670851

DNR-ADMINISTERED PUBLIC LANDS:

THEIR SUITABILITY TO MEET NATURAL RESOURCE MANAGEMENT OBJECTIVES

DEPARTMENT OF NATURAL RESOURCES

OFFICE OF PLANNING

Pursuant to 1983 Laws, chapter 301, section 31, subd 3(o)

July, 1986

DEPARTMENT OF NATURAL RESOURCES
OFFICE OF PLANNING
July, 1986

DNR–ADMINISTERED PUBLIC LANDS: THEIR SUITABILITY
TO MEET NATURAL RESOURCE MANAGEMENT OBJECTIVES

A REPORT TO THE
LEGISLATIVE COMMISSION ON MINNESOTA RESOURCES
PUBLISHED PURSUANT TO CHAPTER 301, SEC. 31, SUBD. 3(0)
LAWS OF MINNESOTA 1983

The cover: The MN-ROS map data (see Figure 8) were converted into a digitized format and pen-plotted. This is yet another illustration of geographic data capabilities.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

The Minnesota Legislature, through the Legislative Commission on Minnesota Resources, funded the Long Range Land Resource Management Project (the Suitability Project) for the 1982/83 and 1984/85 bienniums.

This summary of the Suitability Project's final report to the Legislature highlights project goals, accomplishments, conclusions and recommendations.

INTRODUCTION

The Department of Natural Resources (DNR) is the major institutional steward of Minnesota's natural resources. The department administers 5.3 million acres of state-owned land, and nearly ten million acres of mineral rights. It has additional administrative responsibility for the protected waters of the state.

The DNR is charged with managing natural resources in the public interest. The public interest is determined by the legislative, executive, and judicial branches of government.

In serving the public interest, the DNR must function both as a facilitator of resource development and protector of natural resources. The DNR is responsible for developing mineral, timber and recreational resources. It also is responsible for protecting scenic, wildlife habitat and water resources, and preserving sensitive ecosystems. This dual role as a facilitator of resource development and protector provides an important link in promoting wise use and development of the resources within the framework of environmental and regulatory laws authorized by the legislature.

The DNR has established long-range and strategic planning programs to coordinate natural resource management responsibilities. The Suitability Project is one such planning program.

I. SUITABILITY PROJECT GOALS

The Suitability Project's goals were:

* to improve DNR land resource management;

* to address specific strategic DNR land management issues.

In order to improve DNR land resource management:

* The Suitability Project developed automated resource
  assessments. These resource assessments provide important
  perspectives on the management potential of DNR-administered
  state-owned land.

* The Suitability Project contributed resource assessment
  information to other DNR planning and management efforts to
  ensure common access to relevant resource information.

The Suitability Project addressed a number of strategic resource
management issues. In the process, it evaluated the usefulness of
automated resource information and contributed to improved resource
management.

II. SUITABILITY PROJECT ACCOMPLISHMENTS

ACCOMPLISHMENTS

The Suitability Project was primarily a DNR strategic planning effort.
Strategic planning is a process that assesses past resource use trends,
identifies current resource needs, and anticipates future resource
management issues. The process helps identify resource management
strategies from which management priorities can be established.

As a strategic planning effort, the Suitability Project accomplished the
following:

* It provided a forum for discussion of departmental management
  objectives and strategic planning needs.

* It developed resource information useful for planning the
  long-range management of DNR-administered land.

* It identified resource information needed to improve DNR
  resource management.

The Suitability Project also developed a number of products and
effective planning processes. Six of these are significant
accomplishments and are addressed in detail.

These accomplishments are presented in the following order:

A. Resource Assessments

B. Technical Report for the Minnesota Forest Resources Plan

C. Identification of DNR-administered Surplus Land

D. Proposal for a New Land Classification Effort

E. Acquisition and Disposition Plan for Con-Con Counties

F. Contributions to Other DNR Planning and Management Efforts

G. Production of Interim and Final Project Reports

A. RESOURCE ASSESSMENTS

The Suitability Project developed a set of resource assessments that analyze the potential of DNR-administered land to achieve resource management objectives.

The Suitability Project evaluated the suitability of land for the following natural resource management objectives and related concerns: timber production, outdoor recreation, wildlife habitat, peat and mineral development, residential development, and agricultural production.

These management objectives and concerns were chosen because they are either major DNR resource management responsibilities or are significant private sector land uses that may conflict with DNR land management.

Resource assessments provide a statewide context for DNR resource management programs. Within that statewide context, the range of DNR management options in specific geographic areas can be evaluated and prioritized using the resource assessments.

The Suitability Project designed resource assessments based on automated information so that consistent, statewide evaluation criteria could be developed and various DNR planning programs could share in their use.

When appropriately used, the assessments are powerful planning tools. However, they do have limitations. Many of these limitations involve availability and quality of automated resource information. To ensure that limitations are properly recognized, automated resource assessments should be applied within established and ongoing planning processes.

Brief descriptions of the objective, method, information used, limitations, and significant findings of each resource assessment follow.

1. <u>Resource Assessment For Timber Production.</u>

Purpose: to evaluate the economic potential of DNR-administered
           land for long-term timber production.

Method:

*   The analysis estimated potential net return through timber
      sales on investment in timber management.

*   Roughly 2.7 million acres of DNR-administered forest land were
      evaluated. This is about two-thirds of the DNR-administered
      forest land base.

Information Used:

*   Site productivity (from the Phase II Forest Inventory);

*   Local timber prices (from DNR timber sale records);

*   Regional timber management costs (from DNR forest development
      records);

*   Assumptions concerning growth in timber prices and required
      rate of return.

Limitations:

*   Approximately 850,000 acres of DNR-administered forest land
      (mostly in Itasca and southern St. Louis counties) were not
      evaluated because automated Phase II Inventory data were not
      available at the time of evaluation.

*   Impacts (positive and negative) of timber production on local
      economies, wildlife habitat, watersheds and outdoor recreation
      were not considered.

*   Future timber prices and production costs are uncertain,
      because economic conditions and technologies are constantly
      changing.

Significant Findings:

*   About one-fourth of the evaluated DNR-administered land has
    economic potential for long-term intensive timber management.
    According to the analysis, these sites will return enough
    revenue through timber sales to recover reforestation costs.

*   Another third of the evaluated land has economic potential for
    long-term extensive timber management (natural regeneration
    with minimal site preparation). These sites will probably not
    return enough through timber sales to justify investment in
    artificial regeneration (although other resource management
    objectives may indicate that such investment is appropriate).

*   Evaluated land with economic potential for timber management,
    either intensive or extensive, is more than adequate to supply
    the DNR's current share of timber sales, statewide.

*   Over a third of the evaluated land probably cannot return
    enough through timber sales to be economic for extensive
    management. Investment for timber production purposes alone
    is not appropriate on these sites. However, timber management
    for other resource objectives may be appropriate on these
    sites.

*   A modest assumed value for net non-timber benefits can
    positively affect resource suitability for timber
    management.

*   Further analysis is needed to better understand how benefits
    of timber management compare to its adverse impacts.

2.   Resource Assessment For Outdoor Recreation.

Purpose: to evaluate the physical and locational quality of
           DNR-administered land for outdoor recreational use.

Method:

*   Assess physical resource characteristics that determine the
    quality of an area for recreational use.

* Evaluate resource location relative to current and projected recreational use patterns to assess relative recreational demand.

Information Used:

* Land use and accessibility (from MLMIS data);

* Physical site characteristics such as topography, vegetation, water type and climate (from MLMIS data);

* Recreation user demand information (derived from the State Comprehensive Outdoor Recreation Plan (SCORP) recreation activity data).

Limitations:

* Perception of resource quality for recreational use is dependent on individual preferences. Thus resource quality can be modelled only broadly.

* The analysis assesses resources for generalized outdoor recreational use rather than for each of the potentially numerous recreational activities.

* Recreation use information characterizes general areas rather than individual parcels.

* Recreation use projections are based on population-specific use trends. They may not reflect the impact of location, intensity and mix of recreational use resulting from: 1) unforecasted changes in population growth; 2) changes in recreational use patterns; or 3) resource development and promotion.

Significant Findings:

* Not surprisingly, outdoor recreational use patterns show concentrations in north-central Minnesota and other areas where opportunities exist for water-based recreation amid scenic surroundings in relatively close proximity to population centers.

* About sixteen percent of all DNR-administered land is both primitive or natural in character (i.e., relatively undeveloped) and lies within current and projected high recreational use areas. Almost half of this land has moderate to high topographical relief (i.e., hills and/or valleys that add to scenic diversity).

*   Another eleven percent of DNR-administered land is primitive
    or natural in character, with moderate to high relief, but
    lies outside present and projected high recreational use
    areas.

*   In all, over ninety percent of DNR-administered land is
    primitive or natural (about forty percent of the state is in
    these two classes), but two-thirds of that—over half of all
    DNR-administered land—has little topographical relief (is
    flat and usually wet) and is in current and projected low
    recreational use areas.

*   In most areas where substantial growth in recreational use is
    expected, the density of DNR-administered land is relatively
    low.

    Less than ten percent of all land in projected high demand
    growth areas is DNR-administered. High-quality natural
    resources administered by the DNR in these areas may become
    increasingly valuable for public recreation as land in other
    ownerships receives heavier use or is developed for other
    purposes.

3.   Resource Assessment For Wildlife Habitat.

Purpose: to develop a process for assessing the wildlife habitat
         management potential of DNR-administered land; to demonstrate
         potential use of the wildlife habitat assessment process for a
         broad range of management concerns.

Method:

*   Assess availability of required habitat components for
    selected game and nongame species.

*   Evaluate habitat availability with respect to demand for the
    wildlife resource (patterns of resource uses such as hunting,
    bird watching or nature study activities).

Information Used:

*   Land use and land cover (from MLMIS data);

*   DNR wildlife inventories and species population census data;

*   Hunting demand information (derived from SCORP hunter activity data).

Limitations:

*   The analysis examined only a few of the primary wildlife species for which adequate information was available.

*   Resource information relevant to wildlife habitat and critical ecological relationships was frequently unavailable. In some instances, information was not available in a form the Suitability Project could use.

*   The analysis does not predict size or location of wildlife populations, but simply indicates where habitat might be.

*   Wildlife resource use information tends to overlook sites with regional importance in otherwise low use areas, especially in the predominantly agricultural regions of the state where natural habitats are scarce.

Significant Findings:

*   Virtually all DNR-administered land provides potentially valuable habitat for wildlife.

*   Consumptive use (hunting) of the wildlife resource concentrates in areas with high densities of accessible public land that permit hunting, and around major accessible state and federal wildlife management areas.

*   Nonconsumptive uses of the wildlife resource, such as bird watching and nature study activities, are among the recreational activities with the highest growth potential – particularly near population centers.

4. <u>Resource Assessment For Mineral and Peat Development.</u>

Purpose: to evaluate the relative potential of DNR-administered
           land for mineral and/or peat development.

Method: Summarize, with respect to DNR-administered land,
           existing department studies that:

    *   assess potential for recoverable mineral deposits based
           on available geological information, statewide;

    *   determine peatland development potential based on tract
           size, road access and proximity to potential markets;

    *   identify ecologically significant peatlands based on
           unique formation and biological characteristics.

Information Used:

*   <u>Mineral potential</u>: drill cores, geochemical surveys,
     aeromagnetic surveys, prospect evaluations and geologic
     mapping.

*   <u>Peat development potential</u>: peatland maps and surveys from
     the peatland inventory project, the Minnesota Soils Atlas,
     MLMIS data, DNR land records, aerial photos and USGS maps.

Limitations:

*   Since mineral research and exploration are ongoing, mineral
     potential ratings often change as new information becomes
     available.

*   Economic value currently is not part of mineral potential
     determination.

*   Peat inventory data is sometimes unreliable, especially with
     regard to peat depth.

Significant Findings:

* Mineral exploration indicates that three percent of
  DNR-administered land contains geologic formations where
  significant mineralization has been found.

* Over sixty percent of DNR-administered land possesses geology
  similar to that in other areas where major metallic
  mineralization has been found. More exploration is needed.

* Potentially developable peatlands are concentrated in Koochi-
  ching, northern Aitkin and southwestern St. Louis counties,
  with additional large tracts in Beltrami and Lake of the Woods
  counties.

* Ecologically significant peatlands are found mainly in
  Beltrami and Koochiching counties.

5. Resource Assessment For Residential Development.

Purpose: to determine where resource management conflicts and
          opportunities may result from permanent or seasonal residen-
          tial development on or near DNR-administered land.

Method:

* Evaluate the permanent residential development potential of
  DNR-administered land based on population change, road
  accessibility and proximity to major urban centers.

* Further evaluate the development potential of DNR-administered
  shoreland based on tree cover, soils/beach, type and lake
  type.

Information Used:

* Population census data (U.S. Census Bureau);

* MLMIS data for road orientation, soils, and land cover;

* DNR shoreland data.

Limitations:

*   Missing soils and vegetation data prevent analysis of some
    DNR-administered parcels on large lakes (greater than 145
    acres).

*   The data base for development on rivers and small lakes is not
    comprehensive.

Significant Findings:

*   Only five percent of DNR-administered land has significant
    potential for permanent residential development. Most (about
    sixty percent) of this land was acquired through purchase
    specifically for parks, water accesses and wildlife management
    units.

*   Shoreland development is concentrated around the state's
    large urban areas with nearby lake resources (the Twin Cities,
    St. Cloud and Brainerd). Moderately high densities of
    development also occur near Alexandria, Grand Rapids, Bemidji
    and Park Rapids.

*   Almost eighty percent of new shoreland development occurs in
    locations with presently low development densities and within
    prime shoreland development areas--i.e., the remaining
    undeveloped shoreland on lakes in prime shoreland areas is
    being developed.

*   This information could be used as the basis to identify new
    public use areas that would be suitable for some sort of
    development.

6. Resource Assessment For Agricultural Production.

Purpose: To evaluate the relative potential of DNR-administered
           land for agricultural crop production.

Method: Examine DNR-administered land with respect to the
           cropland productivity potential model developed by the
           Minnesota State Planning Agency.

Information Used:

*   Cropland productivity potential model: soil properties
    (Minnesota Soils Atlas, soil landscape units) and climatic
    regimes;

*   MLMIS public land ownership data.

Limitations:

*   Productivity can vary among soil series within soil landscape
    units.

*   The model assumes drainage of wet soils in south-central and
    western Minnesota, resulting in an upward bias in evaluation
    of DNR-administered wetlands, which are usually undrained.

*   The model evaluates productivity potential for the major
    Minnesota crops (corn, soybeans, small grains and hay), but
    not for specialty crops.

Significant Findings:

*   Most DNR-administered land (almost ninety percent) has low
    productive potential for agricultural crops.

*   Statewide, less than three percent of the land with moderate
    to high productive potential is administered by the DNR.
    This land serves vital natural resource management objectives
    and often is the only remaining uncultivated land within an
    area.

B. TECHNICAL REPORT FOR THE MINNESOTA FOREST RESOURCES PLAN

The Suitability Project considered effective communication of resource information essential to improving DNR resource management efforts.

To more effectively communicate resource assessment information:

* The Suitability Project produced a technical report for the Minnesota Forest Resources Plan (MFRP). It focused on regional assessments of resource quality and distribution that can guide management of forest resources.

The Suitability Project compiled and evaluated resource assessment information relevant to DNR forest resource management. It also highlighted additional sources of information that should be considered when updating the MFRP. The technical report will be useful in coordinating the statewide MFRP with forest unit plans.

* Resource assessment information is available for use by other DNR strategic resource planning efforts.

The DNR is developing statewide management plans for mineral and fish and wildlife resources. Similar technical reports, focusing on regional resource assessments, might have relevance to these other strategic planning efforts.

C. IDENTIFICATION OF DNR-ADMINISTERED SURPLUS LAND

1983 Resource 2000 legislation requires the DNR to offer for sale as much land as it acquires with 1983 Resource 2000 funds. Ten to twelve thousand acres of surplus DNR-administered land will be needed to meet this legislative mandate.

*   The Suitability Project developed a three-step process that evaluated all DNR-administered land and identified sufficient surplus acreage to meet Resource 2000 requirements.

The three step process involved the following:

1. An automated resource assessment to identify land with high priority for continued management.

2. An in-depth resource evaluation by regional and field staff of land not identified as having high retention priority in step 1.

3. Final identification of surplus land based on field evaluation.

This process identified more than nine thousand acres of surplus DNR-administered land. This acreage, combined with surplus acreage identified in 1982, met the projected acreage requirements for 1983 Resource 2000 acquisition.

The Suitability Project reported these results in "Surplus DNR-administered Land: A Report to the Legislative Commission on Minnesota Resources, July 1, 1984".

D. PROPOSAL FOR A NEW LAND CLASSIFICATION EFFORT

Land classification is an important resource management tool. It can
provide resource managers with important information on resource
potential, existing management, and recommended management.

The Suitability Project evaluated the current DNR land classification
system to determine the extent to which it meets management and planning
needs.

* The Suitability Project determined that a new classification
  of existing DNR land management is needed.

* The Suitability Project developed the basic framework for that
  classification.

The DNR will begin classifying land according to existing use or DNR
land management based on that framework during the 1986/87 biennium.

That classification would use the following categories that will
accommodate multiple uses per parcel:

- Residential
- Agricultural
- Peat Development
- Extractive
- Recreation
- Timber
- Wildlife
- Natural Area
- Fisheries
- Water
- Other

E. ACQUISITION AND DISPOSITION PLAN FOR CON-CON COUNTIES

1984 legislation required the DNR to develop a long-range land
acquisition and disposition plan for DNR-administered land in counties
with Consolidated Conservation (Con-Con) Areas.

*   The Suitability Project compiled DNR plans for land
    acquisition and disposition within the seven Con-Con counties:
    Aitkin, Beltrami, Koochiching, Lake of the Woods, Mahnomen,
    Marshall, and Roseau. It incorporated these various plans
    into one document.

The plan indicates general and specific DNR acquisition and disposal
intentions in the Con-Con counties. It also indicates wetland and
upland character of such lands to the extent that this information is
known.

The DNR submitted the plan to the counties for review. The plan was
published as the "Long Range Plan for Land Acquisition and Disposition
in Counties with Consolidated Conservation Areas", August, 1984.

F. CONTRIBUTIONS TO OTHER DNR PLANNING AND MANAGEMENT EFFORTS

The Suitability Project contributed staff time and provided resource information to a variety of DNR planning and management efforts. The following is a partial list:

* identification of potential areas for off-road vehicle use;

* identification of potential areas for field dog trials;

* identification of federal ownership of riparian lands;

* analysis of pheasant population declines;

* evaluation of shoreland resident questionnaires;

* resource information to assist county governments.

G.   PRODUCTION OF INTERIM AND FINAL PROJECT REPORTS

In 1981, the Department of Natural Resources (DNR), with funding through
the Legislative Commission on Minnesota Resources (LCMR), began a major
evaluation of the suitability of DNR-administered lands to serve various
natural resource purposes. The purpose of the Long Range Land Resource
and Management Plan Project is to ensure that public lands serve the
best interests of the people of the state of Minnesota. Toward this
end, interim and final project reports have been produced.

        *   The Suitability Project reported its interim results in
             "DNR-ADMINISTERED PUBLIC LANDS: THEIR SUITABILITY TO MEET
             NATURAL RESOURCE MANAGEMENT OBJECTIVES, NOVEMBER, 1983."

        *   The Suitability Project reported its final results in an
             executive summary and a full report in "DNR-ADMINISTERED
             PUBLIC LANDS: THEIR SUITABILITY TO MEET NATURAL RESOURCE
             MANAGEMENT OBJECTIVES, JANUARY, 1986."

        *   Maps and other material not used in the interim and final
             reports are scheduled to be used in a cooperative atlas
             project within the DNR.

III. PROJECT CONCLUSIONS AND RECOMMENDATIONS

Conclusion 1

*   Most DNR-administered land serves important natural resource management objectives.

*   A substantial proportion of DNR-administered land presents opportunities for intensive resource management.

Resource assessments suggest that when all alternative resource uses are considered, a substantial proportion of DNR-administered land possesses high resource management suitability. However, a relatively small percentage of the total land base is highly suitable for any given individual resource use.

Most DNR-administered land possesses moderate suitability for various types of resource management. These areas often may be managed extensively to produce valuable resource goods and services at low levels of management investment.

DNR-administered land concentrated in remote, swampy areas of northern Minnesota often serves important resource conservation objectives under custodial management.

Resource assessments can help identify appropriate levels of management investment on state-owned land. Such information can be used by the DNR to help guide management investment.

Recommendation 1

*   The DNR should consider the Land Suitability resource assessment information when establishing resource management priorities and developing management plans.

*   The DNR should concentrate intensive resource management on land with the best potential to recover the higher investment costs through benefits produced. Yet the benefits of resource management often are not fully measureable in dollars.

*   The DNR should continue to improve resource assessment information by developing better economic analysis of resource management potential and improved techniques for monitoring resource demand.

*   The DNR does not administer large acreages of state-owned land
    that are surplus to natural resource management.

Most state-owned land administered by the DNR is managed to serve a
variety of public-interest objectives (e.g., timber, wildlife,
mineral, recreation, and water resource management).

Some DNR-administered land has low potential for resource
management. Such marginal land is often swampy, devoid of peat or
unique wildlife habitat, and is isolated from other state-owned
land.

Marginal resource management land is also marginal for private
sector uses. Consequently, there is very little market for this
land.

If marginal resource management land is sold, development of the
land could create conflicts with other public-interest management
objectives. Development could create environmental problems such
as flooding; it could create management conflicts on adjacent
parcels; it could be inconsistent with land and resource
management plans of local governments.

Furthermore, disposal of large acreages of state-owned land could
depress local real estate values.

Finally, the costs of preparing and administering the sale of
state-owned land might surpass the land's market value.

Recommendation 2

*   The state should continue to offer surplus state-owned land
    for sale on a limited basis. However, it should continue to
    ensure that all sales are consistent with the public-interest
    management priorities of all levels of government.

Conclusion 3

*   The state's resource management objectives cannot be met fully
     with the existing state-owned land base.

In some areas, existing land may not have sufficient resource
quality or may not be appropriately located to meet some critical
resource management needs.

The State Comprehensive Outdoor Recreation Plan (SCORP) indicates
continued growth in outdoor recreation. Much of that increase will
occur close to population centers. Most DNR-administered land,
however, is located in remote areas.

Certain land use trends, such as wetland drainage, are reducing the
supply of high quality wildlife habitat.

Management objectives in the R.J. Dorer Memorial Hardwood State
Forest include recreation, wildlife and water resources management,
and timber production. Often the state can not attain these
objectives with the existing state-owned land in that state forest.

Recommendation 3

*   To meet important public-interest resource management needs,
     the state should continue land acquisition in high demand/need
     areas as determined by resource and use monitoring.

Conclusion 4

* Without continued investment in data collection, automation, validation, and maintenance, the state's ability to address resource management issues will diminish.

The increasing complexity of resource management issues and broad scope of responsibility assigned to the DNR give high priority to data and information needs.

State investment in resource information systems is considerable. Responsibility for collecting, editing, and updating the files are dispersed among various users. This approach meets the needs of many individual users but not always of those who need various data elements from different sources.

Automated information needed for resource assessment often is unavailable or has reduced value because of generality or age of the data (e.g., the land use data are almost 20 years old).

Recommendation 4

* A "data plan", addressing the needs of all users of automated natural resource information, should be developed.

The plan should address the following areas:

1. Identification of existing natural resource and user demand information, both in automated and manual formats.

2. Identification of current and future data needs and priorities. This would include needs for updating aging files and validating those with accuracy concerns.

3. Determination of need for common data collection and storage formats.

4. Determination of data responsibility, e.g., who should collect, store, edit and update key data components.

Conclusion 5

*   The state needs an effective method for anticipating future natural resource issues and developing appropriate management strategies.

Changes in demographics, economics, and technology will present opportunities, as well as dilemmas, for natural resource management.

Recommendation 5

*   DNR strategic planning should be continued and expanded so that effective natural resource management strategies will be developed.

Conclusion 6

*   There are significant resource management opportunities on state-owned shoreland.

The state owns thousands of miles of lake and river shoreland. Resource assessments indicate that many of these shorelands have a high potential for a variety of natural resource management objectives.

There is no comprehensive, strategic plan for state-owned shorelands.

Recommendation 6

*   The DNR should explore funding options to support a comprehensive, strategic management plan for all state-owned lake and river shoreland.

Conclusion 7

*   A clarification of the effects of land ownership patterns on resource management objectives would improve coordinated public-interest land management.

Effective natural resource management is strongly influenced by the pattern of public land ownership. A dispersed public land ownership pattern is beneficial to some resource management objectives, while a consolidated ownership pattern is beneficial to other objectives.

Recommendation 7

*   The DNR should clarify its objectives for land ownership patterns as they relate to resource management priorities. The Accelerated Land Exchange Study Program should address this issue.

Conclusion 8

*   Maintenance of a positive relationship between private agricultural development and natural resource management is essential.

The relationship is often marked by competition for land resources or conflict over land management practices. However, agricultural interests and public resource managers often cooperatively pursue common goals.

Recommendation 8

*   The DNR should explore ways to minimize conflicts with agricultural development and activities. The DNR should also explore ways to maximize opportunities for cooperation in such resource management concerns as: erosion control, reuse of abandoned and marginal farm land, hunting on private land, and habitat protection.

Conclusion 9

*   Income from some trust lands can be enhanced through
    certain management changes.

The DNR has responsibility for managing 2.5 million acres of
land for the benefit of the state's public schools. It also
manages a million acres of severed mineral rights on school
trust land that has been sold.

These 'trust' lands were granted by the Federal government to
be managed by the state for the exclusive benefit of
supporting public schools. Revenues from management or sale
of these lands are deposited in the Permanent School Fund or
reinvested by the DNR for forest management on trust fund
lands.

The guiding principle for management of school trust lands is
to "secure the maximum long-term economic return...consistent
with sound natural resource conservation and management
principles and specific policy guidance as provided in state
law." (See Laws of Minnesota, 1985, Chapter 116.)

About 64% of trust fund lands are in state forests. Another
32% are outside of management units but managed as forest
lands. Timber sales and mineral leasing are the largest
revenue sources from the trust lands.

