Minnesota Southeast Landscape

Current Conditions and Trends Assessment

Minnesota
Forest
Resources
Council
Landscape Program

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Table of Contents

Table of Contents 3
List of Tables 5
List of Figures 7
References 8
Introduction 9
Background 10
Definitions 11
Findings 11
Historical Conditions 12
Findings 12
Comparisons of pre-settlement vegetation to current vegetation 12
Observations 12
Natural Resources and Ecological Conditions and Trends 20
Findings 20
Recent extent of forestlands 21
Observations 21
Structure of timberland 22
Observations 22
Riparian areas 29
Observations 29
Vascular plants and wildlife species 32
Observations 32
Social and Economic Conditions and Trends 38
Findings 38
Land Use and Ownership 38
Observations 38
Demographics 48

Observations 48
Employment 55
Observations 55
Economic Production 62
Observations 62
Recreation and Tourism 67
Observations 67
Appendix A. Metadata - General Information of Data 70
Appendix B. Summary of FIA Sampling and Estimation Procedures 73

List of Tables

Table 1. A summary of rare natural features (element occurrance records), by ecological landscapes and feature type. 16
Table 2. Relative difference in abundance of tree species as estimated from the public land survey of the late 1800s and the 1990 Forest Inventory and Analysis, for the Southeast ecological landscape. 18
Table 3. Extent of forestland in the Southeast landscape, 1977 and 1990. 21
Table 4. Ratio of forestland to non-forestland for the Southeast landscape, 1977 and 1990. 21
Table 5. Area (in acres) of timberland by forest type and stand-size for the Southeast landscape, 1977. 25
Table 6. Area (in acres) of timberland by forest type and stand-size for the Southeast landscape, 1990. 25
Table 7. Average net annual growth, mortality, and removals of growing stock (in million cubic feet) on timberland by species group for the Southeast landscape, 1990. 26
Table 8. Average net annual growth, mortality, and removalsof sawtimber (in million board feet, int'l 1/4" rule) on timberland by species group for the Southeast landscape, 1990. 27
Table 9. Density of waterways in the Southeast landscape. 29
Table 10. Total acres of riparian areas (classified by the National Wetlands Inventory) in the Southeast ecological landscape. 31
Table 11. Richness of vascular plants in Owenby and Morley (1991) by MFRC landscape. 33
Table 12. Numbers of vascular plants in Owenby and Morley (1991) with recorded occurrence limited to a particular MFRC landscape. 35
Table 13. Richness of forest-associated mammals, amphibians and reptiles, and breeding birds in Minnesota. 35
Table 14. Status of Minnesota's forest-associated endangered, threatened, and special concern vertebrate wildlife, 1984. 36
Table 15. Status of Minnesota's forest-associated endangered, threatened, and special concern vertebrate wildlife, 1996. 37
Table 16. Area (in acres) of land by GAP ownership group for the Southeast ecological landscape. 41

Table 17. Area of timberland by ownership group for the Southeast landscape, 1977 and 1990. 42
Table 18. Area of timberland summed by public and private ownership for the Southeast landscape, 1977 and 1990. 43
Table 19. Area of land use classes (in acres) in the Southeast ecological landscape. 45
Table 20. Population of Minnesota and counties in the Southeast landscape. 49
Table 21. Population projections for Minnesota and the Southeast landscape, 1995-2025. 51
Table 22. Population projection by age group for Minnesota and the Southeast landscape, 1995-2025. 52
Table 23. Persons with incomes below the poverty level, 1990. 53
Table 24. Per capita personal income (in dollars) for Minnesota and counties in the Southeast landscape, 1990-1996. 54
Table 25. Number of employees by major industry in the Southeast landscape, 1995. 58
Table 26. Projected employment by major industry, 1994-2005: Southeast Projection Area . 60
Table 27. Percent unemployed for Minnesota and counties in the Southeast landscape. 61
Table 28. Earnings by major industry for the Southeast landscape, 1995. 65
Table 29. Minnesota pulpwood production, exports and imports, 1993-1997. 76

List of Figures

Figure 1. Ecological subsections in the Southeast landscape. 9
Figure 2. Forest Change in the Southeast ecological landscape: 1800s to 1990s 17
Figure 3. Area (in acres) of timberland by forest type groups for the Southeast landscape, 1977-1990. 23
Figure 4. Area (in acres) of timberland by stand-size for the Southeast landscape, 1977-1990. 24
Figure 5. Wetlands and waterways in the Southeast ecological landscape. 30
Figure 6. GAP Ownership inthe Southeast ecological landscape. 39
Figure 7. GAP Ownership (in acres) in the Southeast ecological landscape. 40
Figure 8. Map of reserved lands and forests for the Southeast ecological landscape. 44
Figure 9. Land use from satellite data for the Southeast ecological landscape, 1990. 45
Figure 10. Distribution of nonindustrial private forest (NIPF) acres statewide by ownership class size, 1990. 47
Figure 11. Population projection for the Southeast region, 1995-2025. 50
Figure 12. Number of employees by major industry for Minnesota, 1970-1995. 56
Figure 13. Number of employees by major industry for the Southeast region, 1970-1995. 57
Figure 14. Projected employment by major industry for Minnesota, 1998-2045. 58
Figure 15. Earnings by major industry for Minnesota, 1970-1995. 62
Figure 16. Earnings by major industry for the Southeast region, 1970-1995. 63
Figure 17. Projected earnings by major industry for Minnesota, 1998-2045. 64
Figure 18. Road mileage statewide in Minnesota, 1989-1999.. 67
Figure 19. Major roads in the Southeast ecological landcsape. 68
Figure 20. Trail mileage statewide in Minnesota, 1984-1996. 69

References

Almendinger, J. C. Minnesota's Bearing Tree Database. Minnesota Department of Natural Resources. St.Paul, MN, 1996.

Generic Environmental Impact Statement (GEIS) Study on timber Harvesting and Forest Management in Minnesota. Minnesota Environmental Quality Board.1994.

Green, J. C. "Birds and Forests: A Management and Conservation Guide." MN Dept. of Natural Resources. St. Paul, MN, 1995.

Jakes, P. The fourth Minnesota forest inventory: area. Resource Bull. NC-54. USDA Forest Service, North Central Forest Experiment Station. St. Paul, MN, 1980.

Heinselman, M. L. "Interpretation of Francis J. Marschner's Map of the Original Vegetation of Minnesota." USDA Forest Service North Central Forest Experiment Station. St. Paul, MN, 1974.

Murray, P. Forest Statistics for Minnesota's Northern Pine Unit, 1990. USDA Forest Service, North

Central Forest Experiment Station. St. Paul, MN, 1991.

Miles, P. D., C. M. Chen, & E. C. Leatherberry. Minnesota Forest Statistics, 1990, Revised. USDA Forest Service North Central Forest Experiment Station. St. Paul, MN, 1995.

Minnesota Department of Natural Resources. "Checklist of Endangered and Threatened Animal and Plant Species of Minnesota." St. Paul, MN, 1984.

Minnesota Department of Natural Resources. "Minnesota's List of Endangered, Threatened and Special Concern Species." St. Paul, MN, 1996.

Minnesota Department of Natural Resources, Trails and Waterways Unit. Minnesota Registry of Public Recreational Trail Mileages. St. Paul, MN, 1996.

Minnesota Forest Resources Council. Status of Minnesota Timber Harvesting and Silvicultural Practice in 1996. St.Paul, MN, 1996

Owenby, G. B. and T. Morley. Vascular Plants of Minnesota: A Checklist and Atlas. Minneapolis: U of MN Press, 1991.

Tester, J. R. Minnesota's Natural Heritage. St. Paul: U of MN Press, 1995.

