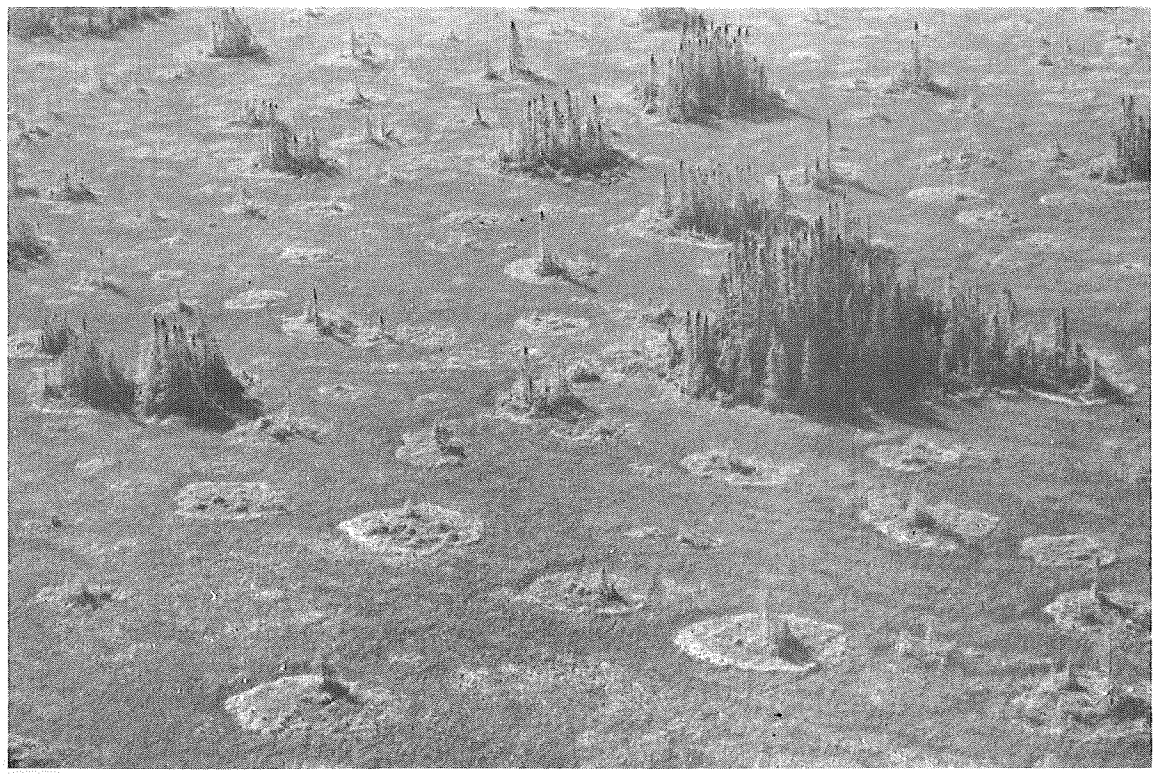
RECOMMENDATIONS FOR THE

PROTECTION OF ECOLOGICALLY SIGNIFICANT PEATLANDS IN MINNESOTA



MINNESOTA DEPARTMENT OF NATURAL RESOURCES

Cover: Aerial view of circular islands in the Red Lake Peatland.
(Photograph by D. Luce.)

RECOMMENDATIONS FOR THE PROTECTION OF ECOLOGICALLY SIGNIFICANT PEATLANDS IN MINNESOTA

Minnesota Department of Natural Resources

November 1984

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FOREWORD

This report presents the Minnesota Department of Natural Resources' recommendations for the protection and management of Minnesota's ecologically significant peatland complexes. Also contained in the report is a concise summary of the information on which these recommendations are based and the process used to formulate these recommendations. A preliminary report was published in June 1984 (Preliminary Report on the protection of Ecologically Significant Peatlands in Minnesota); a technical summary, enlarging on information in this report, will be published in 1985.

These recommendations are the culmination of work that began in 1978, as part of the DNR's Peat Program, to identify the state's ecologically significant peatlands greater than 3,000 acres. In 1981, 22 peatland complexes were nominated as candidates for protection by the Task Force on Peatlands of Special Interest and formally recognized in the policies of the Peat Program (Minnesota Peat Program: Final Report, 1981). Legislation passed in 1983 directed the department to continue the work:

> The commissioner shall review all peatlands identified as ecologically significant areas in the Minnesota peat program final report dated August, 1981. If any of these lands meet the resource and site qualifications for designation as a unit of the outdoor recreation system under Minnesota Statutes, chapter 86A, the commissioner shall designate the units or recommend that the legislature authorize the units pursuant to Minnesota Statutes, section 86A.07 on or before July 1, 1986. (Minn. Stat., 1983, chapt. 301, sec. 22)

To carry out this task, the Commissioner of DNR appointed the DNR Peatland Protection Task Force. This work was to have been completed by July 1, 1986. However, legislation passed in 1984 directed that "the commissioner of natural resources shall, by November 15, 1984, submit a report to the legislature containing specific recommendations for appropriate protection of those peatlands identified as ecologically

significant in the August 1981 Minnesota Peat Program Final Report" (Minn. Stat., 1984, chapt. 654, sec. 11).

Two task forces have played an integral part in the department's peatland protection program. The first is the Task Force on Peatlands of Special Interest, who acted as an advisory group to the DNR and nominated the 22 peatlands as candidates for protection. Following is a list of the members:

Norm Aaseng, DNR Peat Program, Division of Minerals (co-chair)
Barbara Coffin, DNR Natural Heritage Progam (co-chair)
Bill Berg, DNR Wildlife Research
Dr. Paul Glaser, University of Minnesota
Dr. Eville Gorham, University of Minnesota
Dr. Miron Heinselman, University of Minnesota
Dennis Ingvaldson, DNR Division of Forestry
Paul Rundell, DNR Division of Parks and Recreation
Dr. Donald Siegel, U.S. Geological Survey (now Syracuse University)
Dr. Herbert Wright, Jr., University of Minnesota

The second is the DNR Peatland Protection Task Force, appointed by the commissioner in 1983, whose members have been instrumental in the preparation of this report. Following is a list of the members:

Dennis Asmussen, Peat Program, Division of Minerals (chair)
Norm Aaseng, Peat Program, Division of Minerals
Jim Brooks, Division of Forestry
Barbara Coffin, Natural Heritage Program
Bob Djupstrom, Scientific and Natural Areas Program
Kim Hennings, Division of Fish and Wildlife
Mary Keirstead, Peat Program, Division of Minerals
Jon Parker, Division of Fish and Wildlife
Stephanie Warne, Bureau of Lands
Bruce Zumbahlen, Division of Forestry

To assist the department in the formulation of final recommendations, the Peatland Protection Area Review Committee was established, whose participants (listed below) represent a wide range of interests. The committee's role in the formulation of the recommendations is reported in the chapter "Development of Recommendations."

Russell Allen, Timber Producers Association
R. Bruce Barker, Boise Cascade
Geoff Barnard, The Nature Conservancy
Eric H. Bauman, Cooperative Power Association

Robert Binger, Advisory Committee on Scientific and Natural Areas
Karl Bremer, Minnesota Public Interest Research Group
Robert Buckler, Minnesota Forest Industries Association
Ken Bukowski, Wood Fiber Employees
Edward H. Eisenbrey, E. K. Lehmann and Assoc., Inc.
Rouse Farnham, University of Minnesota
Jim Fisher, Fiber Fuels Institute
Nelson French, Sierra Club/Project Environment
Max D. Fulton, Blandin Paper Company
Eville Gorham, University of Minnesota
Janet C. Green, Minnesota Audubon Council
Roger Head, Indian Affairs Intertribal Council
Miron L. Heinselman, Izaak Walton League
Kenneth Hiemenz, Minnesota Conservation Federation
Ramon Killmer, Timber Producers Association
Victor Kollock, Boise Cascade
Ernest K. Lehmann, E. K. Lehmann and Assoc., Inc.
Joe Leoni, Power-O-Peat
Gary Lockner, Lake of the Woods County
Neil K. Muncaster, Tenneco Minerals
Douglas C. Pratt, University of Minnesota
Robert Roe, Kerr-McGee Corporation
Donald Sandbeck, Koochiching County
Erika Sitz, Izaak Walton League
Larry Smith, Texasgulf Minerals & Metals, Inc.

MINNESOTA'S ECOLOGICALLY SIGNIFICANT PEATLANDS

Introduction

Minnesota's six million acres of peatland represent a major component of the state's natural heritage. Peatlands occur throughout Minnesota except in the extreme southwestern and southeastern corners (see fig. 1). The largest contiguous areas of peatland are located in the northern part of the state, where glacial erosion and deposition formed topography favorable for peat accumulation in the beds of Glacial Lakes Agassiz, Aitkin, and Upham. Smaller, scattered peatlands occur throughout other parts of the state.

The Minnesota Department of Natural Resources has developed a comprehensive approach to management of peatlands that recognizes their value as a resource capable of serving many uses. An important component of the department's program is the protection of those peatlands found to be ecologically significant.

The fact that most of Minnesota's peatlands are now undeveloped and many are undisturbed offers an unusual opportunity to protect ecologically significant peatlands. Too often the preservation of ecosystems, such as Minnesota's prairie or

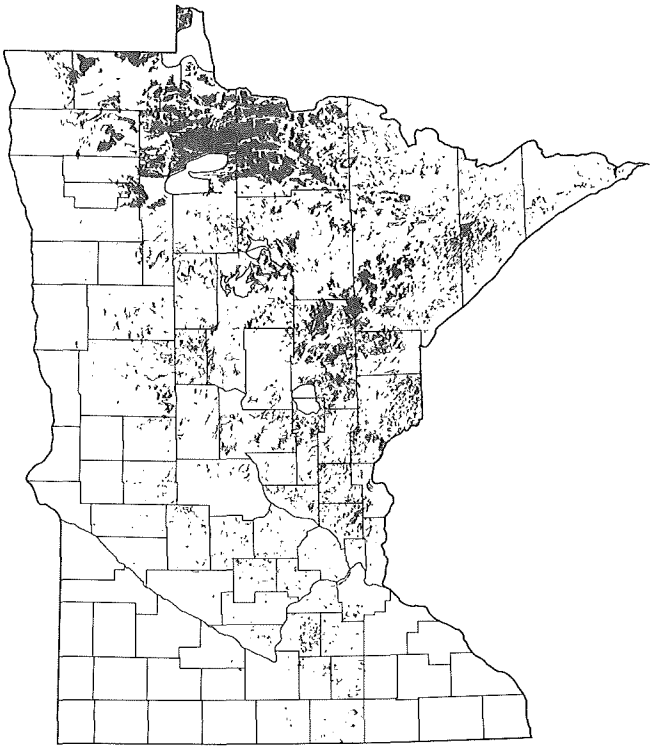


Figure 1. Distribution of peat resources in Minnesota

the "Big Woods", has been more difficult because development has proceeded to the point where only isolated remnants of former ecosystems remain intact.

Identification of significant peatlands for preservation concurrent with the process of identifying peatlands for development allowed for the systematic evaluation of their ecological significance and a careful assessment of potential land-use conflicts. The department's recommendations are the result of an effort to balance protection, existing uses, and future development.

Significance of Minnesota's Peatlands

International Context. Minnesota's peatlands are located within the boreal zone of worldwide peatland systems (see fig. 2). The greatest concentrations of peatlands in this zone occur in the vast lowlands of Canada, Scandinavia, and the Soviet Union, where a cool, moist climate combined with a poorly drained topography have promoted the formation of extensive peat areas (Glaser 1983; Sjors 1961). A characteristic feature in the boreal peatlands is the occurrence of landform patterns caused by the intricate relationship between vegetation and subtle variations in the peatland environment, particularly in hydrology, topography, and climate. Because of this feature, boreal peatlands are often referred to as patterned peatlands. Plates 1, 2, and 3 show examples of landform patterns.

The boreal peatlands can be classified into two main types according to climatic influences on the development of patterned peatlands. The first type, the nonforested raised bog type or maritime peatland, is formed in the cool, humid environment provided by oceanic influence and is characterized by the occurrence of nonforested raised bogs. This type is found predominately in northeastern Canada and Scandinavia.

The second type is the forested raised bog type or continental

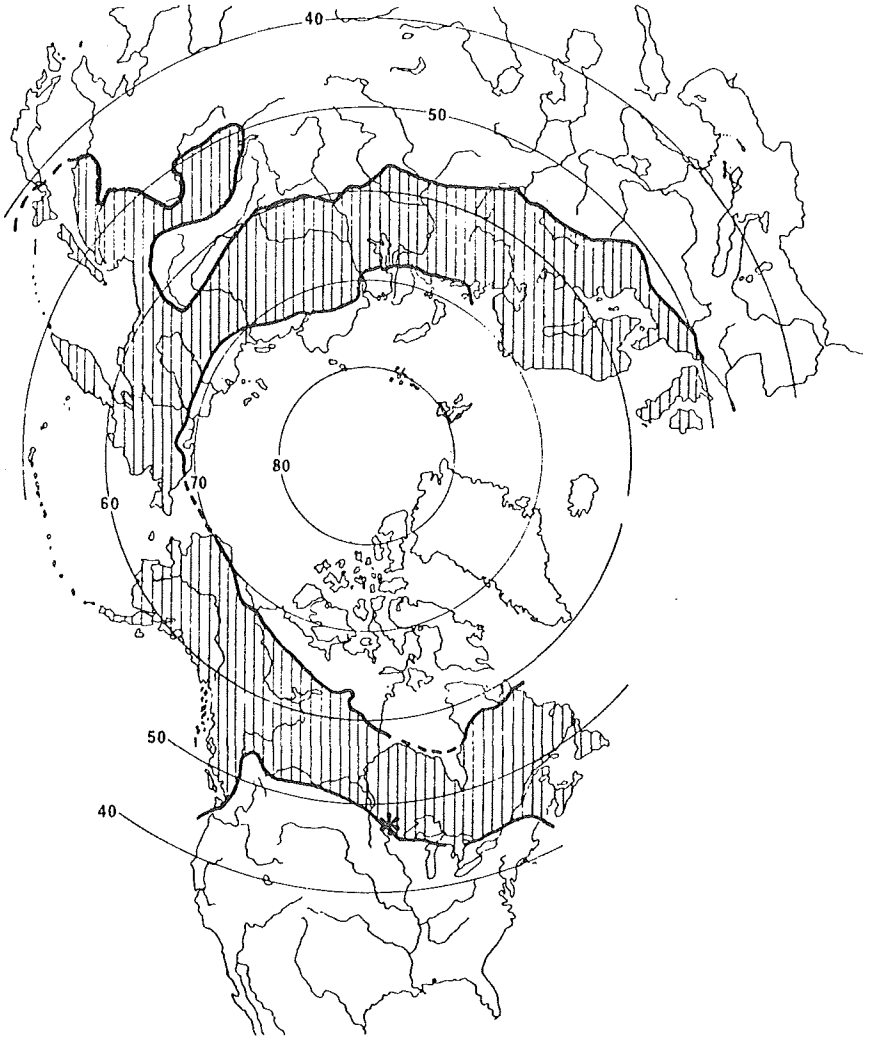


Figure 2. Boreal peatland regions of the world (Damaan 1983)

peatland, which forms under cooler and less humid conditions than the first type and is found in the northern interiors of North America and Eurasia. This type is characterized by the occurrence of forested raised bogs, which often show a distinct radiating pattern on aerial photos.

Plate 1. Aerial photograph showing (1) ovoid islands and (2) ribbed fen pattern in the Red Lake Peatland. Arrows indicate direction of water flow (1 in : 1¼ mi).

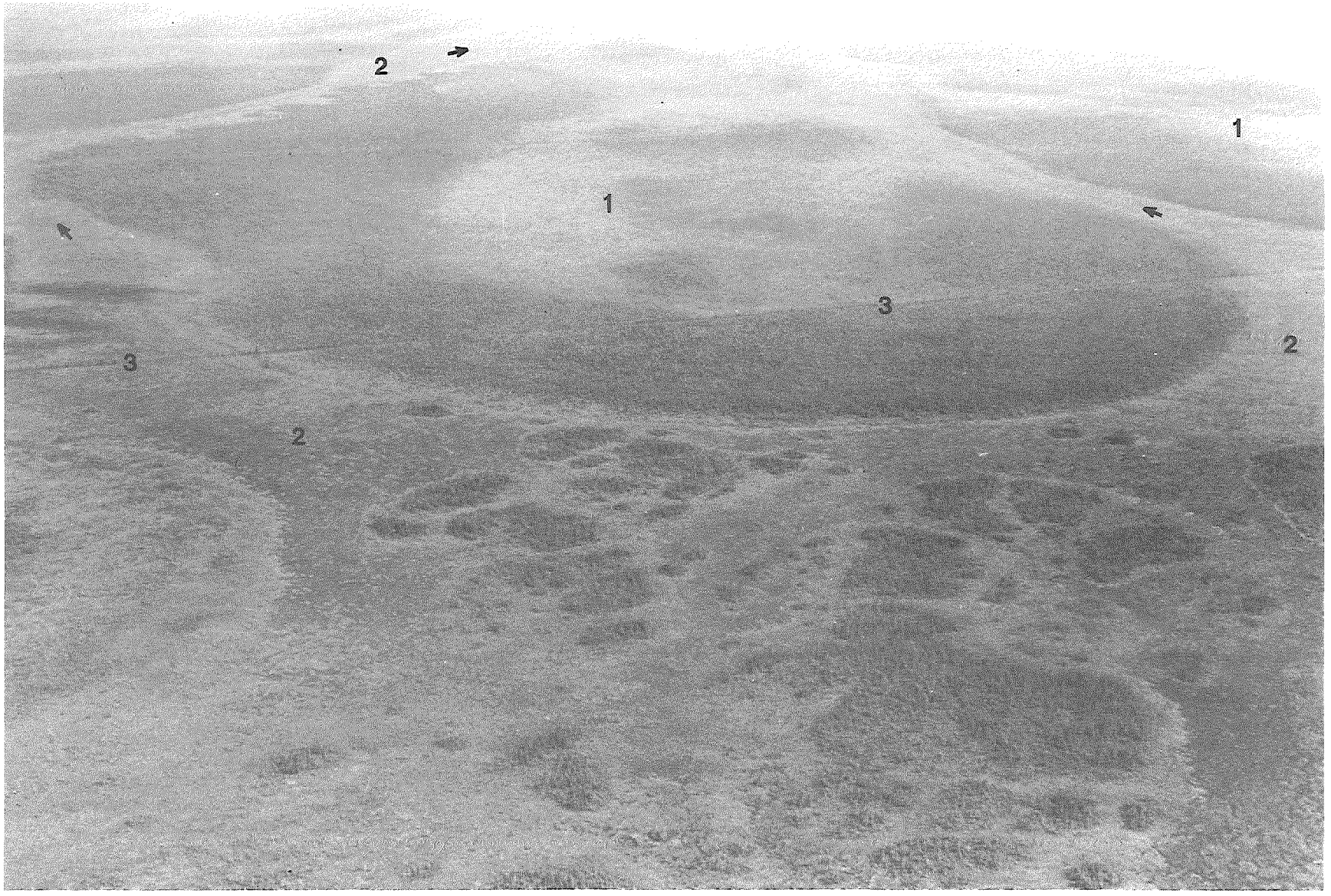


Plate 2. Aerial view showing (1) forested ovoid islands dissected by (2) fen water track. Note (3) abandoned ditch. Arrows indicate direction of water flow. (Photograph by D. Luce.)