Some trust fund lands are situated in management units, such
as wildlife management areas (3.8% of all trust lands), state parks
and waysides (0.4%), and all other management units (0.04%), where
maximizing long-term economic return may be constrained. The 1985
legislature directed the DNR to resolve these conflicts in state
parks. They should be resolved elsewhere, as well.

Additional revenues might be generated through new approaches
to management of trust lands. Such activities as innovative
leasing, land exchange and reforestation could enhance revenue
without significant increases in management costs. These
management techniques on state lands have been promoted
through specific program appropriations to the DNR through the
Legislative Commission on Minnesota Resources. (See the
Minnesota Department of Natural Resources' School Trust Land
Management Report, 1983, pages 35-100.)

*   School trust lands should continue to be managed by the
    DNR to maximize long-term economic return and to enhance real
    estate market value of trust lands, where feasible and
    practical, consistent with sound natural resource conservation
    and management principles and specific policy guidance as
    provided in state law. The DNR should continue to explore new
    opportunities for enhancing economic return from management of
    trust and all other public lands. The DNR should seek
    legislative authorization and funding as appropriate to
    implement these opportunities.

*   Conflicts in management of school trust fund lands should be
    resolved.

FINAL REPORT

CHAPTER I

THE SUITABILITY PROJECT AND DNR STRATEGIC PLANNING

The Legislature, through the Legislative Commission on Minnesota
Resources, has funded the Long Range Land Resource and Management Plan
Study (Suitability Project). The Suitability Project has evaluated the
quality of Department of Natural Resource (DNR)-administered lands to
serve a range of resource management objectives. The Project goal is to
help promote efficient use and management of DNR-administered lands. In
the 1983-85 biennium, the project sought to refine and explore uses for
computerized resource assessments and information. While this document
is a final report to the LCMR, it is also a product reporting the DNR's
ongoing efforts to improve the natural resource management of
state-owned lands.

Throughout the course of this project, resource managers have expressed
a need to keep the crises of the present and the past in perspective so
that natural resource managers can better anticipate, recognize, and
respond to future opportunities. Strategic planning provides one method
of doing this. Anticipatory or strategic land use planning, as
developed in this report, has three assumptions:

1) conflict among competing uses for state-owned land will
continue;

2) competition will be among relatively broad classes of land use
(e.g., cultivation, commercial timber production, residential,
recreational or natural open space); and

3) as land use demands change, priorities that determine which
locations should be managed for development or preservation
may also change.

Thus, strategic land use planning addresses certain basic questions
using long-range resource management objectives: e.g., what is the most
sensible development - in what chronological order and where? Its
purpose is to guide differing, but interrelated uses by analyzing the
present situation and anticipating the future in a systematic fashion
for DNR-administered lands.

The Suitability Project has made extensive use of numerous computerized
information resources and data evaluation techniques. Automated models
that assess the natural resource qualities of public lands have been
created. DNR resource management personnel have participated in the
development and review of the natural resource evaluation assessments
and models presented here.

The Suitability Project is one vehicle for strategic planning. The
Project's approach has been two-fold:

1) to develop automated (and other) methods for assessing
resource management potential of DNR-administered land, and

2) to apply those methods in resource management and planning.

This chapter discusses fundamental premises guiding the Suitability Project's analysis of resource management potential of DNR-administered land. These concern the nature of DNR public-interest management of state-owned land, the process of strategic planning in the DNR, and the role of automated information in assessing management potential of DNR-administered land. The chapter also identifies products of the Project's strategic planning efforts.

This report summarizes the suitability of DNR-administered lands for meeting natural resource management objectives, as described by particular natural resource evaluation assessments. It provides examples of how assessment information has been used by the DNR in resource management planning efforts. It also contains a proposal for developing a dynamic, "existing use" land classification.

A.   PUBLIC-INTEREST MANAGEMENT

The term "public interest" identifies benefits to individuals and society as a whole. However, on any issue there may be several special interest groups with different perspectives. Although they are part of the "public", their views and desires must be carefully evaluated to ensure that a balance is struck that applies to the broader population.

In managing Minnesota's resources, the DNR must balance economic, social, and environmental considerations. The department's management reflects statutory mandates of promoting wise use and development of natural resources through economically-oriented development programs, and also promoting socially and environmentally acceptable programs through regulatory controls.

The DNR's role is to implement legislatively established initiatives through executive actions in order to provide a balanced perspective in natural resource management. This requires the DNR to translate a broadly defined public interest into feasible and practical natural resource management objectives and action programs. A large number of resource management objectives and plans have been, and are being established by the DNR to meet this need.

The dual responsibility of promoting reasonable development and protecting the environment can be accomplished successfully only if DNR management objectives are clear and specific. A major concern throughout the Suitability Project effort has been the need for clearer statements of resource management objectives. This applies to a broad range of land management concerns and especially to land tenure objectives associated with different management options.

Public land ownership patterns in Minnesota reflect the historical development of a public-interest land management philosophy. Three phases characterize this development:

1.   federal land grants to promote economic development;
2.   reservation of land to promote resource conservation; and
3.   strategic acquisition to promote recreational development, wildlife habitat preservation, and water resource protection.

The federal government holds title to approximately 3.2 million acres of land, concentrated in the northeast, and north-central counties (see Figure 1). The state holds title to another 8.2 million acres. The DNR administers 5.3 million acres of state-owned land, scattered throughout the northern part of the state (see Figure 2). County governments administer about 2.8 million acres of state-owned land (Figure 3). The remaining state-owned land is administered by other state agencies and organizations.

The highly dispersed pattern of federal, state and county land ownership complicates determination of public interest since those interests vary depending on land owners and resource managers. Determination of state public interests is defined in state legislation and DNR policy guidelines.

1984 Minnesota Statutes 83A-105 outline DNR's public-interest resource management responsibilities across its six administrative regions (see Figure 4). The statutes delineate boundaries of management units and identify resource products to be drived from land management. According to legislation, commercial products, such as timber, minerals and agricultural crops, are not the only products of land resource management. Outdoor recreation, wild plant and animal species preservation and propagation, and protection of sensitive ecosystems also are desired products of natural resource management.

The DNR has developed a statement of its resource management goal. That goal is:

> To achieve optimum and beneficial natural resources planning, protection, and development responsive to public need, consistent with resource potentials, and for the social, spiritual and economic well-being of both present and future generations through an effective and efficient organization. (DNR Policy Directive 19)

The DNR goal recognizes that products of public-interest management are not limited to commercial goods, but also include intangible benefits of resource management. Policy Directive 19 goes on to state that "optimum" implies that standards for resource management shall be set by the DNR using analytical techniques such as benefit/cost analysis, and that "beneficial" implies "that all resource management must benefit people commensurate with their expenditures". In other words, determination of optimal public-interest resource management involves evaluation of resource management benefits relative to resource management costs.

All benefits of resource management cannot be measured consistently. Some products of resource management, such as timber and minerals, are bought and sold in their respective markets, where their value is reflected in price. Other products of public natural resource management, such as outdoor recreation, wildlife populations, or environmental protection, often can be valued only indirectly or subjectively at best. Evaluation of resource management benefits relative to management costs is thereby complicated and open to legitimate, possibly conflicting, alternative viewpoints.

Figure 1
Density of Federally Owned Lands

Percent of forty–acre
land parcels in a
township that contain
this ownership

1. Greater than
75 percent

2. 50.1 to 75 percent

3. 25.1 to 50 percent

4. 5.1 to 25 percent

5. Less than or equal
to 5 percent

Note: Includes Bureau of
Indian Affairs ad–
ministered lands
that are Indian
trust properties.
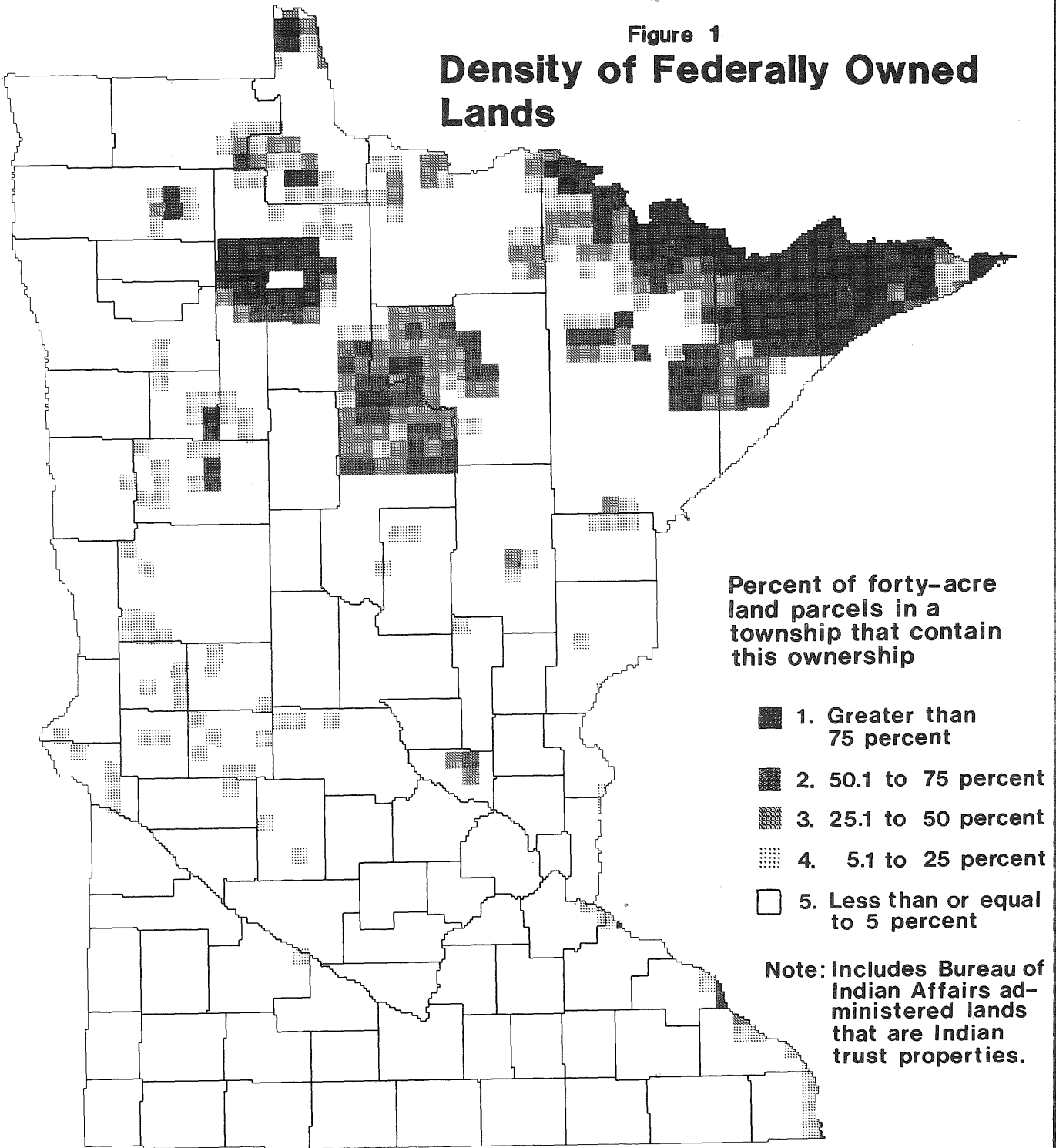
Source: Minnesota Land Management Information System (1969 data for Bureau of
Indian Affairs and Corps of Engineers; 1978 data for other federal lands).

0   20   40 miles

0   20   40   60
km.
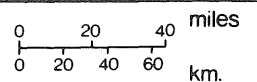
Figure 2

Density of State Owned Lands

Percent of forty-acre land parcels in a township that contain this ownership

1. Greater than 75 percent
2. 50.1 to 75 percent
3. 25.1 to 50 percent
4. 5.1 to 25 percent
5. Less than or equal to 5 percent

Note: Does not include state-owned tax-forfeited lands that are county administered
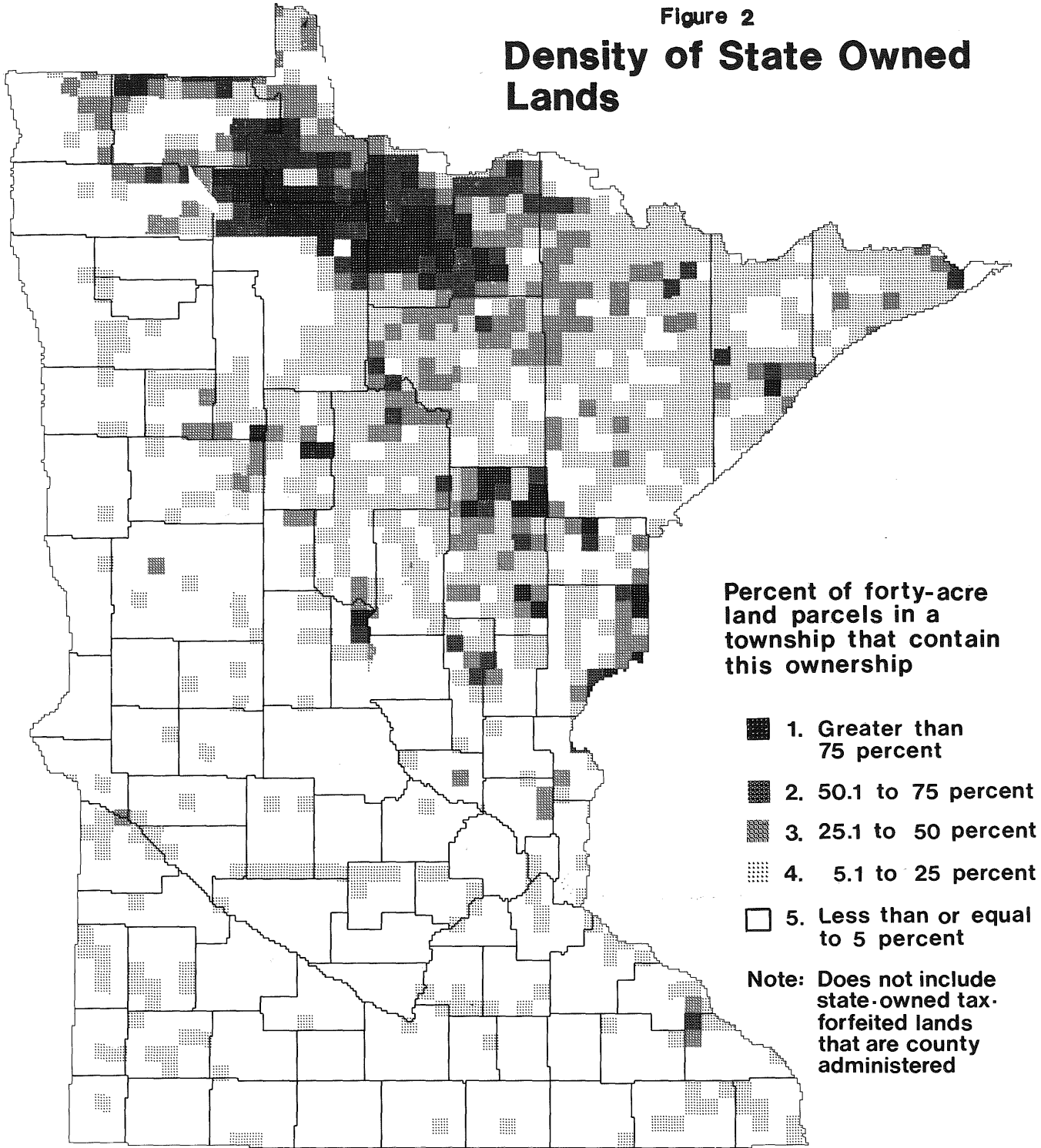
Sources: Minnesota Department of Natural Resources (1982 data, DNR administered lands). Minnesota Land Management Information System (1978 data for other state administered lands).

0   20   40 miles
0   20   40   60 km.

Figure 3
Density of County Owned and Administered Lands

Percent of forty·acre land parcels in a township that contain this ownership

1. Greater than 75 percent
2. 50.1 to 75 percent
3. 25.1 to 50 percent
4. 5.1 to 25 percent
5. Less than or equal to 5 percent

Note: Includes state·owned tax·forfeited lands that are county administered

Figure 4

DNR Regions

Public resource management agencies are under increasing pressure to justify management practices using narrowly defined benefit/cost analysis. Such analysis emphasizes monetary returns (e.g., timber sale revenues, mineral lease payments and royalties, license fees, etc.) from resource products and often ignores valuable resource products not sold in the marketplace. Thus, management costs are unfairly compared to, at best, partial benefit estimates. Such analysis can direct management to focus on a narrow range of resource products that "pay" - in the sense that they generate revenues that recover costs. The underlying premise of optimal public-interest resource management, as outlined in the department goal, is to maximize net social benefits rather than maximize monetary returns. Social benefits include direct monetary returns to resource management as well as less tangible, non-monetary returns that are not captured by most benefit/cost analyses. It is often necessary to consider these other resource values in a subjective fashion.

The Suitability Project's resource assessments cannot adequately capture all costs and benefits of resource management. Consequently, resource assessments do not produce "bottom line" answers to questions of where the state should invest in resource management. Rather, assessments provide information that highlight opportunities for public-interest resource management. Suitability assessment information alone cannot determine the best public-interest management for a given area.

An example may clarify how resource assessments can assist in developing resource management strategies. Suppose that the DNR must determine whether private sector agricultural production or public sector wildlife management best meets the public interest on a given area of land in southern Minnesota. Suitability assessment info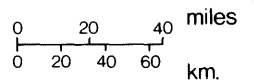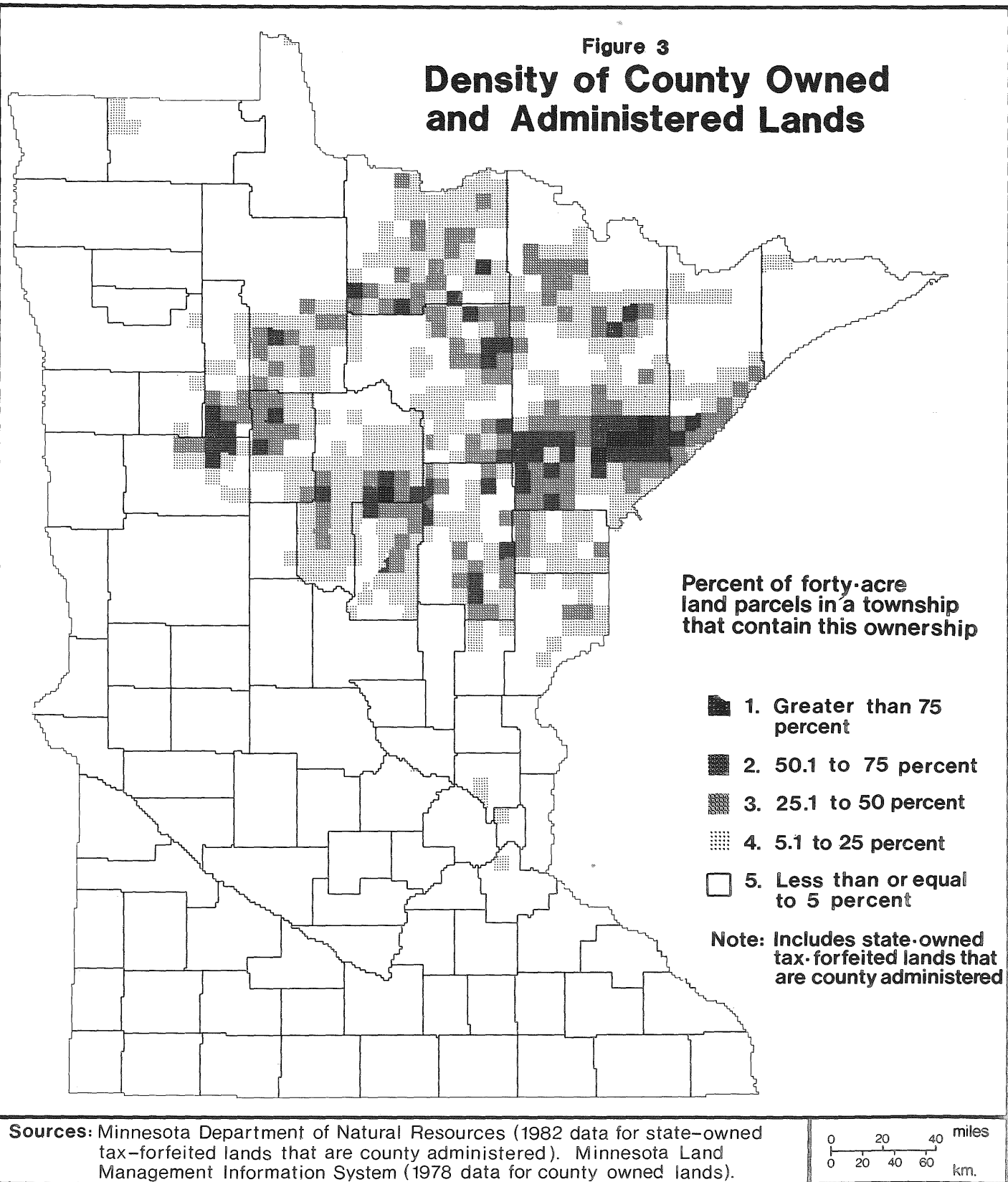rmation can estimate how much publicly-owned land is suitable for agricultural production. It can highlight the trends in agricultural production and identify some of the results of agricultural intensification over the past several decades. It also can identify demand for products of natural resource management in rural areas (for example, wildlife production and recreational opportunities). But, suitability assessment information cannot quantify the costs and benefits of agricultural production versus wildlife management. It does not provide a simple answer to such a complex question.

B.   DNR STRATEGIC PLANNING

To manage resources in the public interest, the DNR must understand the types of resource products desired by society and develop its management strategies accordingly. This creates a need for DNR strategic planning. Such planning efforts require that public-interest legislation and departmental policy be reviewed to determine DNR responsibilities, goals, and objectives. Trends in natural resource use must be analyzed to understand the implications of future demand for resource products. Information on land resource productivity must be developed to describe management opportunities. This information must be presented to decisionmakers in a comprehensive and understandable fashion so that resource management strategies reflect the public interest.

Strategic and short-term operational planning are both appropriate in serving the public interest. Strategic planning is an on-going process that assesses past resource use trends, identifies current resource needs, and anticipates significant future resource management issues. The process identifies alternative resource management strategies, from which resource management priorities can be established. Short-term operational planning is an on-going process that develops implementation strategies for specific management programs guided by results of strategic planning efforts.

Since most DNR-administered land has been legislatively designated for forestry management, documents such as the "Minnesota Forest Resources Plan" provide valuable tools in defining balanced resource management objectives related to multiple uses of those state lands in the public interest. The Minnesota Forest Resources Plan (MFRP) will be updated. The Division of Forestry is also developing forest administrative unit plans. The Division of Parks and Recreation has developed plans for each of the state parks. The Trails and Waterways Unit has developed a long-range plan for state trails and a state-wide priority system for public water accesses. The Division of Fish and Wildlife is developing a long-range planning process. The Division of Minerals is developing a Mineral Resource Development Plan. This plan will address the need for mineral exploration on state-owned land and the potential conflicts between exploration and other resource management activities.

C.   AUTOMATED RESOURCE ASSESSMENT

A primary task of the Suitability Project has been development of methods for assessing the resource management potential of DNR-administered land. Resource assessments were designed to use existing automated information to the fullest extent possible. Automated information can be defined as information available in computer systems. Automated assessment methods are evaluation techniques that employ computers to analyze and display information.

The State of Minnesota has a number of sophisticated automated information systems. The Land Management Information Center (LMIC) operates and maintains a geographic information system (GIS) with extensive natural resource and land use data: Minnesota Land Management Information System – MLMIS. Also, the DNR has collected and automated a great deal of resource information. The Suitability Project has made extensive use of DNR information and the MLMIS system in developing automated resource assessments.

MLMIS has provided the Project with an extensive array of automated natural resource information. Unfortunately, much of the MLMIS resource information was developed to address resource issues different from the needs of current suitability evaluations. Lacking direct measures of certain resource characteristics key to suitability evaluation, Project staff were forced to infer those characteristics from available information.

For example, information on statewide vegetation cover in MLMIS is contained in two files: a file on land use and a file on forest cover (Phase I data, which covers all ownerships in the state). The Suitability Project needed information on statewide vegetation cover in order to analyze wildlife habitat potential. The vegetation cover information in MLMIS does not contain the specific categories of vegetation cover needed for habitat analysis. For instance, the land use file contains categories such as forest cover, marsh, pasture/open and cultivation. Vegetation cover can be inferred from these land use categories, but it cannot be directly identified. Similarly, the forest cover (Phase I) file contains categories of major forest cover types (e.g., pine, aspen-birch, spruce-fir). But it does not contain information on the ages of forest types or understory vegetation, both of which are important to habitat evaluation. The Project's ability to evaluate habitat is limited by the lack of automated information on specific categories of statewide vegetation cover - across all types of ownership. While Phase II forest cover information is quite detailed, it covers almost exclusively DNR-administered lands.

A different limitation is posed by generalized resource information. All resource information contained within a GIS has been generalized to some degree. When resource information is placed in MLMIS, a gridwork corresponding to a particular unit of land area (e.g., forty-acre parcel, section, or township) is "overlaid" on the state. The grid cells are analyzed for particular resource characteristics (e.g., land use, forest cover type) and are classified accordingly. The classifications are stored in MLMIS. When grid cells are classified as containing a particular resource characteristic, they usually contain only a percentage of that characteristic. Other resource characteristics are often present in the same grid cell. Two grid cells classified as containing identical resources by such a GIS, might differ considerably in their actual resource composition. For example, one forty-acre parcel identified as marsh on the land use file might contain fifty-five percent marsh and forty-five percent pasture. Another parcel identified as marsh might contain seventy-five percent marsh, ten percent forest and fifteen percent open water. While their actual resource composition is different, these parcels will be classified as being identical under the coding rules of the geographic information system. Generalizations as these become acute when resource characteristics are classified for whole sections or townships.

These limitations do not invalidate the automated information or the Project's resource assessments. Project staff have been conscious of the limitations of automated information and have designed the resource assessments accordingly. However, all users of Suitability resource assessments must be aware of the current limitations of automated information systems in order to use Project information correctly.