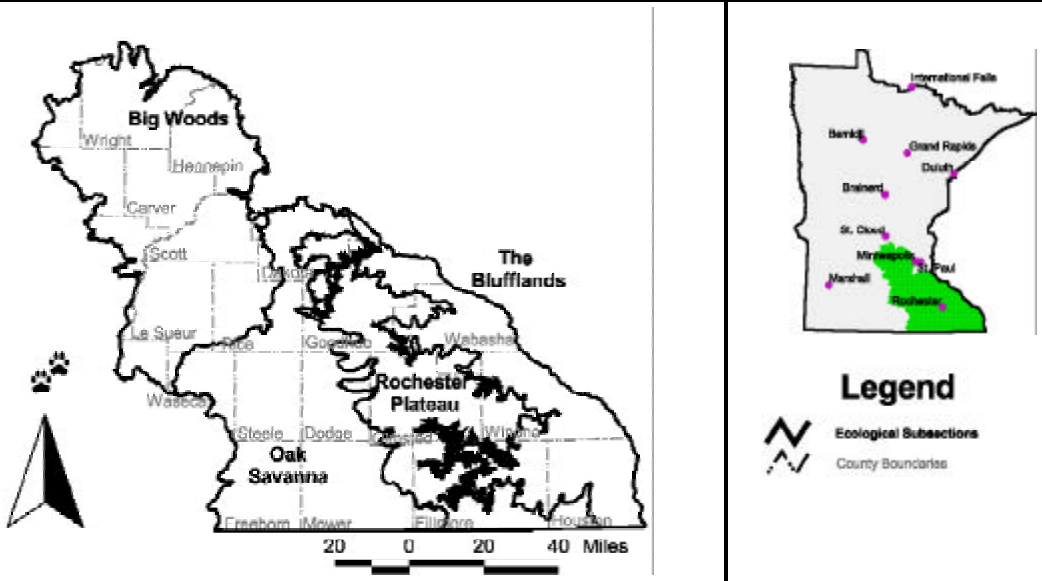
Introduction

The process for conducting assessments of landscape conditions and trends for the Southeast landscape of Minnesota (see Figure 1) is explained in the background section below. At the time of this writing, the following sections of the assessment are completed:

- Historical Conditions
- Natural Resource and Ecological Conditions and Trends
- Social and Economic Conditions and Trends

The information in this assessment will serve as the starting point for establishing a regional forest resource committee in the Southeast landscape, which includes all of Dodge, Fillmore, Freeborn, Goodhue, Houston, Le Sueur, Mower, Olmsted, Rice, Steele, Wabasha, Waseca and Winona counties. As additional ecological and social/economic data becomes available, it will be analyzed and presented to the regional committee for its consideration in determining desired future conditions, goals, and strategies for the landscape.

Figure 1. Ecological subections in the Southeast landscape.



Background

Subdivision 2 of Minnesota's 1995 Sustainable Forest Resources Act (SFRA) authorizes the establishment of citizen-based regional forest resource committees to foster landscape-based forest resource planning.

The SFRA defines landscape-level planning as long-term, broad-based efforts that may require extensive analysis and planning over large areas and that may require extensive coordination among all landowners in a region. Regional committees provide the opportunity to involve private citizens, forestry professionals, and members of various interest groups in implementing landscape-level planning to promote forest sustainability. The SFRA charges the regional committees to:

- include representative interests;
- serve as a forum to discuss issues;
- identify and implement an open and public process whereby landscape-level strategic planning can occur;
- identify sustainable forest resource goals for the landscape and strategies to achieve those goals; and
- provide a regional perspective on forest sustainability to the Minnesota Forest Resources Council (MFRC).

The landscape program follows a general planning process in each landscape region. The regional forest resource committees use this five-step process to gather, share, and communicate information. It is:

- prepare an assessment of current conditions and trends (ecological, social, and economic) in the landscape;
- determine a vision, goals, and issues that address existing and potential forest resource conditions considered desirable for the region;
- develop strategies for implementing the vision and goals, and resolve issues in the region;
- encourage voluntary implementation of the strategies by coordination among landowners; and
- conduct an evaluation to determine how well the strategies accomplish the vision and goals and resolve issues.

This "Current Conditions and Trends Assessment: Southeast Landscape Region" represents the first step in the general planning process for southeastern Minnesota. Although this assessment is a work in progress, it contains enough information to get the regional committee started on the steps in the general planning process. As additional ecological and social/economic data becomes available it will be presented to the regional committee to use in determining desired future conditions, goals, and strategies for the forest resources in the landscape.

As stated in the SFRA, an important part of the landscape program is to "reflect a balanced consideration of economic, social, and environmental conditions and needs of each landscape". This is the idea of Ecosystem

Sustainability, where many factors are looked at including: flora and fauna composition and distribution, noninventoried species, species composition (including humans), species age class and spatial distribution, and many other components.

Definitions

Observations: Significant points about the information presented in the graphs and tables. At the beginning of each section in the assessment there are basic observations about the data presented. These are developed by MFRC landscape program staff.

Findings: A general theme that emerges from a set of observations. Overall findings from the assessment are noted in this document's introduction; findings about specific topics are listed at the beginning of that section. These are developed by MFRC landscape program staff.

Issues: An area of concern based on the interpretation of the findings and people's values. These are to be determined by the Southeast Regional Landscape committee.

Goals: A benchmark to strive towards in resolving the issues. Goals are not listed in this assessment; the Southeast Regional Landscape Committee will set goals for addressing each issue.

Strategies: Methods to meet goals. These also are not listed in the assessment but will be part of the regional forest resource committee's work.

Findings

· There is a wide range of hydrological systems from well defined to less well defined (Historical, Natural Resources).

· Most land is privately owned and is farmed or ranched (Social and Economic).

· Most of the timberland is privately owned, and there is a high demand on oak and other softwood species. Even with this high demand, overall timberland has slightly increased between 1977 and 1990 (Natural Resources).

Findings

· Substantial decrease of natural vegetation.

Comparison of Pre-settlement vegetation to current

Observations

· Conversion of natural vegeation (forest and prairie) to farms and pastures (Geographic Description)

· Varying hydrological system from well defined with stream networks, to undefined with constrained lakes (Geographic Description)

· Large decrease of forest (Figure 2), specifically bur oak (Table 1)

Geographic Description of Historical Landscape

The description of the Southeast landscape is based on its four ecological subsections, smaller areas defined by the Minnesota Department of Natural Resources Ecological Classification System

BIG WOODS Ecological Subsection

LANDFORM. The primary landform is a loamy mantled end moraine associated with the Des Moines Lobe of late Wisconsin glaciation. Parts of the moraine have ice disintegration features. Topography is characteristically gently to moderately rolling across this subsection. The dominant landscape feature is circular, level topped hills bounded by smooth side slopes and above a broad lower level. The lower level is interspersed with closed depressions containing lakes and peat bogs. Drainage is often controlled by the lake levels (Dept. of Soil Science, Univ. of Minn., 1973).

SOILS. The soils are dominantly loamy, with textures ranging from loam to clay loam (Dept. of Soil Science, Univ. of Minn., 1973). Parent material is calcareous glacial till of Des Moines Lobe (Late Wisconsin glaciation) origin. They are classified primarily as Alfisols (soils developed under forests). There are some Mollisols (soils developed under grassland) found on the west side of the subsection.

HYDROLOGY. The Minnesota River runs through the middle of this subsection. The Mississippi River forms part of the eastern boundary. The other major river is the Crow River and its associated forks. This subsection has an undeveloped drainage network, due to landform characteristics. Lakes are common. There are over 100 lakes that are 160 acres or greater in size. Many of these are groundwater controlled with no inlets or outlets.

PRESETTLEMENT VEGETATION. Oak woodland and maple-basswood forest were the most common vegetation types on the irregular ridges of this subsection. Based on his study of the *GLO* notes, Grimm (1984) found that order of dominance in the sugar maple-basswood forest was elm (27%), basswood (14%), sugar maple (12%), bur oak (10%), ironwood, red oak, and aspen (7%). He also found that along the western margin of the subsection, aspen was most common (53%), followed by bur oak (22%); on all other margins, oak woodland was dominated by a mix of aspen, red oak, bur oak, and to the east, white oak.

PRESENT VEGETATION AND LAND USE. Greater than 75% of the subsection is cropland, with an additional 5-10% pasture. The remaining 10-15% of the subsection remains as either upland forest or wetland (Dept. of Soil Science, Univ. of Minnesota 1973, 1980b, 1981a).

NATURAL DISTURBANCE. Although fire occurred within the subsection, it was much less common than on prairies to the west. This is primarily due to irregular topography and presence of lakes. Windthrow was probably also an important natural disturbance, but no references were encountered in the literature (Albert 1993).

OAK SAVANNAH Ecological Subsection

LANDFORM. Much of the subsection is a loess plain over bedrock or till. Topography is gently rolling. The subsection contains few lakes. Stagnation moraines in the southwest are not large, but slopes are often steep.

SOILS. This subsection is a mosaic of Mollisols and Alfisols. Alfisols correlate with savanna and forest vegetation, and Mollisols correlate with either upland prairie on relatively flat ridgetops or wetland prairies in broad depressions. Common soils include Aquolls (wet soils developed under prairie vegetation), Udolls (well drained soils developed under prairie vegetation), Udalfs (well drained soils formed under forest vegetation), and Aqualfs (wet soils developed under, forest vegetation) (Cummins and Grigal 1981).

HYDROLOGY. Most of this subsection has a fairly well developed drainage network. This is due to the nature of landforms within the unit. There are few lakes in this subsection. They are found in the moraines that form the western side of the unit.