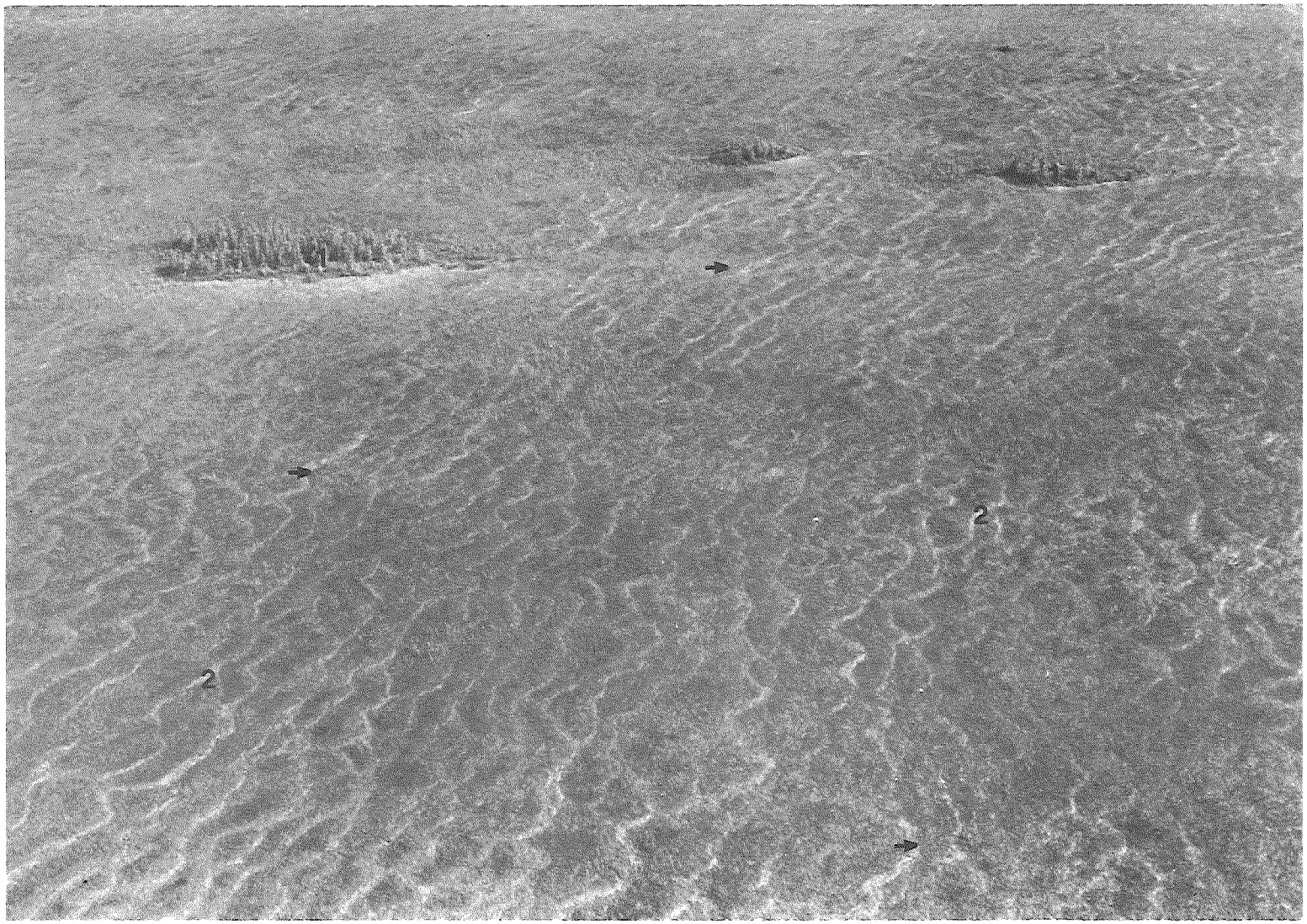


Plate 3. Aerial view of the western water track in the Red Lake Peatland showing (1) forested teardrop islands and (2) ribbed fen pattern. Arrows indicate direction of water flow. (Photograph by D. Luce.)

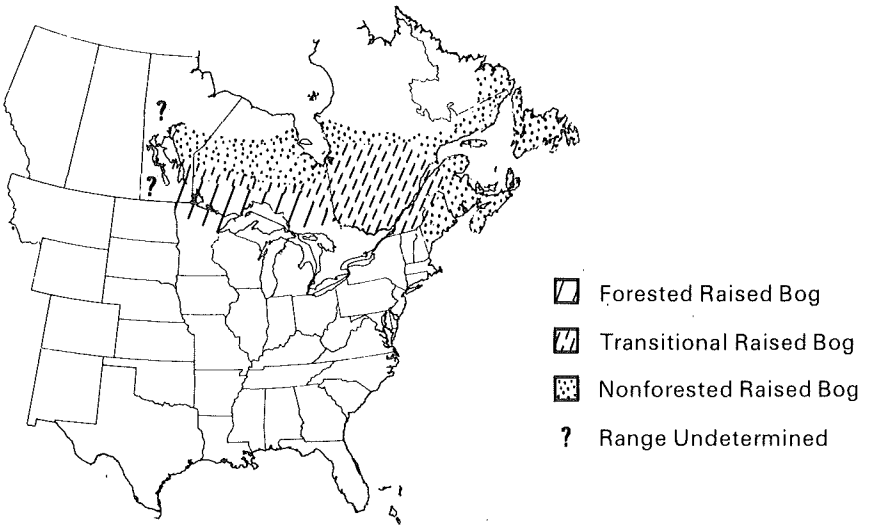


Figure 3. Range of raised bog types in northeastern North America (Glaser 1984)

Minnesota's peatlands occur in the southern part of the range of the forested raised bog type in North America (see fig. 3) and are a significant component of this type. The vast plain of Glacial Lake Agassiz in northcentral Minnesota has provided a unique setting for the development of peatlands that exhibit a diversity of surface patterns. These patterns are not found in comparable size or complexity anywhere else in the world except in the Hudson Bay Lowlands and possibly in Siberia.

In a world-wide context, the patterned peatlands in Minnesota are extremely valuable for the study of ecological and developmental processes in peatlands. First, this extreme southerly occurrence of patterned peatlands provides a unique climatic setting for the comparative study of peatland processes in different environmental settings. Second, Minnesota's peatlands lack permafrost, the presence of which is a complicating factor in the study of Canadian and northern European

peatlands. Third, the complex groundwater systems in the Glacial Lake Agassiz Basin allow extensive peatland development in an area with relatively low precipitation. Finally, and most importantly, Minnesota's peatlands are valuable for research because they are relatively undisturbed, unlike most of the peatlands in Europe, and are also more accessible for study than the similarly pristine peatlands in Canada and Siberia. Minnesota's peatlands therefore provide an important laboratory for ecological research on developmental processes and regional hydrology of the peatland ecosystem.

National Context. In the United States, patterned peatlands are found outside of Minnesota in Maine and Alaska and to a very limited extent in Michigan, Wisconsin, and New York. Only in Alaska are there peatlands thought to compare in size and complexity to those in Minnesota. However, these peatlands are not the forested raised bog type found in Minnesota.

Significance for Rare and Unusual Species. Although peatlands lack the diversity and richness of plant and animal species present in upland habitats, their environmental conditions, ranging from extremely acid and low in nutrients to highly calcareous, have created unique habitats for plant and animal species. Twenty-five vascular plant and animal species that occur in peatlands of northern Minnesota have been identified by the department's Natural Heritage Program and Nongame Wildlife Program as endangered, threatened, or of special concern on a state-wide level. Recent studies have also identified several mosses and liverworts from Minnesota peatlands that have been proposed as endangered, threatened, or of special concern. Included is one species of moss, Calliergon aftonianum, that has been discovered growing in Minnesota's peatlands and that had previously been reported to occur only as a fossil in peat cores from North American peatlands.

The peatlands also provide habitat for plants with unusual adaptations to the harsh peatland environment, such as the insectivorous

pitcher plants, sundews, and bladderworts, and for numerous species of orchids and ericaceous plants that may not be rare but are usually confined to peatland habitats.

The peatlands are also an important habitat for some animal species that are not necessarily rare but are highly dependent on peatland habitat. Some examples are bird species such as the palm warbler, Lincoln's sparrow, Connecticut warbler, and the great gray owl.

Significance for Scientific Research. Peatlands offer an unusual opportunity for research on cultural and natural history. Because the peatland environment inhibits decomposition, artifacts of prehistoric and historic significance are often preserved in the peat. Pollen and other plant fossils that have been deposited over thousands of years provide information on past climatic changes and vegetation history.

The shores of former glacial lakes and rivers in Minnesota that existed before peat formation began were inhabited by prehistoric cultures. No extensive effort has yet been made to explore potential sites, although Minnesota's peatlands may hold interesting archaeological opportunities. In Europe, well-preserved remains of humans have been uncovered in peatlands and have provided detailed information on past cultures (Glob 1969).

DEVELOPMENT OF RECOMMENDATIONS

Ecological Evaluation

Phase I. The DNR's effort to identify and protect ecologically significant peatlands grew out of the Peat Program's research efforts, which were begun in 1975 in response to interest in development of the peat resource for energy. Early in this program, it became apparent that basic information about the ecology of peatlands was sadly lacking; thus, the department funded research to obtain this information.

DNR staff began to gather existing data from both the scientific literature and individual researchers on ecologically significant peatlands and peatland types in Minnesota. To assist in this process, an advisory group composed of representatives from within the department and experts from outside the department was appointed as the Task Force on Peatlands of Special Interest.

The task force compiled a list of candidate peatlands greater than 3,000 acres for potential protection status. (The evaluation of peatlands smaller than 3,000 acres is an important future task.) Twenty-two peatland complexes were identified as ecologically significant areas and recommended for special protection.

Because of the intimate interdependence between peatland features and the surrounding hydrologic regime, the task force also recommended a two-level management approach. The processes that perpetuate the peatland ecosystem, as well as plant communities and rare species, are extremely sensitive to changes in water levels and water chemistry. Accordingly, adequate protection of significant peatland features requires two types of protection. First, the peatland features must be protected directly from onsite physical disturbance. Second, the hydrology of the surrounding peatland area must be sufficiently protected in order to maintain the ecological integrity of the features under special protection.

To accomodate this two-level approach, the task force defined two

management zones, a core preservation zone and a watershed protection zone, now referred to as core area and watershed protection area. The areas are defined as follows:

CORE AREA - The area within each candidate peatland area that contains the features of greatest ecological significance. Management guidelines within this area should concern onsite disturbance.

WATERSHED PROTECTION AREA - The peatland area surrounding the core area that is the buffer required to maintain the ecological integrity of the core area. Management guidelines in this area should be confined to those activities that may have a significant hydrologic impact on the core, such as ditching and peat mining.

Phase II. DNR staff began in 1981 to review the task force's recommendations, to conduct a more detailed evaluation of the ecological significance of the 22 peatlands, and to define the boundaries of the core and watershed protection areas. The review and evaluation proceeded according to the following steps. (For a more detailed discussion of the evaluation procedures, see the Preliminary Report on the Protection of Ecologically Significant Peatlands in Minnesota, June 1984.)

(1) Development of a peatland classification system. A classification of peatland complex types was developed (Glaser et al., in manuscript) to insure that the full range of Minnesota's patterned peatlands are adequately represented. This classification identifies 11 peatland complex types based on the hydrologic and topographic conditions characteristic of the range of peatland landform development.

(2) Development of criteria. Criteria were developed that weighted those attributes of a peatland that are of ecological significance to adequately document the relative significance of a peatland. These included the occurrences of rare plants and animals, peatland landforms, and peatland complex types; viability;

lack of disturbance; and potential for research and education.

(3) Collection of peatland data. More ecological data had been collected for some peatlands than others. Additional field work was carried out in order to have comparable data to use in the ecological evaluation.

(4) Identification of the best examples of each peatland type. By use of the criteria developed and the data available, those peatlands containing the best examples of at least one of the 11 peatland complex types, were identified.

Because of this evaluation, two refinements were made in the original list of 22 peatlands. First, four of the peatlands were found not to contain the best examples of any of the 11 peatland complex types. Their primary importance is their high value for wildlife and all four areas are currently managed as National Wildlife Refuges or state Wildlife Management Areas. Specific recommendations were made for these four areas in the preliminary report (June 1984)

A second refinement of the original list is the substitution of Hole-in-the-Bog peatland for Oteneagen peatland, since the former was found to be a better example of one of the 11 complex types.

Figure 4 shows the location of the 18 peatland protection areas and the four wildlife areas.

(5) Ranking of relative ecological significance. The peatlands identified in the previous step were then compared with each other and ranked according to their relative significance. Table 1 shows the rankings, which are a measure of their relative ecological significance. The exceptionally high ranking of Red Lake as well as Myrtle Lake, Lost River, and North Black River corresponds with the judgement by most peatland ecologists that these peatlands are of international and national significance.

Figure 4. Location of Peatland Protection Candidate Areas in Minnesota

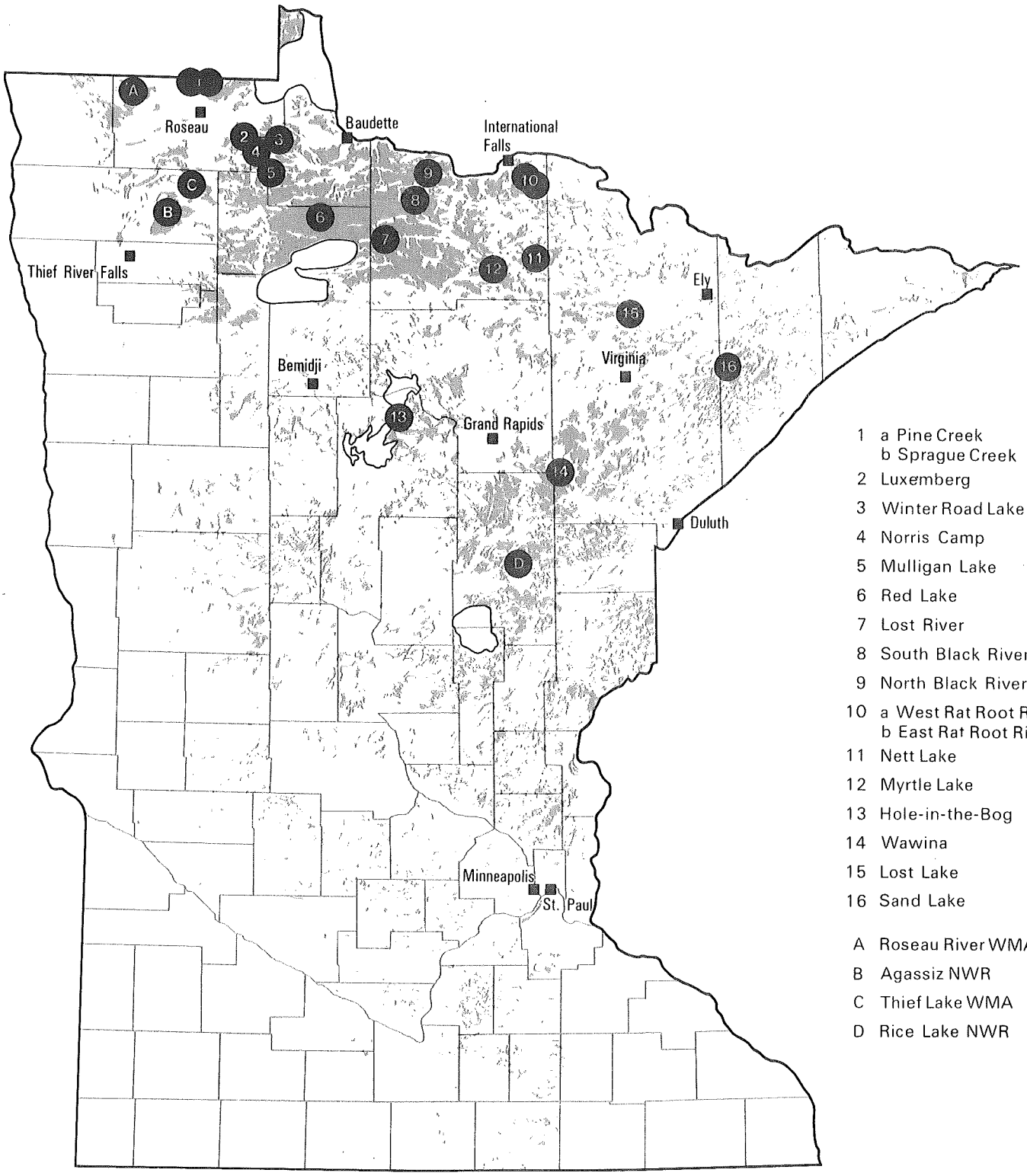


TABLE 1
Summary of Evaluation of Peatland Candidate Areas

	Peatland Features						Peatland Characteristics				
	Plant	Animal	Fen Landform	Bog Landform	Peatland Types	Subtotal	Viability	Lack of Disturbance	Scientific Research Value	Subtotal	Total
Red Lake	10*	5	10	10	8	43	10	7	10	27	70
Myrtle Lake	6	2	6	8	4	26	8	10	10	28	54
Lost River	7	1	7	7	9	28	8	9	8	25	53
N. Black R.	4	0	4	8	10	26	8	9	8	25	51
Sand Lake	3	2	4	3	5	17	7	9	7	23	40
Mulligan L.	3	3	5	0	4	15	7	10	5	22	37
Pine Creek	4	1	2	0	4	11	7	10	5	22	33
Lost Lake	3	0	2	2	4	11	5	10	6	21	32
S. Black R.	1	1	2	5	2	11	7	10	4	21	32
Winter Road L.	0	1	3	0	2	6	6	10	5	21	27
E. Rat Root R.	0	0	1	3	3	7	6	10	3	19	26
Hole-in-the-Bog	0	0	0	3	4	7	3	9	5	17	24
Wawina	0	0	1	2	6	9	5	5	5	15	24
Nett Lake	2	0	1	0	3	6	1	10	5	16	22
Luxemberg	1	1	2	0	1	5	3	10	4	17	22
Sprague Creek	2	1	1	0	2	5	7	5	3	15	20
W. Rat Root R.	0	0	1	2	1	4	3	2	4	9	13
Norris Camp	0	1	1	0	0	2	4	1	2	7	9

*The numerical values in this table are points that were assigned to each peatland based on an evaluation of its significance for each of the features and characteristics. In this table the total points for each peatland are compared to provide a relative ranking of the peatlands.

(6) Boundary Determinations. For each of the 18 peatland areas, boundary lines were drawn for a core area or areas and for a watershed protection area. The boundary lines of the core areas were drawn to include the most ecologically significant peatland features. The watershed protection area boundary lines were drawn to include a sufficient peatland buffer so that development outside the watershed protection area would not significantly alter the hydrology of the peatland and disturb the core area. The location of these boundary lines was based on the orientation of surficial water flow in the peatlands and the current understanding of potential hydrologic impacts due to peatland development.