Reliance on automated information has provided opportunities as well as constraints. The most dramatic opportunity afforded by automated information is the ability to evaluate statewide resource characteristics in a timely manner. Several resource characteristics for a given area of land can be simultaneously evaluated with automated methods. This has allowed the Project to develop assessments based on

consistent, statewide evaluation criteria. The automated mapping capabilities of the state's GIS has allowed the Project to quickly produce useful and easily reproduceable maps.

D.   PRODUCTS OF THE SUITABILITY PROJECT

The primary product of the Suitability Project is a set of resource assessments that analyze the potential of DNR-administered land to achieve public-interest resource management objectives. Resource assessments have been developed for the following land management objectives and concerns:

    1.   commercial timber management;
    2.   outdoor recreation management;
    3.   wildlife habitat management;
    4.   metallic mineral and commercial peat production;
    5.   residential development; and
    6.   agricultural production.

The assessments provide a statewide context for many DNR resource management efforts. These resource assessments can be used by DNR staff to examine the range of management options available to the department within a geographical area.

A primary impetus for development of these resource assessments was the strategic disposition of DNR-administered land. The 1983 Resource 2000 legislation (Laws of Mn. 1983, Chap. 344, Sec. 3, Subd. 4) requires the DNR to offer for sale as much land as it purchases with Resource 2000 funding within two years of purchase. The Suitability Project developed a process for identifying DNR-administered land that could be offered for sale to meet the legislative requirement. Results of the Project's efforts to identify such land are published in "Surplus DNR-administered Land: A Report to the Legislative Commission on Minnesota Resources July 1, 1984."

The Suitability Project has cooperated with the Division of Forestry in two significant planning efforts.

    The first is the update of the Minnesota Forest Resources Plan
    (MFRP). The Suitability Project prepared a technical report
    summarizing resource assessment information relevant to the
    division's long-range plan. This technical report was used in
    updating the MFRP.

    The second cooperative planning effort occurred in forest
    administrative unit planning. This in-depth planning process
    develops management strategies for Division of Forestry
    administered lands. The Suitability Project supplied resource
    assessment information to forest unit planning teams.

In the course of developing and implementing resource assessments, the project was delegated responsibility for developing a long-range plan for acquisition and disposal of land in counties containing Consolidated Conservation land. This plan was required by legislation passed in 1984 (Laws of Mn. 1984, Ch. 654, Art. 2, Sec. 83). The results of this planning effort were published in August, 1984, in a report entitled "DNR Plan for Acquisition and Disposal of Land in Counties with Consolidated Conservation Lands."

The Project has also reviewed DNR needs for a formal land classification system useful for strategic planning. From that review, the Project developed a proposal for a new land classification system. The results of the review and the proposal are discussed later in this report.

Finally, an important long-range planning function performed by the Suitability Project has been development of increased communication and transfer of resource information within the department. The Project has stimulated discussion of departmental management objectives, long-range planning needs, and information development and application. The Project has sought consensus on the DNR role in meeting public interest natural resource management objectives. The Project has developed and supplied useful resource assessment information to other planning efforts developing long-range management strategies for DNR-administered land.

CHAPTER II

RESOURCE ASSESSMENT

A. INTRODUCTION

The Suitability Project evaluated the suitability of land for the
following natural resource management objectives and related concerns:
timber production, outdoor recreation, wildlife habitat, peat and
mineral development, residential development, and agricultural
production. These management objectives and concerns were chosen
because they are either major DNR resource management responsibilities
or significant private sector land uses that may conflict with DNR land
management.

Resource assessments provide a statewide context for DNR resource
management programs. Within that statewide context, the range of DNR
management options in specific geographic areas can be evaluated and
prioritized.

1. Objectives of Resource Suitability Analysis

With nearly 5.3 million acres of land in state ownership - about
ten percent of the state's total land area - the state is the
largest individual land owner in Minnesota. The DNR is the major
institutional steward of state-owned land, with management
responsibility for approximately 97 percent of the total. In
addition, the department has administrative responsibility for the
state's protected waters, plus 10 million acres of state-owned
mineral rights. Thus, the DNR is in a position to significantly
affect, through management of natural resources, the welfare of the
people of Minnesota.

However, land administered by the DNR, while serving important
natural resource management objectives, is not uniformly valuable
for resource management. Much of DNR-administered land has little
apparent economic value to the private sector. Such land tends to
have no commercial timber, low mineral potential, low agricultural
productivity, no significant peat resources, and is often too wet
to provide for significant recreational or residential homesite
development. Much of it is located in remote, swampy areas in
northern Minnesota, where it was acquired largely through
tax-forfeiture. On the other hand, a considerable portion of
DNR-administered land is located in prime timber-growing and
outdoor recreation areas, and in predominantly agricultural areas,
where it often serves vital public needs.

Determining the relative potential of DNR-administered land to
achieve natural resource management objectives is the goal of
resource suitability analysis. The Suitability Project has
developed a set of resource assessments, designing automated
resource models and using some existing models, for this purpose.

2. Limitations in Application of Suitability Analysis

Evaluation of resource suitability requires methodologies tailored to the data available for analyzing resource potential and user preferences for each individual resource use. Consequently, tools employed to assess resource suitability vary widely in the procedures used and in the results provided.

For example, the metallic mineral suitability model develops estimates of relative metallic mineral potential based on known or inferred geologic conditions. There is no explicit consideration of mineral resource value. The wildlife habitat model provides a framework for identifying habitats and ranges for selected wildlife species. Relative habitat value is suggested (in part) by overlaying hunting demand projections from the recreation analysis. The timber suitability model employs a more complex, mathematical formulation for estimating potential net timber returns, based on price and cost data and estimated productivities (from the Phase II Inventory).

Because measures of resource suitability such as those described above are not directly comparable, assessing comprehensive resource value cannot be done automatically. No equation exists that can combine resource assessments as unlike as metallic mineral potential and estimated net timber returns, for example, to generate a single, objective resource suitability value. However, each suitability assessment provides information regarding one aspect of a resource's potential value. When each is considered with other resource assessments, a more complete picture of resource management potential can be developed.

In comparing suitability assessments for alternative resource uses, potential tradeoffs are highlighted. Inevitably, questions of resource allocation are raised. In its role as a provider of strategic management information, suitability analysis does not dictate solutions to these resource allocation questions. Rather, it helps clarify long-range options available for achieving departmental resource management objectives.

Making resource allocation decisions is not an appropriate function for suitability analysis. The proper function of suitability analysis in resource management is to develop information about how resources could be managed for the greatest net benefit, given specified goals and objectives. Thus, conclusions regarding resource suitability are expressed conditionally, in terms of a management objective—i.e., a resource may be suitable for... if the objective is...

Determination of how resources should be managed is beyond the technical capability of suitability analysis using automated information systems. It is not possible to capture all the complexity of resource management in a computer model. Computers can not replace humans as resource managers.

Descriptions of the objective, method, information used, limitations, and significant findings of each resource assessment follow.

B. RESOURCE ASSESSMENT FOR TIMBER PRODUCTION

1. Overview.

Approximately 16.7 million acres or one-third of Minnesota's land
area is forested. Of that total, 13.7 million acres are considered
"commercial" forest land by the U.S. Forest Service. Nearly 20
percent (2.65 million acres) of total commercial forest land is
state-owned, and most of this is administered by the DNR (Table 1).
This amounts to half of the DNR-administered land base, and almost
two-thirds of the more than 4 million acres of commercial and
non-commercial forested land owned by the state.

Due to the harsh climate and either wet or rocky soils common in
much of the forested zone of northern Minnesota, forest
productivities are generally low, although some highly productive
land is found in the area. About 11 percent of the 16.7 million
acres of forested land in the state is classified by the U.S.
Forest Service as "unproductive non-commercial". In addition, 6.5
million acres of commercial forest land, or 47 percent of total
commercial acreage, are in the lowest productivity class (Table 1).

Because much of the better forest land has either remained in
federal ownership or been acquired by the private sector,
state-owned forest land is concentrated in the lower productivity
classes. Nevertheless, the state owns 1.1 million acres of
commercial forest land in the moderate to high productivity
classes--about 16 percent of total acreage in those classes.
Timber management in these areas makes a significant contribution
to the economy of the state.

The DNR's Forest Economist estimates that for each dollar's worth
of saw timber sold (on the stump) in the state, $14.16 of value-
added for labor, materials and capital employed in the harvesting
and processing of timber products remains in the state. Because of
more extensive processing, the value-added per dollar's worth of
pulpwood stumpage sold is estimated at $24.93. Based on recent
annual sales of $3.6-3.8 million for state-owned timber, the total
annual value-added attributable to state timber sales is estimated
to be $80-85 million, paid to individuals or businesses residing or
based in Minnesota.

2. The Timber Model.

A model has been developed by the DNR to evaluate the suitability
of DNR-administered forest land for timber production. The model
incorporates market values (stumpage prices), site productivity
estimates and management costs to predict potential net timber values
for long-term timber management, by site. It does not consider existing
timber volumes. Rather, it is concerned with the potential value of
each site for continued timber production following harvest of the
existing stand.

Table 1

Area of Commercial Forest Land by Ownership and Site Class, Minnesota, 1977
(Thousand of Acres)

| Ownership class | All classes | Site class (cubic feet of growth/acre/year) | | | | | |
		225 or more	165-224	120-164	85-119	50-84	20-49
National Forest	1,715.1	--	--	1.5	177.3	694.5	841.8
Bureau of Land Mgmt.	43.9	--	--	--	4.2	14.9	24.8
Indian	466.8	--	1.4	8.7	78.1	151.0	227.6
Miscellaneous federal	110.5	--	--	--	5.8	48.3	56.4
State	2,650.5	--	1.4	31.5	374.4	722.4	1,520.8
County and municipal	2,341.6	--	1.3	46.8	468.7	919.5	905.3
Forest industry	772.0	--	1.2	17.5	164.8	230.5	358.0
Farmer	3,403.7	--	1.4	30.7	414.1	1,318.3	1,639.2
Farmer owned-leased	--	--	--	--	--	--	--
Misc. private-corp.	466.7	--	--	5.2	89.0	201.4	171.1
Misc. private-indiv.	1,712.0	--	--	17.7	265.5	691.1	737.7
Misc. priv.-corp., leased	5.7	--	--	--	1.4	4.3	--
Misc. priv.-indiv., leased	6.6	--	--	--	1.0	2.7	2.9
Total	13,695.1	--	6.7	159.6	2,044.3	4,998.9	6,485.6

(Source: Jakes, 1980)

-44-

Thus, the timber model is not explicitly designed to provide information about the management potential of existing timber stands, although it may lead to conclusions regarding management of existing stands in some situations. Neither is the timber model designed to account for delays in reforestation on sites where existing stands are not mature. These delays may be several decades in some instances, and may significantly affect site suitability for timber management in the future, since economic and technological circumstances can change in the meantime.

Economic analysis of resource management as performed with the timber model is unique among the resource assessments. It is made possible by two factors that do not apply consistently to other resource uses:

1. timber management involves a tangible, commercial product whose output can be readily measured and whose value (price) is determined objectively in the market; and

2. the DNR has invested considerable effort in forest resource data collection.

In considering the results of the timber analysis, the following limitations should be kept in mind:

-- The timber model provides incomplete estimates of returns to timber management in that timber prices do not capture values of non-timber impacts. Consequently, where these impacts are significant, timber value may be over- or understated by the model. Recognizing non-timber impacts in local and regional economies, wildlife habitat, and recreational opportunities means that timber management should not necessarily be limited to sites that will turn a profit.

-- The analysis of timber suitability has been limited to land for which Phase II Forest Inventory data were automated—about 70 percent of the total DNR-administered forested land base. This includes over 100,000 stands with stocked, commercial timber types, accounting for nearly 2.7 million acres. Results from the analysis of inventoried land cannot be generalized to the as yet unevaluated land because site and market conditions may not be comparable.

-- Approximately 850,000 acres of DNR-administered forest land (mostly in Itasca and southern St. Louis counties) were not evaluated because automated Phase II Inventory data were not available at the time of evaluation.

-- An additional one million acres for which automated inventory data were available have not been evaluated, either because they were identified as non-forested cover types (e.g., marsh or muskeg) or because the data provided were not adequate for the analysis. Acreage typed as non-stocked commercial forest (about 650,000 acres, some potentially valuable for timber management) is included in this last category.

-- The model assumes that demand for Minnesota timber products will increase in the future, and that this increasing demand will be expressed in the form of rising timber prices. This view is shared by forest economists in private industry and

within the department. Based on their estimates, a price growth rate of 1.9 percent annually, over inflation, has been built into the model. This growth rate implies that real (inflation-adjusted) prices will double in 35-40 years. If price growth for individual species varies significantly in either direction from this assumption, the impact on suitability for timber management can be great. Given current age-class imbalances for certain species (e.g., aspen), faster growth in real prices may be conceivable in some instances. Consequently, stumpage price trends should be monitored and estimates of net timber value revised periodically to remain current.

-- The model anticipates no technological breakthrough that would lead to economic uses for resources that were previously unmerchantable. Actually, changes in reforestation, harvesting or processing technology can reduce costs or increase prices and thus change timber management suitability. The recent development of the aspen waferboard industry is a good example of a technological change that would require reevaluation of timber suitability.

3. Significant Findings Regarding Timber Suitability.

a. Suitability For Intensive Timber Management:

The timber model indicates that good long-term intensive timber management opportunities exist on high-productivity sites of aspen and softwood saw timber species in the north and hardwood saw timber species in the southeast. Intensive management refers to artificial regeneration (planting or seeding with site preparation and herbicide treatment), except for aspen, for which natural regeneration with occasional site preparation is standard. Additional acreages (largely softwood pulp species) possess economic potential for intensive management with reduced reforestation costs.

Statewide, about 28 percent of the evaluated forest land is potentially suitable for intensive management, based on expected direct returns and reduced costs--i.e., expected revenues from future timber sales fully recover reforestation and sale costs, allowing for reductions in reforestation costs as recommended in the 1983 Minnesota Forest Resources Plan (Table 2).[1] The percentage is highest in DNR Region III (39 percent) and lowest in DNR Region II (20 percent). The low percentage in DNR Region II is attributable to a combination of low productivities and higher-than-average reforestation costs, due to local labor markets and frequently rough terrain.

---

[1] The 1983 Minnesota Forest Resources Plan calls for reduction of reforestation costs through modification of timber sale practices, to eliminate the need for costly site preparation activities (MDNR, 1983a).

Table 2

Potential Suitability of DNR-Administered Forest Land
For
Timber Management
(Acreages Summarized by DNR Region)

| DNR Region | Total Acres Evaluated[1] | Acres Potentially Suitable for: | | |
		Intensive Mgmt.[2]	Extensive Mgmt.[3]	Custodial Mgmt.[4]
I	941,263	291,532	227,055	422,676
II	1,106,133	220,561	442,318	443,254
III	581,944	225,949	181,822	174,173
IV	39,098	10,894	28,204	-0-
State	2,668,438	748,936	879,399	1,040,103

[1] Acreage inventoried in Phase II as of December 1984 (about 70% complete). Does not include non-stocked or non-forested acreage.

[2] Acres with potential to recover reforestation costs through timber sale revenues, allowing for cost reductions through elimination of site preparation. Including non-timber values in the analysis adds to these acreages.

[3] Acres with potential to return enough through timber sale revenues to recover cost of sales and minimal site preparation for natural regeneration. Including non-timber values in the analysis adds to these acreages.

[4] Acres not expected to return enough to recover costs of extensive management. Including non-timber values shifts substantial acreages from this category to the extensive management category.

(Source: Minnesota Department of Natural Resources, 1985.)

b.   Suitability For Extensive Timber Management:

Another 33 percent of the evaluated forest land is potentially
suitable for long-term extensive timber management (natural
regeneration), not counting the nearly 600,000 acres of the
aspen-birch type included in the intensive management
category, above (Table 2). This is based on the expectation
that these sites will return enough through timber sales to
recover sale costs and the cost of minimal site preparation to
encourage natural regeneration. About half of the land suit-
able for extensive management is in Region II, where it
comprises 40 percent of the land evaluated. Nearly
three-fourths of the land evaluated in Regions IV, V and VI is
in this category.

c.   Potential Annual Yield:

Sites judged to have economic potential, either for intensive
or extensive timber management, are capable of producing more
timber annually than the state currently sells. Assuming that
they are all accessible and managed appropriately, they can
yield as much as 670,000 cords annually--50 percent greater
than the average annual volume sold by the state from Fiscal
Year 1980-1984.

d. Suitability For Custodial Management:

Strictly on the basis of timber sale revenues (i.e., ignoring
non-timber values), 39 percent of the evaluated forest land is
too unproductive for extensive management at projected prices
(Table 2). These sites fall into a custodial management
category. In this category, land may require management for
fire protection or insect and disease control. Timber may be
justifiably harvested to serve wildlife habitat or other
non-timber purposes. Investment for timber production
purposes alone is not appropriate on these sites and is not
normally practiced by the department. Over 80 percent of the
land in this category is in Regions I and II, where it
comprises 45 and 40 percent, respectively, of the land
evaluated.

e. Timber Suitability By Section--Statewide Perspective:

A statewide perspective for the timber suitability of
DNR-administered land is provided in Figure 5. The evaluated
land has been characterized by section (an area of one square
mile) as either: (1) containing DNR-administered land
evaluated as suitable for intensive management; or (2)
containing DNR-administered land evaluated but not suitable
for intensive management. Any amount of land suitable for
intensive timber management in a section causes the section to
be classed as suitable, even if other land in the section is
evaluated as unsuitable.

The total number of sections containing DNR-administered land evaluated for timber suitability is 10,576. Of the total, 6,646 contain some land potentially suitable for intensive timber management. These sections are widely distributed across the state, as shown in Figure 5. The remaining 3,930 sections are concentrated in the lowland areas of northern Minnesota. Notable in Figure 5 is the large area in the north-central part of the state (Itasca and St. Louis counties) where automated Phase II Inventory data are not yet available for analysis.

f. Potential Impact of Non-Timber Values on Timber Suitability:

Non-timber impacts of timber management, in some instances, may be sufficient to warrant investments that are not fully recoverable through future timber sales alone. These non-timber values have been much discussed in the field of resource economics, but no reliable method has been developed for measuring them. However, assuming a modest value of $1 per acre per year for net non-timber benefits can illustrate their potential impact on suitability for intensive timber management.

Added to expected timber sale revenues for all species, without regard to the relative non-timber value of one species versus another, a non-timber return of $1 per acre, annually, increases the area potentially suitable for intensive management from 28 percent to nearly half (49 percent) of total land evaluated. Extensive management becomes economically feasible on virtually all sites initially thought to be suitable only for custodial management.

However, some timber types and sites are more important for non-timber purposes than others (e.g., aspen, jack pine, oak, and white cedar for deer browse and cover; and accessible sites near high-quality water resources for recreation). Furthermore, intensive timber management on certain sites may benefit some wildlife species at the expense of others, or have an undesirable impact on outdoor recreation or soil erosion. Consequently, the net non-timber impact of timber management may, in some cases, be negligible or even negative.

As a result, the effect on timber suitability of non-timber impacts is uncertain. Future analysis to develop more precise estimates of non-timber values associated with timber management could be immensely useful in determining the broader economic potential for management of the state's timber resource.

Potential Suitability of DNR-Administered Forest Land for Timber Management

Figure 5
Timber Management Classes

Class 0: Sections Containing No DNR-Administered Land

Class 1: Sections Containing DNR-Administered Land Not Yet Presently Evaluated

Class 2: Sections Containing Evaluated DNR-Administered Land Suitable Only For Extensive Or Custodial Management

Class 3: Sections Containing Evaluated DNR-Administered Land Suitable For Intensive Management (may also contain land not suitable for intensive management)

Note: Based on projected prices and current average reforestation costs.

Evaluation subject to availability of Phase II forest inventory data.

Source: Minnesota Department of Natural Resources, 1985.

C.   RESOURCE ASSESSMENT FOR OUTDOOR RECREATION

1.   Overview--Natural Resources, Population and Recreation.

The geographic relationship between state-owned land and population
distribution is an important factor in determining the relative
suitability of that land for many uses, especially outdoor recreation.
Because lands located in or near population concentrations are often
easier or cheaper for people to use (i.e., accessible), they have
"elevated" suitabilities for people-oriented uses. For example, parcels
near metropolitan centers often are more valued as recreational open
space than are remote but otherwise similar parcels. For some natural
resource-based activities, particularly dispersed recreation activities
such as hunting or wilderness camping, proximity to population is detri-
mental to recreation management suitability because the range of
resource management options is restricted in these areas.

    a.   Population Patterns in Minnesota:

    There is no single measure of accessibility that is useful for
    all applications. Accessibility is measured differently for
    different markets. For example, accessibility to an
    international airport serving a statewide market would be
    measured differently from that of a regional shopping center
    (e.g., Southdale), or from that of a neighborhood gas
    station/convenience store. The latter could well use
    population density as an effective measure of accessibility
    (Figure 6), whereas the former two require looking at
    population distributions over wider distances (that is, wider
    market areas).

    The Twin Cities metropolitan area dominates statewide accessi-
    bility because the seven-county metropolitan area contains
    about half of Minnesota's population. In no other location in
    Minnesota can a parcel of land be accessed by as many people,
    with such ease, as in the metropolitan area. Outside the Twin
    Cities, accessibility falls off most slowly toward moderately
    dense population concentrations to the south and southeast.
    Local peaks of statewide accessibility are evident for Duluth,
    along the Iron Range, Fargo-Moorhead, Grand Forks-East Grand
    Forks, as well as for Mankato, Red Wing, Rochester, St. Cloud,
    Wabasha, and Winona.

    Accessibility by population changes as the settlement pattern
    changes. The most significant regional growth of the 1970's
    was in the Twin Cities - accounting for approximately 60
    percent of the state's net population gain (Figure 7). From
    1980 to 1995, the heaviest growth is projected to occur in the
    counties surrounding the Twin Cities; especially in those to
    the immediate north and northwest along the I-94 corridor to
    Stearns county.

b.   Accessibility of DNR-Administered Land:

The DNR-administered land base is heavily concentrated in the northcentral and northeastern regions of Minnesota. These regions are outside of the higher 1980 population density zones, outside of primary growth areas of the 1970's, and had generally low accessibility to the state's population in 1980. (Over 85 percent of DNR-administered lands are in areas where the 1980 population density was less than ten people per square mile.[1]) None of this is surprising, given the history of the land base. The DNR-administered land base has a greater ability to provide for land uses that require remoteness from the state's population, than for those uses requiring better access. This fact has significant implications for recreational suitability.

c.   Emphasis on Resource Accessibility in Recreation
       Management:

Recent years have witnessed significant change in the way state decisionmakers and the public view the role and importance of outdoor recreation in Minnesota. Outdoor recreational resource management is becoming more user- or consumer-oriented. By determining what outdoor recreationists prefer to do, and where, and by providing appropriate recreational settings, the quality of outdoor recreation management can be improved. Public agencies have begun to shift from policies directing managers to simply accommodate growing numbers of users to policies offering appropriate mixes of desired experiences. The DNR, as the state's primary vehicle for managing outdoor recreational resources and providing recreational facilities, is in a leading position to implement state recreation investment policy for the purpose of enhancing the lifestyle and economic well-being of the people.

2.   Recreation Suitability Assessment:

Evaluation of resource suitability for outdoor recreation is based on three factors. These were reached by consensus and include:

--   Variety in physical/cultural settings that provides an array of outdoor recreational opportunities (land use and road orientation);

--   Natural resource quality, based on physical site characteristics (topography, water type, vegetation, and climate); and

--   Outdoor recreation user demand information (including resource accessibility and regional resource scarcity).

---

[1] Public ownership data were taken from the Minnesota Land Management Information System (MLMIS). In MLMIS, public ownership overrides private ownership in labelling a parcel - regardless of whether the private party owns the majority of a parcel. This has been done for practical reasons. It would be a huge task to determine whether any public agency actually owns the majority of every parcel it has interest in, given the size of the public domain in Minnesota. Therefore, the quantity of public land is overestimated.