PRESETTLEMENT VEGETATION. Bur oak savanna was the primary vegetative community, but areas of tallgrass prairie and maple-basswood forest were common. Tallgrass prairie was concentrated on level to gently rolling

portions of the landscape, in the center of the subsection. Bur oak savanna grew on rolling moraine ridges at the western edge of the subsection and in dissected ravines at the eastern edge. Maple-basswood was restricted to the portions of the landscape with the greatest fire protection, either in steep, dissected ravines or where stream orientation reduced fire frequency or severity (Albert 1993).

PRESENT VEGETATION AND LAND USE. Presently, most of the area is farmed. Urban development is accelerating along the northern boundary.

NATURAL DISTURBANCE. Fire is the most important disturbance within the subsection. Tornadoes and high wind events also created significant disturbances. Flooding in river and stream valleys periodically created and still creates problems.

ROCHESTER PLATEAU Ecological Subsection

LANDFORM. This subsection consists of level to gently rolling older till plains. Topography is controlled by underlying glacial till along the western edge of the subsection, where loess is several feet thick. As glacial drift thins to the east, topography is largely bedrock controlled (Dept. of Soil Science, Univ. of Minnesota 1973). Sinkholes are common in the southwestern portion of the subsection.

SOILS. Loess thickness is variable: loess deposits are as thick as 30 feet on broad ridgetops, to less than a foot on valley walls. The predominant soils are Udalfs, with localized Aquents along the floodplains of major rivers (Cummins and Grigal 1981). Cambrian siltstones, sandstones, and shales influence soil properties.

HYDROLOGY. There are few lakes in this subsection. The drainage network is well developed and dendritic in nature. Major rivers include the headwaters of the Root, Whitewater, Zumbro, and Canon. There are some coldwater trout streams in the eastern part of this subsection.

PRESETTLEMENT VEGETATION. Tallgrass prairie and bur oak savanna were major vegetation communities.

PRESENT VEGETATION AND LAND USE. The majority of this unit is heavily farmed, with approximately 80% in crops, 10% in pasture, and 5-10% in woodland. (Dept. of Soil Science, Univ. of Minnesota 1973). In Minnesota, Wheeler et al. (1985) found species characteristic of oak openings and barrens to be abundant (based on herbarium collections)

NATURAL DISTURBANCE. Fire was important on the upland prairie and oak savannah dominated ecosystems. Recent records of tornadoes and ice storms indicate that they locally impacted forest vegetation.

BLUFFLANDS Ecological Subsection

LANDFORM. The area is a loess-capped plateau, deeply dissected by river valleys. The greatest amount of relief occurs along the Mississippi River, where relief is up to 600 ft. In the east, loess lies directly on bedrock. In the southeast, loess overlies red clayey residuum that was formed directly from limestone and/or sandstone. Paleozoic sedimentary rocks crop out in valley walls, but are generally mantled with colluvium or loess. Topography is controlled by underlying glacial till along the western edge of the subsection, where loess is several feet thick. As glacial drift thins to the east, topography is largely bedrock controlled (Dept. of Soil Science, Univ. of Minnesota 1973). Sinkholes are common in the southwestern portion of the subsection.

SOILS. Loess thickness is variable: loess deposits are as thick as 30 feet on broad ridgetops, to less than a foot on valley walls. The predominant soils are Udalfs, with localized Aquents along the floodplains of major rivers (Cummins and Grigal 1981). Cambrian siltstones, sandstones, and shales influence soil properties.

HYDROLOGY. There are no lakes in this subsection. The drainage network is well developed and dendritic in nature. Major rivers include the Mississippi (which forms the eastern boundary), Root, Whitewater, Zumbro, and Canon. There are numerous coldwater trout streams throughout the subsection.

PRESETTLEMENT VEGETATION. Tallgrass prairie and bur oak savanna were major vegetation types on ridge tops and dry upper slopes. Red oak-white oak-shagbark hickory-basswood grew on moister slopes, and red oak-basswood-black walnut forests in protected valleys. Prairie was restricted primarily to the broader ridge tops, where fires could carry, but also occurred on steep slopes with south or southwest aspect.

PRESENT VEGETATION AND LAND USE. About 30 percent of this subsection is cropped, 20 percent is in pasture and 50 percent is in woodland (Dept. of Soil Science, Univ. of Minnesota 1973). In Minnesota, Wheeler et al. (1985) found species characteristic of oak openings and barrens to be abundant (based on herbarium collections). People are finding good recreational opportunities in this subsection.

NATURAL DISTURBANCE. Fire was important on the upland prairie and oak dominated ecosystems. Recent records of tornadoes and ice storms indicate that they locally impacted forest vegetation.

Table 1. A summary of rare natural features (element occurrance records), by ecological landscapes and feature type.

Landscapes	Geologic Process	Geologic Time	Natural Community	Other (nesting/breeding sites, bat/mussel sites)	Special Animals	Special Plants	Total
East Central	19	9	492	78	1,340	804	2,742
Metro	3	4	224	61	742	210	1,244
North Central	21	2	328	255	1,341	902	2,849
Northeast	36	15	156	136	614	1,078	2,035
Northern	18		572	197	1,063	847	2,697
Prairie	37	18	1,482	473	1,558	1,445	5,013
Southeast	31	19	1,839	257	2,492	2,384	7,022
West Central	8		266	33	275	168	750
Statewide	173	67	5,359	1,490	9,425	7,838	24,352

Notes:

Examples of feature types

Geologic process: fault, fold, groundwater deposit, glacial formations (esker, kame)
Geologic time: rock outcrop (igneous, metamorphic, sedimentary), fossils
Natural Community: praire, fen, forests
Other: nesting/breeding sites, bat/mussel sites
Special Animals: animals listed as endangered, threatened, or special concern (see table 15)
Special Plants:

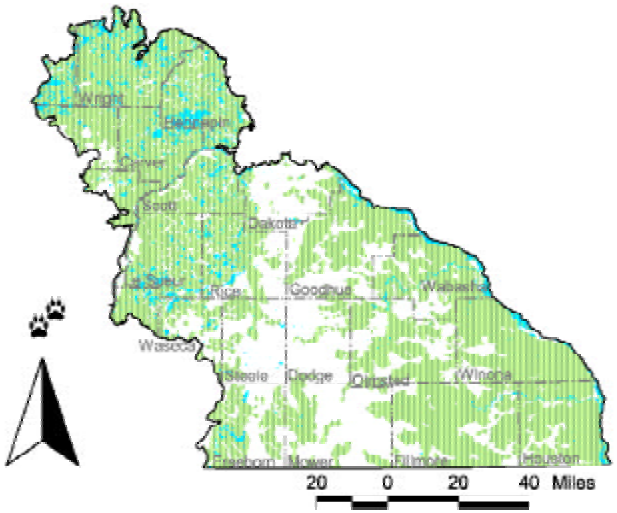
Other data avaiable from the Minnesota County Biological Survey, for this region includes detailed maps of native plant communities, and maps of areas of biological significance (using native plant data and the point data summarized above).

Copyright 2000 State of Minnesota, Department of Natural Resources (MNDNR). Rare features data have been provided by the Natural Heritage and Nongame Research Program of the Section of Ecological Services, MNDNR and were current as of 7/31/2000. These data are not based on an exhaustive inventory of the state. The lack of data for any geographic area shall not be construed to mean that no significant features are present. In addition, there may be inaccuracies in the data, of which MNDNR is not aware and shall not be held responsible for.

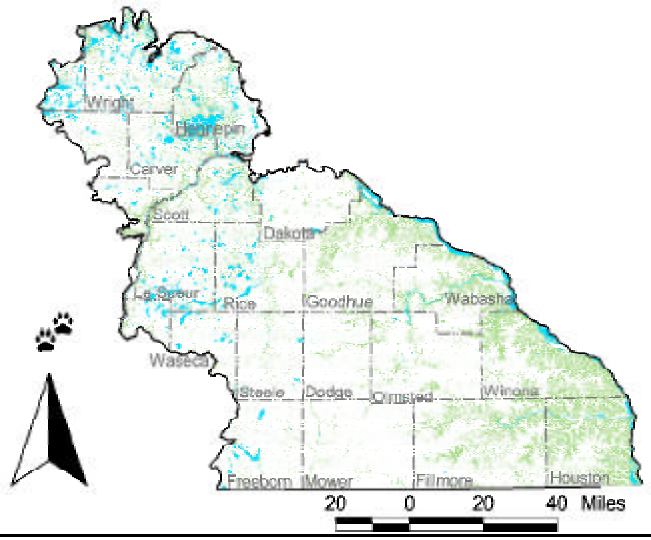
The data source for the Marschner map (on left) is a vegetation survey analysis done in the 1930s of 19th century information (Heinselman, 1974). The data for the map of current vegetation (1990s) is from remotely sensed information. The two sources differ considerably in resolution and vegetation classification systems (see Appendix A). Because of these differences, direct quantitative comparisons between the geographic information systems (GIS) data are not accurate.