The boundaries were later drawn to conform to the general land survey system (the smallest unit being one half of a forty). The areal extent of the 18 areas is shown in Figure 5, and the acreages of both core areas and watershed protection areas are listed in Table 2. Maps of the areas, which show the boundaries of the management areas and the location of significant ecological features, are provided in Appendix A.

Review of Land Management Considerations

Recognizing that the protection of the peatland candidate areas could affect the management of peatland resources, the department began to gather data necessary to assess possible conflicts between protection of the peatland protection areas and land management for other peatland resources. The DNR Peatland Protection Task Force was established to aid in this process.

A preliminary assessment of the possible impacts on management of peat, wildlife, timber, mineral, and recreational resources contained within the candidate areas was prepared for the preliminary report issued in June 1984. Land ownership in the candidate areas and administrative and legislative options for providing protection were also reviewed in the report. As a result of this assessment, the following

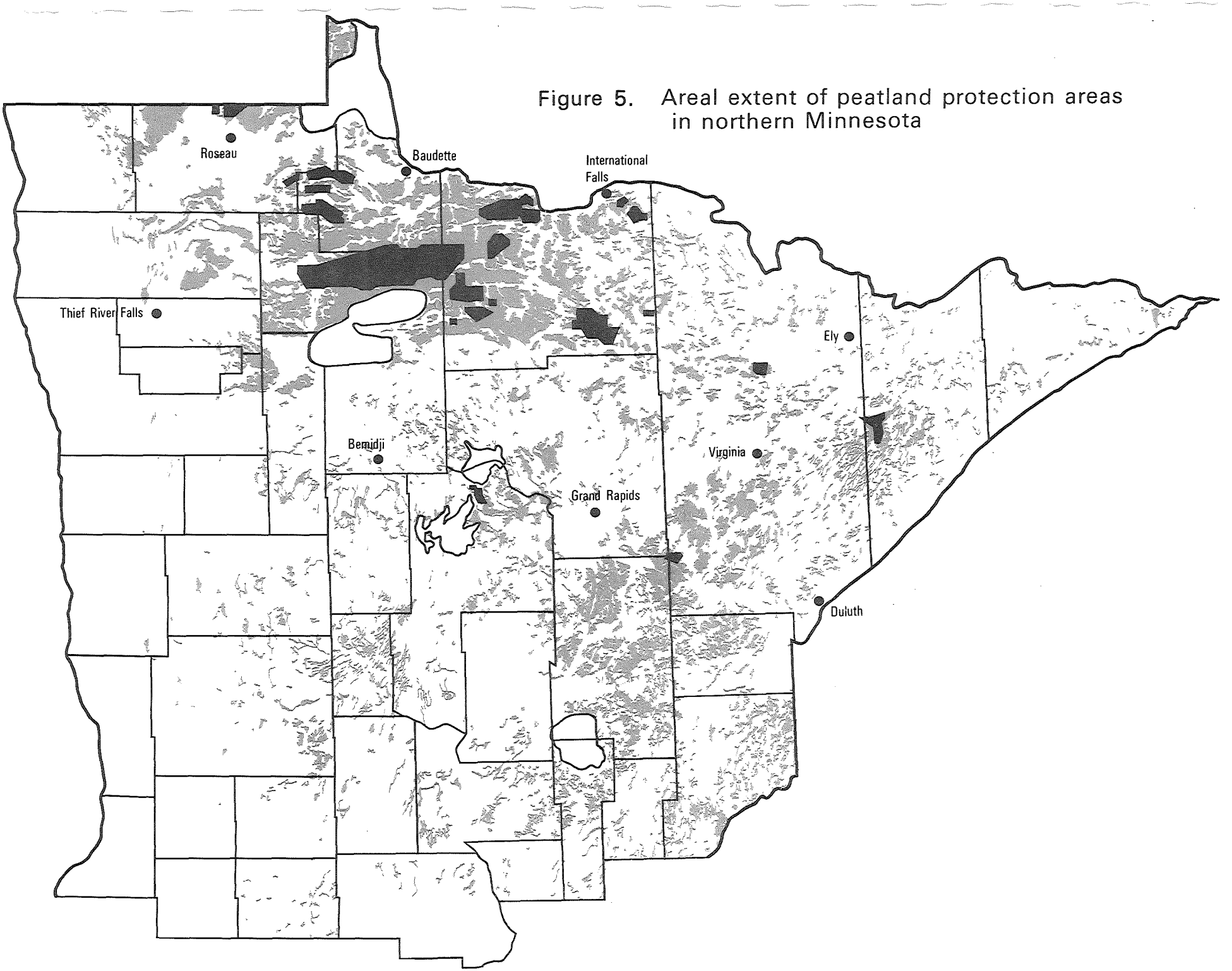


Figure 5. Areal extent of peatland protection areas in northern Minnesota

TABLE 2
Acreage in Core and Watershed Protection Areas

	Core Area	WPA	TOTAL
Red Lake	87,580	145,928	233,508
Myrtle Lake	22,950	12,614	35,563
Lost River	11,888	49,289	61,177
N. Black River	10,793	31,559	42,352
Sand Lake	4,923	8,448	13,371
Mulligan Lake	6,145	14,591	20,736
Pine Creek	944	1,652	2,596
Lost Lake	2,660	4,322	6,982
S. Black River	5,992	8,577	14,569
Winter Rd. Lake	4,300	14,684	18,984
E. Rat Root River	2,892	5,023	7,915
Hole in the Bog	1,622	1,542	3,164
Wawina	4,092	4,590	8,682
Nett Lake	400	820	1,220
Luxemberg	1,132	1,990	3,122
Sprague Creek	820	10,790	11,610
W. Rat Root River	1,450	2,550	4,000
Norris Camp	1,656	4,866	6,522
TOTAL	172,239	323,835	496,072

issues were identified as areas of concern to be examined in more detail during the formulation of final recommendations:

- possible conflicts with commercial timber harvesting,
- possible conflicts with mineral exploration and mining,
- the significant amount of federal (BLM) land in the North Black River peatland;
- the significant amount of School Trust lands in some of the areas and the possibility that economic uses of these lands might be precluded, and
- the significant amount of county tax-forfeited acreage in some of the areas.

No significant conflicts with either current wildlife management or recreational uses were identified.

Preliminary Conclusions

In June 1984, the department published the Preliminary Report on the Protection of Ecologically Significant Peatlands in Minnesota, which detailed the ecological evaluation of the 18 candidate areas and reviewed possible impacts of protection on natural resources management. The primary purpose of the report was to provide the information necessary to begin a wider review process and the formulation of final recommendations. The department offered the following guidelines for the review process:

1. The ranking of the candidate areas according to their ecological significance should be used as a basis for establishing priorities.
2. The groupings established by the ecological ranking should be used as a guideline in determining which peatlands should receive greater protection from disturbances associated with resource managment, economic development, and recreational activities.
3. The impact of the various administrative and legislative options

on all resource management activities should be considered in the process of evaluating the appropriate designation for each core area and watershed protection area. In addition, the impact of these options with regard to the issues of School Trust lands and state-owned or state-administered mineral rights should be considered. In view of the constitutional constraints regarding School Trust lands, inclusion of such lands in units of the Outdoor Recreation System will require compensation to the trust.

4. The identification of appropriate resource and recreational activities within the core and watershed protection areas should be defined for each candidate area.

PPARC Review

With the publication of the preliminary report, the department began the formulation of final recommendations for the protection of the 18 peatland candidate areas. To assist in this process, the Peatland Protection Area Review Committee (PPARC) was formed as an advisory group. The committee membership (see Foreword) was designed to represent the diversity of groups with an interest in the DNR's recommendations.

The committee met six times from July to November. Discussions at the meetings provided a forum for the presentation of the concerns of the various interest groups. The members' overriding concern was the apparent conflict between preservation and economic opportunities offered by the peatland protection areas. Early in the discussion, it was pointed out that all of the core areas of the 18 peatlands might qualify for designation as Scientific and Natural Areas, which would preclude any economic development. Economic opportunities that would be foregone by this designation were then identified as mineral exploration and mining, timber harvesting, and peat mining. Thus, the focus of the

DNR's formulation of recommendations became the need to find a balance between protection of the 18 peatlands and economic uses.

The PPARC committee's deliberations mirrored the diverse viewpoints represented on the committee. The department's final recommendations are based on careful consideration of the viewpoints of committee members. The following summarizes the discussion of the major issues.

Timber Resources. Timber industry representatives and representatives of local government expressed concern that commmercial timber harvesting in the core areas of the peatland protection areas would be prohibited because this activity conflicts with the protection of the peatland vegetation. Over the course of the PPARC meetings, estimates of the acres of commercial timber in the core areas became available. The data showed that most of the timber in the core areas is marginally commercial, is relatively dispersed, and often inaccessible. DNR staff said that small adjustments to some core area boundaries could be made to exclude commercial stands that were of minor ecological significance. Consequently, forestry interests no longer objected to prohibition of timber harvesting in the core areas.

A second issue raised was the possibility that there are stands of commercial timber outside the core areas that can only be reached by traveling across the core areas. However, no specific access problems were identified, and it was agreed that if use of existing winter roads were allowed, access would no longer be a major concern.

Mineral Resources. Mining industry representatives' major concern was the impact protection would have on the availability of lands to explore for mineral deposits. An economic mineral deposit is a rare occurrence, since a number of physical and chemical conditions must be favorable for its formation. A large area of land available for exploration is needed to find a deposit. The probability of finding one decreases with the amount of area closed to exploration.

Presentations were made to PPARC by mining industry representatives

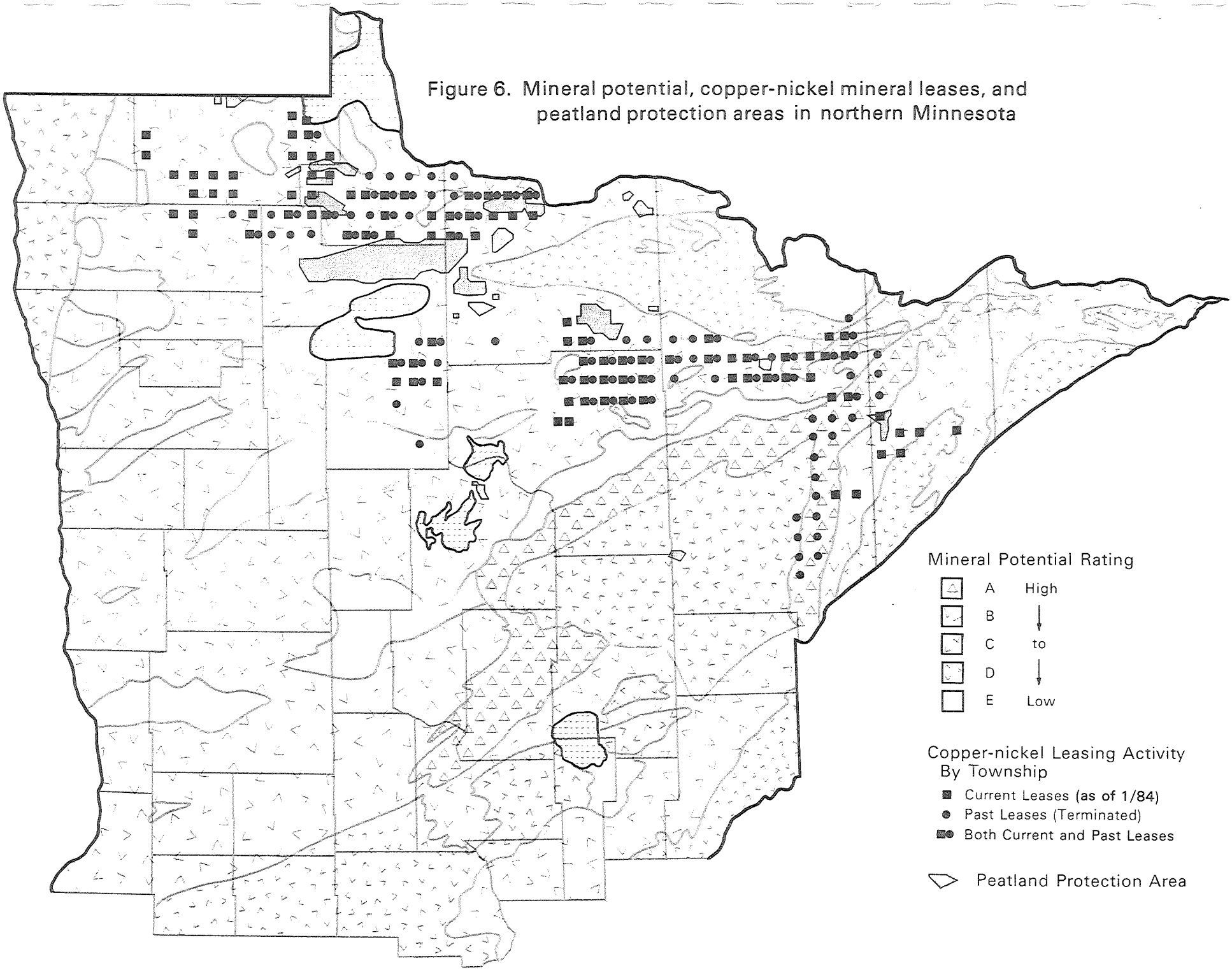
and Division of Minerals staff that further explained the issue. As Figure 6 shows, some of the protection areas possess some of the highest mineral potential in Minnesota. There is currently a great deal of exploration activity in Minnesota including some activity in the peatland candidate areas. The case was made that this exploration activity has no long-term impacts on peatlands. To insure that impacts are minimized, the DNR conducts a special review of exploration activities on sensitive sites on state leases. This review is in addition to the requirements of state copper-nickel leases and the Exploratory Borings Law.

While acknowledging that the impacts of exploration can easily be minimized and that exploration produces no long-term impacts, representatives of the environmental groups argued that their main concern was that exploration could lead to the greater environmental impacts of mining if a mineral deposit should be discovered. Mining industry representatives then argued that the decision to mine in a peatland protection area should be handled by the existing regulatory process that provides for environmental review and permitting. They further argued that there would be little impact from mining in the protection areas since only a few deposits are likely to be discovered in these areas and would probably be mined underground. The total area of land disturbed by a greenstone mine is on the order of 50 to 100 acres. However, most of the facilities would be located outside of the peatland area. Therefore, disturbance in the peatland would be limited to access and underground mining facilities.

Further discussions made evident that some compromise would be necessary between the need for keeping land available for exploration and the need for peatland protection.

Peat Resources. The possible constraints on the development of the peat resource, particularly for energy use, created by prohibition of

Figure 6. Mineral potential, copper-nickel mineral leases, and peatland protection areas in northern Minnesota



peat mining in the peatland protection areas was of interest to the committee. To answer this concern, the department undertook extensive computer mapping to identify the overlap, if any, of areas proposed for peatland protection and those of highest suitability for fuel or horticultural peat production.

Although Minnesota contains about 6 million acres of peatlands, not all of the acreage is the right depth and type or in the right location or ownership category to be economically viable for development. The computer model focuses on eleven northern cities (Crookston, Bemidji, Brainerd, Sartell, Baudette, International Falls, Grand Rapids, Hibbing, Virginia, Hoyt Lakes, and Duluth); paved highways emanating from these cities outwards to 50 miles; and access to peatlands at least 160 acres in size. This first phase of the modeling effort identified peatlands with development potential based on these transportation criteria.

These peatlands were then grouped into three categories: (1) peatlands available for state leasing, (2) peatlands in federal or private ownership that are unavailable for state leasing, and (3) peatlands in management units or classifications that preclude their development. Figure 7 shows state, federal, and private peatlands with development potential based on the transportation criteria.

The categories thus identified were finally screened with a variable that considers peat depth and type, thereby establishing their development potential. Peat deposits, as a rule, should be at least five feet in thickness to be economically viable.

A numerical summary of the computer mapping work is shown in Table 3. Minnesota contains about 6.2 million acres of peatland; however, when proximity to the 11 northern Minnesota communities most likely to serve as markets for peat fuel is considered there are about 1.8 million acres of peatland that are both accessible and available for state leasing.

Sections 2 through 4 of the table add the depth of peat to the

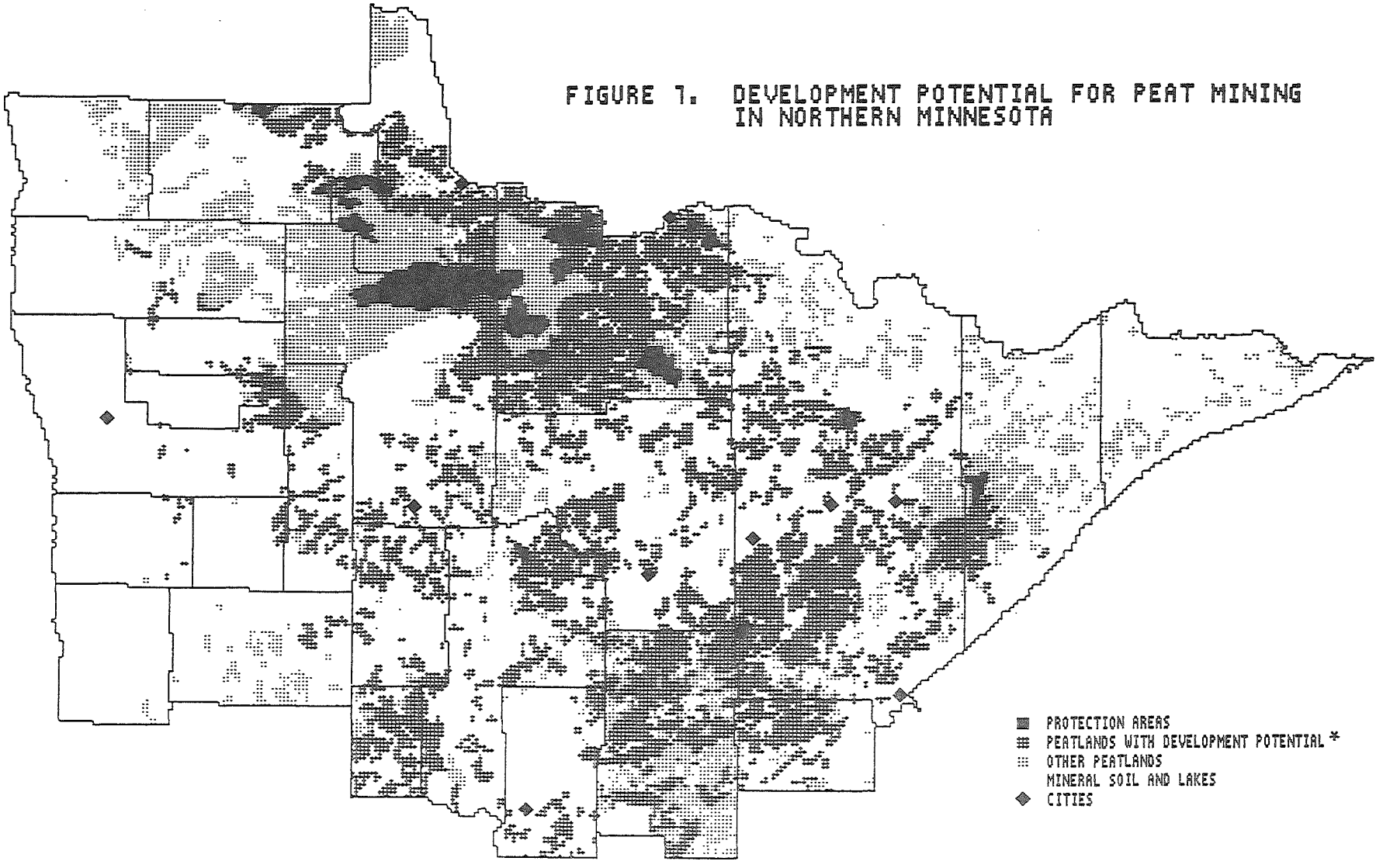


FIGURE 7. DEVELOPMENT POTENTIAL FOR PEAT MINING IN NORTHERN MINNESOTA

*The mapped development potential is based on the accessibility of the peatlands. These peatlands include those available for state leasing, as well as those that are federally or privately owned. They do not include any areas of peatlands lying within management units that restrict the use of the peatland.