Figure 6

Population Density, 1980
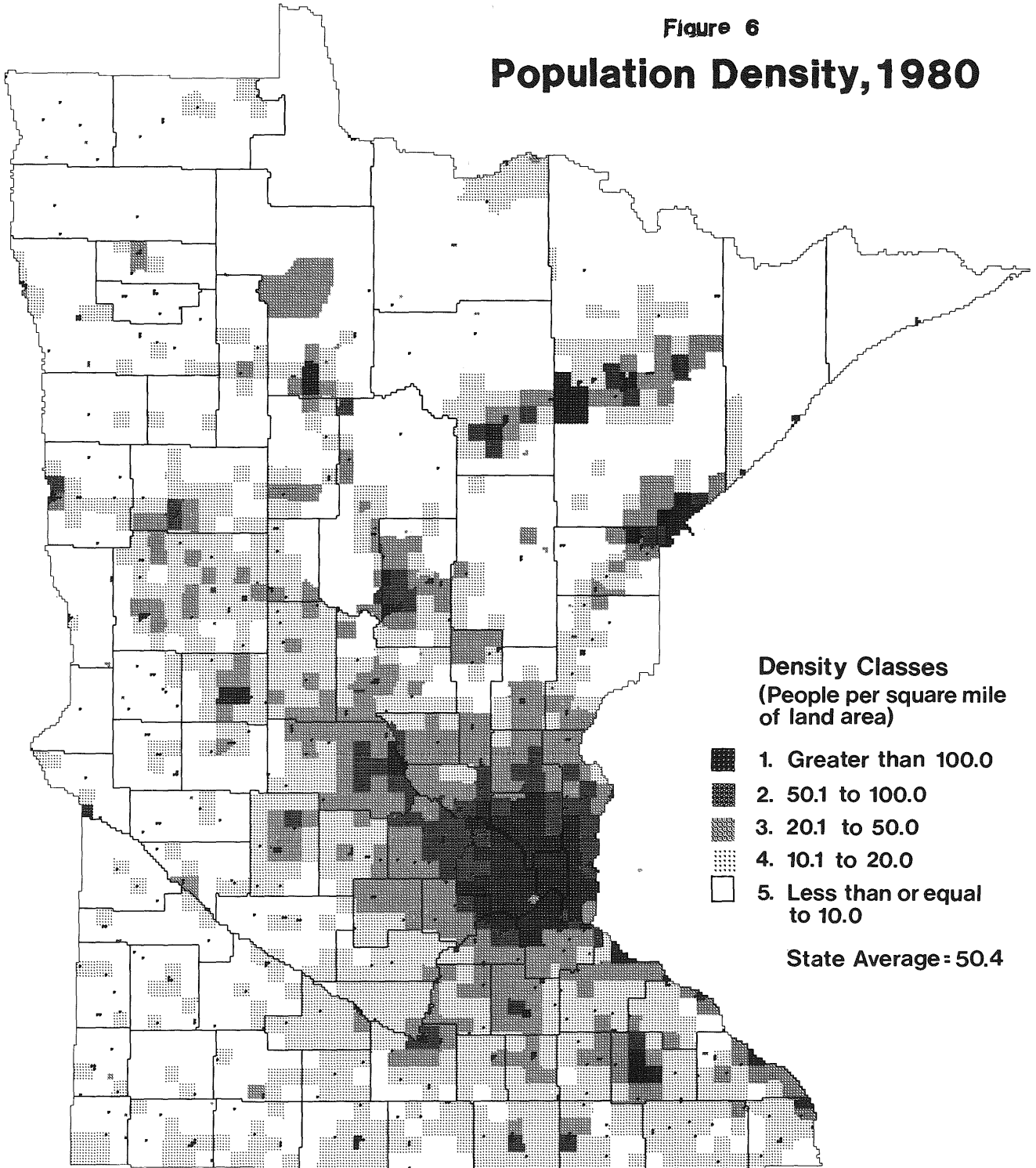
Density Classes
(People per square mile
of land area)

1. Greater than 100.0
2. 50.1 to 100.0
3. 20.1 to 50.0
4. 10.1 to 20.0
5. Less than or equal
   to 10.0

State Average = 50.4

Source: U.S. Department of Commerce, Bureau of the Census. 1981. 1980 Census of
Population and Housing.
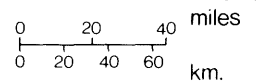
Figure 7

Population Density Change, 1970-1980
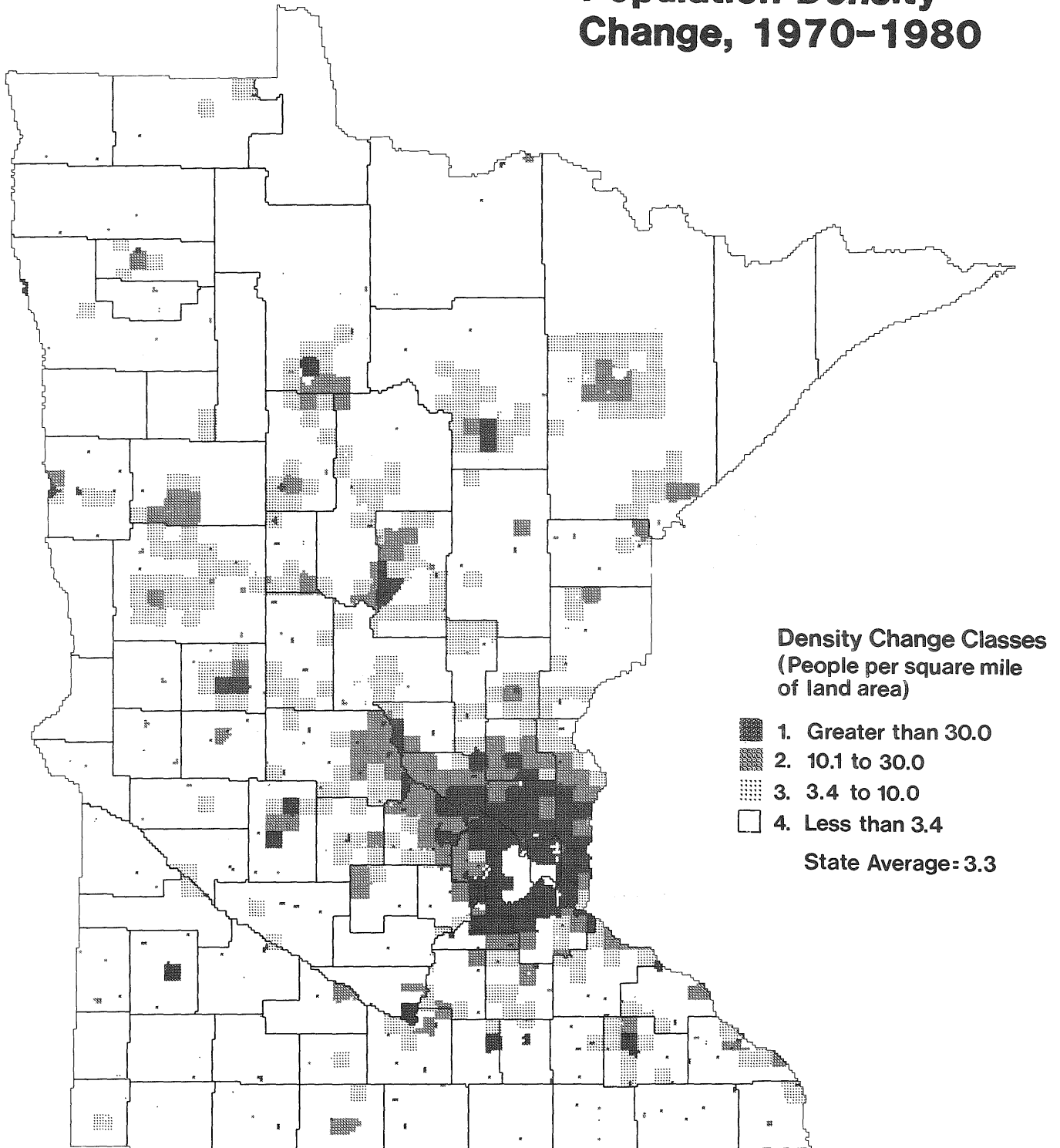
Density Change Classes
(People per square mile
of land area)

1. Greater than 30.0
2. 10.1 to 30.0
3. 3.4 to 10.0
4. Less than 3.4

State Average= 3.3

Source: U.S. Department of Commerce. Bureau of the Census. 1981. 1980 Census of
Population and Housing.

0   20   40 miles
0   20   40   60
km.

a.   Recreation Opportunity Spectrum:

Minnesota offers a wide variety of cultural and natural
resource settings for outdoor recreation. The Recreation
Opportunity Spectrum (ROS) encompasses the range of cultural
and natural resource settings, from the pristine to the urban.
ROS, developed by the U.S. Forest Service, was adapted by the
Suitability Project for Minnesota's range of recreational
opportunities (see MDNR, 1983b). The Suitability Project
created a computer-generated resource assessment, called
MN-ROS, of recreation settings that are characterized by
accessibility (road access) and the "naturalness" of the
landscape (land use/cover). A primitive setting has a natural
landscape (e.g., forest and marsh) and is remote from the road
network. As the landscape becomes more developed, and as road
access improves, the setting classification changes from the
semi-primitive to gradations of the natural, rural and
intensive.

This project's development of MN-ROS portrays the primary
elements of physical/cultural settings that relate to outdoor
recreation experiences. Thus, the ROS pattern represents
generalized resource potential. It characterizes the
predominant type of recreational setting in an area. It does
not represent existing development or management; neither
does it indicate that no other types of recreational settings
are available in the area.

In Minnesota, the more primitive settings are largely in the
forested zone to the north and northeast, especially in and
about the Boundary Waters Canoe Area Wilderness (BWCAW) and in
areas of concentrated public land ownership (Figure 7).
Natural settings occur within the more primitive areas, near
the periphery of cities and along road corridors; they
represent extensive areas along the southeastern and southern
periphery of the forest zone. Most of the rest of the state
is classified rural because of the large areas devoted to
agricultural activities in the native prairie and prairie-
forest transition zones. The intensive class occurs largely
in conjunction with urban areas, but also in conjunction with
extractive land uses, particularly on the Iron Range.

Of DNR-administered lands, almost 70 percent are in the
primitive and semi-primitive setting classes (accounting for
about one-third of all land in these categories).
(Seventy-seven percent of federal and 65 percent of county
lands are in these same setting categories.) One-fourth of
DNR-administered land is in the natural setting classes; less
than 10 percent is in the rural setting class (which accounts
for less than 2 percent of all land in this category,
statewide). In contrast, 97 percent of the land in the rural
setting class is privately-owned. This class characterizes
over 70 percent of the privately-owned land in the state.

b.   Natural Resource Quality:

Natural resource quality information is used to enhance the
MN-ROS setting classes in a manner that will demonstrate the
range of natural resource values within each class.   The
Suitability Project has added information on topography, water
orientation, lake type, river valley classes, and vegetation
or cover type descriptions to MN-ROS setting classes.   These
factors can be used to distinguish between parcels within a
given recreation setting class that possess desirable natural
features (e.g., hills, trees and water) and other parcels in
the same class that lack those features.   For example, because
appealing recreational resources are often in short supply in
the rural setting class, lake-oriented rural parcels with
topographic relief of greater than fifty feet may be of great
local value for recreation.

Combined with knowledge of existing development and
management, MN-ROS provides one-third of the information
necessary to match physical/cultural settings with
recreational demand.   In addition, facility or unit managers
need market research on their customer's motivations and
preferences and research on the carrying capacity of each
setting they administer.   To date, applications of MN-ROS have
largely been to describe shoreland resources (shoreland lot
development and river segments--see Zachmann, 1984), and for
discussions of scenic amenities in the state.

c.   User Demand Information--SCORP Surveys:

Demand for the outdoor recreational opportunities of a site
are affected by population accessibility, income, personal and
social preferences, rarity of the resource, and the location
and level of development of outdoor recreation facilities.
Analysis of these factors is complicated by the diversity of
recreation activities and experiences.

This diversity is reflected in the 1978 SCORP surveys, which
analyze patterns in recreational activities in the state.
Specifically, the surveys determined the amount of activity
participation, the distribution of activity participation
among demographic groups, the geographic patterns of
recreation participation, and the relationship between
geographic patterns of activity participation and home
locations of outdoor recreationists.[1]   Multi-township areas

---

[1]   Detailed information on the SCORP surveys can be found in: 1978
SCORP Surveys: an Overview, Minnesota Department of Natural
Resources, Office of Planning. Report Number 2317.   SCORP occasion
data published in the 1979 SCORP report are not directly comparable
to those figures reported in the 1985 document and elsewhere.   This
is due to three reasons.   First, non-resident activity data were
not included in the 1979 SCORP report data.   Non-resident data are
included in the 1985 data.   Second, the 1979 SCORP report's
projections used 1978 State Demographer's estimates of population
distribution which define present outdoor recreational amenity

used heavily for outdoor recreation by residents and non-residents have been delineated. These surveys indicate that the demographic structure of the population significantly correlates with participation rates. Most activities have definite participation rate peaks in certain age classes. Coupled with forecasted changes in the population age-class structure, the sex/age participation rate of each activity determines its projected statewide participation (in this case, to 1995 – but it can be done for almost any period of time using State Demographer projections).[2]

The growth of population within Minnesota has especially great implications for participation in activities occurring close to home.

---

areas. 1985 SCORP projections used 1980 U.S. Census figures and 1995 populations estimates from the State Demographer's office. Finally, the 1979 SCORP numbers represent total season activity occasions, while the 1985 report gives "average weekly" participation values for summer and winter recreation seasons.

[2] Statewide projections of future participation depend on the age-class location of the peak, the concentration of participation in the peak, and the length of the forecast (i.e., how far population bulges are rolled into the future). The projections use a conditional framework. Conditional projections say that _if_ factor 1 and 2 change as specified (and _if_ we can measure their given relationship) _then_ we can present some version of the future. The projection methodology applied here to assess change in resident activity participation from 1980 to 1995 is to hold activity participation rates from the 1978 SCORP survey constant and roll participation forward using available population forecasts for age, sex and residence. (The 1978 sample data have been made equivalent to the 1980 U.S. Census and are used as 1980 data.)

In 1980, the population distribution displays the normal tapering in the older age brackets, a uniform distribution between 35 and 60, a large bulge in young adults (the "baby boom" generation), and a tapering from the young adults into the youngest age brackets (the "baby bust" generation). In 1995, the expected elderly age brackets show moderate increases, and the baby boom generation produces major increases in the middle age brackets. Moderate increases are found in the youngest age brackets, which represent the children of the baby boom generation (the "echo boom" generation).

However, areas of population increase will have less influence on the locations of participation gains for activities that generate frequent, long-distance travel.[3] More than 30 percent of all backpacking, camping, summer fishing, boating, and hunting (waterfowl and big game mammals) occurs at distances greater than 75 miles from home. For camping, summer fishing, and boating, Twin Cities metropolitan residents travel considerably farther from home than nonmetro residents (though at least 50 percent of all resident participation for these activities occurs within 75 miles of home).

Participation by state residents in summer fishing, boating, and camping is expected to grow at about the same rate as the state's population (10.4 percent), due to the uniformity of participation rates across age classes. Canoeing and swimming have moderate projected percentage participation increases. Although canoeing has its largest participation rate in the age classes forecasted to experience the largest population declines, it has enough participation in the age classes forecasted to have the largest population gains that its projected participation increase is of moderate size. Cross-country skiing has the largest projected percentage participation rise for winter activities. This is accounted for by higher participation rates in the age classes of the baby boom generation than in the age classes of the baby bust generation.

Nonresidents' participation in recreation activities are quite similar to those of Minnesotans on vacation. They are avid campers, participate heavily in water-oriented activities and are frequent visitors at historic sites. (Fishing, which dominates now, has by far the greatest forecasted increase in nonresident activity. Camping and boating, both popular today, are projected to have the next largest increases in activity occasions.) Out-of-state tourists are drawn to Minnesota by resources for which the state is renowned: inland lakes and primitive north-woods settings (Lake Superior's North Shore and the BWCAW region)--40 percent of nonresident outdoor recreation activity occasions in 1978 occurred within ten miles of the BWCAW or the North Shore (SCORP, 1985). Other tourist magnets are the Twin Cities and the state's major lake regions.

---

[3] Activities for which people will travel a great distance were identified on the basis of actual resident travel distances (and on high nonresident participation). All other activities have a greater proportion of participation near home and, therefore, have distribution patterns with a large population-based component. Activities have been further subdivided on the basis of resident age class participation rates, to directly link population patterns to activity origins (home locations).

Figure 8

Minnesota Recreation Opportunity Spectrum
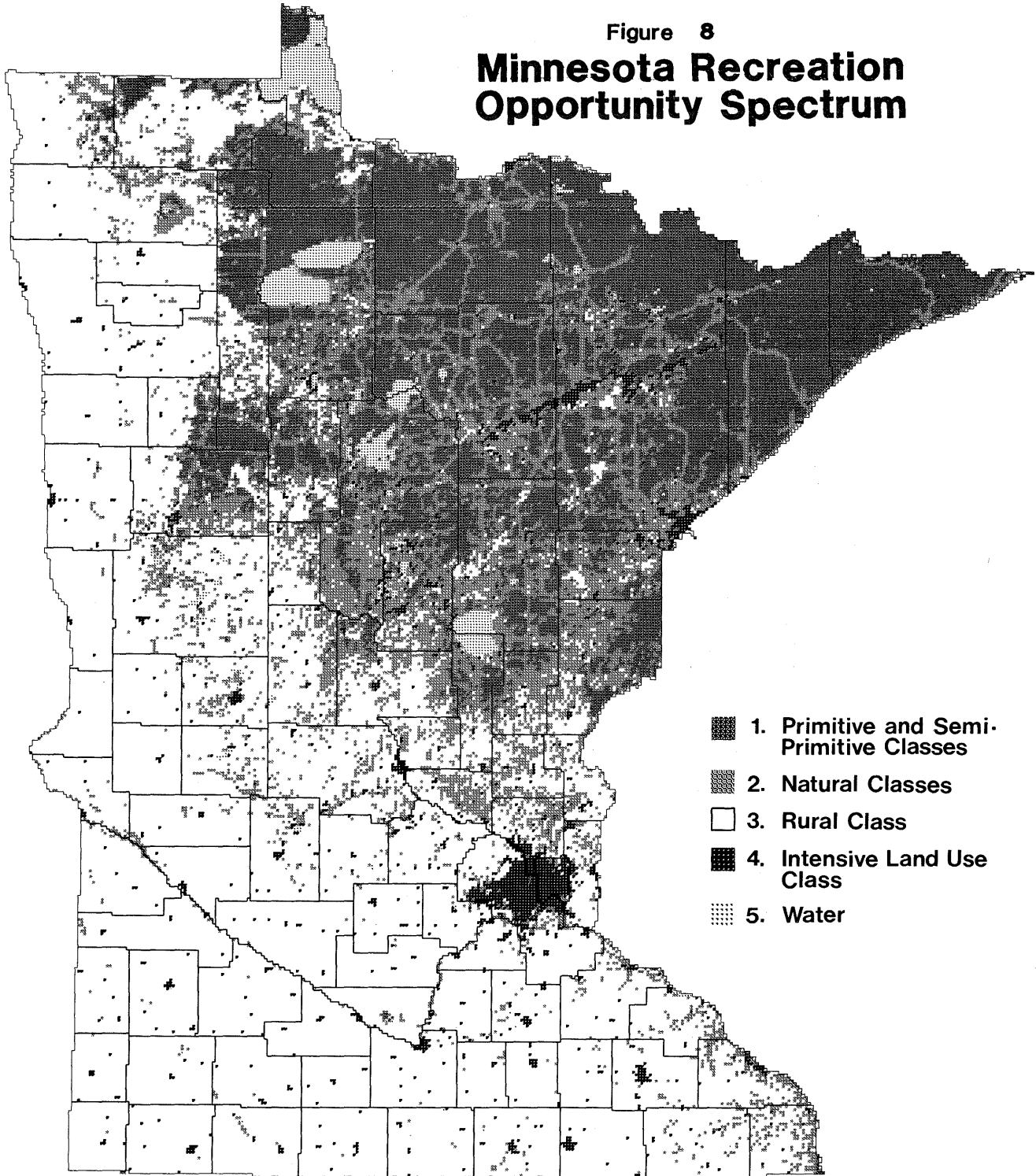
1. **Primitive and Semi-Primitive Classes**
2. **Natural Classes**
3. **Rural Class**
4. **Intensive Land Use Class**
5. **Water**

```
0        20        40   miles
0   20   40   60
                      km.
```
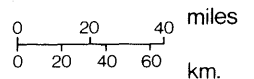
d. Time Investment Approach to Evaluation of User Demand:

SCORP's average weekly activity occasion assessments portray outdoor recreation across the state in terms of the numbers of visits made to a given township.[1] A person who fishes and camps in one day would be counted as having two activity occasions. Since SCORP demonstrates that varying amounts of time are spent in different outdoor recreation activities, a better measure of outdoor recreation demand is to calculate the total time spent by participants for each recreation activity. Thus, "time investment" (TI) calculations have been made for each township in the state. These sum the time reported spent by all participants recreating in the township--for all SCORP activities (time spent in travel can also be added to this value).[2]

To demonstrate time investment, twenty-one activities were selected for being predominantly "natural resource" oriented.[3] Figure 9 illustrates the projected 1995 total time distributed across the state for all of these activities. Table 3 indicates the distribution of DNR-administered lands among the

---

[1] One "occasion" for an activity is one person participating in that activity during one day. In that day, the one occasion could have occurred in a single continuous time period or in more than one time period. If on a particular day, a person participated in more than one activity, one occasion is reported for each of the activities. The problem this causes in double, triple,..., counting people who participate in more than one activity per day is avoided with the time investment assessment approach.

[2] SCORP's "time investment" models are based on "travel cost" methods. These approaches explicitly recognize that there is a spatial characteristic to the outdoor recreation market, beyond that of natural resource distributions. That is, each individual recreator faces a different range of alternative recreation sites and costs depending upon the location of his/her home. See Yardas and others (1982) for an excellent discussion of this method for evaluating recreation demand.

[3] The twenty-one activities and their 1980 percentages of total time invested, across the state, are: (1) summer fishing (21.12%); (2) camping (13.38%); (3) swimming (13.15%); (4) boating (12.42%); (5) picnicking (6.88%); (6) snowmobiling (5.91%); (7) winter fishing (5.22%); (8) big game mammal hunting (3.57%); (9) canoeing (2.99%); (10) other game bird hunting (2.76%); (11) hiking (2.62%); (12) cross-country skiing (2.34%); (13) waterfowl hunting (1.86%); (14) nature-study (1.55%); (15) visiting historic sites (1.55%); (16) horse-back riding (1.09%); (17) backpacking (0.83%); (18) summer orienteering (0.44%); (19) snowshoeing (0.27%); (20) dog sledding (0.02%); and (21) ice boating (0.01%).

Projected Demand Areas, 1995:
Time Spent in 21 Natural Resource-
Oriented, Outdoor Recreational Activities

Figure 9
Percentage of Statewide Demand

Upper 50 Percent of State Total

Next Highest 26 Percent

All Other Lands

Note: Information on recreational activities and projections,
see SCORP, 1985.
Source: Minnesota Department of Natural Resources, 1985.

Projected Demand Increase in **Growth** Area, 1980-1995: Time Spent in 21 Natural Resource-Oriented Outdoor Recreational Activities

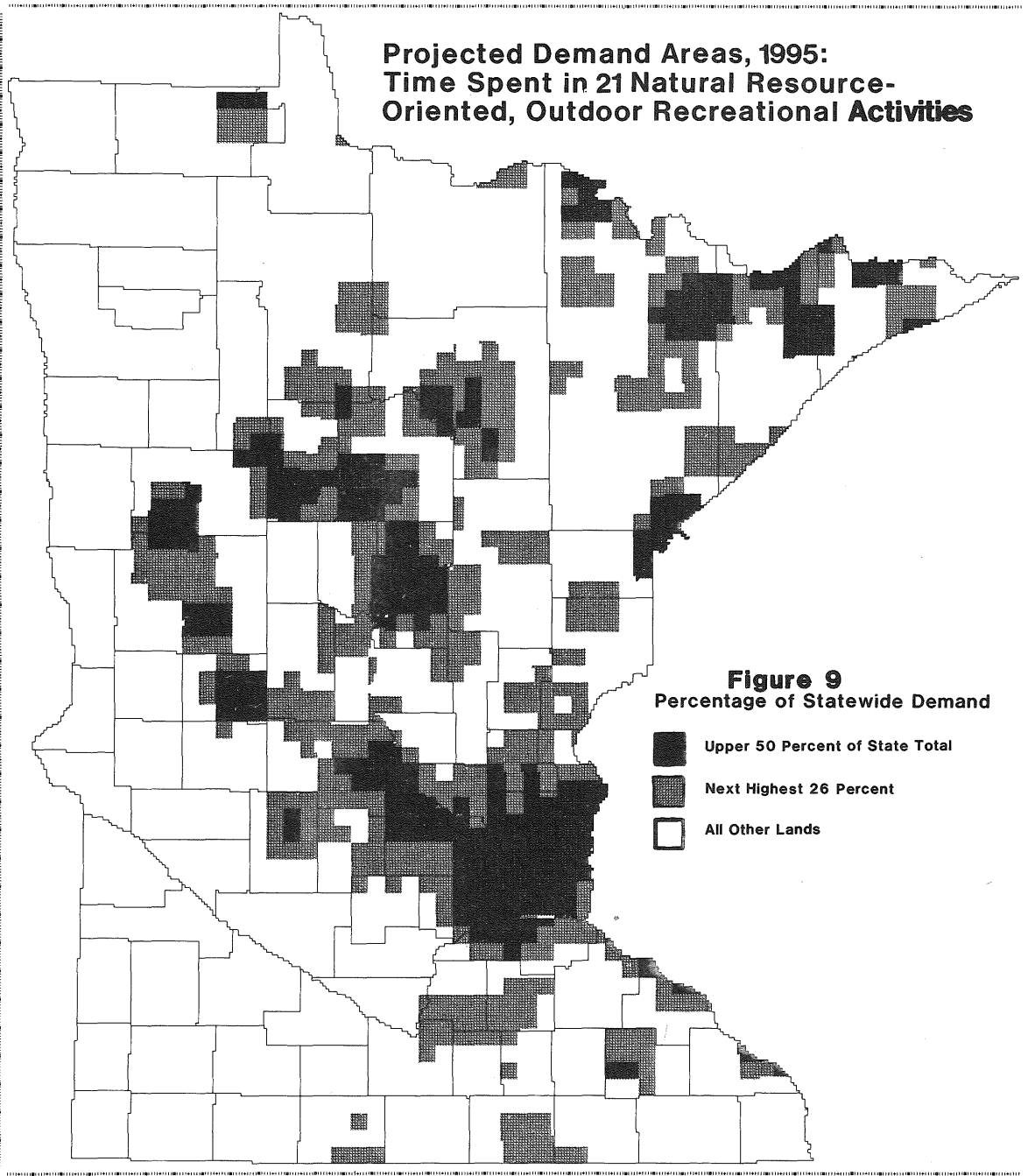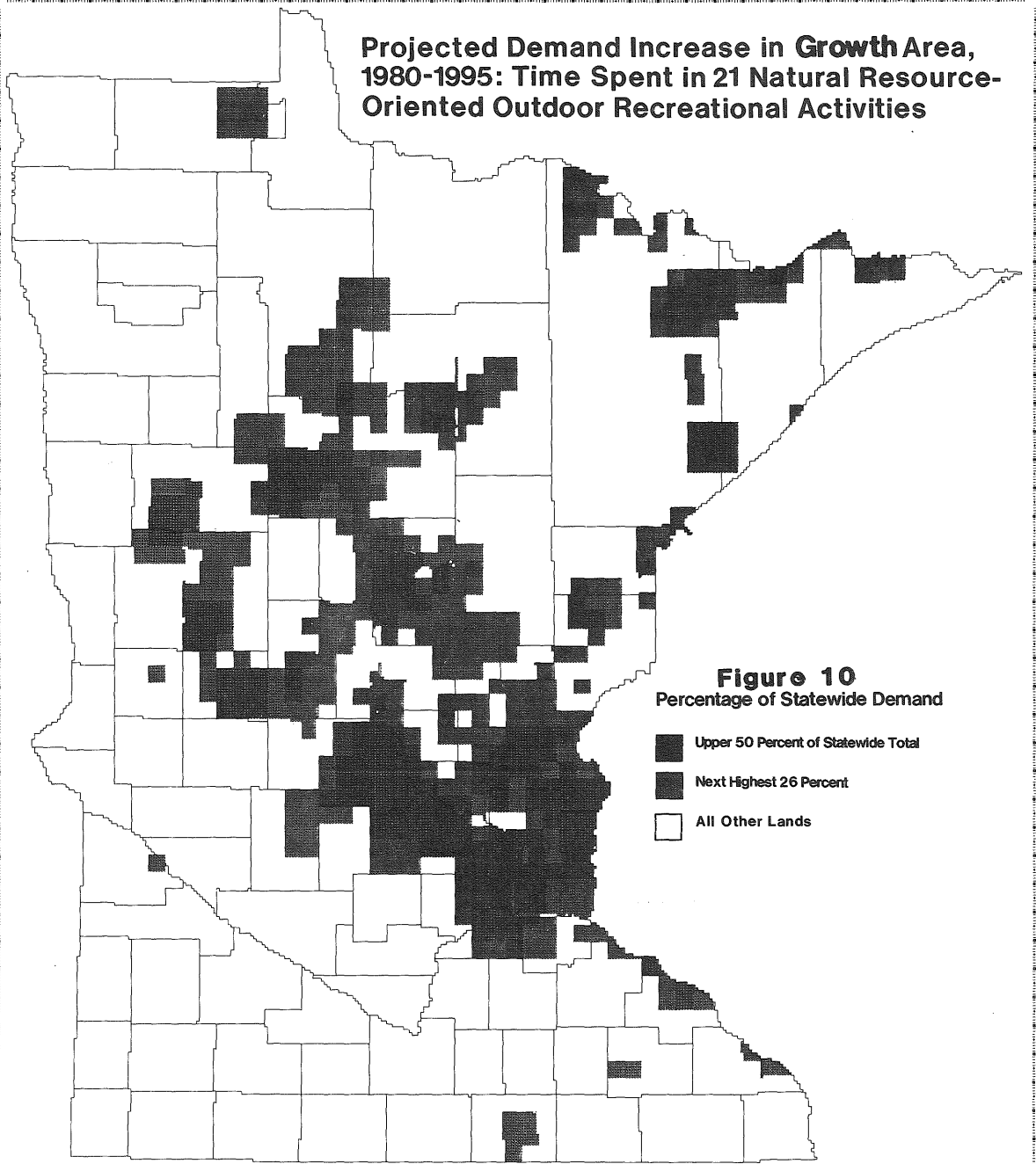**Figure 10**
Percentage of Statewide Demand

Upper 50 Percent of Statewide Total

Next Highest 26 Percent

All Other Lands

Note: Information on activities and projections see   SCORP, 1985.