Figure 2. Forest Change in the Southeast ecological landscape, 1800s to 1990s.

Area of forest cover, 1880s[A]



Area of forest cover, 1990s[B]



Legend

County Boundaries
Forested
Water

Source:
[A]Marschner data based on public land survey records, 1930 (marsh forests not included).
[B]Remotely sensed data, 1988-1996 (marsh forest not included).

The Public Land Survey (PLS) system was started in the late 1800s. As an essential part of the survey, process surveyors notched or blazed bearing trees to facilitate the relocation of survey corners. They also noted the species, diameter, and distance and azimuth from the corner for each bearing tree (Almendinger, 1996). John Almendinger, Minnesota Department of Natural Resources, has analyzed the bearing tree data and compared them to plot-level data from the 1990 Forest Inventory and Analysis (see Appendix B for an explanation of FIA). Tree records were selected from the 1990 FIA plot data to reproduce as closely as possible the procedure that the surveyors used to select bearing trees. (For a more detailed description of the methodology used, contact John Almendinger directly at the DNR Division of Forestry, Resource Assessment Office.)

Table 2. Relative difference in abundance of tree species estimated from the public land survey of the late 1800s[A] and the 1990 Forest Inventory and Analysis[B] for the Southeast ecological landscape.

Tree Species	Difference	Proportional Difference
Ash—Fraxinus nigra, F. pennsylvanica, F. americana	12.04	23.18
Aspen—Populus tremuloides, P. grandidentata, P. balsamifera (in lesser part)	-1.29	2.65
Birch—Betula papyrifera, B. cordifolia	4.21	24.89
Black Birch—Betula nigra, B. alleghaniensis (in part)	0.01	1.14
Black Oak—Quercus nigra, Q. ellipsoidalis (in part)	-24.31	-49.4
Black Walnut—Juglans nigra	2.92	21.0
Box-Elder—Acer negundo	25.32	406.04
Bur Oak—Quercus macrocarpa	-167.38	-12.5
Butternut—Juglans cinerea	2.3	18.26
Cherry—Prunus serotina, P. pennsylvanica	9.62	94.9
Cottonwood—Populus deltoides	5.96	141.26
Elm—Ulmus americana, U. rubra, U. thomasii	15.48	14.2
Hackberry—Celtis occidentalis	2.54	29.75
Hawthorn—Crataegus spp.	0.74	0
Hickory—Carya cordiformis, C. ovata	7.17	18.26

Table 1 continued on next page.

Source:
[A]Public Land Survey Bearing Tree Data, late 1800s.
[B]United States Forest Service Forest Inventory and Analysis.

Table 1 summarizes the results of Almendinger's analysis for the southeast landscape's ecological assessment area. The table compares abundance of bearing trees to abundance of FIA possible bearing trees. The "difference" column shows the percentage point difference between the bearing tree abundance values and the FIA values. The right-hand column shows the proportional difference for each species. For example, ash was 23 times more abundant among the selected FIA trees than among the bearing trees.

Table 2 (continued). Relative difference in abundance of tree species estimated from the public land survey of the late 1800s[A] and the 1990 Forest Inventory and Analysis[B] for the Southeast ecological landscape. (continued)

Tree Species	Difference	Proportional Difference
Illegible or Not Recorded—equivalent unknown	0.7	38.58
Ironwood—Ostrya virginiana	-2.26	6.77
Jack Oak—Quercus ellipsoidalis	-4.67	-11.33
Jack Pine—Pinus banksiana	3.05	0
Juniper or Red Cedar—Juniperus virginiana	2.76	439.23
Linden or Basswood—Tilia americana	19.39	20.6
Maple—Acer rubrum, A. saccharum, A. saccharinum	4.71	19.71
Oak—Quercus rubra, Q. macrocarpa, Q. ellipsoidalis, Q. velutina, Q. alba, Q. bicolor	-0.53	0
Plum—probably Prunus americana	0.34	1.89
Red Elm—Ulmus rubra	10.65	0
Red Oak—Quercus rubra, Q. ellipsoidalis (in part or as hybrid)	49.35	30.38
Red, Norway, or Yellow Pine—Pinus resinosa	0.17	20.81
Sugar Maple—Acer saccharum	10.82	62.29
Tamarack—Larix laricina	-0.9	0
White Pine—Pinus strobus	0.49	26.42
Willow—Salix spp.	7.91	55.97

Source:
[A]Public Land Survey Bearing Tree Data, late 1800s.
[B]United States Forest Service Forest Inventory and Analysis.

Natural Resources and Ecological Conditions and Trends

Findings

· Most of the forest is in older age classes, but in general has slightly increased between 1977 and 1990.
· Statewide harvesting volumes have changed much over the last 10 years and there is an increase in leaving more trees during harvest (clearcut with residuals) and allowing natural regeneration. In this region there is a high demand of oak and other soft hardwoods (boxelder, birch, chinkapin, hackberry, butternut, black cherry, black willow, elm).
· There are 104 vascular plants and vertebrate wildlife species, with know occurrence in the Southeast landscape, that are listed by the State as endangered, threatened, or of special concern.

This section includes data on forest patterns, riparian areas, forest composition (number and type of tree species present) and age structure, growth, and removals on timberland, silvicultural and harvesting practices, vascular plants, and wildlife in the Southeast landscape. The only detailed forest cover type data available across all ownerships (public and private) in the Southeast landscape is Forest Inventory and Analysis (FIA). See Appendix B for an explanation of the FIA program. Satellite data are available for recent years but are generally not detailed enough to use in conducting a thorough analysis of the region's forest resources. The information that exists on other taxonomic groups (e.g., herbaceous plants, insects, lichens, and mosses) consists primarily of lists of species that have been found in the region. Little information on species abundance or population trends is available for these groups.

NOTE. In Summer 2000, the DNR has completed an assessment for the Rochester Plateau and Blufflands Ecological Subsections, two of the ecological subsections included in the Southeast landscape (see page 13 for a description of these subsections). This assessment provides information about forest lands administered by the Divisions of Forestry and Wildlife in these subsections. Specifically, information on forest land composition and structure, silvicultural practices, ecological descriptions of the subsections and native plant communities, forest health, and wildlife species is included.

The document is on the Internet at: http://www.dnr.state.mn.us/forestry/subsection/blufflands/assess.html

Recent extent of forestlands

Observations

· Between 1977 and 1990 there has been an increase of forestland (Tables 2 and 3).

Table 3. Extent of forestland in the Southeast landscape, 1977 and 1990.

Land Use	1977 area	1990 area	Change
Forestland	534,700	632,100	97,400
Nonforestland	4,330,200	4,274,700	-55,500
Total	4,864,900	4,906,800	41,900

Tables 2 & 3

Table 4. Ratio of forestland to non-forestland for the Southeast landscape, 1977 and 1990.

Ratio: forestland to nonforestland	1977	1990
Southeast landscape	3/25	3/20

Source:
[A]Jakes and Raile, 1980.
[B]Murray, 1991.