TABLE 3
Development Potential for Peat Mining in Minnesota*

PEAT CATEGORIES	ACRES
1. TOTAL PEAT	6,200,000
Total available	2,700,000
Accessible, available	1,800,000
2. DEEP PEAT (>5 ft.) IN DNR INVENTORY AREA	800,000
Total available	450,000
Accessible, available	360,000
3. SHALLOW PEAT IN DNR INVENTORY AREA	1,790,000
Total available	1,170,000
Accessible, available	760,000
4. TOTAL SOIL ATLAS PEAT IN REST OF STATE	3,600,000
Total available	1,070,000
Accessible, available	670,000

* The transportation and accessibility modeling for this Table considers the entire state. The model uses the peat information collected by the DNR Peat Inventory Project in five counties (Koochiching, SW St. Louis, Carlton, Beltrami, and Lake of the Woods) to identify the areas of peatland greater than 5 feet deep. These five counties contain over half of the total peatland acreage in the entire state. For the rest of the state, peat information from the Minnesota Soil Atlas is used; however, the Soil Atlas provides incomplete depth data for peat soils, making it necessary to estimate deep peat acreage as we have done in the text.

analysis. Unfortunately, as the footnote to Table 3 explains, information on peat depth (meeting mining criteria) is available only for those counties where the DNR Inventory has conducted surveys. Nevertheless, Section 2 shows that about 360,000 acres of the surveyed peatlands exceed five feet in thickness and satisfy accessibility and availability criteria. To put this figure in perspective, Finland, after two decades of aggressive peat development, has less than 100,000 acres under production today. No conceivable stimulation of demand for fuel peat in Minnesota in the next two or three decades would call for more than a fraction of the 360,000 acres identified for possible leasing.

Section 3 presents shallow peat acreages from the DNR Inventory counties. Although these peat areas may be too shallow for mining purposes, they may well be suited for other economic uses, including agriculture, biomass production, and forestry.

The last section shows the peat described in the Minnesota Soil Atlas. Depth data are incomplete for these areas, but it is reasonable to assume that a significant fraction of the total, perhaps 25%, is deep enough for mining. These areas, therefore, represent an additional fund of approximately 170,000 acres of peatland that might be exploited in the future should demand for fuel peat warrant its use.

In summary, the data in Table 3 demonstrate that the state has available for leasing about 360,000 acres of peatland that satisfy all of the economic criteria reviewed: location, depth, and size. In addition to this very considerable fund, there are probably another 170,000 acres of peat that are sufficiently deep to be economically viable to mine and are also accessible and available for state leasing. This very substantial fund of suitable peatland, from which the peatland protection areas, lands not owned or managed by the state, and peatlands in management units have been excluded, should be able to meet any imaginable demand for fuel peat in the foreseeable future.

Local Government Concerns. Two members of the PPARC committee

represented the interests of county government. Both Koochiching and Lake of the Woods counties contain large areas of peatland within the proposed protection areas. County representatives expressed concern about prohibition of economic uses and recreational uses such as snowmobiling.

Koochiching County offered two resolutions to the committee expressing the county's disapproval of peatland protection plans. However, in meetings with the county boards of all other counties containing peatland protection areas, DNR staff found a variety of views, ranging from support through neutrality to opposition. Lake of the Woods County, for example, was in favor of protection, possibly because the county has previously engaged in development planning for its peatlands and has found no conflict with those plans.

Early in the discussion it was emphasized that protective measures apply only to state lands and not to federal, private, or county lands (see table 4 for ownership in the protection areas). County ownership is primarily concentrated in two of the peatland protection areas, Wawina and Lost Lake.

School Trust Fund Compensation. Of the total acreage of proposed peatland protection areas, over 80% is in state ownership. The balance of ownership is county, federal, and private (see table 4). School Trust lands, those lands given to the state by the federal government through land grants and managed for revenues apportioned to the Permanent School Fund for the support of the common schools of the state, comprise about 26% of the total proposed for peatland protection.

The DNR goal for the management of School Trust lands is to secure the maximum long-term economic return from the lands consistent with sound natural resource conservation and management principles and specific policy guidance as provided in state law. When economic activities that would provide income to the Permanent School Fund are restricted or

TABLE 4
Summary of Land Ownership in Peatland Protection Areas

	Core Area		Watershed Protection Areas		Total	
		(acres)		(acres)		(acres)
STATE	**85%**	**146,238**	**84%**	**273,107**	**85%**	**419,344**
Consolidated Conservation	55%	94,201	59%	191,778	58%	285,979
School Trust	29%	50,909	23%	74,988	25%	125,897
Volstead	1%	1,107	2%	5,680	1%	6,787
Other	<1%	20	<1%	660	<1%	680
FEDERAL	**10%**	**17,048**	**9%**	**29,338**	**9%**	**46,386**
Bureau of Land Management	5%	8,375	4%	13,243	4%	21,618
Bureau of Indian Affairs	4%	7,742	3%	9,970	4%	17,712
National Forest & Park	<1%	499	1%	3,634	1%	4,133
LUP (leased to state)	<1%	432	1%	2,490	<1%	2,922
COUNTY	**4%**	**6,641**	**4%**	**12,592**	**4%**	**19,232**
PRIVATE	**1%**	**2,312**	**3%**	**8,799**	**2%**	**11,111**
TOTAL	**100%**	**172,239**	**100%**	**323,835**	**100%**	**496,072**

prohibited, the DNR's policy is to compensate the fund for economic value foregone.

For these reasons, it became clear that any School Trust lands within units of peatland protection areas in which economic activities were restricted would require compensation of the Permanent School Fund for the loss of revenue potential. There was nearly unanimimous agreement by members of the committee about this issue.

Environmental Concerns. At initial meetings of PPARC, the environmental representatives argued that since all 18 peatland protection candidate areas were of ecological significance, all 18 should be given a maximum level of protection such as that provided by Scientific and Natural Area designation. Accepting that economic concerns needed consideration, representatives of the environmental groups agreed to compromises allowing mineral exploration and mining in some of the core areas, provided that clear standards for exploration and mining in proposed legislation would limit the impacts of these activities.

The PPARC committee also agreed that the current level of disturbance in the protection areas, for example, winter roads, trails, and powerlines, should be clearly documented. In addition, members agreed that proposed legislation should include a mechanism to insure that monitoring of activities in the watershed protection areas would be carried out to detect any impacts on the core areas.

RECOMMENDATIONS

Summary of Legislation

The Department's recommendations are presented in the form of a legislative proposal, which is based upon staff research, public response, and the discussion and comments of the PPARC committee. As such, the draft bill is an attempt to establish effective protective designations for the 18 areas and to deal with the issues of land ownership, economic opportunities lost or gained, School Trust land compensation, and management of activities in the protected areas.

Categories of Designation. The proposed legislation would create three categories of protected peatland: Scientific and Natural Areas (SNA) (an existing designation in the Outdoor Recreation Act), Peatland Scientific Protection Areas (PSPA), and Peatland Watershed Protection Areas (PWPA). The first two, SNA's and PSPA's, correspond to the core areas of the 18 peatlands. The cores, it will be recalled, contain the features of greatest significance in the peatland, for example, ovoid islands, ribbed fen, and rare plants. The third category, PWPA, corresponds to the watershed protection areas that surround the core areas to provide a buffer. These designations would apply only to state-owned lands within the ecological boundaries that delineate the core and watershed areas.

The Scientific and Natural Area designation is reserved for the core areas of international and national significance, which occur in the following peatlands:

Red Lake

Myrtle Lake

Lost River (two of the five core areas)

North Black River

For the remaining 14 core areas, the Peatland Scientific Protection Area designation is proposed, conferring a less restrictive level of protec-

tion than the SNA category.

For all of the 18 proposed areas, whether SNA or PSPA, a Peatland Watershed Protection Area is proposed. This designation confers the least restrictive level of protection of the three types.

Table 5 summarizes the proposed designations and gives the acreages in each peatland for each designation by category of land ownership. The maps in Appendix A show the boundaries of the areas proposed for designation.

Activities Prohibited or Permitted. Table 6 displays the prohibited and permitted activities in Scientific and Natural Areas and Peatland Scientific Protection Areas specified by the proposed legislation. Some permitted activities are subject to approval in management plans to be prepared for each of the areas. In Peatland Watershed Protection Areas, the only activity specifically prohibited is peat mining. Other activities are allowed as long as they meet the standard set in the legislation, that is, that they do not affect the natural features and overall functioning and integrity of the core areas.

Exploration for metallic minerals is regulated by the requirement that an exploration plan be submitted for approval by the commissioner. Mineral mining in Peatland Scientific Protection Areas can only occur if, in addition to completing environmental review and permitting, the developer acquires and donates to the state twice the amount of acreage of PSPA that is to be disturbed by mining. The replacement acreage would be selected from ecologically significant peatlands identified by the commissioner. The total amount of PSPA land mined cannot exceed 1,500 acres.

It should be noted that the prohibition against development of mineral rights in peatland Scientific and Natural Areas applies only to state-owned mineral rights. Development of private or federal mineral rights is not prohibited under the proposed legislation, although devel-

TABLE 5
Land Ownership in Peatland Protection Areas
(acres)

CORE AREA

	SNA			PSPA			Other Lands Within Ecological Boundary*					TOTAL CORE
	Total State	(Trust Fund	Other State)	Total State	(Trust Fund	Other State)	Total Non-State	County	Federal BIA	Federal Other	Private	
Red Lake	82,783	(-	82,783)				4,796	(186	3,730	-	881)	87,580
Myrtle Lake	22,630	(22,630	-)				320	(320	-	-	-)	22,950
Lost River	6,198	(4,935	1,263)	5,650	(5,339	311)	40	(-	-	-	40)	11,888
N. Black River				1,220	(680	540)	9,573	(218	640	8,375+	340)	10,793
Sand Lake				4,545	(4,545	-)	379	(60		199	120)	4,924
Mulligan Lake				5,236	-	5,236)	909	(-	693	40	176)	6,145
Pine Creek				944	(944	-)	0	(-	-	-	-)	944
Lost Lake				200	(200	-	2,460	(2,385	-	-	75)	2,660
S. Black River				5,992	(5,992	-)	0	(-	-	-	-)	5,992
Winter Rd. Lake				2,469	(	2,469)	1,832	(-	1,439	392	-)	4,300
E. Rat Root River				2,732	(2,732	-)	160	(-	-	160	-)	2,892
Hole in the Bog				1,482	(1,482	-)	140	(-	-	140	-)	1,622
Wawina				0	(-	-)	4,092	(3,452	-	-	640)	4,092
Nett Lake				0	(-	-)	400	(-	400	-	-)	400
Luxemberg				592	(-	592)	540	(-	500	-	40)	1,132
Sprague Creek				820	(-	820)	0	(-	-	-	-)	820
W. Rat Root River				1,430	(1,430	-)	20	(20	-	-	-)	1,450
Norris Camp				1,316	(-	1,316)	340	(-	340	-	-)	1,656
TOTAL	111,611	(27,565	84,046)	34,627	(23,344	11,283)	26,001	(6,641	7,742	9,306	2,312)	172,239

* Lands not affected by proposed legislation.
\+ Lands proposed to be transferred to state.

TABLE 5 (cont.)

WATERSHED PROTECTION AREA

	PWPA			Other Lands Within Ecological Boundary*					TOTAL WPA
	Total State	(Trust Fund	Other State)	Total Non-State	County	Federal BIA	Federal Other	Private	
Red Lake	137,682	(80	137,602)	8,245	(	4,513	1,102	2,630)	145,928
Myrtle Lake	12,194	(12,194	-)	420	(220			200)	12,614
Lost River	46,045	(36,661	9,384)	3,244	(881	99	120	2,144)	49,289
N. Black River	12,744	(1,439	11,305)	18,815	(4,378	840	12,061	1,536)	31,559
Sand Lake	5,518	(5,518	-)	2,929	(240		2,129	560)	8,448
Mulligan Lake	12,205	(-	12,205)	2,386	(	1,182	776	428)	14,591
Pine Creek	1,652	(1,572	80)	0	(			)	1,652
Lost Lake	1,780	(1,780	-)	2,542	(2,279		40	222)	4,322
S. Black River	8,499	(8,091	409)	78	(58			20)	8,577
Winter Rd. Lake	11,209	(	11,209)	3,475	(	2,036	1,294	146)	14,684
E. Rat Root River	3,375	(3,375	-)	1,648	(642		845	160)	5,023
Hole in the Bog	882	(882	-)	660	(		660	)	1,542
Wawina	305	(305	-)	4,285	(3,772			512)	4,590
Nett Lake	0	(	)	820	(60	680		80)	820
Luxemberg	1,630	(-	1,630)	360	(	320		40)	1,990
Sprague Creek	10,710	(640	10,070)	80	(			80)	10,790
W. Rat Root River	2,450	(2,450	-)	100	(60			40)	2,550
Norris Camp	4,226	(-	4,226)	640	(	300	340	)	4,866
TOTAL	273,107	(74,988	198,119)	50,729	(12,592	9,970	19,368	8,799)	323,835

* Lands not affected by proposed legislation.

TABLE 6
Prohibited (N) and Permitted (Y) Activities in the
Peatland Protection Areas

Activities	Management Categories	
	Scientific and Natural Areas	Peatland Scientific Protection Areas
New ditches	N	N
Improve ditches	N (with exceptions)	N (with exceptions)
Repair ditches	N (with exceptions)	N (with exceptions)
Peat and industrial minerals mining	N	N
Mineral exploration	N	Y (with conditions)
Timber harvesting	N	N
New corridors of disturbance	N	Y (if permitted by management plan)
Non-motor recreation activities	Y	Y
Scientific and educational work	Y	Y
Maintenance and use of corridors of disturbance	Y (with exceptions)	Y
Motorized uses on corridors of disturbance	Y (existing)	Y (existing)
Disease, fire control	Y (with exceptions)	Y (with exceptions)
New winter roads	N	Y (if permitted by management plan)
Metallic mining	N	Y (with conditions)
Any other adverse action	N	N

opment would be regulated and affected by other laws and rules.

Compensation for School Trust Lands. Because the proposed legislation would make the approximately 27,000 acres of trust lands within the proposed Scientific and Natural Areas unavailable for ordinary revenue generation for the trust fund, the surface interests, including peat, of those lands would be acquired by exchange or eminent domain, extinguishing the trust responsibilities for those lands. The legislation also requires compensation to the Permanent School Fund for peat resources in Peatland Scientific Protection Areas and Peatland Watershed Protection Areas should demand for these resources be demonstrated that cannot otherwise be accommodated.

The North Black River Peatland. The North Black River peatland contains a mix of state and federal ownership. The U.S. Bureau of Land Management has expressed a willingness to transfer the federal lands to the State of Minnesota to be managed for "recreational purposes" as defined in the Federal Land Management Planning Act of 1976 (90 STAT. 2758). The proposed legislation directs and authorizes the commissioner to apply for the transfer of these lands to the state. If this transfer is completed, the transferred lands in the core areas would be designated as a Scientific and Natural Area, and the transferred lands in the watershed area would be designated as part of the Peatland Watershed Protection Area along with state-owned lands. Lands in the core areas that are already state-owned will be designated as a Peatland Scientific Protection Area.

Legislation

The following pages are a draft of the proposed legislation. The legal descriptions of the boundaries of the areas will be incorporated into the final version.

A bill for an act

relating to natural resources, providing for peatland protection by designating scientific and natural areas, and creating and designating peatland scientific protection areas, and peatland watershed protection areas; providing for acquisition of certain peatlands from the United States Department of Interior; proposing new law coded in Minnesota Statutes 1984, Chapter 84.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF MINNESOTA:

Section 1. [84.034] [PEATLAND PROTECTION ACT]

Subdivision 1. [Citation] Section 1 may be cited as the "Minnesota Peatland Protection Act."

Subd. 2. [Findings] The legislature finds that certain Minnesota peatlands possess unique scientific, aesthetic, vegetative, hydrologic, geologic, wildlife, wilderness and educational values and represent the various peatland ecological types in the state. The legislature finds that it is desirable and appropriate to protect and preserve these state peatlands as a peatland management system through establishment and designation of certain peatland areas as scientific and natural areas, and establishment and designation of other peatland areas as either peatland scientific protection areas or peatland watershed protection areas.

Subd. 3. [Definitions]

(1) Unless the language or context clearly indicates that a

different meaning is intended, the following words and terms, for the purposes of section 1 have the meanings given them:

(2) "Commissioner" means the commissioner of natural resources of the state of Minnesota;

(3) "Winter road" means an access route which may be used by vehicles only when the substrate is frozen;

(4) "Corridors of disturbance" means rights of way which are in existence on the effective date of this act, such as ditches, ditch banks, transmission lines, pipelines, permanent roads, winter roads, and recreational trails. The existence, on the effective date of this act, of a corridor of disturbance may be demonstrated by physical evidence, document recorded in the office of county recorder or other public official, aerial survey, or other evidence similar to the above; and

(5) "Mining area" means any area of land from which material is removed in connection with the production or extraction of metallic minerals; the lands upon which material from such mining is deposited; the lands upon which beneficiation plants and auxiliary facilities are located; lands upon which the water reservoirs used in the mining process are located; and auxiliary lands which are used or intended to be used in a particular mining operation;

(6) "State land" means land owned by the state of Minnesota and administered by the commissioner.

Subd. 4. [Designation of Scientific and Natural Areas] Within the following described peatland boundaries, state lands

are hereby established and designated as scientific and natural areas to be preserved and managed by the commissioner in accordance with subdivision 5 and Minnesota statutes, section 86A.05, subdivision 5:

	AREA	LEGAL DESCRIPTION
(A)	Red Lake Scientific and Natural Area	
(B)	Myrtle Lake Scientific and Natural Area	
(C)	Lost River Scientific and Natural Area	
(D)	North Black River	

Subd. 5. [Activities in Scientific and Natural Areas] Areas designated in subdivision 4 as scientific and natural areas are subject to the following conditions:

(a) Except as provided in clause (b) of this subdivision the following activities are prohibited;

(1) construction of any new public drainage system after the effective date of this act or improvement or repair to a public drainage system in existence on the effective date of this act, under authority of Minnesota statutes, chapter 106, or any other

alteration of surface water or groundwater levels or flows unless specifically permitted pursuant to subdivision 5(b)(5) or 5(b)(6),

(2) removal of peat, sand, gravel or other industrial minerals,

(3) exploring or prospecting for or removal of oil, natural gas, radioactive materials, or metallic minerals except in the event of a national emergency declared by Congress,

(4) commercial timber harvesting,

(5) construction of new corridors of disturbance, of the kind defined in subdivision 3, after the effective date of this act, and,

(6) any other activity which significantly disturbs or adversely affects the peatland scientific and natural area.