Source: Minnesota Department of Natural Resources, 1985.

different demand classes. Demand classes tend to reflect the distribution of the major lake regions and population concentrations. This is because four activities – summer fishing, swimming, boating, and camping – make up about 60 percent of the statewide total outdoor recreation participation in 1980 and for the 1995 projections. For three of them – summer fishing, swimming, and boating – over 65 percent of the total participation by residents occurs within 75 miles of home. (Over 80 percent of swimming occurs within 25 miles of home.) Lake and river-oriented recreation has been and is projected to remain important to outdoor recreation in Minnesota.

The greatest projected growth for the selected activities is expected in the areas to the immediate north and northwest of the Twin Cities, around the north-central morainic lakes, and along the Canadian border lakes in the northeast (Table 4 and Figure 10). This clearly portrays areas of projected increases in population (surrounding the Twin Cities metropolitan area) as well as the major natural resource amenity areas (the western and north-central morainic lakes and in the Arrowhead). It also demonstrates that a large share of outdoor recreation activity is expected to occur close to home.

The analysis of 1995 projected recreation demand and projected 1980-1995 demand growth areas reveals that:

--   Twenty percent of DNR-administered land is within the two highest projected demand zones, which account for 75 percent of projected recreational activity, statewide. DNR Region II has about half of the parcels in these zones, while DNR Regions I and III have about 20 percent each.

--   In contrast, about 25 percent of the private, 33 percent of the county, and 45 percent of the federal lands are in these same categories. Yet, less than 10 percent of all land in the top two demand classes is administered by the DNR. This compares to 70 percent of these same categories found in private, 6 percent in county, and 10 percent in federal ownership.

--   About 16 percent of DNR-administered land is within the highest two projected growth classes, compared to about 22 percent of private, 26 percent of county, and 27 percent of federal land. Again, less than 10 percent of all land in these top two growth classes is administered by the DNR. This is in contrast to over 70 percent found in private, about 7 percent in county, and 8 percent in federal ownerships.

A statistical analysis (linear regression) was done to see how well the 1980 time-in-activity distribution accounts for the 1980-1995 projected growth area pattern. Areas where growth

is expected to to be faster or slower than average are
depicted in Figure 11. The north-central lakes region, near
Duluth along the major travel routes, along the St. Croix
River in Chisago County, the counties northwest (along the I94
highway corridor) and immediately surrounding the Twin Cities,
and around Lake Pepin in the southeast, are expected to grow
faster than the rest of the state (because of population
growth in these areas). On the other hand, participation in
the Twin Cities, Duluth, Grand Marais and the BWCAW areas is
expected to grow more slowly than average.

In most of the fast growth areas, the density of DNR-
administered land is relatively low. This suggests that
high-quality natural resources administered by the DNR in
these areas may become increasingly valuable for recreation as
resources in other ownerships are more heavily utilized or
developed for other purposes.

3.   Conclusions Regarding Suitability For Recreation Management.

   a.   Recreation Suitability of DNR-Administered Land:

   Minnesotans participate heavily in water-based recreation and
   travel longer distances for water-based recreation than for
   land-based recreation. Even for water-based recreation,
   however, the bulk of participation by residents occurs within
   moderate travel distance from home. This suggests that
   resource acquisition, development and redevelopment by the DNR
   should focus on water-oriented facilities. It suggests
   further that the major lake regions of the state (primary
   vacation/tourism areas), and areas near expanding population
   centers, should be targeted (see Figure 11).

   Based on the assessments of resource potential and recreation
   demand discussed above, it appears that:

   --   DNR-administered land with high suitability for natural
        resource-based outdoor recreation is concentrated in the
        north-central lakes area, along the North Shore, in the
        boundary lakes vicinity, and other areas where opportunities
        exist for water-based recreation amid scenic surroundings in
        relatively close proximity to population centers.

   --   About 16 percent of all DNR-administered land is
        primitive or natural in character (i.e., relatively
        undeveloped) and lies within current and projected high
        recreational use areas. Almost half of this land has
        moderate to high topographical relief (i.e., hills and/or
        valleys that add to scenic diversity). These areas could
        be further evaluated as to their water orientation with
        the shoreland data base.

   --   11 percent of DNR-administered land is potentially suited
        to natural resource-based recreation because of its high
        resource quality (i.e., "primitive" to "natural" land

Areas of Faster or Slower-Than-Average Expected Growth in Recreation Demand for 21 Activities, 1980-1995
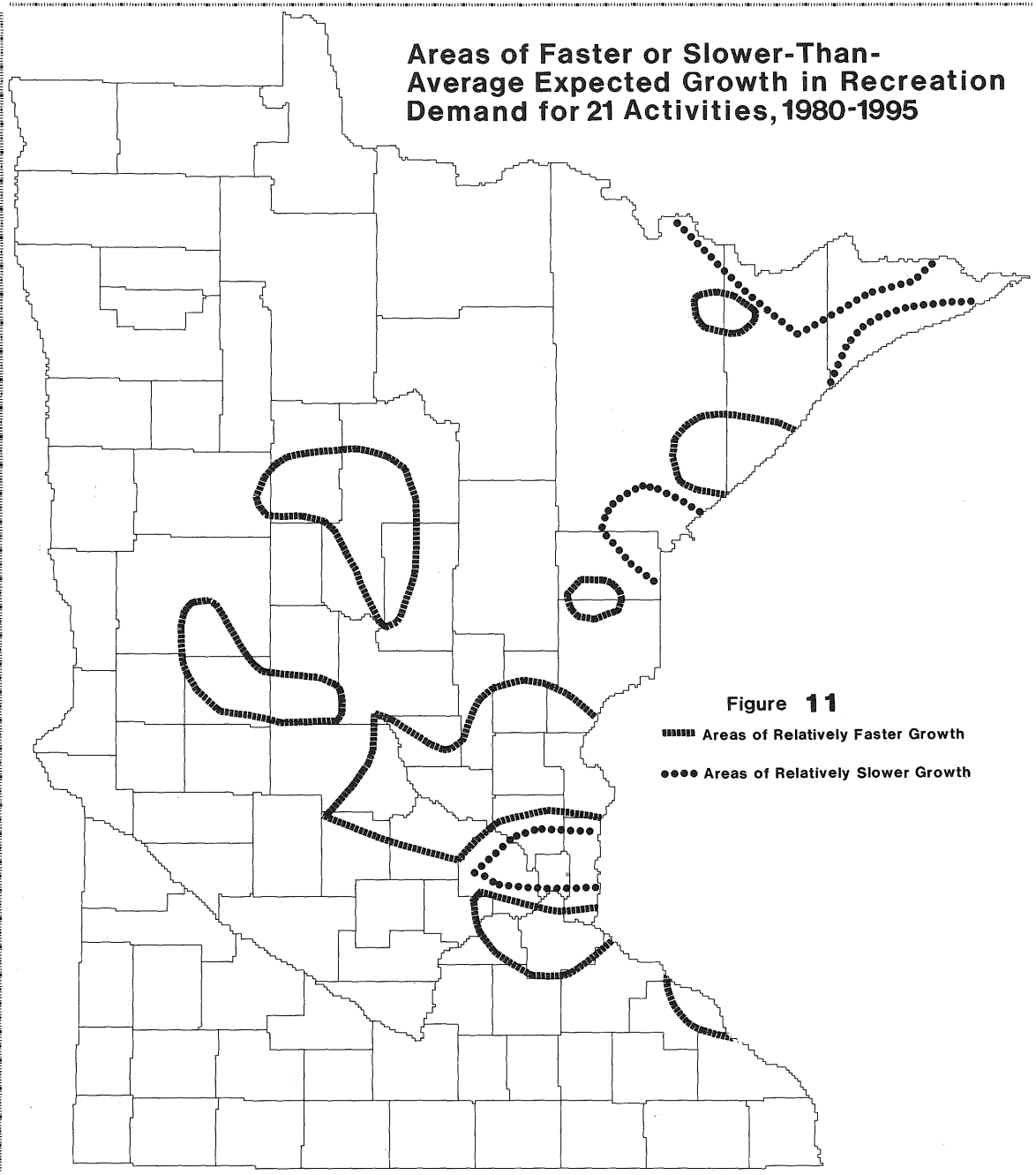
Figure **11**

▨▨▨▨ Areas of Relatively Faster Growth

●●●● Areas of Relatively Slower Growth

Note: Information on activities and projection, see **SCORP, 1985.**

Source: Minnesota Department of Narural Resources, 1985.

Table 3
1995 Projected Recreational Demand Class
for DNR-Administered Land by DNR Region*
(in number of forty-acre parcels)

DNR Regions	Demand Class					
	Lowest 4% of State Total	Next Highest 7%	Next Highest 13%	Next Highest 26%	Upper 50% of State Total	Totals
I	32,103	3,973	2,741	4,306	2,237	45,360
II	30,369	13,237	13,179	9,381	4,305	70,471
III	1,740	4,618	3,124	3,874	1,769	15,125
IV	2,111	1,518	896	566	38	5,129
V	321	782	1,375	590	139	3,207
VI	8	25	-	300	829	1,162
Totals	66,652	24,153	21,315	19,017	9,317	140,454

Table 4
1980-1995 Projected Recreational Demand Growth Class
for DNR-Administered Land by DNR Region*
(in number of forty-acre parcels)

DNR Regions	1980-1995 Projected Statewide Growth Areas					
	Lowest 4% of State Total	Next Highest 7%	Next Highest 13%	Next Highest 26%	Upper 50% of State Total	Totals
I	30,483	6,381	2,180	4,450	1,866	45,360
II	44,171	11,439	7,521	3,689	3,651	70,471
III	1,635	2,532	4,373	4,689	1,896	15,125
IV	3,843	621	421	242	2	5,129
V	924	1,156	686	289	152	3,207
VI	54	144	8	180	776	1,162
Totals	81,110	22,273	15,189	13,539	8,343	140,454

* Both tables are for twenty-one outdoor recreational activities.
  1985 SCORP describes sampling information. (Source: Minnesota
  Department of Natural Resources, 1985)

classes with moderate to high relief), but is outside
high demand areas. Some of these sites may actually be
utilized by the public more than the use projections
suggest. Others might be better utilized by providing
the public with more information about their
availability, investing in development of facilities to
attract users, or by improving accessibility by potential
users.

-- Some potentially high-value recreation land is found
outside areas of high recreation demand. Delineation of
demand areas, as done here, may sometimes overlook sites
with regional importance in areas with generally low
recreational use. This is reflected in the fact that
about half of Minnesota's state parks are in low to
moderate demand areas, including most of the state parks
in the southern and western parts of the state. These
facilities can provide valuable recreational
opportunities not adequately accounted for in this
re-creation demand analysis.

-- While over 90 percent of DNR-administered land is
characterized as "primitive", "semi-primitive" or
"natural", much of it is not well suited to use for many
of the most popular recreational activities (although it
may serve other important resource management purposes,
such as wildlife habitat protection). Sixty-three
percent--58 percent of all DNR-administered land--has
little relief (i.e., is flat and usually wet) and is
outside areas of high projected demand for recreation.

Less than 10 percent of all land in projected high demand
growth areas is DNR-administered. High-quality natural
resources administered by the DNR in these areas may be-
come increasingly valuable for public recreation as land
in other ownerships receives heavier use or is developed
for other purposes.

In view of these findings, future public facility development,
and land acquisition associated with such development, is
required to meet anticipated recreation needs. Existing
public lands, although they will continue to provide important
recreation opportunities, may not be adequate for these
expected needs, because they are limited by resource types and
by location relative to population centers. Much of the
public land base, as illustrated above, is within primitive
and semi-primitive settings that are well removed from
Minnesota residents and areas of high recreation demand. In
addition, key recreation parcels, such as potential water
access sites, cannot be provided with existing public lands.

b.   The DNR's Role in Recreation Management:

Although there is considerable overlap between governmental
jurisdictions, a hierarchy of responsibility exists based on
the trade-offs between providing resource-oriented, as opposed

-67-

to people-oriented, outdoor recreational needs. At one end of
the scale is the totally resource-oriented recreation
experience provided by the federal National Wilderness System.
At the other end of the scale are municipalities, which
provide people-oriented experiences through a system of local
parks and playgrounds. The DNR role lies somewhere between
the two. Its objective is to provide a variety of outdoor
recreation opportunities that are both high in resource
quality and generally accessible to the state's population.

Recreation facilities generally address distinct outdoor
recreation activities. For example, water access sites
provide facilities for boat launching, but usually not for
camping or swimming. In contrast, state forests and other,
similar units (e.g., some of the larger Wildlife Management
Area's - WMA's) are multi-functional. They become
recreational "commons" in that they can serve outdoor recrea-
tion needs that are not (or, in some cases, are) currently
being met by other outdoor recreation facilities. However,
their usefulness can be severely impaired or destroyed if they
are not properly planned and managed. This is an especially
critical concern in that these units will be subject to
increasing, diverse pressures in the future, as recreational
use expands.

Average weekly activity occasion data have been summarized for
several geographic scales (e.g., DNR region, forest
administrative area, county, etc.) for unit planning purposes
(MDNR, 1985b). This can be done for any specified geographic
area in the state, with any of the available data. (Aside
from collecting new survey data, SCORP projections could be
modified by accommodating known trends in the participation
rates of activities. This might give a better portrayal of
both current and projected use levels for those activites that
have gained popularity since 1978.) By looking at the mix of
major and minor activities found to occur within any region
(or any definable geographic area) and its adjacent units, it
is possible to better value an area's resource qualities and
use capabilities.

D.   RESOURCE ASSESSMENT FOR WILDLIFE HABITAT.

DNR has broad responsibilities for managing the wildlife resources of
Minnesota. The legislature has mandated that DNR be responsible for
management of all wild animals and certain rare and endangered plants
and natural communities (Mn. St. Chapters 97-102). Traditional wildlife
management focused on wildlife resources that were commercially or
recreationally hunted, trapped or fished. With increasing concern for
environmental and non-consumptive wildlife resource values, DNR
management focus has broadened to include nongame wildlife and sensitive
ecosystems.

Meeting society's growing demand for wildlife resources is a difficult
challenge. Resource managers and users must understand the factors
contributing to the supply and demand for wildlife resources. Managers
need to improve or protect existing wildlife habitat in order to
increase or maintain populations of desired species. They must also
improve opportunities for people to participate in wildlife-associated
recreation, often by providing better access to wildlife resources.

The DNR Division of Fish and Wildlife has explicit responsibility for
wildlife resource management. The division has direct management
control of 500,000 acres of land. It must receive cooperation from
other DNR divisions, other government agencies, and private citizens in
order to accomplish its goal of maintaining and improving Minnesota
wildlife resources.

1.   Overview--Wildlife Habitat and Land Use Activities.

Theoretically, every animal species requires unique arrangements of
food, cover and water to meet its biological needs. Such
arrangements are termed a species habitat. Within a given area of
land, habitats for different species can exist.

Specific vegetation patterns determine the variety of habitats in a
given area. Vegetation patterns are products of abiotic parameters
(climate, topography, soils, water, and sometimes fire) and human land
use activities. By understanding vegetation patterns of a given area,
insight can be gained into the area's wildlife habitats.

Historically, most regions of the state provided quite different
wildlife habitats than currently exist. Settlement by Europeans
changed vegetation patterns dramatically, and these changes
significantly affected distribution of wildlife resources.
Caribou, elk and cougar disappeared from the forests and the
trumpeter swan and whooping crane disappeared from the prairies of
Minnesota. Other species supported by these new environments
flourished, including white-tailed deer. Previously concentrated
in the transition areas between the prairie and deciduous forest,
white-tailed deer currently find good habitat in some northern and
southern portions of the state.

Land use activities and land use changes continue to alter wildlife
habitats in the state. Agricultural intensification alters habitat
available for important wildlife species, such as waterfowl and
pheasant, by altering the character of agriculture from diverse cropping

patterns on small farms to monotypic cropping on large farms. In addition, intensification often results in drainage of wetlands and riparian areas and removal of woodlots and shelterbelts. Although these are not land use practice conversions per se, the damages to wildlife populations can be equally devastating. This has been especially significant in changing wildlife habitats in the southern and western regions of the state.

Commercial, residential, recreation, and other infrastructure developments are also changing wildlife habitat. Intensive development is expanding northwestward from the Twin Cities. Lake areas form attractive recreational settings, and seasonal lakeshore development is changing wildlife habitat for many species. In some areas, lakeshore development is expanding from large lakes to smaller, shallower lakes that used to provide relatively undisturbed habitats. Expansion of recreation and residential land use is limiting habitat for species preferring unbroken forest cover or distance from human activity.

Timber management has a significant influence on wildlife habitat in forested areas. Timber harvest and timber regeneration all create changes in wildlife habitat. If well planned and effecting favorable cover-types (such as aspen-birch or aspen-fir), these practices can have very positive benefits. However, the permanent loss of forest cover through conversion to other land uses and aging aspen forests and forest encroachment on grassland and brushland habitats that are no longer maintained naturally by wildfire, are major management concerns.

2.   Wildlife Habitat Suitability Assessment.

a.   Identifying Supply of Wildlife Habitat:

One approach to quantifying the supply of wildlife habitat is to develop and use species habitat models. Habitat modeling, developed by the Suitability Project, involves application of particular species requirements to automated resource information. Areas identified in the modeling process can be targeted for site investigation which can provide more precise determination of the amount and quality of habitat.

The Suitability Project has produced habitat models for these species: ring-necked pheasant, prairie chicken, white-tailed deer, sharp-tailed grouse, ruffed grouse, moose, bear, bobcat, waterfowl, red-shouldered hawk, sandhill crane, and bald eagle. They were chosen because they are important game and nongame species. However, they do not represent the only species or habitats of concern to DNR's wildlife management.

The models are based on wildlife population inventories and automated land use data available through MLMIS. Available information on land cover and land use, special inventory data, and population census data were combined with species population ranges to construct models and produce maps identifying species habitats. Species' primary and secondary ranges were delineated based on historical and existing wildlife populations and habitats.

Certain limitations in the habitat models should be stressed. Comprehensive habitat evaluation requires detailed information on species habitat requirements, such as composition and arrangement of plant communities, availability of water, location of specific topographic features, and climatic constraints. This detailed re-source information must be accurate and up-to-date. Such detailed resource descriptions are not available in automated systems. Available data on vegetative cover and land use were collected for purposes other than wildlife habitat assessment and were collected over ten years ago. They do not adequately describe all of the ecological relationships critical to wildlife species' use of an area. In many cases, occurrence of species habitat requirements was inferred by project staff from available information, rather than being identified directly in resource data.

Additionally, a great deal of information pertinent to habitat evaluation is missing from the analysis. The following is a partial list of valuable habitat components and plant communities not currently identifiable (or only partially so) with automated data but that often impart great wildlife habitat value to a given area of land: wetlands (types 1-6); islands; unvegetated sandy beaches; stream valley woodlands; small woodlands, shelterbelts, and windrows; mature hardwoods; old growth forest; ledges, cliffs, caves, and rocky outcrops; grasslands, old fields, agricultural cropping patterns or the timing of land disturbance for agriculture.

This requires that caution be exercised when using the Project's habitat models. The models do not predict size or occurrence of wildlife populations. They do indicate where management effort might be able to enhance species' populations through habitat management. They should be used only as general indicators of habitat location. Model results must be interpreted by resource managers familiar with specific areas under analysis. Such model interpretation can be accomplished during divisional planning efforts that develop management strategies for specific areas.

Figure 12 provides an example of the Project's habitat modeling effort. The figure displays potential habitat for white-tailed deer. The deer habitat model uses preferred vegetation cover types for summer habitat (aspen-birch, oak) and winter habitat (spruce-fir, forested riparian areas) in combination with deer population census data. The deer habitat model illustrates the following:

1. in the predominantly agricultural south and west, the primary winter deer habitat is found along streams and rivers with forest cover;

2. similarly, in the transition area, high value deer habitat is located where topography limits intensive land uses;

3. good deer habitat is concentrated in the northern forest where aspen or spruce-fir predominate.

An index of remoteness from human populations was developed when modeling black bear and bobcat habitats. Remoteness was based on

MLMIS land use information and U.S. Census data. It is an
important feature of these species habitat models, but it also has
broader implications for wildlife. In general, remote areas suffer
less ecological disturbance than areas heavily, or even moderately,
populated by humans. Thus, they often provide sanctuaries for
wildlife where fewer human/wildlife conflicts are likely to occur.
Maintenance of remote areas is becoming a problem in some areas due
to the expansion of intensive development. Identification of
existing remote areas can provide managers with insight into areas
worthy of special consideration when developing regional management
strategies.

Special inventory data can also be used to develop regional
perspectives on supply of specific wildlife resources. The Natural
Heritage Program (NHP) maintains a data base containing sightings,
nesting sites and specialized habitats used by endangered and
threatened animal species, plant species and natural communities.
Another source of specialized inventory data is the location of
deer winter concentration areas. These are areas that provide
critical winter cover for large numbers of white-tailed deer.

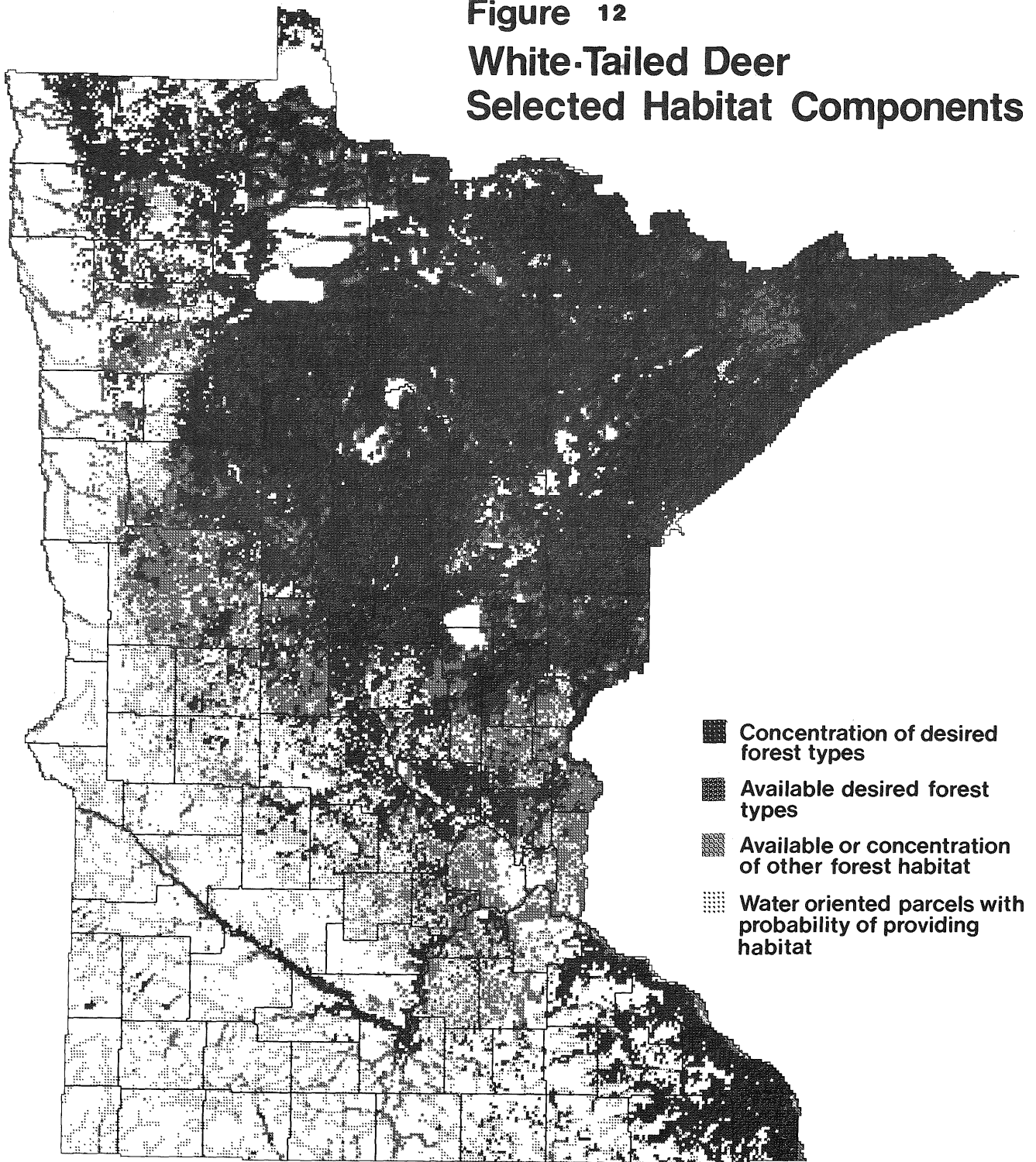b.   Identifying Demand for Wildlife Resource Use:

Wildlife-associated recreation (e.g., hunting and birdwatching) is
very popular in Minnesota. Visitors, as well as residents, enjoy
opportunities to use the wildlife resources of the state. Wildlife
resource supplies may be inferred from wildlife-associated recreation
use patterns. People plan wildlife-associated recreation on land where
they have access and where they believe wildlife resources exist.