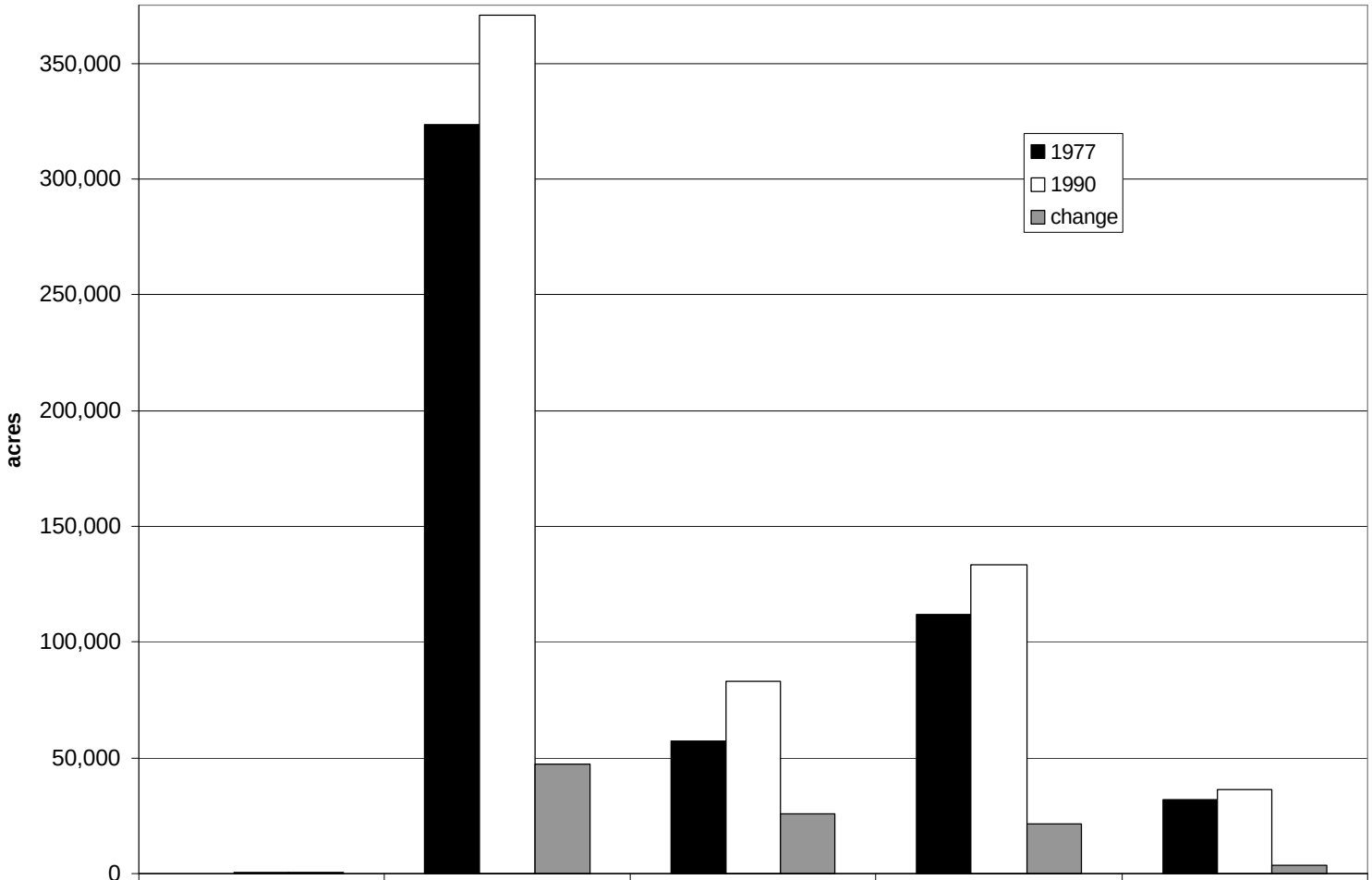
Notes:
• Data in tables are based on a sample and are therefore subject to statistical error.
• Forestland includes timberland, reserved forestland, and other forestland.
• Forestland is land with at least 16.7% stocking by trees or land formerly having such cover and not currently in a nonforestland use (Miles et al. 1995).
Timberland - land on which timber production is allowed and where industrial wood crops are able to grow at a sufficient rate. It is these lands on which timber harvesting occurs.
Reserved forestland - land on which trees grow but timber production is prohibited.

Structure of Timberland

Observations

· The forest is mostly oak/hickory and in older age classes (Figure 4, and Tables 4 and 5).
· Both oak, and "other soft hardwood" (buckeye, boxelder, birch, chinkapin, hackberry, butternut, magnolia, black cherry, black willow, elm) have seen mortality and removals at levels above growth, ie high demand (Tables 6 and 7).

Figure 3. Area (in acres) of timberland by forest type groups for the Southeast landscape, 1977-90.



	Wht_rd_jck	Oak_hick	Elm_ash_cot	Mpl_bch_brch	Asp_brch
1977	0	323,600	57,200	111,900	32,200
1990	800	370,900	82,900	133,300	36,100
change	800	47,300	25,700	21,400	3,900

forest type

Source:
United States Forest Service Forest Inventory and Analysis, 1990.

Notes:
Data in table are based on a sample and are therefore subject to statistical error.

Forest type groups
Forestlands are classified into types based on the predominant tree species in a stand. Forest types exhibit broad ranges of species composition and structure. For example, the aspen forest type will include areas of pure aspen and also areas with multiple species such as aspen, birch, and fir. Forest type groups are collections of one or more forest types. For example, the aspen-birch group includes forest types aspen, birch, and balsam poplar.

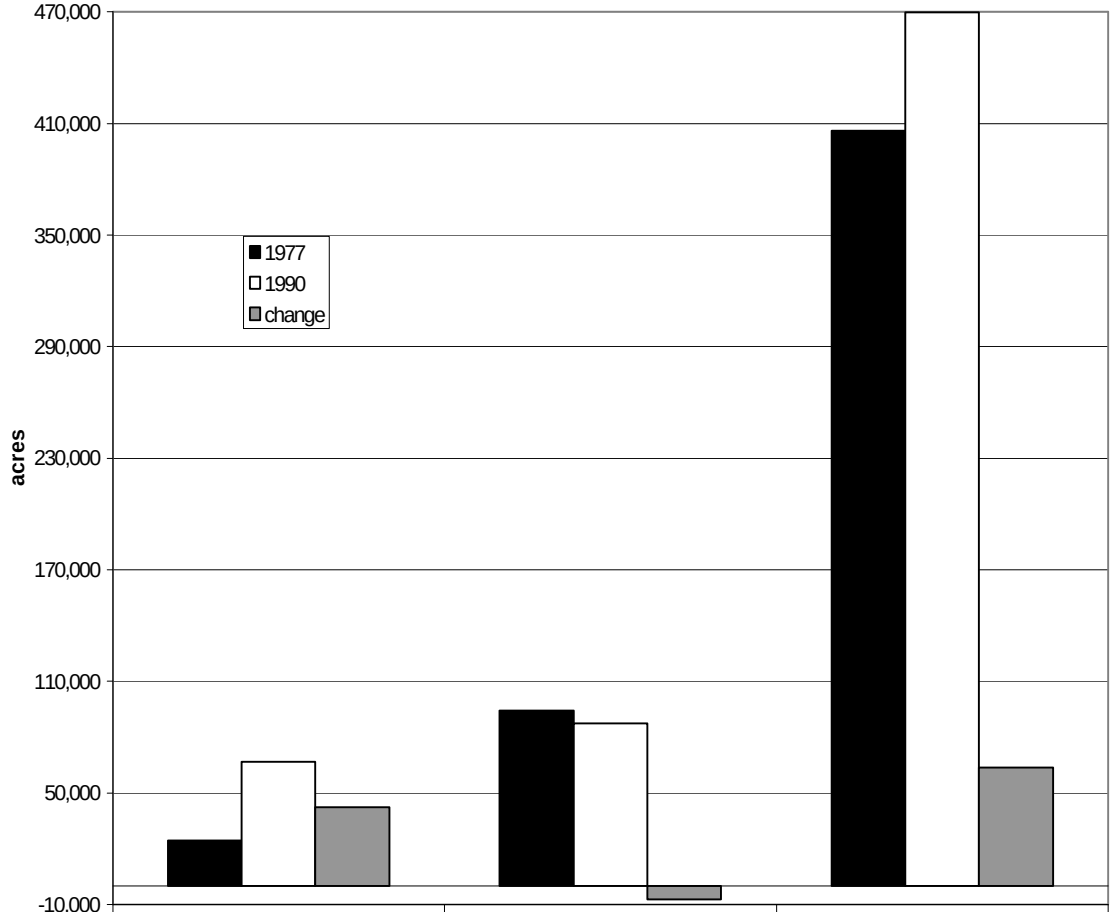
Figure 4. Area (in acres) of timberland by stand-size for the Southeast landscape, 1977-90.

Source:
United States Forest Service Forest Inventory and Analysis, 1990.

Notes:
Data in table are based on a sample and are therefore subject to statistical error.

Stand Size
A stand size class represents the maturity of the trees being measured (at least 50% of stocking). It goes from younger smaller sapling trees to larger older sawtimber trees.

Seedling-sapling - trees less than 5" diameter at breast height (dbh).
Poletimber - trees greater than 5" dbh and stocking of sawtimber trees is less than poletimber.
Sawtimber - trees greater than 5" dbh and stocking of sawtimber trees is greater than poletimber.



	Sapling_seedling	Poletimber	Sawtimber
1977	24,400	94,500	406,000
1990	66,800	87,400	469,800
change	42,400	-7,100	63,800

stand-size

Table 5. Area (in acres) of timberland by forest type and stand-size for the Southeast landscape, 1977.

Forest Type	Sawtimber	Poletimber	Sapling/ seedling	Nonstocked	Total
Oak-hickory	266,600	49,600	7,400	0	323,600
Elm-ash-cottonwood	43,300	9,100	4,800	0	57,200
Maple-beech-birch	87,100	18,400	6,400	0	111,900
Aspen-birch	9,000	17,400	5,800	0	32,200
All types	406,000	94,500	24,400	0	524,900

Table 6. Area (in acres) of timberland by forest type and stand-size for the Southeast landscape, 1990.