(b) The following activities are permitted;

(1) recreational activities, including hunting, fishing, trapping, cross country skiing, snowshoeing, nature observation or other recreational activities permitted in the management plan approved by the commissioner,

(2) scientific and educational work,

(3) maintenance of corridors of disturbance,

(4) use of corridors of disturbance unless limited by the commissioner's management plan prepared pursuant to subdivision 6,

(5) improvements to a public drainage system in existence on the effective date of this act only when it is for the benefit of the peatland scientific and natural area and when included in a management plan prepared pursuant to subdivision 6 and approved

by the commissioner,

(6) repairs to a public drainage system in existence on the effective date of this act which crosses a natural and scientific area and is used for the purposes of providing a drainage outlet for lands outside of the scientific and natural area, provided that there are no other feasible and practical alternative means of providing such drainage outlet. The commissioner shall cooperate with the ditch authority in the determination of any feasible and practical alternatives. No repairs shall be made unless approved by the commissioner,

(7) motorized uses that are engaged in on corridors of disturbance on or before the effective date of this act,

(8) control of forest insects, disease, and wildfires, unless limited or prohibited by management plan.

Subd. 6. [Management Plans] The commissioner shall develop a management plan for each scientific and natural area, each peatland scientific protection area, and each peatland watershed protection area designated pursuant to section 1.

Subd. 7. [Establishing and Designating Peatland Scientific Protection Areas]

(a) State peatland scientific protection areas, as described in this subdivision, are hereby established and are managed and administered by the commissioner.

(b) Within the following described peatland boundaries, state lands are designated as peatland scientific protection areas to be preserved and managed in accordance with subdivision 8:

AREA	LEGAL DESCRIPTION
(1) Sand Lake	
(2) Mulligan Lake	
(3) Lost Lake	
(4) Pine Creek	
(5) Hole-in-the-Bog	
(6) Wawina	
(7) Nett Lake	
(8) East Rat Root River	
(9) South Black River	
(10) Winter Road Lake	
(11) Sprague Creek	
(12) Luxemberg	
(13) West Rat Root River	
(14) Lost River	
(15) Norris Camp	
(16) North Black River	

Subd. 8. [Activities in Peatland Scientific Protection Areas] Areas designated pursuant to subdivision 7 as peatland scientific protection areas are subject to the following conditions:

(a) Except as provided in clause (b) of this subdivision, the following activities are prohibited;

(1) construction of any new public drainage system after the effective date of this act or improvement or repair to a public drainage system in existence on the effective date of this act, under authority of Minnesota statutes, chapter 106, or any other

alteration of surface water or groundwater levels or flows except under the same circumstances and in the same manner as is permitted in a peatland scientific and natural area under subdivision 5(b)(5) or 5(b)(6),

(2) commercial timber harvesting,

(3) removal of peat, sand or gravel, except as provided in subdivision 14,

(4) any other activity which significantly disturbs or adversely affects the peatland scientific protection area.

(b) The following activities are permitted;

(1) activities described in subdivision 5(b),

(2) construction, use, and maintenance of new winter roads on routes not in existence on the effective date of this act, when specified in a management plan approved by the commissioner, except that these roads should be confined to corridors of disturbance to the greatest extent possible,

(3) mineral exploration under conditions that (a) minimize disturbance to surface or ground water hydrology or chemistry so as to prevent significant change to vegetative and landscape features outside the permitted area and (b) provide for site restoration to the maximum extent practical, all as specified in an exploration and restoration plan approved by the commissioner, provided that access shall be confined to winter conditions and, to the greatest extent possible, along corridors of disturbance, and

(4) metallic or industrial mineral mining if:

(a) an adequate environmental impact statement has been prepared and approved by the commissioner, which describes the measures, including restoration measures, which must be taken to protect the peatland scientific protection area and which describes the measures that must be taken to minimize disturbances to the areas outside the mining area to surface or ground water hydrology or chemistry so as to prevent significant change to vegetative and landscape features outside the permitted area,

(b) following approval of a mining project and prior to mining activities at the site, the operator acquires and donates to the state of Minnesota other peatland acreage of ecological significance which has been identified by the commissioner as ecologically significant and in an amount twice the acreage of the peatland used as a mining area, and

(c) the maximum combined total of all mining areas within peatland scientific protection areas shall not exceed 1,500 acres.

Subd. 9. [Establishing and Designating Peatland Watershed Protection Areas]

(a) State peatland watershed protection areas described in this subdivision are hereby established on state land to protect and insure the natural functioning of the ecological and hydrological processes of peatland areas designated as either scientific and natural areas or peatland scientific protection areas.

(b) State peatland watershed protection areas are to be managed and administered by the commissioner in accordance with subdivision 10.

(c) Within the following described peatland boundaries, state lands not otherwise designated as peatland scientific and natural areas or peatland scientific protection areas are designated as peatland watershed protection areas to be preserved and managed in accordance with the criteria listed in subdivision 10:

	AREA	LEGAL DESCRIPTION
(1)	Red Lake	
(2)	Lost River	
(3)	Myrtle Lake	
(4)	North Black River	
(5)	Sand Lake	
(6)	Mulligan Lake	
(7)	Lost Lake	
(8)	Pine Creek	
(9)	Hole-in-the-Bog	
(10)	Wawina	
(11)	Nett Lake	
(12)	East Rat Root River	
(13)	South Black River	
(14)	Winter Road Lake	
(15)	Sprague Creek	
(16)	Luxemberg	
(17)	West Rat Root River	
(18)	Norris Camp	

Subd. 10. [Activities in Peatland Watershed Protection Areas] Areas designated pursuant to subdivision 9 as peatland watershed protection areas are subject to the following conditions:

(a) The following activities are prohibited;

(1) peat mining except as provided in subdivision 14, and

(2) any other activities which significantly modify the water levels or flows, water chemistry, plant and animal species and communities, or other natural features of either the peatland scientific and natural areas or the peatland scientific protection areas.

(b) The following activities are permitted:

(1) motorized uses that are engaged in on corridors of disturbance on or before the effective date of this act, and

(2) timber management, mineral exploration and mining, wildlife management, recreational use and any other activity to the extent these activities are not prohibited by clause (a) of this subdivision.

Subd. 11. [Establishing Base Line Data] The commissioner shall establish base line data on the ecology of a scientific and natural area or a peatland scientific protection area in any case where the commissioner determines it is necessary to ascertain through monitoring whether changes are occurring in the scientific and natural area or the peatland scientific protection area as a result of activities permitted in the watershed protection area. These base line data may include but are not limited to the history

of the peatland and its geologic origins, plant and animal communities, hydrology, and water chemistry.

Subd. 12. [North Black River Acquisition and Designation] The commissioner shall make application by July 30, 1985 to the United States Department of Interior, Bureau of Land Management, to acquire all or such portions of federally owned land in Koochiching County, Minnesota as the commissioner deems appropriate for the establishment of the North Black River scientific and natural area and the North Black River peatland watershed protection area. The commissioner is authorized to do all things necessary to complete this acquisition. Upon completion of the transfer of land from the United States of America to the state of Minnesota, the lands shall be included by order of the commissioner in the North Black River scientific and natural area or the North Black River peatland watershed protection area.

Subd. 13. [Ditch Abandonments] In order to eliminate repairs or improvements to any public drainage system that crosses a peatland scientific and natural area or a peatland scientific protection area in those instances where the repair or improvement adversely affects an area, the commissioner may petition for the abandonment of parts of the public drainage system. If the public drainage system is necessary as a drainage outlet for lands outside of the peatland scientific and natural area or the peatland scientific protection area, the commissioner will cooperate with the ditch authority in the development of feasible and practical alternative means of providing a drainage outlet which avoids the

crossing of the peatland scientific and natural or protection areas. In so doing the commissioner may grant flowage easements to the ditch authority for disposal of the outlet water on other state lands. The ditch authority shall approve the abandonment of parts of any public drainage system crossing a peatland natural and scientific area or a peatland scientific protection area, if the public drainage system crossing of those areas is not necessary as a drainage outlet for lands outside of the areas or if there are feasible and practical alternative means of providing a drainage outlet without crossing such areas. In any abandonment under this subdivision the commissioner may enter into an agreement with the ditch authority regarding apportionment of costs and, contingent upon appropriations of money for that purpose, may agree to pay a reasonable share of the cost of the abandonment.

Subd. 14. [Compensation for Trust Fund Lands] The commissioner shall acquire by exchange or eminent domain the surface interests, including peat, on trust fund lands contained in scientific and natural areas established in subdivision 4. If there is request for a peat, sand, or gravel lease located on trust fund peatlands contained in peatland scientific protection areas established in subdivision 7 or for a peat lease located on trust fund peatlands contained in peatland watershed protection areas established in subdivision 9, and the request cannot be satisfied with resources from trust fund land outside these areas, the commissioner shall lease the resource from the trust for a two year period at current market value. The commissioner shall

report these leases to the legislature in January of each year following the issuance of a lease. If the legislature does not authorize condemnation or long term lease of a peatland reported to it, restrictions on the development arising from the designation of the area either as a peatland scientific protection area or a peatland watershed protection area no longer apply.

Subd. 15. This act is effective the day following final enactment.

Discussion

Achievement of Peatland Protection Objectives. The overall objective of the peatland protection project is to preserve the best examples of Minnesota's ecologically significant peatlands. This objective was elaborated most recently by the 1984 legislature's charge to the department to formulate recommendations to provide for the protection of the peatlands previously identified as ecologically significant. The draft legislation presented in this report seeks to carry out this charge. The following is a discussion of how this objective is met by the proposed legislation.

The 18 areas addressed in the legislative proposal are the best examples of the peatland complexes in Minnesota and some of the most ecologically significant in the United States. The 18 areas represent the top examples of the peatland complex types that occur in the state and also include examples of the extremes in the geographic range of the types. These conclusions are supported by a study, a joint effort by DNR staff and University of Minnesota ecologists, of the ecology of Minnesota peatlands that includes the classification of complex types. The investigators from the University of Minnesota's Department of Ecology and Behavioral Biology are internationally recognized as experts in peatland ecology.

Recommended Designations for the 18 Areas. If protection objectives were the only resource management concerns for the 18 areas, it would be easiest to recommend maximum protection for all of them using, for instance, the Scientific and Natural Area category of the Minnesota Outdoor Recreation Act. However, there are other resources in the 18 areas that must be considered. These are timber, peat, and potential mineral resources. Furthermore, there are county, federal, and private lands in addition to state lands within the ecological boundaries of the areas.

The compromise the legislative proposal strikes provides the level

of protection provided by the Scientific and Natural Area designation only to core areas in the top four of the 18 areas, those peatland complexes widely considered of international or national importance. Two of the top four peatlands, Red Lake and Myrtle Lake, are recognized by the federal government as National Natural Landmarks.

The second proposed designation for the core areas of the candidate peatlands, Peatland Scientific Protection Area, accommodates both protection and economic considerations. Their designation does not allow activities such as ditching, peat mining, and timber harvesting but does allow tightly regulated mineral exploration and metallic mineral mining. Exploration and mining are, however, subject to environmental standards specified in the proposed legislation. A provision for replacing peatlands disturbed by mining with other ecologically significant peatlands is also included in the legislation.

The third category, Peatland Watershed Protection Areas, is a designation that would protect the Scientific and Natural Area and Peatland Scientific Protection Area cores from adjacent development. The boundaries of the watersheds were delineated to enclose an area large enough to provide an adequate buffer from development carried on in adjacent areas.

Management Plans. The proposed legislation states that management plans will be prepared by the Commissioner. These plans will ensure that activities permitted by the legislation, as well as management activities, will be conducted so that they will not negatively affect the areas and their significant features.

Accommodation of Economic Interests. Forestry and peat development are affected very little by the proposed legislation. The impact on metallic mineral development is unknown until minerals are discovered. Areas of commercial timber generally do not coincide with the features of interest in the peatlands, and where they do, an attempt has been

made to draw core area boundaries to exclude substantial timber stands.

Peat resources of commercial value occur mainly outside of the proposed protection system. Most of the peatland protection candidate areas are far from fuel or horticultural peat markets as our computer modeling shows.

Mineral exploration and mining are excluded from the proposed Scientific and Natural Areas, which contain about 112,000 acres. However, not all of these lands have been open to exploration in the past. Exploration has been excluded from the public lands in the Myrtle Lake core area (22,630 acres) by policy. Federal lands in North Black River (8,375 acres) have been excluded from exploration because they are not included under federal leasing laws.

The proposed legislation permits exploration on lands in Peatland Scientific Protection Areas and Peatland Watershed Protection Areas. In PSPA's, exploration plans must be approved by the commissioner. This special review of exploration plans has been successfully carried out in peatlands and on other sensitive sites in the past.

Land Ownership Considerations. The legislation applies only to state lands within the ecological boundaries of the peatlands. Three of the peatlands, Nett Lake, Lost Lake, and Wawina, contain only small acreages of state lands and are therefore not greatly affected by the legislation.

The responsibility of the department for the management of School Trust lands is recognized in the legislative proposal by compensation of the Permanent School Fund outright for School Trust lands within the most restrictive designation, Scientific and Natural Area. If there is demand for peat resources on School Trust lands in the other two designations that cannot be otherwise accommodated, the proposed legislation requires that the legislature take action to compensate the fund or to allow the lease of the resource.

REFERENCES

Damaan, A. 1983. Map printed in Maine Peatlands: Protection of their Ecological Value. Land and Water Resources Center, University of Maine at Orono.

Glaser, P. H. 1983. Vegetation patterns in the North Black River Peatland, northern Minnesota. Can. J. of Botany 61: 2085-2104.

Glaser, P. H. and J. A. Janssens. 1984. Raised bogs in eastern North America: transitions in surface patterns and stratigraphy. Can. J. of Botany (in press).

Glaser, P. H., J. A. Janssens, G. Wheeler, and D. Janecky. The distribution and classification of patterned peatlands in northern Minnesota and their relation to potential successional trends. In manuscript.

Glob, P. V. 1969. The Bog People. London: Faber and Faber.

Minn. Dept. of Natural Resources. 1981. Minnesota Peat Program: final report.

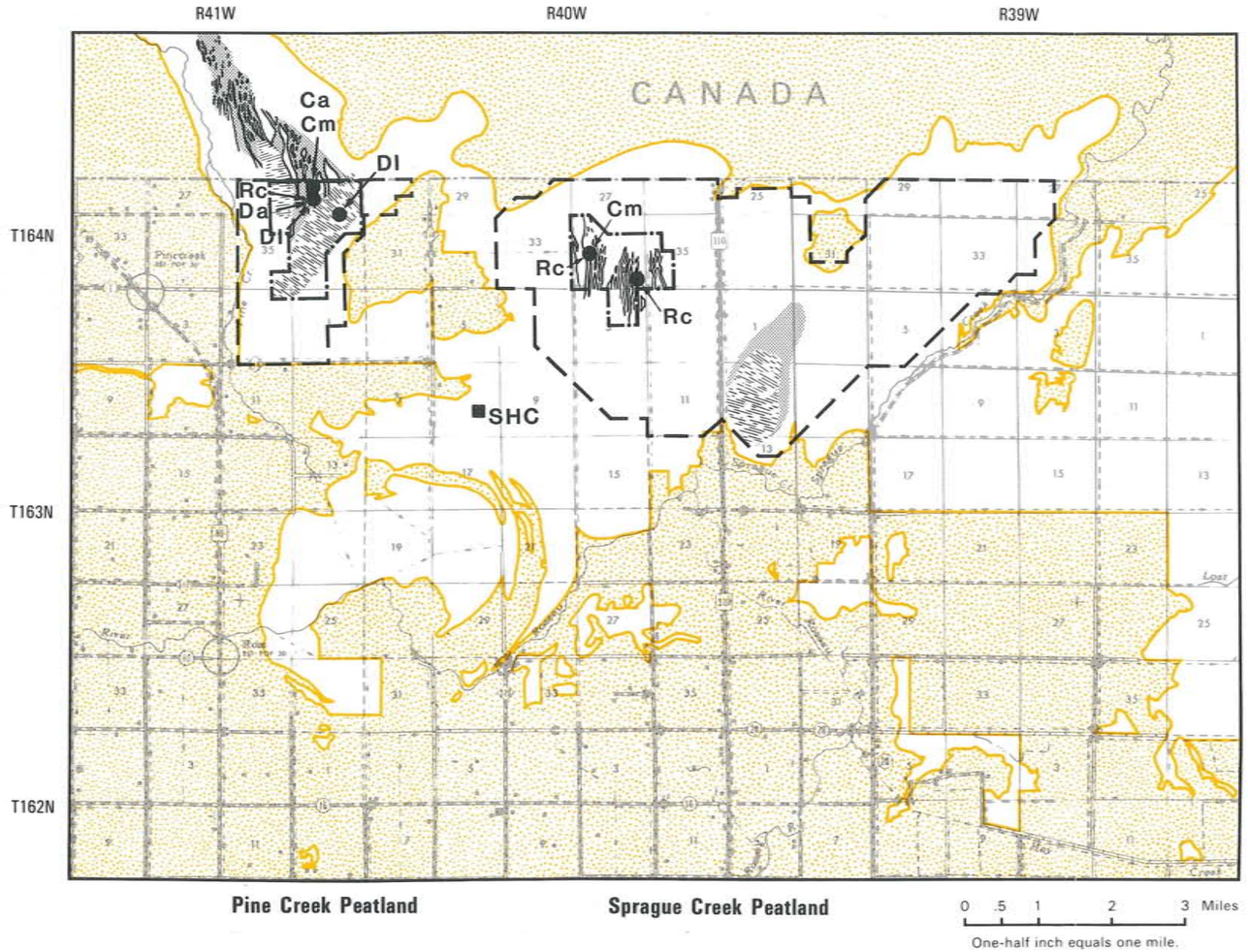
Minn. Dept. of Natural Resources. 1984. Preliminary report on the protection of ecologically significant peatlands in Minnesota.

Sjors, H. 1961. Surface patterns in boreal peatland. Endeavour 20: 217-224.