Suitability Project and SCORP information can be used to display
use patterns for some wildlife-associated recreation activities.
These activities include hunting and birdwatching/nature study.
The information also allows anticipation of changes in those use
patterns over several decades by projecting use patterns based on
U.S. Census population projections.

Hunting information was generated from the results of a two-step
recreation survey taken in 1978. Information on the location of
hunting activity and demographics of hunters was obtained. Three
groups of hunting activities were analyzed: big game, waterfowl,
and upland game birds. The patterns generated from this analysis
reflect not only wildlife resources and amount of huntable land,
but to some degree they also reflect hunting season regulations in
effect during 1978. It is important to understand that new hunting
regulations might direct resource use pressures to other areas of
the state. Determination of resource use patterns through surveys
and other research techniques should be an on-going process in
order to maintain an accurate picture of use pressure.

Figures 13-15 display the aggregate amounts of time that
individuals reportedly spent hunting big game, waterfowl, and
upland game birds, respectively. The maps delineate multi-township
areas that received a certain percentage of the total time
individuals spent hunting in the state. These delineations are
based on the amount of time reported for hunting in the 1985 SCORP
survey.

Figure 12
White-Tailed Deer
Selected Habitat Components

■ Concentration of desired
forest types

■ Available desired forest
types

▨ Available or concentration
of other forest habitat

⋮⋮ Water oriented parcels with
probability of providing
habitat

Source: Minnesota Department of Natural Resources, **1983.**

miles
0   20   40
0   20   40   60
km.

Figure 13 displays the aggregate amount of time that individuals spent hunting big game. Big game hunting is dominated by white-tailed deer. Most big game hunting occurred in the forest zone where deer have their highest population per square mile. The resource use pattern also reflects concentration of publicly-owned land in the northern forest area, where hunting is permitted.

Outside the forest zone, use patterns are concentrated around major state and federal wildlife management land (e.g., Sherburne National Wildlife Refuge and Carlos Avery State Wildlife Management Area, both north of the Twin Cities). 1978 was the first year in which central Minnesota (deer hunting zone 2 - transition zone) was subject to antlerless deer permit regulations. Since a more uniform pattern of regulation currently exists, the concentration of big game hunting in the northeast might have diminished somewhat since 1978. Similarly, the deer hunting season was shortest in the agricultural and southeastern regions of the state in 1978. As season lengths change in these areas, hunting patterns might also change.
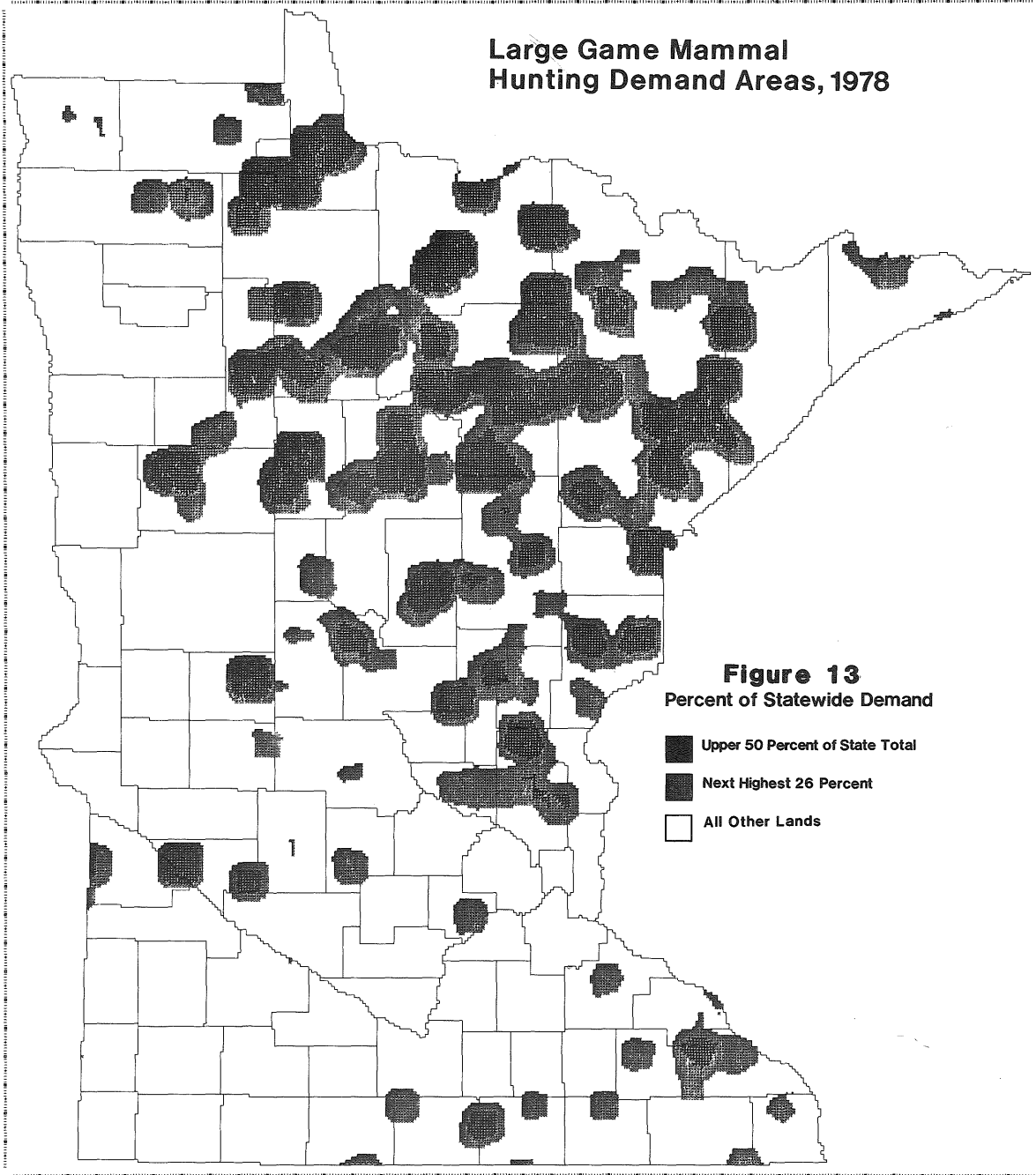
Figure 14 displays the amount of time individuals spent hunting waterfowl. Waterfowl hunting is comprised of ducks and geese. A primary hunting band is located from north to south along the western side of the state, where concentrations of remaining wetlands in the prairie and forest-prairie transition zones are situated. Many of these wetlands are in public wildlife management areas. Widely scattered hunting occurred in the north-central forested zone, probably in large measure for species of diving ducks.

Figure 15 displays the amount of time individuals spent hunting upland game birds. Upland game bird hunting was comprised chiefly of grouse (ruffed, spruce and sharptail) and ring-necked pheasants. Upland game bird hunting was widely scattered in the state. The primary concentration areas occurred near human population centers: central St. Louis and Itasca counties (grouse hunting), northeast of the Twin Cities metropolitan area (grouse and pheasant), and south and southeast of the metro area (pheasant).

Fluctuations in ruffed grouse and ring-necked pheasant populations will have a large, though possibly delayed effect, on resource use patterns. As species populations decrease in some areas and increase in others, hunting pressure is likely to change as well in those areas (i.e., hunting pressure generally increases when species populations are high and decreases when populations fall).

SCORP also provides information on birdwatching/nature study activities. The distribution pattern of this activity also reflects population centers (e.g., Twin Cities and Rochester), public wildlife management areas (e.g., Lac qui Parle and Twin Lakes) and other places such as the North Shore, the BWCAW and vicinity, and the Mississippi River below the Twin Cities. The importance of non-consumptive wildlife recreation is expected to continue increasing. SCORP projects it to be one of the recreation activities with the highest growth potential (a positive percentage change of 24.5% between 1980 and 1995).

Large Game Mammal
Hunting Demand Areas, 1978

Figure 13
Percent of Statewide Demand

Upper 50 Percent of State Total

Next Highest 26 Percent

All Other Lands

Note: Information on data, see SCORP, 1985.

Source: Minnesota Department of Natural Resources, 1985.

Waterfowl Hunting
Demand Areas, 1978
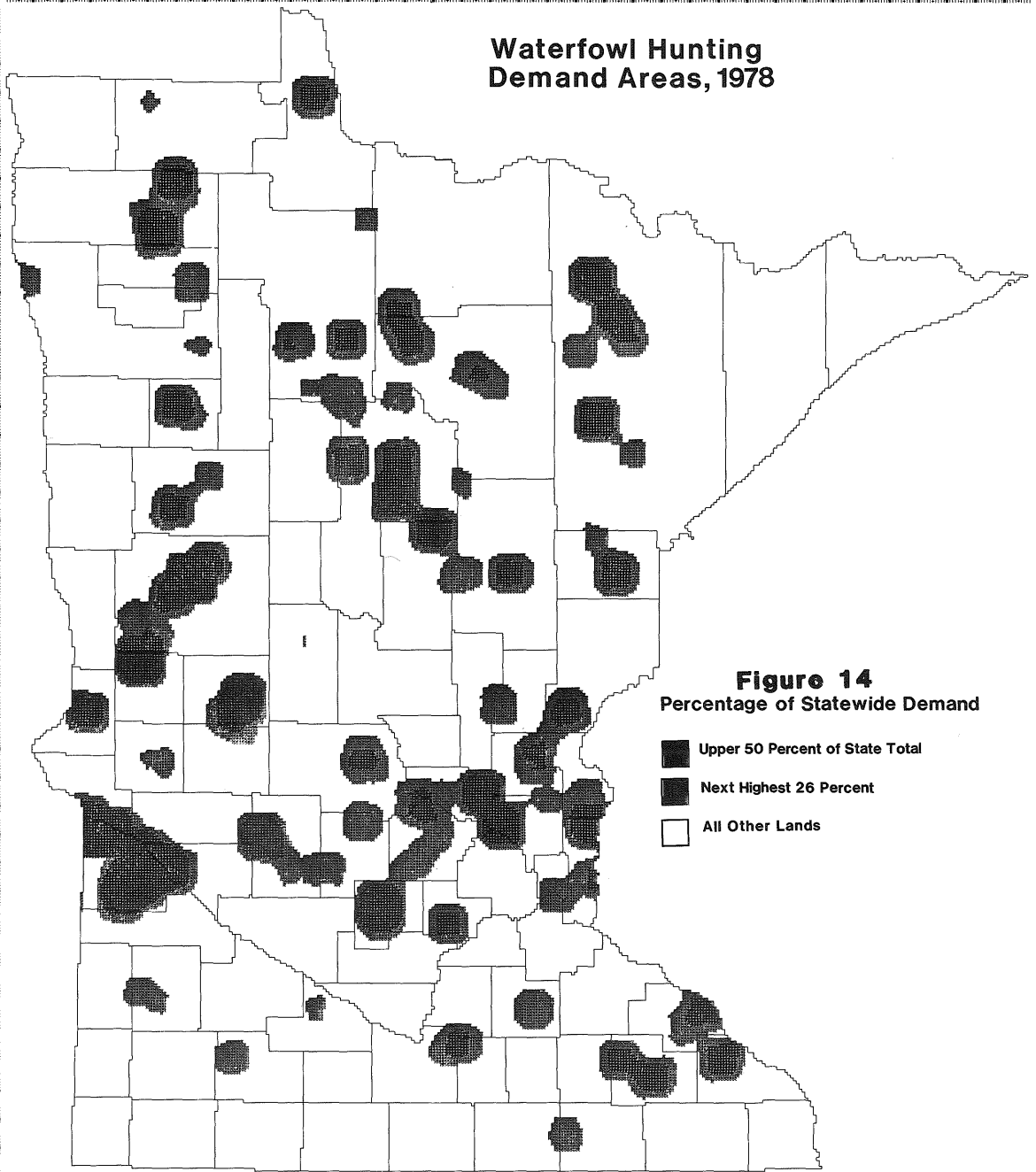
Figure 14
Percentage of Statewide Demand

■ Upper 50 Percent of State Total

■ Next Highest 26 Percent

□ All Other Lands

Note: Information and data, see SCORP, 1985.

Source: Minnesota Department of Natural Resources, 1985.

Upland Game Bird
Hunting Demand Areas, 1978

Figure 15
Percentage of Statewide Demand

■ Upper 50 Percent of State Total

■ Next Highest 26 Percent

□ All Other Lands
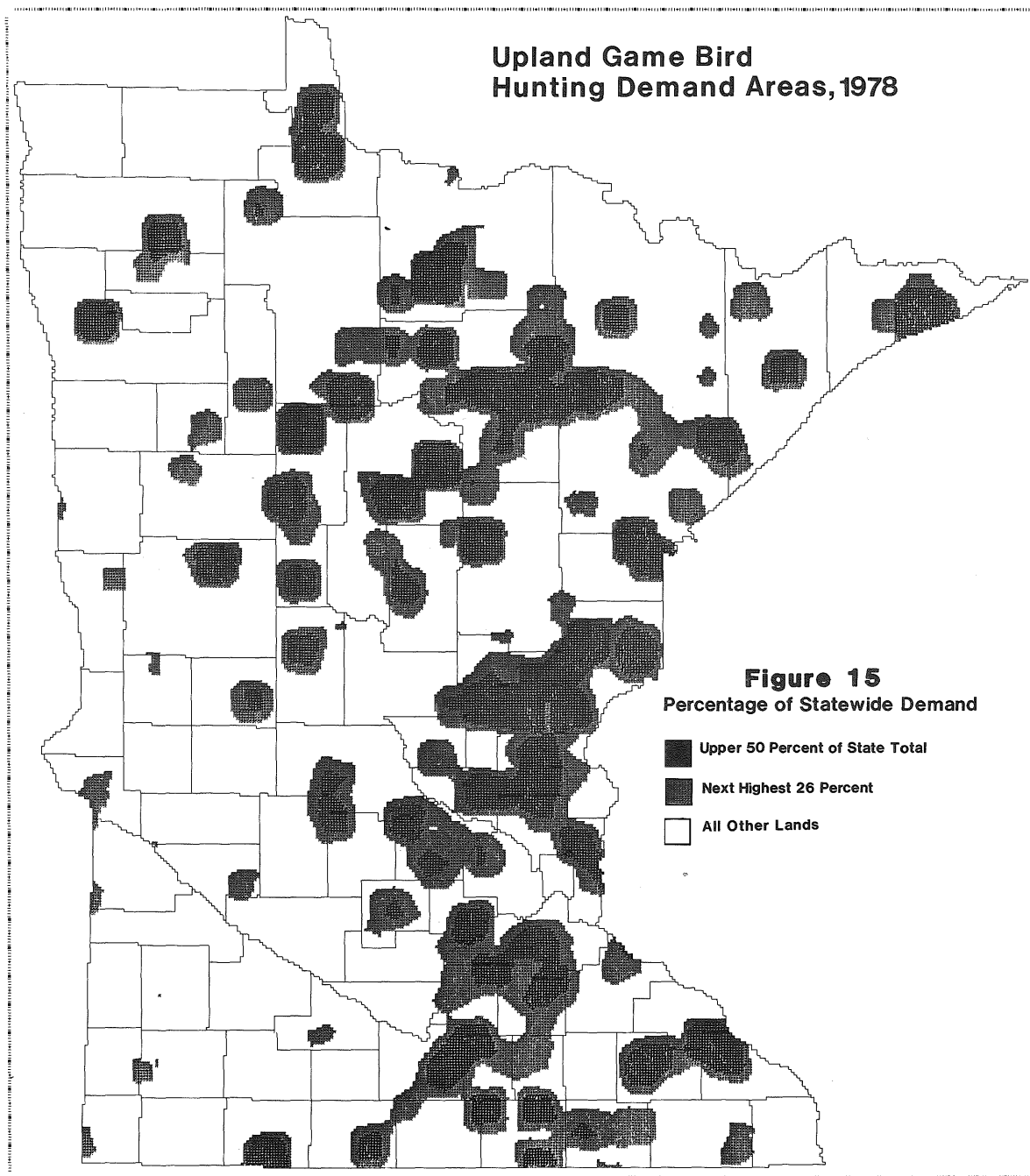
Note: Information and data, see SCORP, 1985.

Source: Minnesota Department of Natural Resources, 1985.

3. <u>Conclusions Regarding Wildlife Habitat Suitability.</u>

DNR wildlife resource management goals involve recreational and environmental values of wildlife resources. Coordination of DNR wildlife resource and other resource management goals will require a commitment to creative, integrated resource management. Any wildlife habitat improvement on DNR-administered land furthers the department's wildlife resource management goals. Improved wildlife habitat enhances both the recreational and environmental resource management goals of the DNR.

However, conflicts between wildlife management and other resource management will inevitably occur. In such cases, commitment to cooperative management efforts guided by coordination policies and management guidelines must be maintained by all department personnel. The Forestry/Wildlife Coordination Policy and Management Guidelines are examples of this commitment to cooperative management.

There are species and specific wildlife habitats that require special consideration and should take precedence over other management goals on specific sites. Habitats of rare and endangered species, species of special concern or sensitive ecosystems are worthy of such special consideration.

The amount of wildlife-associated recreation pressure an area experiences is an important consideration when developing management strategies. Areas that experience high use might need increased development to cope with the use pressure. On the other hand, high use areas might be "saturated", that is, they cannot tolerate any further increase in use without endangering the resource. In these cases, management might want to direct use to other areas able to accommodate an increase in wildlife-associated recreation.

The information used by the Project provides insights into locations of specific wildlife habitats, occurrences of rare and endangered species and sensitive ecosystems, and concentrations of wildlife-associated recreational use. These insights allow resource managers to target areas of special concern for wildlife resource management. It is the responsibility of divisional planning efforts to investigate areas highlighted by Project information and develop appropriate wildlife resource management strategies.

The purpose of this part of the Suitability Project was to develop a process for assessing the wildlife habitat management potential of DNR-administered land and to demonstrate potential use of the wildlife habitat assessment process for a broad range of management concerns.

It had the following limitations:

--   The analysis examined only a few of the primary wildlife species for which adequate information was available.

-- Resource information relevant to wildlife habitat and critical ecological relationships was frequently unavailable. In some instances, information was not available in a form the Suitability Project could use.

-- The analysis does not predict size or location of wildlife populations, but simply indicates where habitat might be present.

-- Wildlife resource use information tends to overlook sites with regional importance in otherwise low use areas, especially in the predominantly agricultural regions of the state where natural habitats are often extremely scarce.

Three findings of particular significance were:

-- Virtually all DNR-administered land provides potentially valuable habitat for wildlife.

-- Consumptive use (hunting) of the wildlife resource concentrates in areas with high densities of accessible public land that permit hunting, and around major accessible state and federal wildlife management areas.

-- Nonconsumptive uses of the wildlife resource, such as bird watching and nature study activities, are among the recreational activities with the highest growth potential - particularly near population centers.

E.   RESOURCE ASSESSMENT FOR MINERAL AND PEAT DEVELOPMENT.

   1.   Overview.

   Extractive resources managed by the DNR include metallic minerals,
   industrial minerals (sand and gravel) and peat. Over the years,
   these resources have made important contributions to the state's
   economy. Besides its leading role in production of iron ore,
   Minnesota ranks high nationally in production of dimension stone,
   sand, and gravel. The state has the nation's largest resource of
   nickel sulfides and has proven resources of copper, manganese,
   titanium and vanadium. Potential exists for exploitable deposits
   of gold and a number of strategic minerals such as platinum, cobalt
   and chromium.

   In recent years, state-owned peatlands have attracted interest in
   extractive use for horticultural purposes, as a raw material for
   the chemical industry and as a fuel. These are in addition to long
   standing use of peatlands for agriculture, forestry and scientific
   and natural purposes.

   Management of these resources involves two primary functions which
   exemplify the dual role played by the department in natural
   resource management:

   --   to facilitate and promote development of extractive resources,
         ensuring a flow of revenues to the state from exploration and
         mining; and

   --   to preserve and protect significant and sensitive aspects of
         the state's natural heritage (pertaining to unique peatland
         areas).

   While these functions do not always involve surface land
   management, they may have significant impacts on it by limiting
   options for other resource uses. For example, a dispersed pattern
   of state land ownership is thought to increase potential income to
   the state from future mineral "finds" by improving the likelihood
   that deposits will be found on state land. This would provide
   revenues from land as well as mineral leases. However, other
   resource objectives--particulary efficiency in forest
   management--may be better served by a more consolidated pattern of land
   ownership. Thus, extractive resource potential is an important
   consideration for a variety of resource management purposes.

   2.   Extractive Resource Models.

   The Division of Minerals has developed models and data bases useful
   in evaluating extractive resource potential, particularly for
   metallic minerals and peat. Analysis of industrial mineral
   potential is less well developed, lacking an automated information
   system on aggregate (sand, gravel, and crushed rock) resource
   quality.

-80-

a. Metallic mineral potential:

Determination of metallic mineral potential in Minnesota may be defined as an estimate of the relative likelihood that metallic minerals exist in concentrations that may be mineable now or in the future, in the various geologic terrains of the state. Determination of the metallic mineral potential of a rock type is based on the available geologic, geochemical and geophysical information. Potential ratings are, therefore, subject to change as more information becomes available.

Economic value is not part of the mineral potential determination for a particular geologic unit. Future advances in exploration, mining, and metallurgical technologies, as well as strategic requirements, can significantly increase the economic viability of a mineral resource. A mineral resource that is uneconomic today may well become economic in the future.

Following are the definitions of the mineral potential categories. The "A" category represents the most favorable terrain and "E" the least favorable and show only a relative potential that is not necessarily linear or exponential:

Class   Description

A   Geologic units or portions of geologic units where
      significant metallic mineralization is known to occur.

B   Geologic formations where metallic mineral bearing units
      are known to occur. Also, areas where the geology is
      very similar to that in areas elsewhere in the world
      containing major metallic mineralization.

C   Areas where the geology is not well known, but resembles
      geologic environments elsewhere in the world that are
      known to contain a variety of economic mineral deposits.

D   Areas with some possibility for metallic mineral
      deposits, but less than A through C.

E   Areas where available information suggests relatively low
      metallic mineral potential.

The metallic mineral potential profile of the state is illustrated in Figure 16. This map was developed in August, 1982 (and updated in 1984). The profile has changed somewhat since then, and continues to change, with recent interest in exploration for gold prompted by discoveries at Hemlo, Ontario. Geologic formations similar to those in the Hemlo area occur in Minnesota. Besides gold, recent exploration has focused on other precious metals and high-grade massive sulfide deposits (i.e., copper and nickel).

Mineral Potential

Figure 16
Mineral Potential Classes

- Class A
- Class B
- Class C
- Class D
- Class E and Lake of the Woods
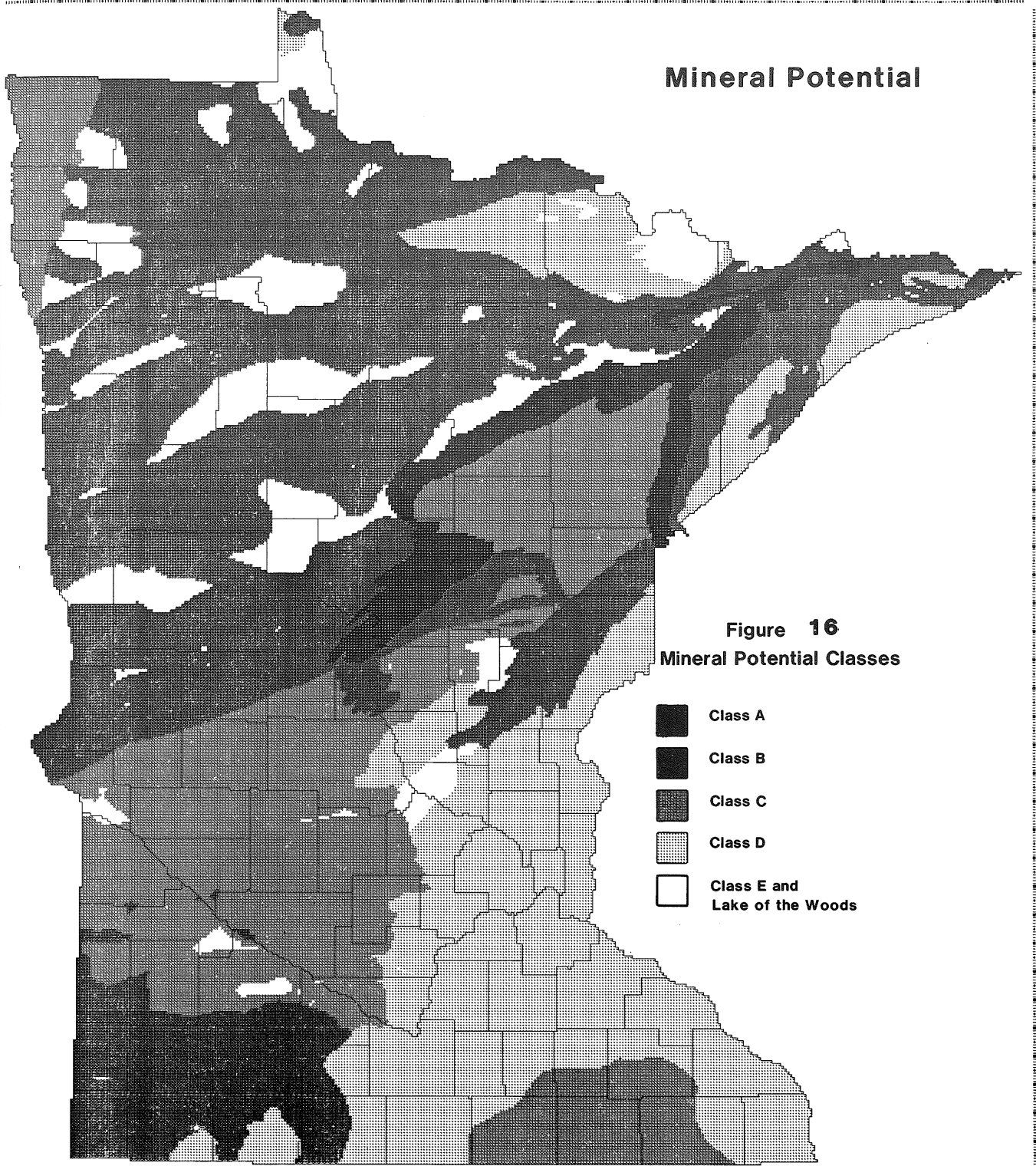
Source: Minnesota Department of Natural Resources, 1984.