Forest Type	Sawtimber	Poletimber	Sapling/ seedling	Nonstocked	Total
White-red-jack pine	0	300	500	0	800
Oak-hickory	316,600	39,700	14,600	0	370,900
Elm-ash-cottonwood	61,500	12,800	8,600	0	82,900
Maple-beech-birch	77,400	18,000	37,900	0	133,300
Aspen-birch	14,300	16,600	5,200	0	36,100
All types	469,800	87,400	66,800	0	624,000

Source:
United States Forest Service Forest Inventory and Analysis, 1990.

Note:
Data in table are based on a sample and are therefore subject to statistical error.

Table 7. Average net annual growth, mortality and removals of growing stock (in million cubic feet) on timberland by species group for the Southeast landscape, 1990.

Species Group	Growth	Mortality	Removals
Other pine	0	0	0
Eastern white-red pine	0.2	0	0
Other softwood	0.3	0	0
Total softwoods	0.5	0	0
Select white oak	2.4	0.3	1.3
Select red oak	3.9	2	5.2
Other red oak	0	0.2	0.2
Hickory	0.7	0.1	0.1
Hard maple	0.6	0.1	0.4
Soft maple	0.8	0.1	0.1
Ashes	0.9	0.1	0.1
Cottonwood-aspen	1.1	0.7	0.1
Basswood	1.2	0.2	0.7
Black walnut	0.4	0	0.1
Other soft hardwood	0.6	5.1	2.1
Other hard hardwood	0	0	0.1
Total hardwoods	12.7	8.9	10.5
All species	13.2	8.9	10.5

Source:
United States Forest Service Forest Inventory and Analysis, 1990.

Note:
Data in table are based on a sample and are therefore subject to statistical error.

Current annual growth, mortality and removals are defined by the U.S. Forest Service as follows (Miles, et al., 1995):

Current annual growth of growing stock - The annual change in volume of sound wood in live sawtimber and poletimber trees and the total volume of trees entering these classes through ingrowth, less volume losses resulting from natural causes.

Current annual removals of growing stock - The current net growing stock volume in growing-stock trees removed annually for roundwood forest products, in addition to the volume in logging residues and the volume of other removals.

Current annual mortality of growing stock- The current growing stock volume in growing stock trees that died in a year due to insects, disease, fire, animals, weather, and other factors.

Table 8. Average net annual growth, mortality and removals of sawtimber (in million board feet, international 1/4" rule) on timberland by species group for the Southeast landscape, 1990.

Species Group	Growth	Mortality	Removals
Other pine	0.1	0	0
Eastern white-red pine	1.2	0	0
Jack pine	0	0	0
Other softwood	0.7	0	0
Total softwoods	2	0	0
Select white oak	15.7	0.9	5.9
Select red oak	24.6	6.9	24.8
Other red oak	0.8	0.9	0.7
Hickory	2.1	0.1	0.2
Hard maple	2.2	0.2	1.7
Soft maple	5	0.2	0.4
Ashes	3.6	0.2	0.4
Cottonwood-aspen	5.2	1.2	0.4
Basswood	5	0.9	3.3
Black walnut	1.5	0.1	0.3
Other soft hardwood	-0.5	14.4	8.2
Other hard hardwood	-0.2	0.2	0.1
Total hardwoods	65	26.1	46.4
All species	67	26.1	46.4

Source:
United States Forest Service Forest Inventory and Analysis, 1990.

Note:
Data in table are based on a sample and are therefore subject to statistical error.

Riparian areas

Observations

· There is a difference in stream systems in the ecological subsections. The Blufflands and Rochester Plateau subsections have a higher density of streams, while the Big woods and Oak Savannah subsections have more dense ditches (Table 8).

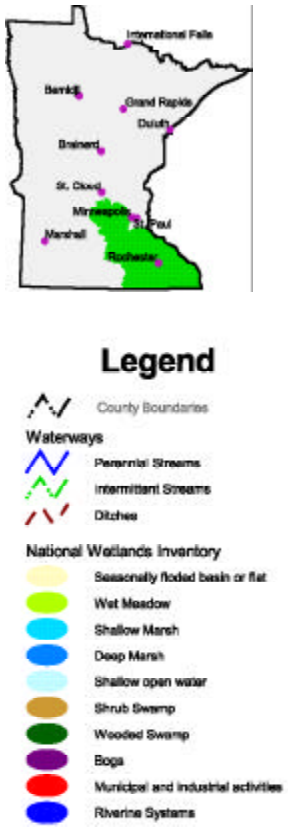
Table 9. Density of waterways, by ecological subsection, in the Southeast ecological landscape.

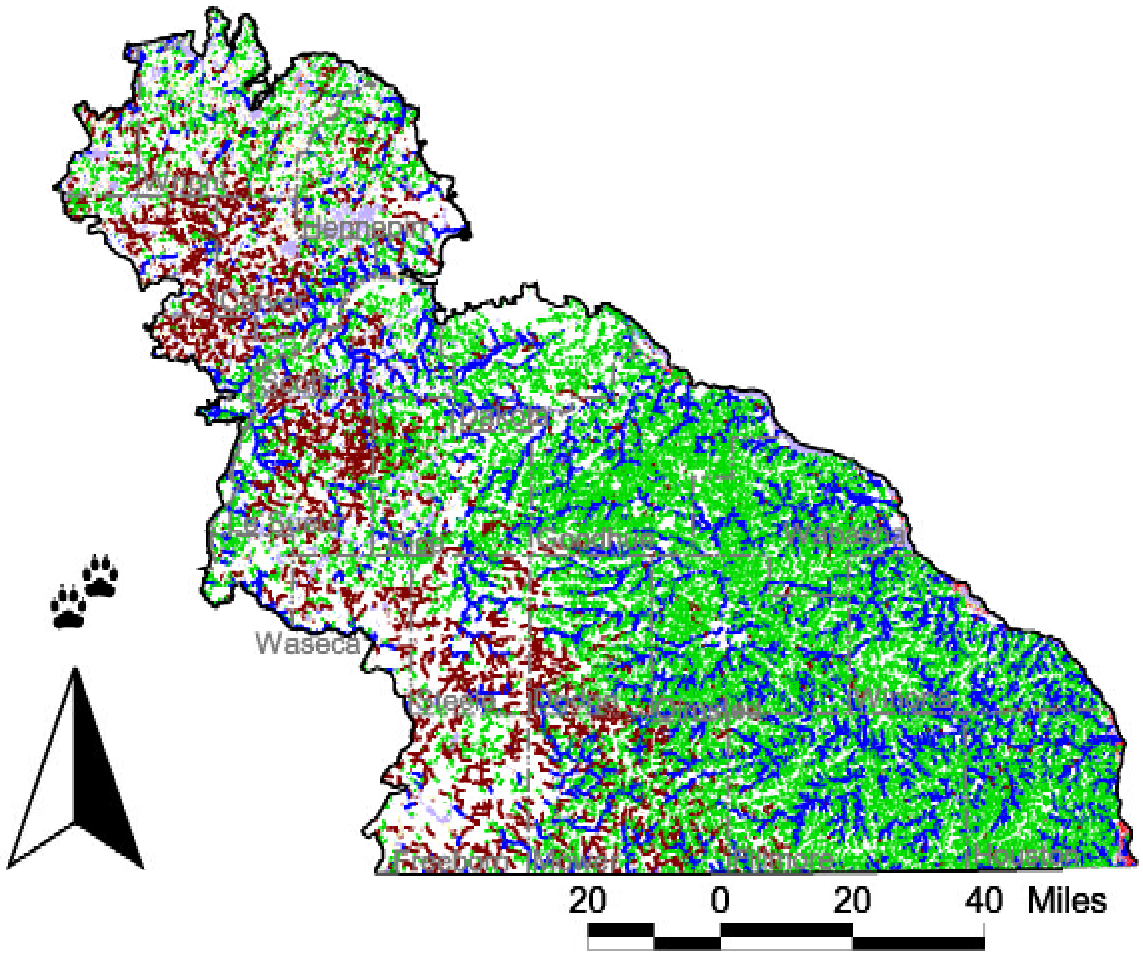
Type of Waterway	Big Woods	Oak Savanna	Rochester Plateau	The Blufflands
Perennial	0.219	0.262	0.349	0.925
Intermittent	0.396	0.663	1.402	1.347
Ditch	0.354	0.395	0.052	0.034

Source: Minnesota Department of Natural Resources GIS data derived from 1980 USGS quadrangle maps.