APPENDIX A

PEATLAND PROTECTION AREA MAPS

Map 1A. Ecologically Significant Elements in the Pine Creek and Sprague Creek Peatlands



LANDFORMS

FEN:

- Featureless Water Track
- Ribbed Fen
- Spring Fen Channels

SPECIES

PLANT OCCURRENCES

- ● Reported, herbarium specimen collected
- ○ Reported, no specimen collected

Ca *Cypripedium arietinum*
Cm *Cladium mariscoides*
Da *Drosera anglica*
Dl *Drosera linearis*
Rc *Rhynchospora capillacea*

ANIMAL OCCURRENCES

- ■ Nesting location
- □ Siting location

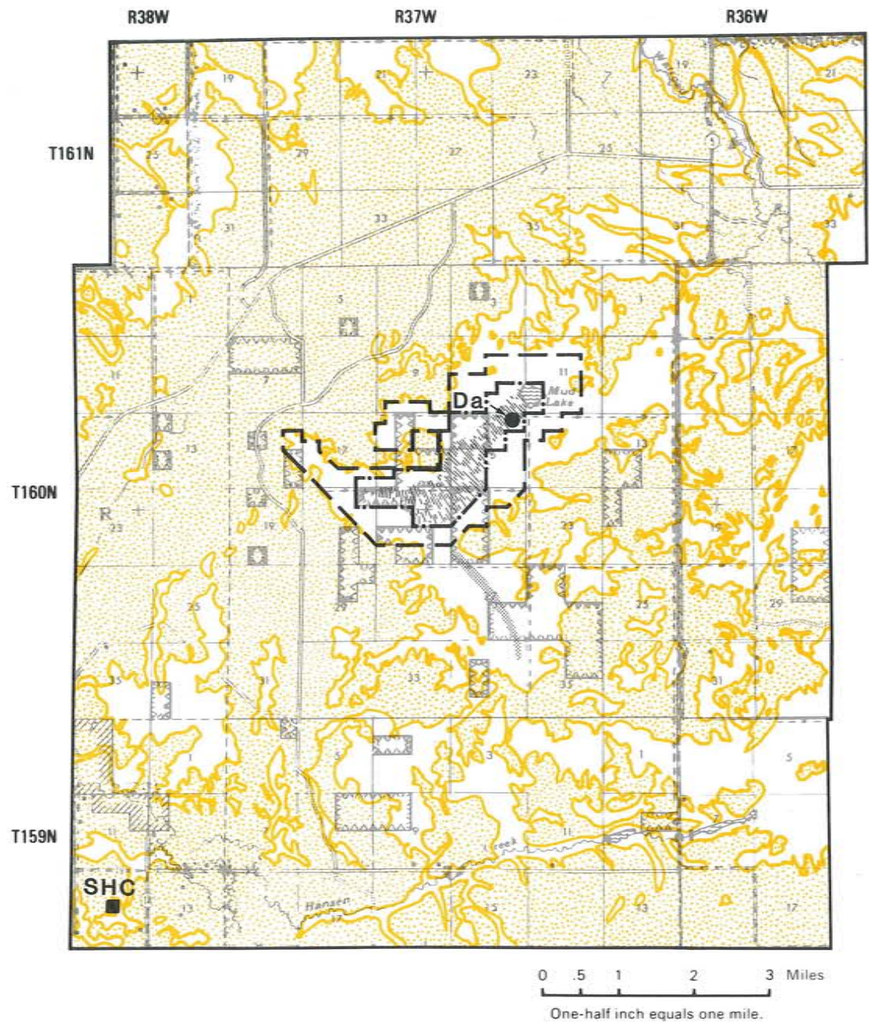
SHC Greater Sandhill Crane

MANAGEMENT AREA BOUNDARY

- —·— Peatland Scientific Protection Area
- — — Watershed Protection Area

SURFICIAL GEOLOGY

- Peat
- Mineral Soil



Map 2A. Ecologically Significant Elements in the Luxemberg Peatland

LANDFORMS

FEN:

- Featureless Water Track
- Ribbed Fen

SPECIES

PLANT OCCURRENCES

- ● Reported, herbarium specimen collected
- ○ Reported, no specimen collected
- **Da** *Drosera anglica*

ANIMAL OCCURRENCES

- ■ Nesting location
- □ Siting location
- **SHC** Greater Sandhill Crane

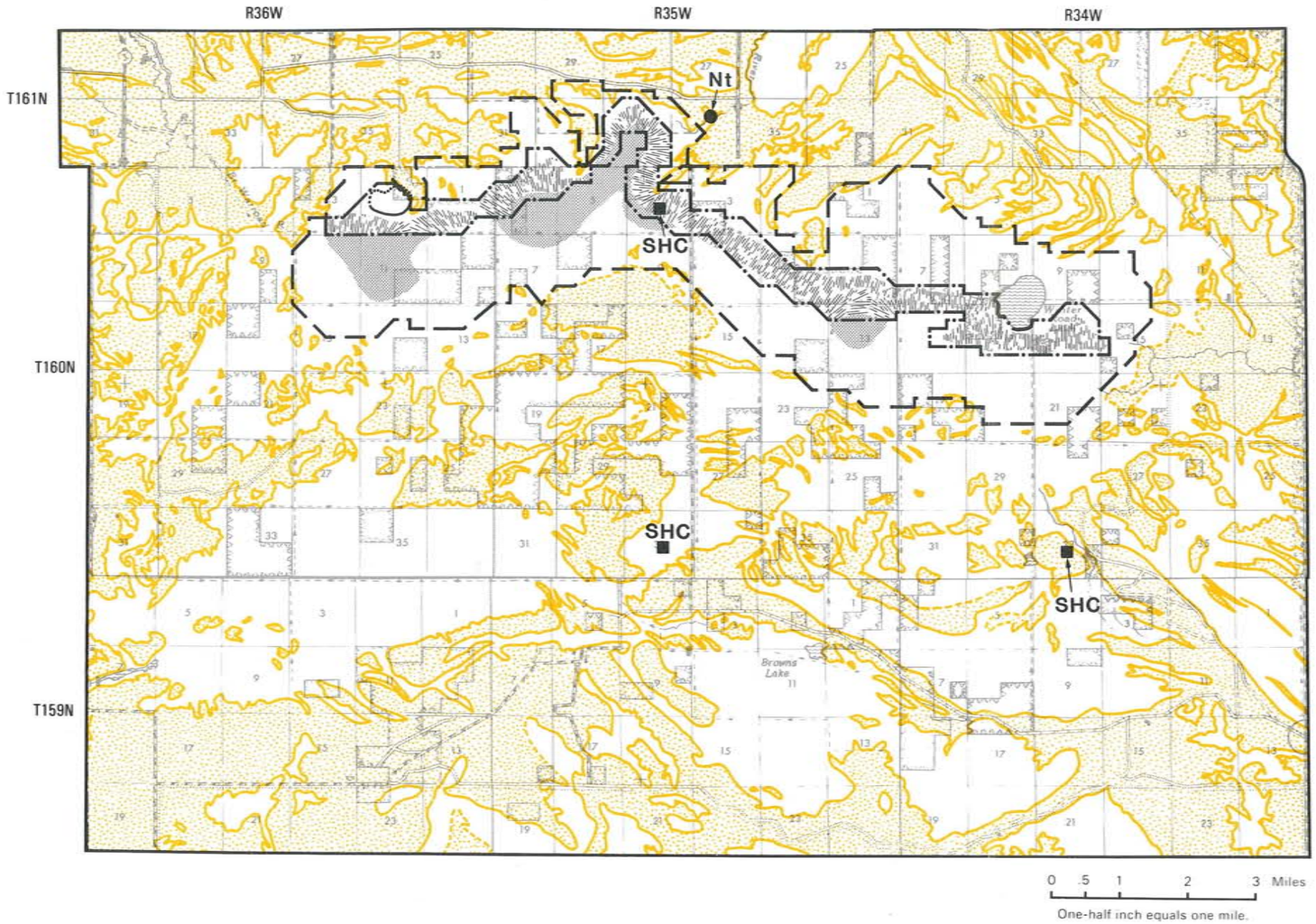
MANAGEMENT AREA BOUNDARY

- —·— Peatland Scientific Protection Area
- — — Watershed Protection Area

SURFICIAL GEOLOGY

- Peat
- Mineral Soil

Map 3A. Ecologically Significant Elements in the Winter Road Lake Peatland



LANDFORMS

FEN:

- Featureless Water Track
- Ribbed Fen

BOG:

- Raised Bog
  - dotted line indicates indistinct boundary
  - solid line indicates distinct boundary

SPECIES

PLANT OCCURRENCES

- ● Reported, herbarium specimen collected
- ○ Reported, no specimen collected
- **Nt** *Nymphaea tetragona*

ANIMAL OCCURRENCES

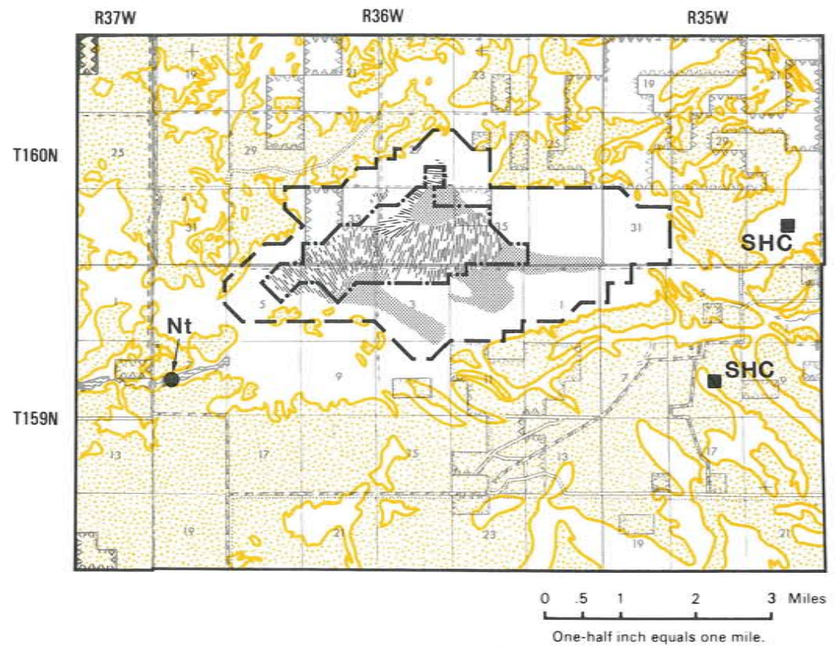
- ■ Nesting location
- □ Siting location
- **SHC** Greater Sandhill Crane

MANAGEMENT AREA BOUNDARY

- —·— Peatland Scientific Protection Area
- — — Watershed Protection Area

SURFICIAL GEOLOGY

- Peat
- Mineral Soil



Map 4A. Ecologically Significant Elements in the Norris Camp Peatland

LANDFORMS

FEN:

Featureless Water Track

Ribbed Fen

SPECIES

PLANT OCCURRENCES

● Reported, herbarium specimen collected

○ Reported, no specimen collected

Nt *Nymphaea tetragona*

ANIMAL OCCURRENCES

■ Nesting location

□ Siting location

SHC Greater Sandhill Crane

MANAGEMENT AREA BOUNDARY

—·— Peatland Scientific Protection Area

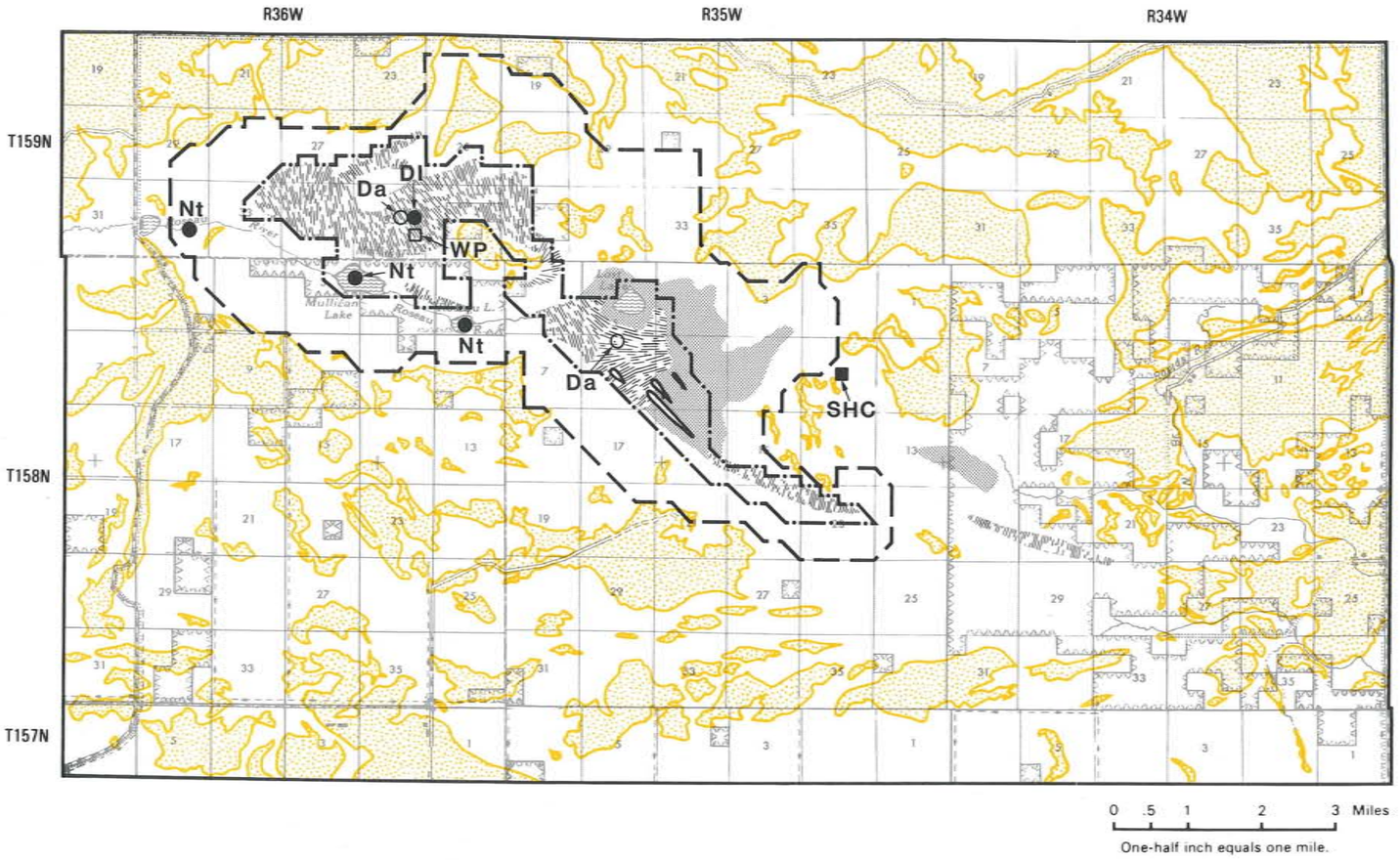
— — Watershed Protection Area

SURFICIAL GEOLOGY

Peat

Mineral Soil

Map 5A. Ecologically Significant Elements in the Mulligan Lake Peatland



LANDFORMS

FEN:

- Featureless Water Track
- Ribbed Fen
- Teardrop Islands

SPECIES

PLANT OCCURRENCES

- ● Reported, herbarium specimen collected
- O Reported, no specimen collected

Da *Drosera anglica*
Dl *Drosera linearis*
Nt *Nymphaea tetragona*

ANIMAL OCCURRENCES

- ■ Nesting location
- □ Siting location

SHC Greater Sandhill Crane
WP Wilson's Phalarope

MANAGEMENT AREA BOUNDARY

- —·— Peatland Scientific Protection Area
- — — Watershed Protection Area

SURFICIAL GEOLOGY

- Peat
- Mineral Soil

R36W R35W R34W R33W R32W R31W

T157N

T156N

T155N

T154N

SHC

Ce

Dl Da Rf Ce Cm Da Js Rf Dl

Ce Ce Rf Js Ce Xm

Da Rf Da Da

SHC Cm Rf Js

Dl Da

YR WP

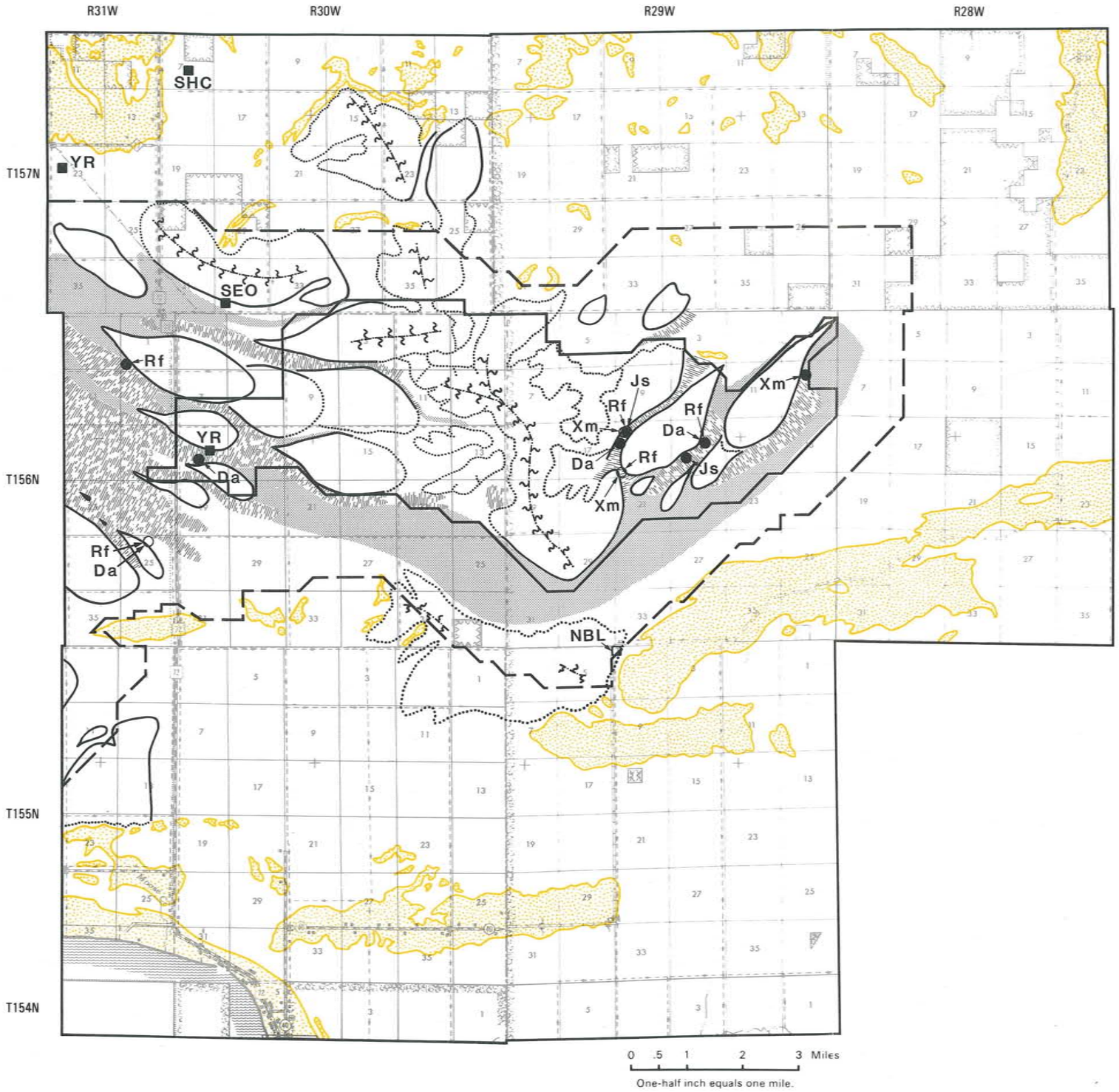
Rf Ce Cm Cm

Dl Da

Dl Da

Da Dl Rf

Upper Red Lake



Map 6A. Ecologically Significant Elements in the Red Lake Peatland

LANDFORMS

FEN:

- Featureless Water Track
- Ribbed Fen
- Teardrop Islands
- Circular Islands

BOG:

- Raised Bog
- Crested Raised Bog

for bog landforms:

dotted line indicates indistinct boundary
solid line indicates distinct boundary

SPECIES

PLANT OCCURRENCES

- ● Reported, herbarium specimen collected
- ○ Reported, no specimen collected

Ce	*Carex exilis*
Cm	*Cladium mariscoides*
Da	*Drosera anglica*
Dl	*Drosera linearis*
Js	*Juncus stygius*
Rf	*Rhynchospora fusca*
Xm	*Xyris montana*

ANIMAL OCCURRENCES

- ■ Nesting location
- □ Siting location

SHC	Greater Sandhill Crane
NBL	Northern Bog Lemming
SEO	Short-eared Owl
WP	Wilson's Phalarope
YR	Yellow Rail

MANAGEMENT AREA BOUNDARY

- —— Scientific and Natural Area
- — — Watershed Protection Area

SURFICIAL GEOLOGY

- Peat
- Mineral Soil

Map 7A. Ecologically Significant Elements in the Lost River Peatland

LANDFORMS

FEN:

- Featureless Water Track
- Ribbed Fen
- Teardrop Islands
- Spring Fen Channels

BOG:

- Raised Bog
- Crested Raised Bog
- Schlenke (bog pools)

for bog landforms:
dotted line indicates indistinct boundary
solid line indicates distinct boundary

SPECIES

PLANT OCCURRENCES

- ● Reported, herbarium specimen collected
- ○ Reported, no specimen collected

Ce *Carex exilis*
Cm *Cladium mariscoides*
Da *Drosera anglica*
Dl *Drosera linearis*
Er *Eleocharis rostellata*
Rc *Rhynchospora capillacea*
Tg *Tofieldia glutinosa*
Tp *Triglochin palustris*

ANIMAL OCCURRENCES

- ■ Nesting location
- □ Siting location

NBL Northern Bog Lemming

MANAGEMENT AREA BOUNDARY

- Scientific and Natural Area
- Peatland Scientific Protection Area
- Watershed Protection Area

SURFICIAL GEOLOGY

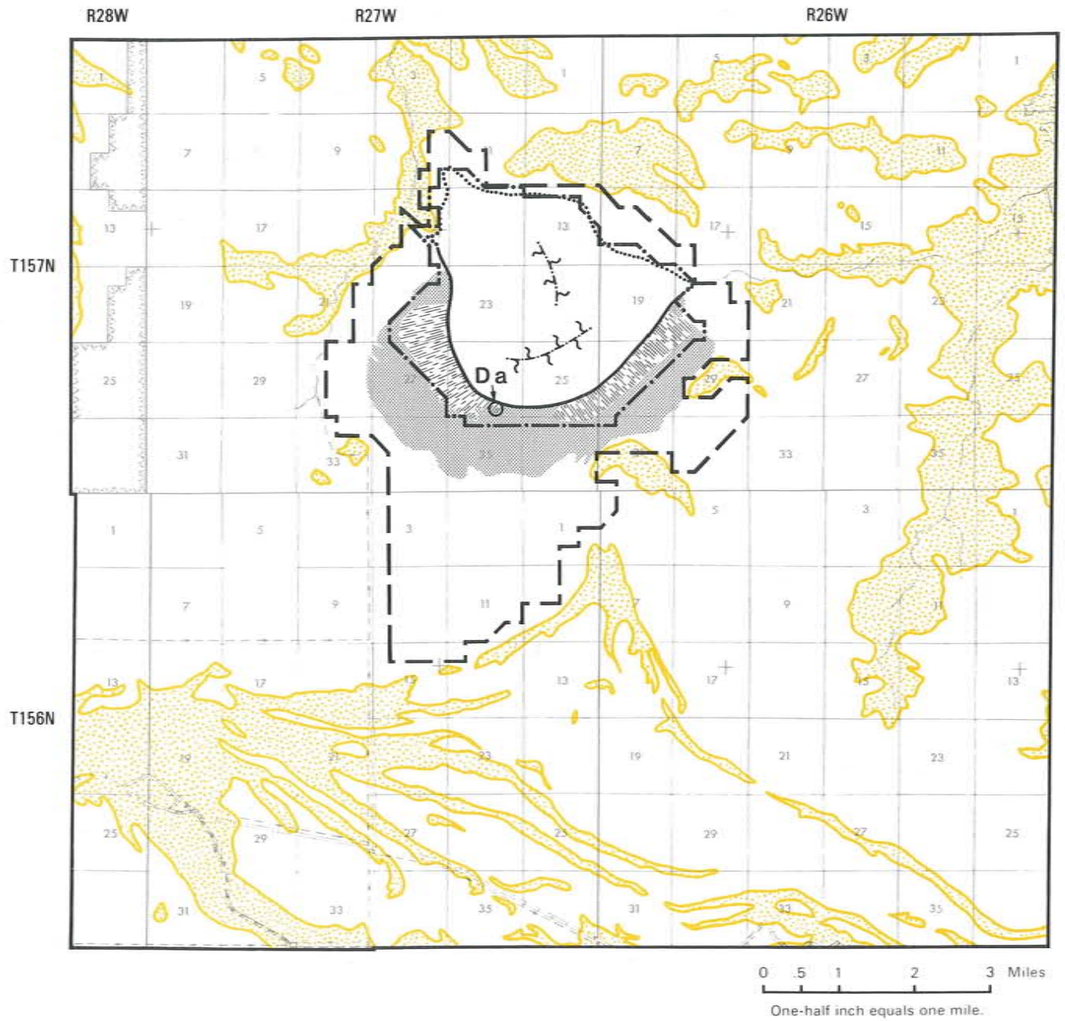
- Peat
- Mineral Soil

R26W R27W R28W R29W

T 156 N T 155 N T 154 N T 153 N T 152 N

0 .5 1 2 3 Miles

One-half inch equals one mile.



Map 8A. Ecologically Significant Elements in the South Black River Peatland

LANDFORMS

FEN:

Featureless Water Track

Ribbed Fen

BOG:

Crested Raised Bog

dotted line indicates indistinct boundary
solid line indicates distinct boundary

SPECIES

PLANT OCCURRENCES

● Reported, herbarium specimen collected

○ Reported, no specimen collected

Da *Drosera anglica*

MANAGEMENT AREA BOUNDARY

—·— Peatland Scientific Protection Area

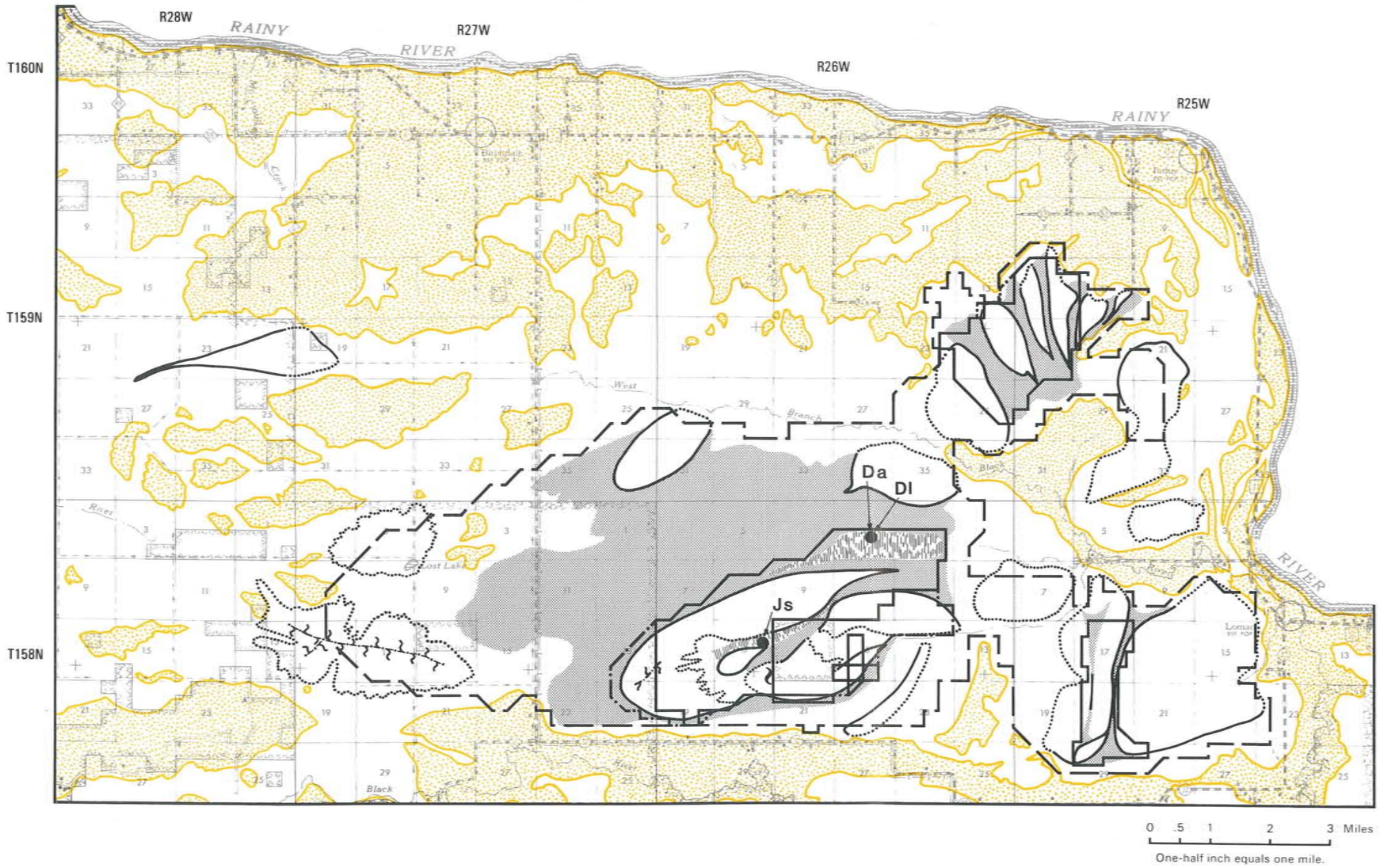
— — Watershed Protection Area

SURFICIAL GEOLOGY

Peat

Mineral Soil

Map 9A. Ecologically Significant Elements in the North Black River Peatland



LANDFORMS

FEN:

- Featureless Water Track
- Ribbed Fen

BOG:

- Raised Bog
- Crested Raised Bog
- ~ Schlenke (bog pools)

for bog landforms:
dotted line indicates indistinct boundary
solid line indicates distinct boundary

SPECIES

PLANT OCCURRENCES

- ● Reported, herbarium specimen collected
- ○ Reported, no specimen collected

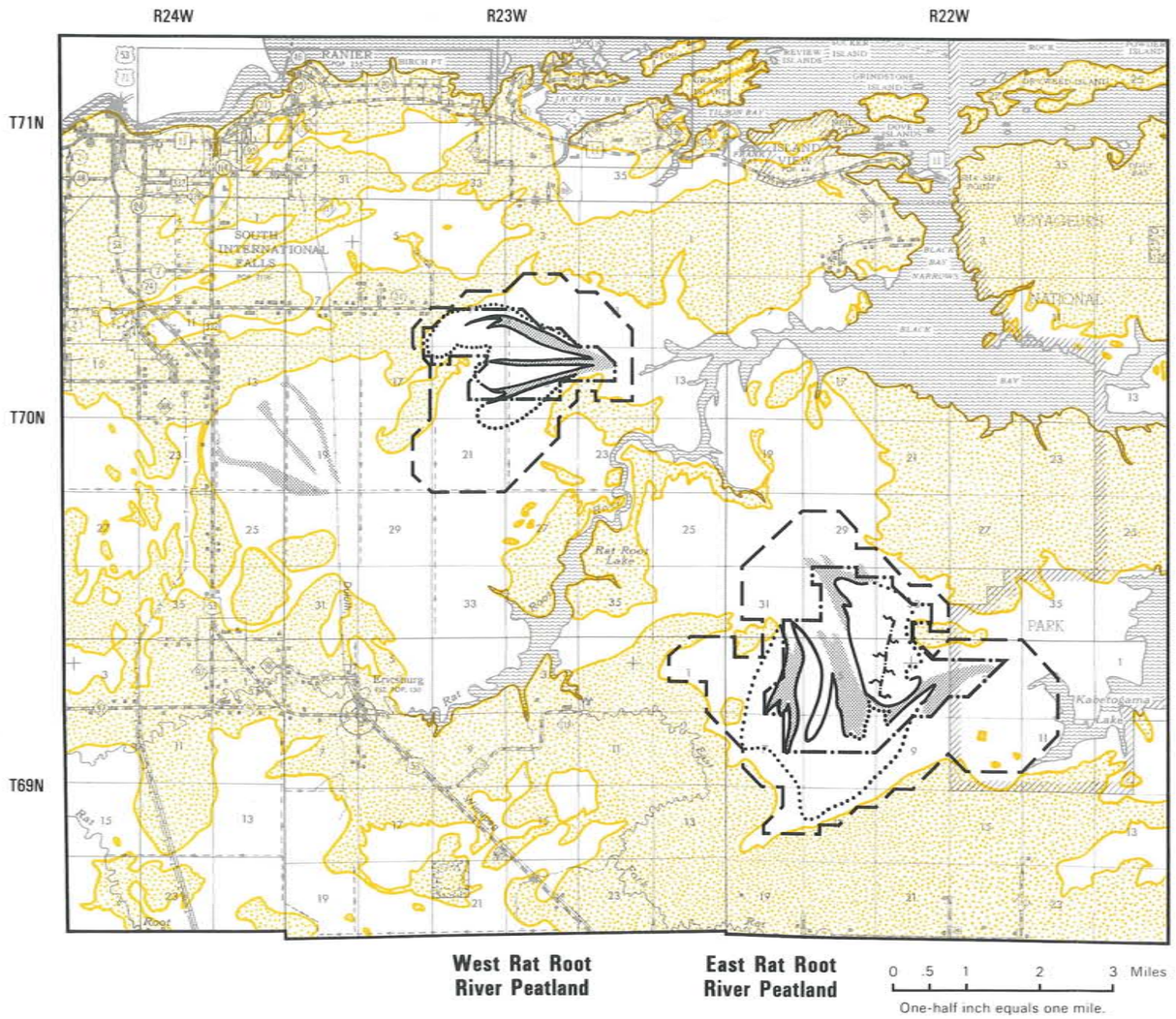
Da *Drosera anglica*
Dl *Drosera linearis*
Js *Juncus stygius*

MANAGEMENT AREA BOUNDARY

- —— Scientific and Natural Area
- —·— Peatland Scientific Protection Area
- — — Watershed Protection Area

SURFICIAL GEOLOGY

- Peat
- Mineral Soil



Map 10A. Ecologically Significant Elements in the West and East Rat Root River Peatlands

LANDFORMS

FEN:

Featureless Water Track

BOG:

Raised Bog

Crested Raised Bog

for bog landforms:
dotted line indicates indistinct boundary
solid line indicates distinct boundary

MANAGEMENT AREA BOUNDARY

Peatland Scientific Protection Area

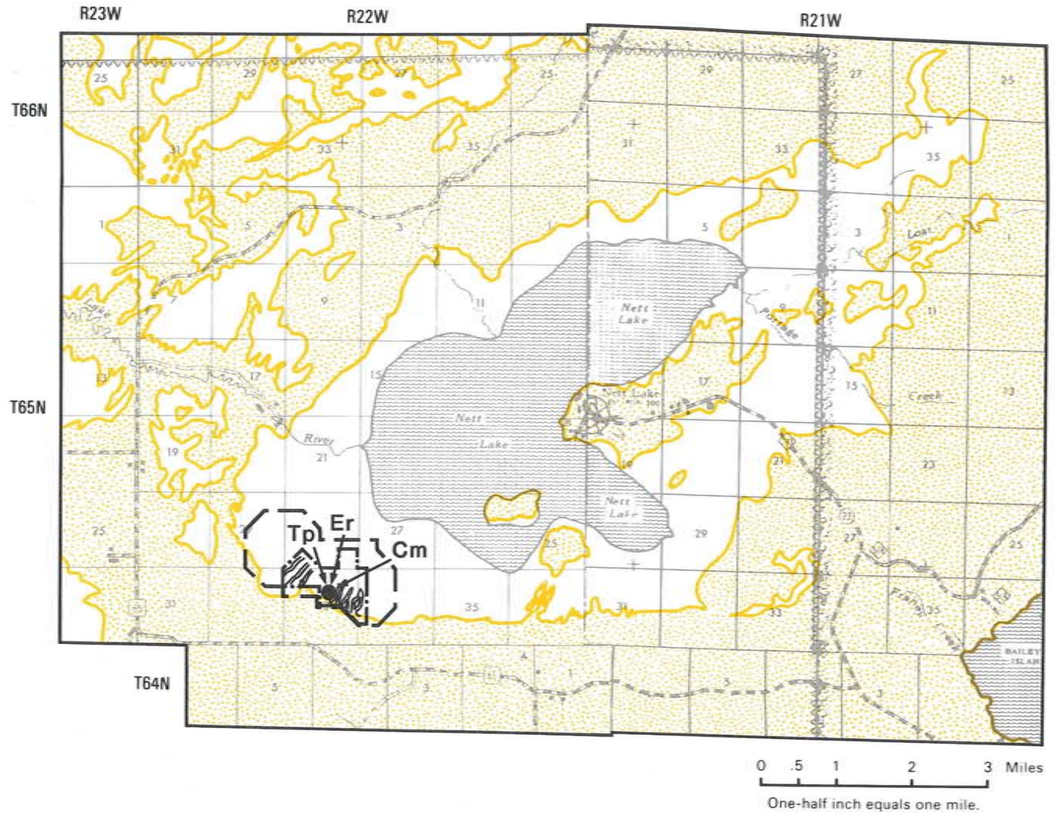
Watershed Protection Area

SURFICIAL GEOLOGY

Peat

Mineral Soil

Map 11A. Ecologically Significant Elements in the Nett Lake Peatland



LANDFORMS

FEN:

Spring Fen Channels

SPECIES

PLANT OCCURRENCES

- ● Reported, herbarium specimen collected
- ○ Reported, no specimen collected

Cm *Cladium mariscoides*
Er *Eleocharis rostellata*
Tp *Triglochin palustris*

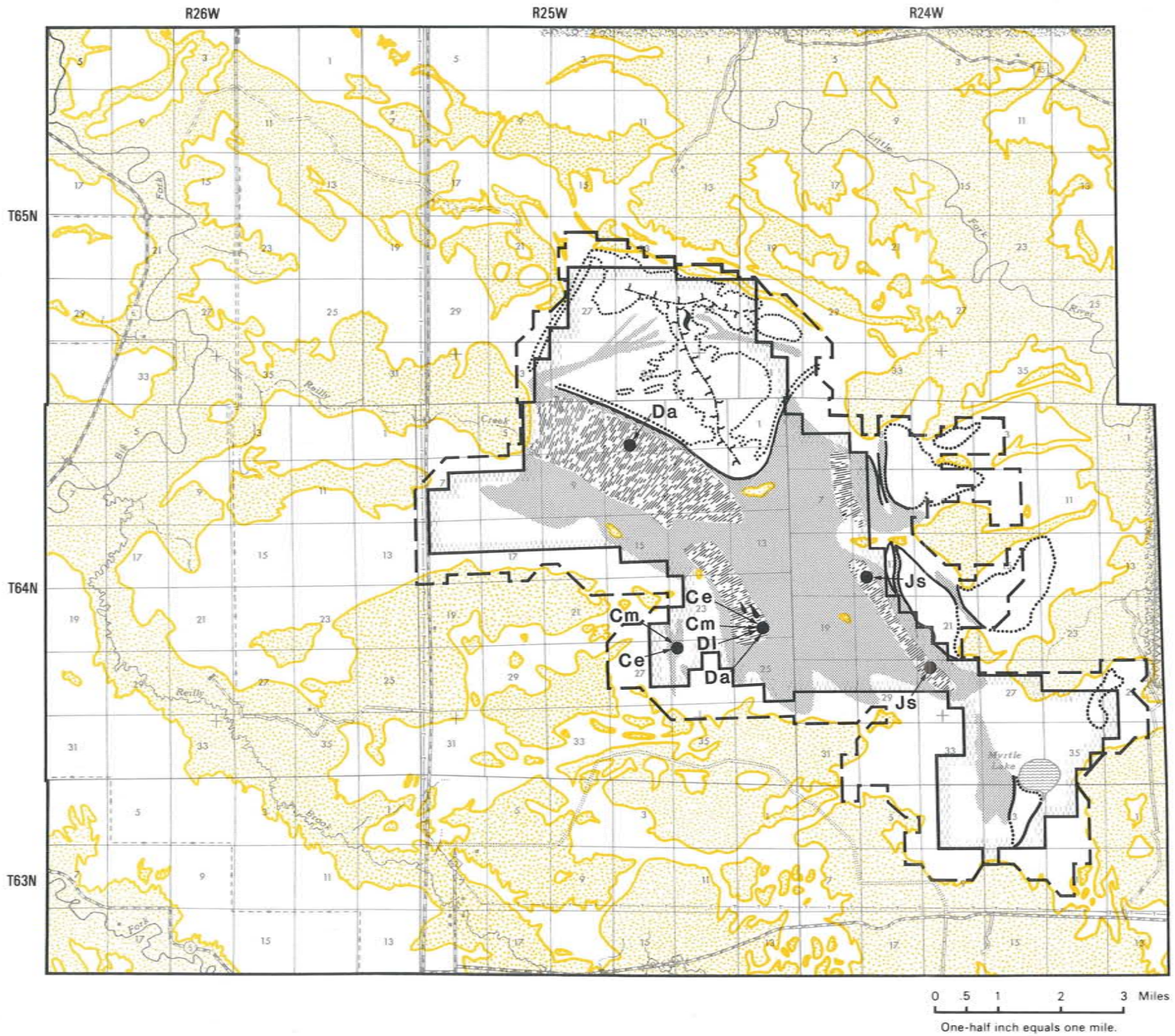
MANAGEMENT AREA BOUNDARY

—·— Peatland Scientific Protection Area
— — Watershed Protection Area

SURFICIAL GEOLOGY

Peat
Mineral Soil

Map 12A. Ecologically Significant Elements in the Myrtle Lake Peatland



LANDFORMS

FEN:

- Featureless Water Track
- Ribbed Fen
- Teardrop Islands

BOG:

- Raised Bog
- Crested Raised Bog
- Schlenke (bog pools)

for bog landforms:

dotted line indicates indistinct boundary

solid line indicates distinct boundary

SPECIES

PLANT OCCURRENCES

- ● Reported, herbarium specimen collected
- O Reported, no specimen collected

Ce *Carex exilis*
Cm *Cladium mariscoides*
Da *Drosera anglica*
Dl *Drosera linearis*
Js *Juncus stygius*

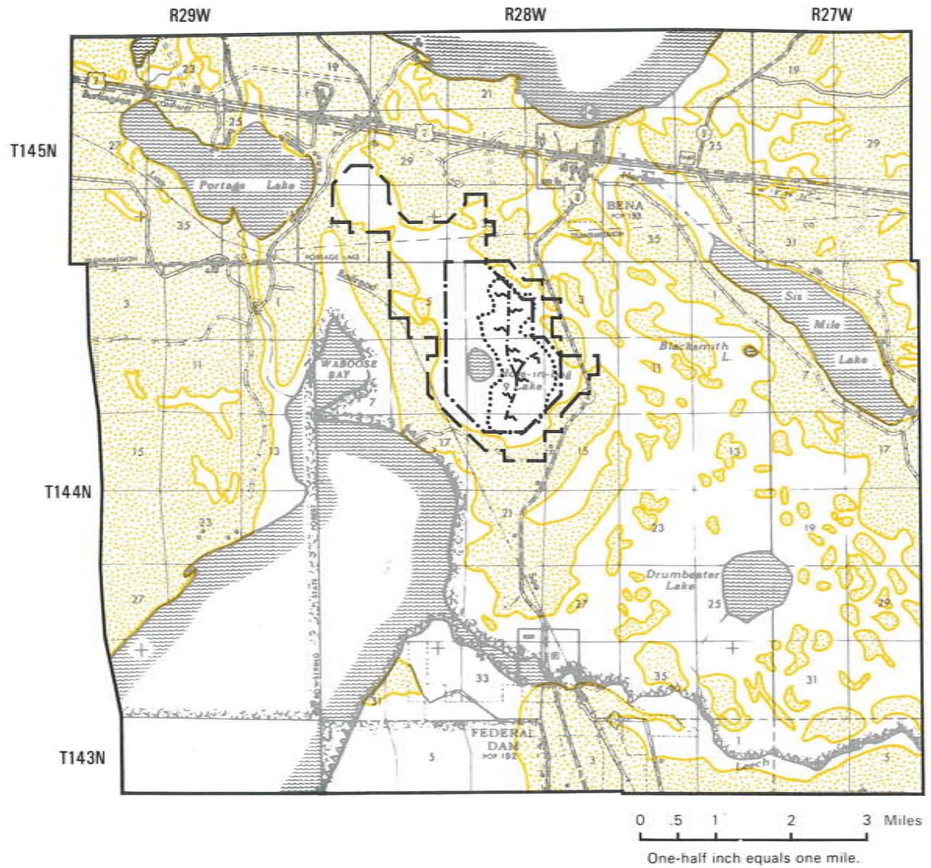
MANAGEMENT AREA BOUNDARY

- —— Scientific and Natural Area
- — — Watershed Protection Area

SURFICIAL GEOLOGY

- Peat
- Mineral Soil

Map 13A. Ecologically Significant Elements in the Hole-in-the-Bog Peatland



LANDFORMS

BOG:

Crested Raised Bog

dotted line indicates indistinct boundary

solid line indicates distinct boundary

MANAGEMENT AREA BOUNDARY

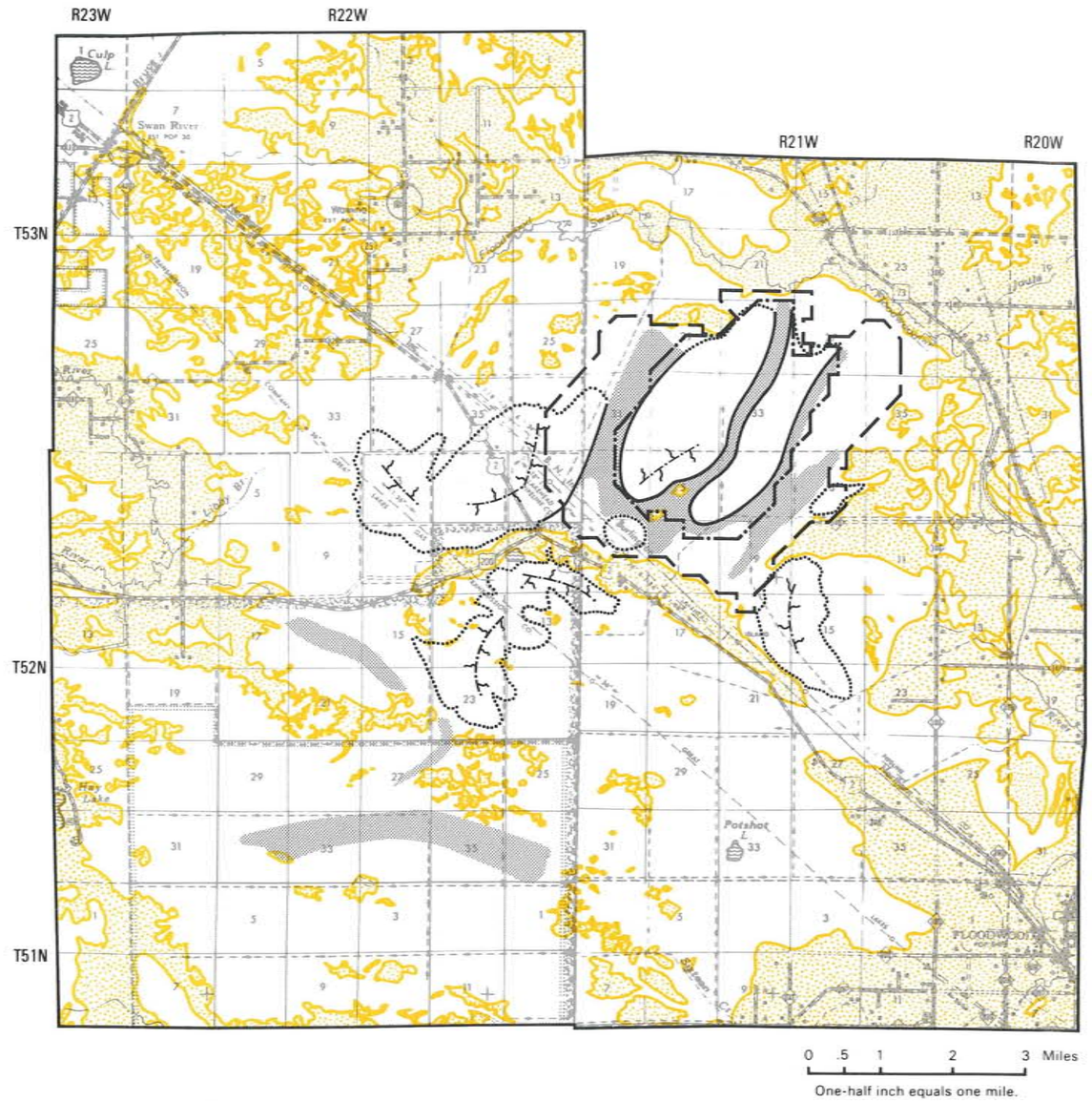
Peatland Scientific Protection Area

Watershed Protection Area

SURFICIAL GEOLOGY

Peat

Mineral Soil



Map 14A. Ecologically Significant Elements in the Wawina Peatland

LANDFORMS

FEN:

Featureless Water Track

BOG:

Raised Bog

Crested Raised Bog

for bog landforms:
dotted line indicates indistinct boundary
solid line indicates distinct boundary

MANAGEMENT AREA BOUNDARY

Peatland Scientific Protection Area

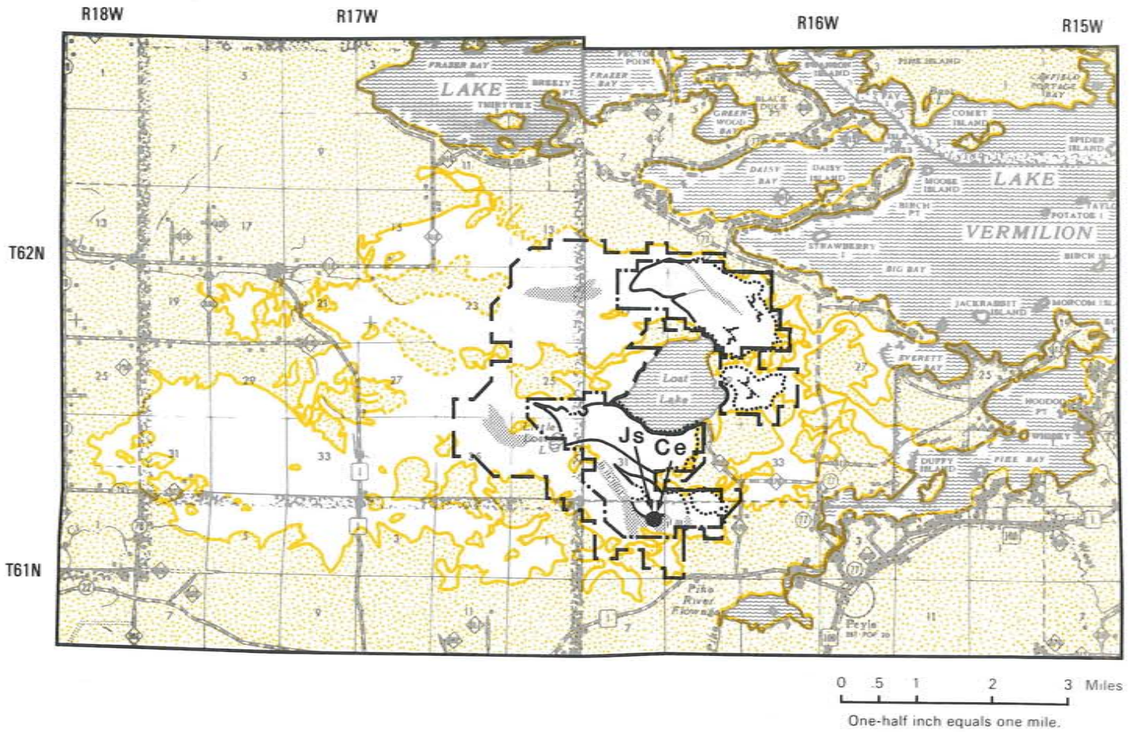
Watershed Protection Area

SURFICIAL GEOLOGY

Peat

Mineral Soil

Map 15A. Ecologically Significant Elements in the Lost Lake Peatland



LANDFORMS

FEN:

- Featureless Water Track
- Ribbed Fen

BOG:

- Raised Bog
- Crested Raised Bog

for bog landforms:
dotted line indicates indistinct boundary
solid line indicates distinct boundary

SPECIES

PLANT OCCURRENCES

- ● Reported, herbarium specimen collected
- ○ Reported, no specimen collected

Ce *Carex exilis*
Js *Juncus stygius*

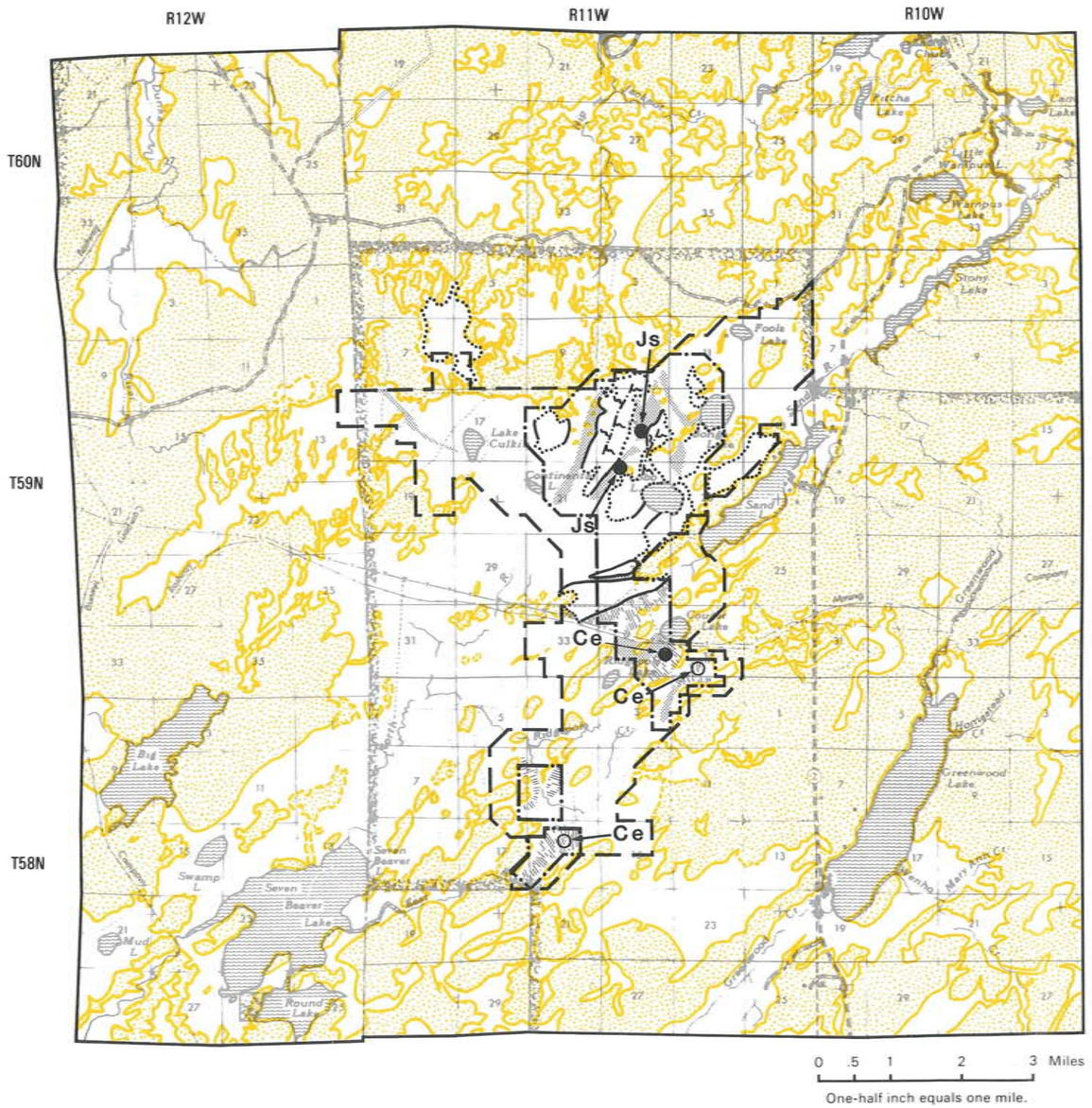
MANAGEMENT AREA BOUNDARY

- —·— Peatland Scientific Protection Area
- — — Watershed Protection Area

SURFICIAL GEOLOGY

- Peat
- Mineral Soil

Map 16A. Ecologically Significant Elements in the Sand Lake Peatland



LANDFORMS

FEN:

- Featureless Water Track
- Ribbed Fen

BOG:

- Raised Bog
- Crested Raised Bog

for bog landforms:
dotted line indicates indistinct boundary
solid line indicates distinct boundary

SPECIES

PLANT OCCURRENCES

- ● Reported, herbarium specimen collected
- ○ Reported, no specimen collected

Ce *Carex exilis*
Js *Juncus stygius*

MANAGEMENT AREA BOUNDARY

- —·— Peatland Scientific Protection Area
- — — Watershed Protection Area

SURFICIAL GEOLOGY

- Peat
- Mineral Soil