Based on recent modifications in mineral potential ratings, the breakdown of DNR-administered land by mineral potential and administrative region is shown in Table 7. DNR-administered land statewide is predominantly in Class B (areas where the geology is similar to that in other areas where major metallic mineralization has been found). This is especially true in Region I. In these areas, concern about maintaining a dispersed pattern of state land ownership to facilitate exploration and development is greatest.

b.   Peatland Potential:

Peat resources are managed to serve both preservation and economic development objectives. A variety of economic uses has been encouraged, except where the resource possesses characteristics worthy of preservation. Since state law prohibits sale of land with potentially commercial peat resources, the management program has focused on inventory and leasing. The DNR currently leases several thousand acres of peat for agriculture (wild rice and other), energy development and other purposes.

Commercial peat is defined as deposits with: (1) at least a five-foot depth; and (2) size large enough to justify commercial use. In addition, other parcels with shallower deposits are regarded as having commercial peat potential if they are adjacent to, or part of, a larger complex of commercial peat.

The DNR also evaluates peat resources as to their development potential. This evaluation is somewhat more intensive than that of commercial potential. Development potential is defined by a number of criteria, including minimum size, accessibility by road, and proximity to a potential market.

The locations of peatlands identified as having development potential are displayed in Figure 17. The largest concentrations of these peat resources occur in Koochiching, northern Aitkin and southwestern St. Louis counties.

The DNR recently completed an evaluation of the state's ecologically significant peat resources. Many of those resources are of regional or national significance in their unique formation and biological characteristics.

3.   Conclusions Regarding Mineral and Peat Development:

--   Mineral exploration indicates that 3 percent of DNR-administered land contains geologic formations where significant mineralization has been found.

--   Over 60 percent of DNR-administered land possesses geology similar to that in other areas where major metallic mineralization has been found. More exploration is needed.

Table 5
Percent of DNR-Administered Land in
Each Metallic Mineral Potential Class
by DNR Region.

Percent of DNR-Administered Land in Each
Metallic Mineral Potential Class

DNR REGION	A	B	C	D	E	Regional Total Percent
I	–	88.9	1.8	0.3	9.0	100
II	5.1	55.2	8.6	25.2	5.9	100
III	6.2	24.6	40.3	20.5	8.4	100
IV – VI	–	16.3	32.1	49.6	2.0	100
None	1.4	81.7	–	–	16.9	100
Statewide Totals	2.9%	60.8%	12.8%	16.2%	7.3%	100%

(Source: Minnesota Department of Natural Resources, 1984.)

DEVELOPMENT POTENTIAL FOR PEAT
MINING IN MINNESOTA

Figure 17

■ PEATLANDS--ACCESSIBLE AND
                AVAILABLE FOR
                STATE LEASING
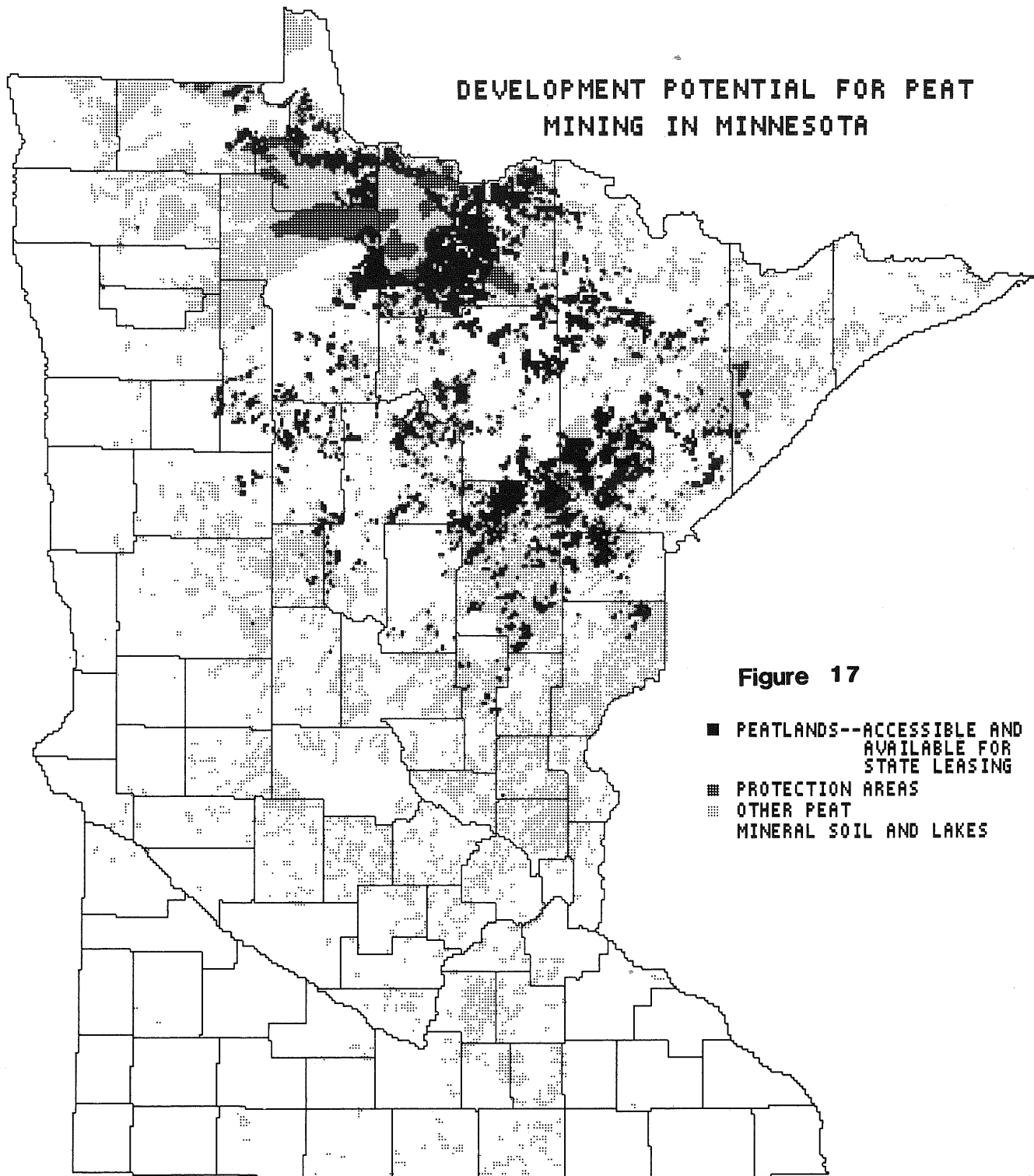▦ PROTECTION AREAS
▨ OTHER PEAT
MINERAL SOIL AND LAKES

Source: Minnesota Department of Natural Resources, 1984.

-- Potentially developable peatlands are concentrated in Koochiching, northern Aitkin and southwestern St. Louis counties, with additional large tracts in Beltrami and Lake of the Woods counties.

-- Ecologically significant peatlands are found mainly in Beltrami and Koochiching counties.

F.   RESOURCE ASSESSMENT FOR RESIDENTIAL DEVELOPMENT.

Residential development becomes a resource management concern when it occurs in the vicinity of natural resources managed by the department. Especially in areas of high-value natural resource amenities (e.g., high-quality shoreland) that are also highly accessible, natural resources may be subject to both direct pressure for development and indirect pressure due to nearby development, which can restrict management activities and lead to degradation of the resource. Thus, the suitability of DNR-administered resources for residential development--shorelands in particular--is an important concern.

1.   Overview--Focus On Shoreland Development.

Residential development, like recreational activity, focuses on shoreland resources. The state's lake resources are not all equally desirable for residential development. Some are remote from population centers, others are inaccessible by primary or secondary roads, and still others have beach, vegetation and lake characteristics that are not preferred by private shoreland owners. The interplay of natural resources with cultural features produces a pattern of shoreline recreation development opportunities that often vary over short distances along the shore.

Demand for lakeshore property is decreasing access to lakes and lakeside recreation for those who do not own lakeshore. Demand for lakeshore homes may explode as baby-boomers reach ages at which they can afford to purchase lakeshore property. At the same time, light manufacturing and service industries are relocating in areas that offer water-resource amenities to draw young, skilled workers.[1]

Shoreland development in previously undeveloped areas can have major impacts in several areas: fisheries, water quality, wildlife and on archaeological sites. Declines in populations of deer and moose have been observed where lakeshore and lake-oriented recreational development has increased (Armstrong and others, 1983; Brusnyk and Gilbert, 1983). Shoreland development reduces shrub cover, changes tree species composition and even individual tree branch distributions, due to activities like pruning, etc. Shoreline development fragments the continuity of habitat, greatly reducing its value as travel zones and night bedding sites.

---

[1]   Hart (1985:10) writes: "The north central part of Minnesota has also attracted in-migrants in the older working age groups (aged 34 to 59) and in the younger retired age groups (aged 60 to 69). These migration data suggest that north central Minnesota may be maturing from a seasonal resort economy into a year-round economy based on winter recreational activities and on the provision of services to retired people."

Regarding impacts on archaeological sites, the "boom in lakeshore
and riverside recreational development is affecting precisely the
areas that appear to have been favored as settlement locations by
Minnesota Indians" (MHS, 1981:ix). For example, in Carver,
Chisago, and Washington counties, between one-fourth and one-third
of all sampled lakeshore parcels are likely to contain prehistoric
sites.

Minnesota has conducted two censuses (1967 and 1982) of residential
development on large lakes (greater than 145 acres in size) that
are located outside the Twin Cities metropolitan area. These
studies found that shoreland residential development in 1982
accounted for nearly 100,000 housing units, or approximately 14
percent of the total housing stock in the shoreland survey
counties. Most of the residential development on large lakes was
seasonal (65 percent), while a lesser share of total residential
development on small lakes was seasonal (59 percent). In contrast,
residential river shoreland development is largely permanent (86
percent). Much of shoreland residential development occurs at
comparatively high densities on a relatively small amount of the
total resource. For both 1967 and 1982, fifty percent of all
residential development on large lakes was at densities greater
than 33 units per shoreland mile.

2.   Residential Suitability Assessment.

     a.   Permanent Residential Development Potential:

     A residential development potential model was created to
     identify the probable locations of new demand for permanent
     (as opposed to seasonal) residences in the near future. Three
     factors were used in the model: (1) 1970-1980 population
     density change; (2) road accessibility; and (3) accessibility
     to major service centers (i.e., location relative to potential
     urban commuter zones). (See MDNR, 1983b, for details of the
     model.) The model identifies areas, rather than individual
     parcels, that are likely to experience pressure for permanent
     residential development. Because site factors (and other
     significant influences on residential development patterns)
     are not included in the model, results are not always
     applicable to individual parcels.

     Five percent of all DNR-administered land has some potential
     for permanent residential development. Table 5 displays
     DNR-administered and private land by residential development
     potential class. Most (about 60 percent) of the DNR-
     administered land with potential for residential development
     was acquired through purchase, specifically for parks, water
     accesses and WMA's, and is dedicated to non-
     residential uses. Most DNR-administered land has little
     potential for permanent residential development because it is
     either in areas of very slow population growth (or population
     decline), has poor road access, or is outside potential urban
     commuter zones.

b.   Shoreland Residential Development Potential:

A model was created to evaluate the potential of shorelands
for residential development.   Five factors were judged to be
important for the model:

1.   distance from major urban service centers;
2.   tree cover (deciduous, coniferous, or no trees);
3.   soils/beach type (sandy, wet, or loamy soils and
     bedrock);
4.   road accessibility; and
5.   lake type (roughfish/gamefish/bullheads, game,
     trout, hard/soft-water walleye, centrarchid walleye,
     centrarchid, or special resource).

Shoreland residential development potential classes, based on
actual development densities, for combinations of the
preceding five factors, are displayed in Table 6.   The class
with the highest densities describes natural resource and
relative location factors that will encourage high development
densities on already developed lots and give a strong
indication that more development is likely on lots with little
or no development.   The identification of such lots should
help resource managers anticipate the location of new
development and to plan accordingly.   Figure 18 is a map of the
classes for a portion of Crow Wing County.

The combination of natural resource and relative location
factors illustrates how shoreland development is guided by
both complementary and offsetting influences.   Lake lot
development densities decrease as lake types become more
eutrophic and as lots become more distant from roads.
However, lots on roughfish lakes, with excellent road access,
have development densities that exceed those on the more
preferred walleye lakes that have poor road access.

The foregoing model can be applied on DNR-administered
shoreland to evaluate: (1) suitability of state-owned
lakeshore for residences; and (2) the development context of
lakes on which public shoreland is located.   The latter
indicates the need for such uses as undeveloped, public
recreational open spaces.

3.   Conclusions Regarding Residential Suitability.

The purpose of evaluating shoreland residential suitability was to
determine where resource management conflicts and opportunities may
result from permanent or seasonal residential development on or near
DNR-administered land.

Table 6
Distribution of DNR-Administered Land
by
Permanent Residential Development Potential Classes

Residential Development Potential Classes	Count of DNR-Administered 40 acre parcels	% of DNR-Administered Land in Class	% of Private Land in Class
Highest Potential	1,437	1.02	5.52
Moderately-High Potential	1,524	1.09	3.38
Moderately-Low Potential	2,178	1.55	6.87
Lowest Potential	2,044	1.46	15.59
Statewide Totals	7,183	5.12% of all DNR-administered land**	31.36% of all private land

* See MDNR (1983) for Permanent Residential Development Potential Classes definitions.

** Or, 0.53% of all lands in the state.

(Source: Minnesota Department of Natural Resources, 1985.)

Table 7

Statewide Development Potential Classes*
and
Housing Units per Mile of Private Shoreline, 1982
by
Lake Type and Road Access Class**

Road Access Class	Lake Type Class			Statewide Distribution for Road Access Classes
	Trout/ Walleye[a]	Centrarchid	Roughfish[b]	
Best (1)	31	29	15	28
(2)	21	20	8	20
(3)	18	16	7	15
Worst (4 & 5)	6	6	2	5
Statewide Distribution for Lake Type Classes	22	20	9	19

* Development Potential Class definitions are: (1) highest potential, (2) moderate to high potential, (3) moderate to low potential, and (4) lowest potential. Table values are averages of total housing units per mile of private shoreline, 1982.

** For lots near a major urban service center with forest cover and sandy soils.

— — — — — — — — — — — — —

[a] Includes hard and soft-water walleye, centrarchid walleye and special resource lakes.

[b] Includes game lakes.

(Source: Minnesota Department of Natural Resources, 1985.)

a. Shoreland Development Patterns:

The foregoing evaluation of shoreland residential suitability
reveals more than general shoreland residential preferences.
High shoreland residential density represents good population
access, good road access, and an appealing resource base--all
of which are the qualities of a setting that are desirable for
public recreational uses as well as private residential
development.

While 12 percent of the state's lake basins are the focus for
most shoreland residential development (and, the top fifty
lakes accounted for almost one third of the shoreland
residential development in 1982), the high price of shoreland
and the declining availability of developable sites on popular
lakes has led to increased development of less popular lake
resource areas (Cohen and Stinchfield, 1984). Development of
less popular resource areas will continue to account for an
increasingly large portion of total shoreland development. In
absolute numbers, however, most of the increase will actually
occur on the most popular resource areas.

The analysis of shoreland development potential further
indicates that:

-- The highest densities of shoreland development are
    nearest the state's important service centers with lake
    resources nearby (the Twin Cities, St. Cloud, and
    Brainerd); moderately high densities also occur near
    Alexandria, Grand Rapids, Bemidji, and Park Rapids.

-- Second tier residential development pressure is growing
    in importance for shoreland areas possessing good road
    access that are already highly developed.

-- Only 5 percent of DNR-administered land has significant
    potential for permanent residential development. Most
    (about 60 percent) of this land was acquired through
    purchase specifically for parks, water accesses and
    WMA's.

-- Almost 80 percent of new shoreland development occurs in
    locations with presently low development densities (i.e.,
    less than ten units per shoremile) and within prime
    shoreland development areas--i.e., the remaining
    undeveloped shoreland on lakes within prime shoreland
    areas is being developed.

-- This information could be used as the basis to identify
    new public use areas that would be suitable for some sort
    of development.

Thus, residential development potential, especially with
regard to shorelands, points to both possible areas of high
and increasing residential development levels and to the

Lake Lot Development Potential in Crow Wing County
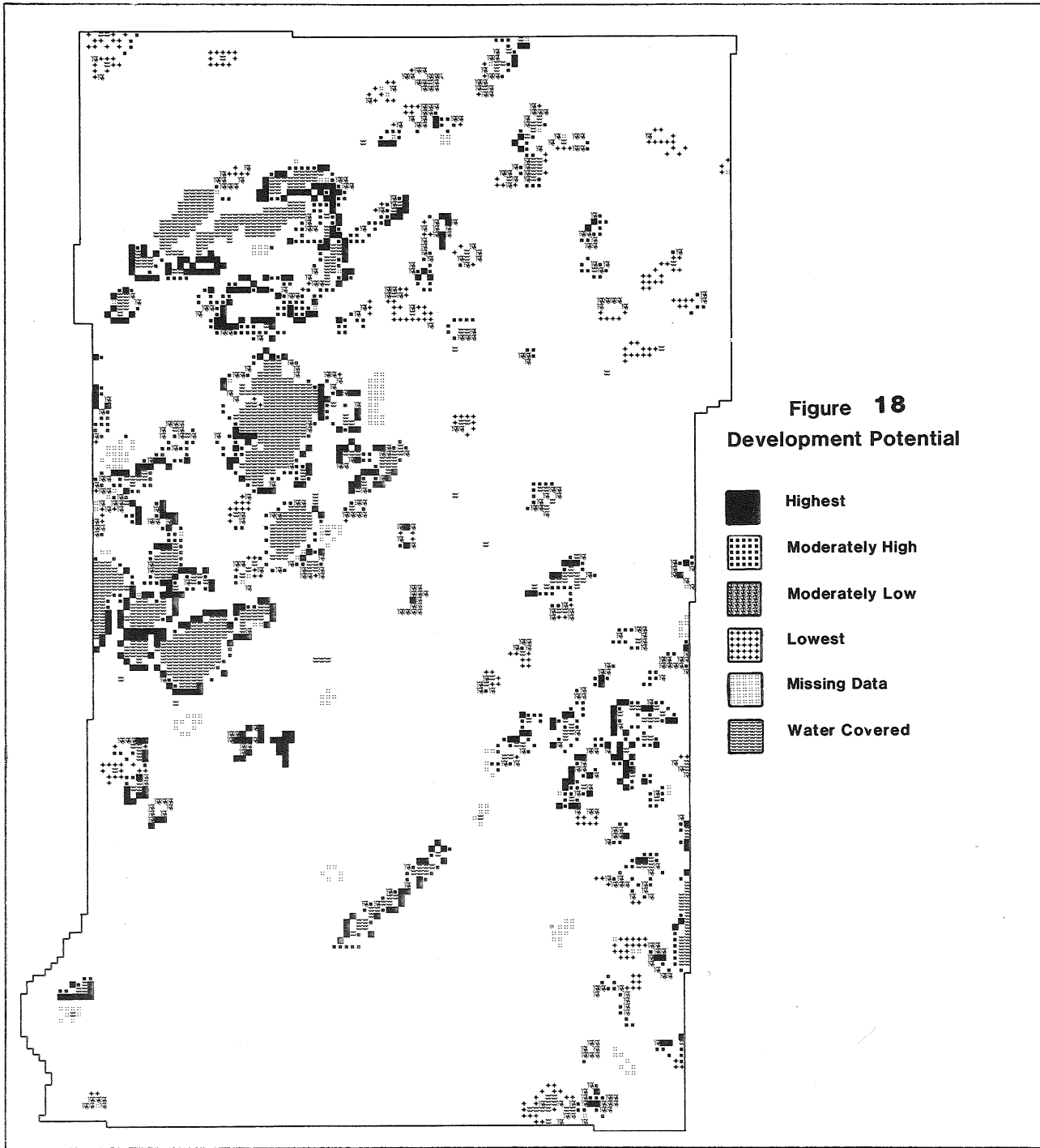

Figure **18**
Development Potential

■	**Highest**
▦	**Moderately High**
▨	**Moderately Low**
▦	**Lowest**
░	**Missing Data**
▨	**Water Covered**

Source: Becker and Kelly, 1985.

parcelization of formerly undeveloped, natural resource lands. The implication of the former is that greater pressures are applied to the resource. The implication of the latter is that smaller, more numerous residential parcels are not conducive to extensive natural resource management activities in an area. The range of resource management options available to resource managers is restricted in some parts of the state, due to increasing levels of private residential development nearby. Further study leading toward the identification of areas where land use changes (on private lands) are affecting natural resource management activities is warranted. This can be best accomplished in cooperation with the DNR's unit planning efforts.

b.   DNR-Administered Shoreland Lease Lots:

The DNR participates directly in seasonal residential development through its leasing program. The purpose of the leasing program is to generate revenue for the permanent school trust fund. (New leases are not currently being let.) The DNR administers 1,784 leases statewide, three-fourths of which are concentrated in three counties - Cass, Itasca, and St. Louis (Klyza, 1984). Eighty-nine percent of the lessees are Minnesota residents (26 percent live in the Twin Cities and 41 percent are from the northeastern part of the state).

Approximately three-fourths of the leases are on large lakes, with virtually all of the remainder on small lakes. Seventy-two percent of large lake leases are on hard/soft-water walleye or centrarchid walleye lakes. Lease lots are more remote from major service centers than the overall seasonal home pattern. Another difference between lease lots and overall seasonal home lots on large lakes is the quality of road access. Two-thirds of all seasonal homes in 1982 were on lots adjacent to an improved road, compared to half of the lease lots.

The management of the leasing program has not always been consistent with DNR's larger responsibility for shoreland management. There are a number of resource management concerns about the leasing program, including nonconforming lot sizes and improper shoreland alterations. Divided responsibilities have hampered effective management of the lease lots: responsibility for oversight of lease lots is shared by area foresters and area hydrologists. Overall, there is a nationwide trend toward maintenance (or termination) of leasing programs. Maintenance of our lakeshore lot lease program is expected, with upward adjustments in lease rates to make them more consistent with other leasing programs and to better reflect market values.

G. RESOURCE ASSESSMENT FOR AGRICULTURAL PRODUCTION

1. Overview.

The DNR does not actively manage state land for agricultural
purposes. Nevertheless, a number of linkages exist between DNR
resource management and agriculture. These include:

-- Agricultural trends, such as production intensification and
    farmland abandonment, have a major impact on land available
    for resource management.

-- The DNR has numerous cooperative management agreements with
    farmers; the DNR also leases land for agricultural
    development.

-- Some land managed by the DNR for natural resource purposes has
    potential for agricultural development and is therefore
    occasionally the focal point for tension between private
    agricultural development and public resource management
    interests.

-- Recent Federal and state legislative proposals have linked
    retirement of marginal agricultural land with expansion of
    resource habitat. This serves multiple objectives, including:
    assisting economically-pressed farmers; reducing agricultural
    surpluses; reducing soil erosion; maintaining productive
    timber land; and, expanding wildlife habitat acreage.

Thus, the DNR must be aware of agricultural trends and their
implications for natural resource management.

2. The Cropland Productivity Potential Model.

The cropland productivity potential model utilizes automated
information on soil properties and climate to produce productivity
scores from 0-100 for each forty-acre parcel in the state. These
scores are broken into five classes of productivity potential. The
model was created by the Minnesota Land Management Information
System.

The model is designed to evaluate a parcel's potential to produce
major Minnesota crops, including corn, soybeans, small grains and
hay. Analysis of expected yields in different productivity classes
demonstrates that land in Classes 1, 2, and 3 is capable of
producing substantially higher yields than land in Classes 4 and 5.

One important limitation in the cropland productivity potential analysis involves the resolution of soils data employed in the model. The model is based on soils landscape units of the Minnesota Soils Atlas. A number of associated soil series can occur within a soils landscape unit, and these series can vary in productivity potential. Productivity scores do not include these variations at the forty-acre level.

A second limitation is the assumption of artificial drainage in south-central and western Minnesota. Wet soils are assumed drained in these regions because drainage is a typical management practice there. However, DNR-administered land is seldom drained.

Despite these limitations, the cropland productivity potential model provides an effective tool for determining statewide cropland suitability because it produces an accurate picture of the broad scale cropland productivity patterns in Minnesota.

3.   Conclusions Regarding Cropland Productivity Potential.

The relative potential of DNR-administered land for agricultural crop production was evaluated. Figure 19 displays cropland productivity potential for all land in Minnesota. The most productive lands are located in the southern part of the state, with an extension along the western border to Canada. Most of the land in the north and northeast has a very low suitability for crop production.

Most DNR-administered land is not highly suited to crop production. Almost 90 percent of DNR-administered land is in productivity potential classes 4 and 5. This is not surprising given the concentration of state land ownership in the northern part of the state, where climate and soils are not conducive to crop production.