Note: Density equals miles of waterway divided by miles square of subsection.

Figure 5. Wetlands and waterways in the Southeast ecological landscape.





Source:
Aerial photography, 1979-1988, and USGS quadrangle maps.

Table 10. Total acres of riparian areas (classified by the National Wetlands Inventory) in the Southeast ecological landscape.

National Wetlands Inventory Classes	Acres	Percent of Southeast Landscape
Uplands, system	5,981,419	89.6%
Shallow marsh	246,029	3.7%
Shallow open water	188,853	2.8%
Seasonally flooded basin or flat	88,819	1.3%
Riverine systems, system	84,713	1.3%
Wooded swamps	43,377	0.6%
Shrub swamp	21,141	0.3%
Wet meadow	13,761	0.2%
Deep marsh	8,404	0.1%
Municipal and industrial activities, water regime	895	0.0%
Bogs	29	0.0%
Total Acres	6,679,393	100.0%

Source:
Department of Natural Resources GIS data derived from aerial photographs taken between 1979 and 1988.

Vascular plants and wildlife species

Observations

· There are 104 vascular plants and vertebrate wildlife species, with know occurrence, in the Southeast landscape, that are listed by the State as endangered, threatened, or of special concern (Tables 12 and 14).

Table 11. Richness of vascular plants in Owenby and Morley (1991) by MFRC landscape.

		1996 State List of Endangered, Threatened, Special Concern Species [B]		
MFRC Regional Landscapes	**Number of species[A]**	**Endangered**	**Threatened**	**Special Concern**
Northeast	1,201	16	19	50
Northern	1,014	1	8	30
West Central	1,066	2	4	19
North Central	1,186	3	11	29
East Central	1,356	12	10	38
Southeast	1,395	21	34	51
Metro	1,088	11	6	19
Prairie	1,199	12	13	45
Statewide	1,887	55	64	125

Source:
[A]Owenby and Morley, 1991.
[B]Minnesota Department of Natural Resources, 1996.

Table 12. Numbers of vascular plants in Owenby and Morley (1991) with recorded occurrence limited to a particular MFRC landscape.

		1996 State List of Endangered, Threatened, Special Concern Species [B]		
MFRC Regional Landscapes	**Number of species[A]**	**Endangered**	**Threatened**	**Special Concern**
Northeast	82	14	12	23
Northern	3	0	1	1
West Central	6	1	0	0
North Central	7	1	3	0
East Central	14	2	2	2
Southeast	82	11	20	15
Metro	9	2	0	0
Prairie	56	8	6	15

Source:
[A]Owenby and Morley, 1991.
[B]Minnesota Department of Natural Resources, 1996.

Table 13. Richness of forest-associated mammals, amphibians and reptiles, and breeding birds in Minnesota.

	All habitats Statewide	Forest associated Statewide
Mammals[A]	80	65
Amphibians and reptiles[A]	49	43
Breeding birds [B]	245	151

Source:
[A]J.R. Tester, 1995.
[B]J.C. Green, 1995.

Table 14. Status of Minnesota's forest-associated endangered, threatened, and special concern vertebrate wildlife, 1984.

Species in larger font are located in Southeast MN

Endangered	*Threatened*	*Special concern*	
Mammals — Birds — Amphibians and reptiles *1. Five-lined skink*	Mammals *1. Gray wolf* Birds *1. Bald eagle* *2. Loggerhead shrike* Amphibians and reptiles *1. Wood turtle* *2. Blanding's turtle*	Mammals *1. Least shrew* *2. Mountain lion* *3. Wolverine* *4. Marten* *5. Rock vole* *6. Woodland vole* *7. Northern myotis* *8. Heather vole* *9. Eastern pipistrelle* *10. Caribou* *11. Eastern spotted skunk* *12. Northern bog lemming* Birds *1. Red-shouldered hawk* *2. Osprey* *3. Louisiana waterthrush*	Amphibians and Reptiles *1. Northern cricket frog* *2. Snapping turtle* *3. Racer* *4. Timber rattle snake* *5. Rat snake* *6. Fox snake* *7. Western hognose snake* *8. Eastern hognose snake* *9. Milk snake* *10. Massasauga* *11. Bullfrog* *12. Pickerel frog*

Table 15. Status of Minnesota's forest-associated endangered, threatened, and special concern vertebrate wildlife, 1996.

Endangered	Threatened	Special concern	
Mammals — **Birds** — **Amphibians and reptiles** *1. Northern cricket frog* *2. Massasauga*	**Mammals** *1. Eastern spotted skunk* **Birds** *1. Loggerhead shrike* **Amphibians and reptiles** *1. Wood turtle* *2. Timber rattle snake* *3. Blanding's turtle*	**Mammals** *1. Gray wolf* *2. Least shrew* *3. Mountain lion* *4. Woodland vole* *5. Least weasel* *6. Northern myotis* *7. Heather vole* *8. Eastern pipistrelle* *9. Smokey shrew* *10. Northern bog lemming*	**Birds** *1. Red-shouldered hawk* *2. Cerulean warbler* *3. Acadian flycatcher* *4. Bald eagle* *5. Louisiana waterthrush* *6. Hooded warbler* **Amphibians and Reptiles** *1. Smooth softshell* *2. Snapping turtle* *3. Racer* *4. Rat snake* *5. Five-lined skink* *6. Western hognose snake* *7. Four-toed salamander*

Species in larger font are located in Southeast MN

Social and Economic Conditions and Trends

Findings

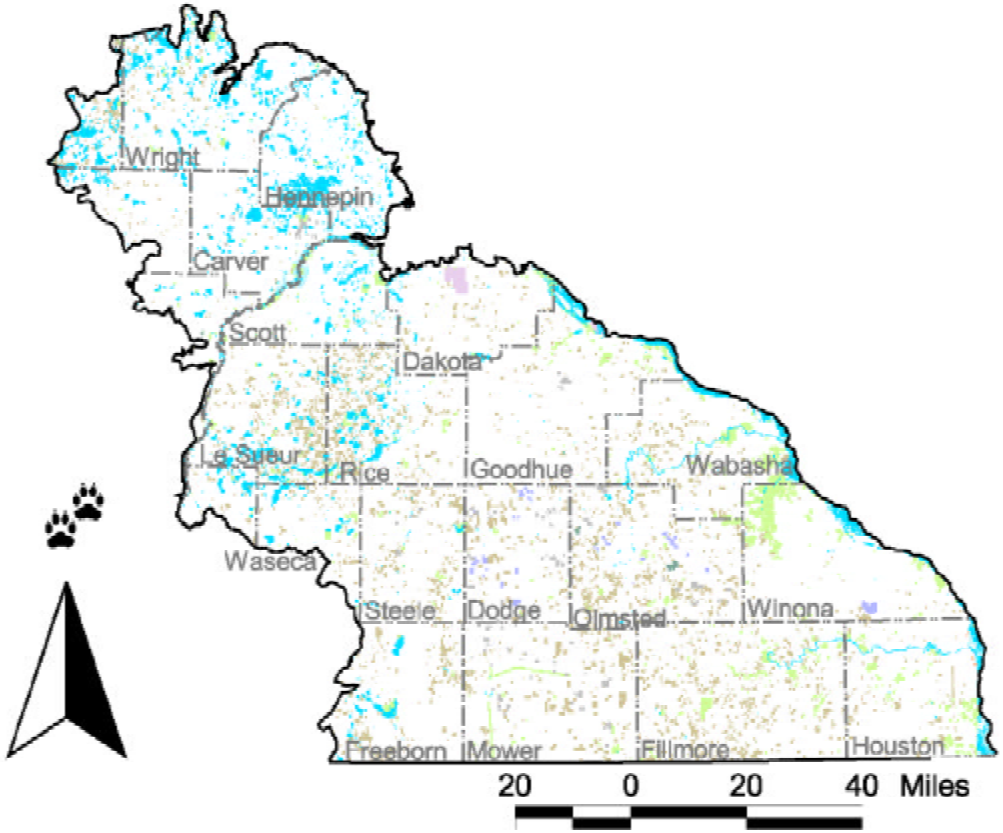
· The area is largely privately owned, with a lot of cultivated and pasture land, and most of the timberland is owned by farmers and ranchers (Land Use and Ownership)
· Fillmore and Olmested counties have very different social and economic trends (demographic, and employment).
· Statewide farming is dropping which is also reflected in the southeast region. However unlike the statewide increase of services, in the southeast services are decreasing (employment and economic).
· Manufacturing is the major industry in this region (employment and economic).
· There is a noticeable increase statewide in road and trail miles (recreation).

