile trail which runs north from McKinley.

The disruption of recreational activities by the direct consumption of land used for those activities is a more difficult impact to gauge. This difficulty is a result of the inability to determine the amount of use a particular area receives from any given activity. Table 3 indicates activities found in the taconite expansion areas. It can be seen that all but two of the activities which occur in the Study Area occur in the taconite buffer zone. This, of course, does not mean that these activities would disappear in the event of mine development in the taconite buffer zone, merely that the land available for some of these activities would be decreased.

9.3.5.2 Population Increase and Residential Settlement Growth--Estimates based on Regional Copper-Nickel Study projections of manpower needs in the taconite industry (see Volume 5-Chapter 5) indicate that the Study Area population will increase about 8% between 1976 and 1984 from 50,160 to 54,050 people because of taconite expansion. Population growth will impact recreation in two major ways:

1) The number of people using existing facilities and activity areas will increase. Particularly in the smaller facilities adjacent to the Study Area cities (facilities more likely to be used primarily by area residents) this may strain the carrying capacity of the facility.

2) Many of the new residents in the Study Area will settle on land which had not previously been residential land. This may decrease the area available for a particular activity or, more importantly, it may alter the habitat of a par-

ticular game animal decreasing an area's value as a hunting spot. Increased residential settlement could also enhance the recreational attractiveness of an area by facilitating access to the area.

9.3.5.3 Summary--In general, impacts resulting from taconite expansion appear to be minimal. Much of the land consumption associated with the expansion will likely be in areas not currently accessible to the public, although impacts could be more serious if land appropriation occurred in the relatively densely settled Virginia-Eveleth Area.

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