In general, publicly-owned land accounts for very little land (less than 3 percent) in the high productivity classes. The vast majority of the land in productivity classes 1-3 is privately-owned (Figure 20). DNR-administered land in classes 1-3, serves vital natural resource management objectives (e.g., wildlife production).

Figure 19
Cropland Productivity Potential

Relative Productivity Potential

■ 1. Highest

▨ 2.

▩ 3.

☐ 4. Lowest

⠿ 5. Water

note: Relative values are based on soil properties and climatic influences.
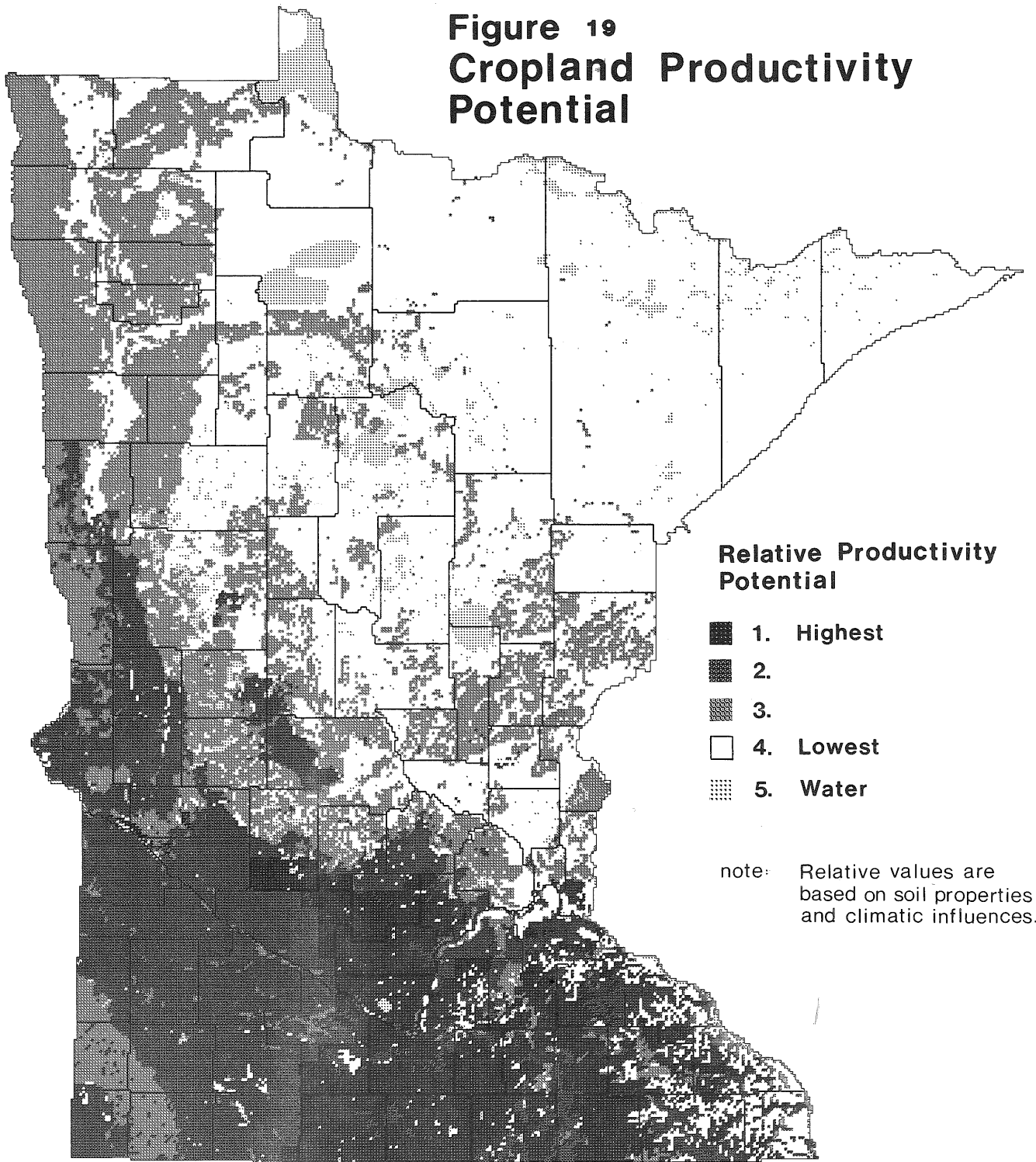
Source: Minnesota Cropland Resources. Minnesota State Planning Agency. May 1979.

miles		
0	20	40
0	20 40	60

km.

Figure 20
Cropland Productivity

Cropland Productivity by DNR-Administered, Other Public,
and Private Land Ownership Classes (acres in millions)

Cropland Productivity Within DNR-Administered, Other Public,
and Private Land Ownership Classes

DNR

Class 4 12.0%
Class 3 7.0%
Class 2 3.0%
Class 1 1.0%
Class 5 77.0%

Total Acres-5.64 million

Other Public

Class 3 7.0%
Class 4 24.0%
Class 2 2.0%
Class 1 1.0%
Class 5 66.0%

Total Acres-7.69 million

Private

Class 2 23.0%
Class 1 14.0%
Class 3 29.0%
Class 5 21.0%
Class 4 13.0%

Total Acres-39.6 million

CHAPTER III

A PROPOSAL FOR A NEW LAND CLASSIFICATION EFFORT

A. INTRODUCTION

The Suitability Project has evaluated available data for use in strategic resource management, resource suitability evaluation and issue assessment. The classification of land suitability in natural resource management has been a recent focus of the Suitability Project.

A preliminary review of DNR land classification needs has been undertaken by the Suitabilty Project. That review sought to determine:

1.   potential uses for land classification information;

2.   strengths and weaknesses of the existing classification systems;

3.   new classification approaches that would be useful in resource management;

4.   a classification taxonomy that characterizes DNR land use at a very specific level; and

5.   availability of automated data that could be used to construct a classification system.

A more comprehensive appraisal of classification needs and how those needs are met by the existing classification system will be undertaken by the DNR during the next biennium. In the meantime, results of this preliminary evaluation are described below.

B. THE CURRENT STATE LAND CLASSIFICATION SYSTEM

The DNR has had a land classification system since the 1960's. That classification system was cooperatively developed and implemented by DNR and county land management staff. A three-part process was established to classify parcels and place them in management units.

In Phase I, land classification was initiated by DNR representatives, generally Division of Forestry staff. They developed recommended land management and disposition classifications for review by county land classification committees comprised of county and DNR staff. In Phase II, proposals were to be developed for patterns of land ownership and administration that would further resource management objectives. Plans to restructure management unit boundaries and proposals for land acquisition and disposal would be also developed. In Phase III, a natural resource management plan would be developed that identified desirable levels of particular resource products, including a long range plan for land disposal. In most counties, the process went no further than Phase I.

The results of that process are still used in some counties and by some DNR field staff, although they are not used extensively by the DNR central office. Instead, new acquisitions are classified by Land Bureau staff based on the objective for which the land was acquired. Also, the Forest Unit Planning process is developing recommendations on reclassification of some DNR-administered parcels. The official status of these recommendations has not been determined yet. Thus, the DNR has three processes by which lands have been or are being classified: 1) original classification; 2) current acquisition classification; and 3) Forest Unit Planning classification.

The classifications have two components, "recommended management" and "recommended disposition". In the initial classification effort begun during the 1960's, recommended management was determined by agreement on 'highest and best use'. That agreement resulted from an in-depth site planning process. Criteria were developed to guide consideration of resource quality, administrative capacity and economic conditions in determining classification. The following categories were used:

Code	"Recommended Management" Classification
0	Not Classified
1	Urban Development
2	Agriculture (cultivation)
3	Agriculture (pasture & open)
4	Extractive
5	Recreation
6	Multiple Use Conservation
7	Fish and Wildife
8	Commercial Peat and Gravel
9	Access to Lake or Other Public Land

Once 'Highest and Best Use' was determined, recommended disposition classification followed. The following classes were used:

Code	"Recommended" Disposition
0	Not Classified
1	Retain for Conservation
2	Retain for Other Purposes
3	Provisional Retain
4	Dispose by Sale
5	Dispose by Exchange

Land disposition was a negotiated process where members on the county land classification committee sought consensus on appropriate disposition classification. The Land Use Coding Manual states that "recommended land use classifications are considered in determining disposition." However, a record was not kept regarding all factors that were considered in rendering a disposition decision.

C. A REVIEW OF CLASSIFICATION NEEDS

Potential uses for a land classification system are numerous and varied. Virtually every program that manages DNR-administered land is a potential user. However, system usefulness will depend upon the level of detail in the classification and the rigor with which classification criteria are applied. The following applications are likely given a detailed and reliable classification system:

1. Strategic Planning

Detailed data on how land is currently used and managed are an important link in designing implementation strategies that effectively address resource management objectives. Allocation of increasingly scarce management resources can be prioritized using such information. DNR efforts to accelerate land exchange during the 1986-1987 biennium are one example of a strategic planning program that would benefit from more detailed classification information.

2. Legislative Liaison

The legislature often requires information describing how management objectives relate to requested appropriations. By providing detailed land classification information, the DNR can better demonstrate how management relates to Resource 2000, LCMR proposals and other budgetary requests. This should assist legislators in setting appropriation priorities.

3. Critical Issues

More detailed information on existing use and management could improve DNR evaluation of land and resource issues. For example, this information is relevant to the Sugar Loaf landing assessment, off-road vehicle use and field dog trial siting.

4. Site Planning

A variety of site planning efforts such as unit planning, facility planning and land acquisition would benefit from detailed information on existing use and management. Such information could help managers identify potential for land use conflicts, land use coordination and land use change when developing management strategies for an area.

5. Agency Coordination

Federal, county and state-owned lands are often adjacent and interspersed. These lands occasionally are managed cooperatively. Better land classification data would improve coordination efforts between agencies and levels of government.

D. EVALUATION OF CURRENT CLASSIFICATION SYSTEM

The Suitability Project's preliminary review indicates that several advantages would be realized by adapting the current land classification system to on-going land management efforts. These advantages include:

-- The current system has been in use for more than 15 years and
   has been a positive force, encouraging effective land management
   in many counties.

-- That system was designed so that the counties and DNR could
   cooperatively manage state-owned land thus minimizing conflict.

-- Consistent procedures were established for land classification.

-- Most DNR and county administered state-owned parcels have been
   classified and the DNR classifications have been recorded on
   DNR land ownership tapes.

Use of the current land classification system also poses several
drawbacks. These include:

-- Most parcels were classified twelve to fifteen years ago. With
   improvements in resource data and changes in management
   philosophies, classification of many parcels may be
   inconsistent with current management needs.

-- The classification lacks sufficient detail for many resource
   management applications. There are only nine classification
   categories - too few to provide much detail on management
   specifics. Another constraint is that most parcels were placed
   in a 'multiple use conservation' category. This category lacks
   specificity and does not allow a detailed understanding of
   potential recommended management or use.

-- Although procedures were established to guide consistency in
   classification, it is not possible to ascertain factors that
   determined the actual classification of parcels.

-- Most on-going land management efforts require information on
   existing use and management of land rather than recommended
   management.

Based on this preliminary evaluation, it appears that the current
classification system poses significant constraints for effective use in
addressing complex land management issues. Clearly, more detailed
classification information will be needed for many management
applications.

E.   CLASSIFICATION RECOMMENDATIONS

Given that the current classification is too limited for many resource
management applications, new classification approaches should be
considered. A detailed blueprint for needed changes has not been
developed. However, the following Suitability Project recommendations
merit further discussion and evaluation.

1. The DNR should develop a new classification system to characterize existing use of all DNR-administered land. The classification would provide managers with a comprehensive picture of existing uses as determined by facilities and management efforts. Development of that system should be based on, but not limited to, existing automated data bases. (Data sources are described later in this chapter.)

2. To be useful in resource management, the new classification system should offer a more comprehensive listing of possible land uses. A proposed taxonomy of classification categories for existing DNR land uses is being developed. These were generated from detailed discussions with resource managers to determine automated data availability, land use information needs and expected applications. (An example of some classification categories is provided in Figure 21.)

3. For many resource planning applications, land management as well as land use information is needed. Land management information would describe the various management components, such as shoreland zoning, that currently characterize DNR land administration. During the 1986/87 biennium, the DNR will assess the needs and costs for a DNR land management classification to complement the land use classification.

4. If existing DNR use and management of land is to be classified using a more detailed classification taxonomy, a classification process or processes must be developed. If most classification can be derived from existing automated files, the process(es) may focus on data verification. Currently, procedures have been established for verifying and correcting automated data files. These will be reviewed. Unit planning may provide an opportunity for such verification depending on time availability. Verification needs and costs will be explored further during the next biennium.

F. AUTOMATED LAND USE DATA BASES

Many existing DNR land uses can be determined from a number of automated data bases. These automated files should allow development of some existing use classification without the need for extensive data gathering. However, data verification will be needed to ensure accuracy. Also, further data automation may be needed to fully develop the classification. Additional existing use classifications will require data gathering, automation and verification.

The state maintains an extensive automated record system for state-owned land. The system is maintained by the DNR Land Bureau. It is known as the DNR Land Ownership/Classification Record System (LO/CRS). LO/CRS incorporates different data items, each developed separately and each characterizing different aspects of state-owned land. This system includes only the current recommended management and recommended disposition classification. LO/CRS currently is being reviewed for

possible update and revision. Resource managers throughout the DNR will identify their information needs as part of the review process. Any proposed changes in the DNR land classification data base will be incorporated into LO/CRS.

LO/CRS currently accommodates only a small share of DNR automated information that describes land use and management. Additional automated files are available from a variety of DNR programs. These automated systems are compatible, however, data often must be moved from one system to another. In addition, data are stored at different geographic levels, from the forty-acre parcel to larger administrative units. Accessing such information can be time consuming and costly. The review of LO/CRS needs will identify DNR data systems useful in structuring a land use classification file. Suitability Project staff also have surveyed resource managers on their data availability and needs. From this will emerge a proposal for an existing land use classification file to be added to LO/CRS.

G. CLASSIFICATION CATEGORIES FOR EXISTING USE

Figure 21 indicates an example of some proposed "existing use" classification categories. To be optimally useful in resource management, the system structure and design should address the following:

-- The information storage design must accommodate multiple uses per parcel. (The 'highest and best use' concept will not be used since a determination of priority use cannot be developed in a consistent and accurate fashion from automated files alone.)

-- The classification must be kept current. A systematic process will be needed that incorporates changes into the LO/CRS. Staff responsibilities for updating should be clarified. Also, costs of data storage and updating should be determined.

-- Classification criteria must be identified and followed rigorously. A classification manual will be needed describing these criteria and their application.

-- Classification should be based on use, not on administration. Thus, the land administrator will not be identified. If administration is important to a resource evaluation, that information can be accessed from the administrator designation on the LO/CRS.

The proposed classification system contains eleven major use categories. Within each category, two-digit sub-category codes provide greater detail. For example, within the 'Recreation' category, there are six sub-categories each containing three or more specific uses. This allows data users to select information at various levels to best meet their

evaluation needs. For "recreational" land, information could be accessed at three levels; the 'recreation' level, the 'lodging' level or the 'campground/group camp/lodge' level. This appears to be an efficient approach to classifying existing use.

The existing use classification does not present the complete picture of land classification possibilities. Use categories being developed for land classification depend on existing (or soon to be created) automated information systems on DNR-administered land. Use is defined to address how DNR personnel have altered the characteristics of land through various management practices. Thus, the classification accommodates campgrounds but not informal campsites used by backpackers. It can accommodate timber harvesting but not administrative regulation such as shoreland zoning. Ad hoc uses also are not accommodated.

H.   CONCLUSION

Land classification is an important resource management tool. It can provide resource managers with important information on resource potential, existing management, and recommended management.

The Suitability Project evaluated the current DNR land classification system to determine the extent to which it meets management and planning needs.

   *   The Suitability Project determined that a new classification
        of existing DNR land management is needed.

   *   The Suitability Project developed the basic framework for that
        classification.

The DNR will begin classifying land according to existing use or DNR land management based on that framework during the 1986-87 biennium.

That classification would use the following categories, which will accommodate multiple uses per parcel:

      - Residential
      - Agricultural
      - Peat Development
      - Extractive
      - Recreation
      - Timber
      - Wildlife
      - Natural Area
      - Fisheries
      - Water
      - Other

Figure 21

An Example of Proposed Categories for Existing Use Classification

PRIMARY USE CATEGORY	SECONDARY LEVEL OF DETAIL		THIRD LEVEL OF DETAIL
RECREATION	11	lodging	- campground (primitive)
	12	"	- campground (modern)
	13	"	- group camp
	14	"	- lodge
	21	visitation	- monument
	22	"	- historic site
	23	"	- wayside
	31	water access	- river
	32	"	- lake
	41	water use	- swimming beach
	42	"	- marina
	43	"	- portage
	44	"	- rest area
	45	"	- angling(trout)
	46	"	- angling(warmwater)
	51	trail	- hiking
	52	"	- biking
	53	"	- horseback
	54	"	- motor vehicle
	55	"	- combinations
	61	wilderness	- area of solitude
	71	miscellaneous	- golf course
	72	"	- volley ball court
	73	"	- support facility

APPENDICES

APPENDIX A

REFERENCES

Edward Armstrong, David Euler, and Gerald Racey.
    1983   "White-Tailed Deer Habitat and Cottage Development
            in Central Ontario." J. Wildl. Manage. 47(3):
            605-612.

William H. Becker and Timothy J. Kelly.
    1985   "Predicting and Understanding Outdoor Recreation Trends
            Through the Use of Geographic Information Systems." Pages
            337-353 in: Wood, James D. Jr.(ed.). Proceedings 1985
            National Outdoor Recreation Trends Symposium II. U.S.
            Department of the Interior, National Park Service, Southwest
            Regional office, Atlanta, GA.

L.M. Brusnyk and F.F. Gilbert.
    1983   "The Uses of Shoreline Timber Reserves for Moose."
            J. Wildl. Manage. 47(673-685).

Philippe Cohen and Joe Stinchfield
    1984   Shoreland Development Trends. Shoreland Update Project
            Report No. 4. Floodplain/Shoreland Management Section.
            Division of Waters. Minnesota Department of Natural
            Resources. St. Paul, MN.

John Fraser Hart.
    1985   "The Baby Boomers are Coming Home."
            CURA Reporter 15(1):7-10.

Pamela J. Jakes.
    1980   The Fourth Minnesota Forest Inventory: Area.
            Resource Bulletin NC-54. U.S.D.A. Forest Service, North
            Central Forest Experiment Station. St. Paul, MN.

T. Kelly and W. Becker.
    1985   "The Geographic Distribution of Travel Related Costs for
            Outdoor Recreation in Minnesota." Internal agency report.
            Minnesota Department of Natural Resources. St. Paul, MN.

Christopher J. Klyza.
    1984   A Study of the State Lakeshore Leasing Program in
            Minnesota. A Summary. Draft Report. CURA.
            University of Minnesota and the DNR.

Minnesota Department of Natural Resources (MDNR).
    1983a   Minnesota Forest Resources Plan, Volume Four:
            Goals and Strategies. Minnesota Department of Natural
            Resources, Division of Forestry, St. Paul, MN.

    1983b   DNR-Administered Public Lands: Their Suitablility to Meet
            Resource Management Objectives. Minnesota Department of
            Natural Resources, St. Paul, MN.

1985a   DRAFT MINNESOTA STATE COMPREHENSIVE OUTDOOR RECREATION PLAN.
         Volumes 1 and 2. Minnesota Department of Natural Resources.
         Office of Planning and Special Services. St. Paul, MN.

1985b   Minnesota Forest Resources Plan Technical Report - Recreation.
         Draft Report. Minnesota Department of Natural Resources.
         St. Paul, MN.

Minnesota Historical Society (MHS).
    1981   Minnesota Statewide Archaeological Survey. Summary:
            1977-1980. St. Paul, MN.

D. Yardas, A. Knipnick, H. Peskin, and W. Harrington.
    1982   Directory of Environmental Asset Bases and Valuation Studies.
            Resources for The Future, Washington, D.C.

William Zachmann.
    1984   A River Classification System. Shoreland Update Project
            Report No. 5. Flood Plain/Shoreland Management Section.
            Division of Waters. Minnesota Department of Natural
            Resources. St. Paul, MN.

APPENDIX B

Terminology

To minimize confusion, the meaning of certain terms and acronyms used in
this report are given below.

    * CON-CON *
    Consolidated Conservation Lands.

    * DNR *
    Minnesota Department of Natural Resources.

    * GIS *
    Geographic Information System.

    * Implementation Strategies *
    Implementation strategies are systematic means of translating the
    strategic vision of an organization into specific plans and
    actions.

    * Land Allocation *
    The administrative disposition of land; including the land
    administrator and final land disposition (e.g., retain, sell, or
    exchange).

    * Land Classification *
    The process of systematically placing DNR-administered parcels of
    land into specific groupings according to previously established
    land use criteria.

    * LMIC *
    Land Management Information Center, State Planning Agency.

    * LCMR *
    Legislative Commission on Minnesota Resources.

    * LO/CRS *
    Land Ownership/Classification Record System.

    * MFRP *
    Minnesota Forest Resources Plan.

* MLMIS *
Minnesota Land Management Information System.

* MN-ROS/ROS *
Minnesota Recreation Opportunity Spectrum - Recreation Opportunity
Spectrum.

* PSNA *
Peatland Scientific and Natural Areas.

* PSPA *
Peatland Scientific Protection Areas.

* PWPA *
Peatland Watershed Protection Areas.

* PIC *
Planning Information Center, State Planning Agency.

* Resource Assessment *
Resource or suitability assessment is the process by which resource
quality or productive potential of a parcel or area is measured and
productive value estimated.

* Resource Management Goal*
A goal is a general target toward which management efforts are
directed. Goals can be narrowly defined for a specific geographic
area or can express statewide management needs.

* Resource Management Objective *
Objectives are specific steps for resource management goals to be
acted out within a specified period of time.

* Resource Suitability *
Resource suitability involves two elements: (a) the capability of a
particular resource area to produce desired goods or services -
i.e., resource quality or productive potential, and (b) the value
of the goods or services produced. Value may be tangible, as with
resource commodities such as timber or minerals, or intangible, as
with resource "goods" such as nongame wildlife or outdoor
recreational opportunities. Because both resource capability and
product value are often difficult to measure, resource suitability
frequently can be determined only generally and in relative terms -
e.g., low ... medium ... high.

* SCORP *
State Comprehensive Outdoor Recreation Plan.

* Strategic Planning *
Strategic planning is a formal process through which an
organization accomplishes three tasks: (1) anticipate and
understand significant trends and events likely to affect the
organization; (2) cultivate explicit and shared understanding of
the nature and purpose of the organization (i.e., organizational
goals and objectives); and (3) create a systematic means of
translating the strategic vision of the organization into specific
plans and actions (i.e, implementation strategies). The concept
can be applied as an on-going approach to setting priorities for an
entire management program or can be structured as a one-time
approach to address a specific issue. Strategic planning assesses
past resource use trends, identifies current resource needs, and
seeks to anticipate future issues. Resource management needs are
identified and priorities for action established to address them.

* Suitability Project *
Long Range Land Resource and Management Plan Project.

* WMA *
Wildlife Management Area Units.

A Partial Listing of Suitability Project Report Maps

Agricultural Information

Cropland Productivity Potential

Basic Resource Information

Precipitation

Runoff

Minnesota Recreation Opportunity Spectrum

Local Relief

Density of Lakes Over 145 Acres in Size with Permanent Fish Population

Miles of Shoreline on Selected Lakes Over 145 Acres in Size

Natural Lake Ecology for Fish Lakes Over 145 in Size

Mineral and Peatland Information

Mineral Potential

Minnesota Peatlands

Peatland Preservation Candidate Areas

Peatlands with Development Potential for Extractive Use. Five County Study Area.

Population Information

Population Density, 1980

Population Density Change, 1970-1980
Highway Type

Major Urban Service Centers

Regional Population Accessibility

Public Ownership Information

Density of State Owned Lands

Percent of Shoreline Miles on Selected Lakes Over 145 Acres in Size that are Publicly-Owned

Percent of Shoreline Miles on Selected Lakes Over 145 Acres in Size That Are Administered by the DNR

Shoreland Information

Change in Permanent Housing Units per Mile of Shoreline on Selected Lakes Over 145 Acres in Size, 1967-1982.

Change in Seasonal Housing Units per Mile of Shoreline on Selected Lakes Over 145 Acres, 1967-1982

Change in Total Housing Units per Mile of Shoreline on Selected Lakes Over 145 Acres in Size, 1967-1982

Total Housing Units per Mile of Shoreline on Selected Lakes Over 145 Acres in Size, 1982

Permanent Housing Units per Mile of Shoreline on Selected Lakes Over 145 Acres in Size, 1982

Seasonal Housing Units per Mile of Shoreline on Selected Lakes Over 145 Acres in Size, 1982

Residential Development on Selected Lakes Less Than 145 Acres in Size, 1982

Residential Development on Selected Rivers, 1982

Percent of County Housing Units on Selected Lakes Over 145 Acres

Percent of 1970-1980 Change in County Housing Units on Selected Lakes Over 145 Acres

Percent of 1980 County Population on Selected Lakes Over 145 Acres

Timber Information

Conifer Primary-Processor Accessibility

Aspen Primary-Processor Accessibility

Hardwood (other than Aspen) Primary-Processor Accessibility

Unproductive Forest Land

Density of Overlap in Primary Wood Processor

Density of Overlap in Primary Wood Processor Supply Zones

Wildife Information

County Density of Small Game Hunter Occasions: Game Birds Other Than Waterfowl

County Density of Small Game Hunter Occasions: Waterfowl and Coots

County Density of Small Game Hunter Occasions: Mammals

Public Wildlife Management Units

Special, Rare, or Endangered Plants, Plant Communities & Animals

Wetland Concentration Areas

Deer Yarding and Winter Concentration Areas

White-Tailed Deer Selected Habitat Components

Red Shouldered Hawk Range with Habitat Clusters

Greater Sandhill Crane Range and Habitat

Prairie Chicken Range

Bald Eagle Range

Minnesota Deer Hunter Distribution and Success Rate

Moose Range in Combination with Census-Strata Information