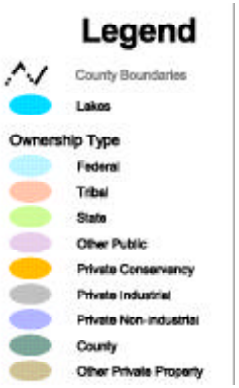
Land Use and Ownership

Observations

· Most of land is privately owned (Figures 12 and 13).
· A majority of timberland is owned by farmers and ranches, although this is decreasing along, and public ownership is slightly increasing (Tables 16 and 17).
· About three fourths of the land is cultivated (61%) and hay/pasture/grassland (11.8%). Only 15% of the land is forested (Figure 15).
· Statewide private ownership parcel size is usually less than 500 acres (Figure 16).

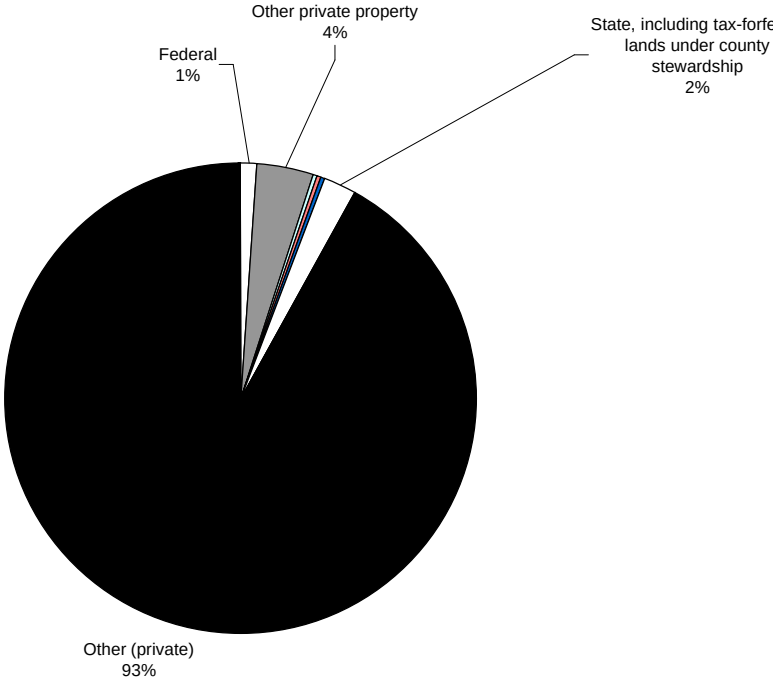
Figure 6. GAP ownership in the Southeast ecological landscape.





Source:
Land records, 1983-1995 (data mapped to whoever owns more than 50 percent of a "forty;" private ownership of less than 1000 acres not mapped).

Figure 7. GAP Ownership (in acres) for the Southeast ecological landscape.



Source:

Note:
See metadata appendix for more information on the data.

Table 16. Area (in acres) of land by GAP ownership group for the Southeast ecological landscape.

GAP Ownership Group	Acres owned
County	2,466
State [A]	149,800
Federal	64,571
Other public	9,951
Private conservancy	200
Private industrial[B]	22,811
Private nonindustrial business or trust[B]	9,783
Tribal	389
Other private property	271,341
Other (private)	6,148,470
Total	6,679,393

Source:

Notes:
[A]Including tax-forfeited lands under county stewardship.
[B]Lands owned over 1000 acres within one county.

Table 17. Area of timberland by ownership group for the Southeast landscape, 1977 and 1990.

	1977		1990		Change	
Ownership Group	**acres**	**percent**	**acres**	**percent**	**acres**	**percent**
National forest	0	0.0%	0	0.0%	0	0.0%
Bureau of Land Mgmt	0	0.0%	0	0.0%	0	0.0%
Tribal trust	0	0.0%	1,200	0.2%	1,200	0.2%
Miscellaneous federal	16,500	3.1%	19,500	3.1%	3,000	0.0%
State	38,700	7.4%	69,300	11.1%	30,600	3.7%
County & municipal	1,500	0.3%	5,500	0.9%	4,000	0.6%
Forest industry	0	0.0%	1,400	0.2%	1,400	0.2%
Farmer & rancher	428,500	81.6%	402,200	64.5%	-26,300	-17.2%
Private corporation	3,900	0.7%	19,600	3.1%	15,700	2.4%
Private individual	35,800	6.8%	105,300	16.9%	69,500	10.1%
Total	524,900	100.0%	624,000	100.0%	99,100	0.0%

Source:
United States Forest Service Forest Inventory and Analysis, 1990.

Note:
Data in table are based on a sample and are therefore subject to statistical error.

Table 18. Area of timberland summed by public and private ownership for the Southeast landscape, 1977 and 1990.

	1977		1990		Change	
Ownership	**acres**	**percent**	**acres**	**percent**	**acres**	**percent**
Public	56,700	10.8%	95,500	15.3%	38,800	4.5%
Private	468,200	89.2%	528,500	84.7%	60,300	-4.5%
Total	524,900	100.0%	624,000	100.0%	99,100	0.0%

Source:
United States Forest Service Forest Inventory and Analysis, 1990.

Note:
Data in table are based on a sample and are therefore subject to statistical error.

Figure 8. Reserved lands and forests in the Southeast ecological landscape.

Legend

- County Boundaries
- Lakes
- Scientific and Natural Areas
- State Parks
- State Forests
- National Forests

Source: Minnesota Department of Natural Resources and U.S. Forest Service management boundaries.

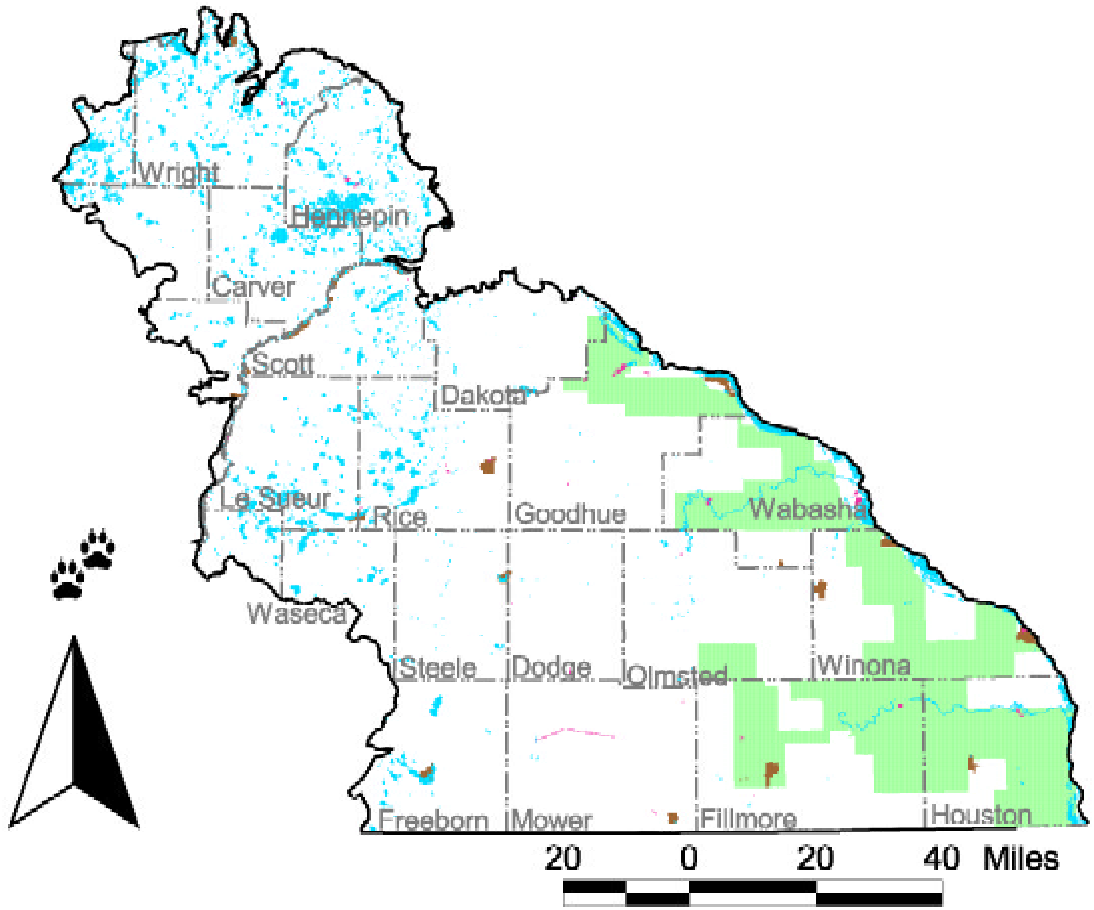
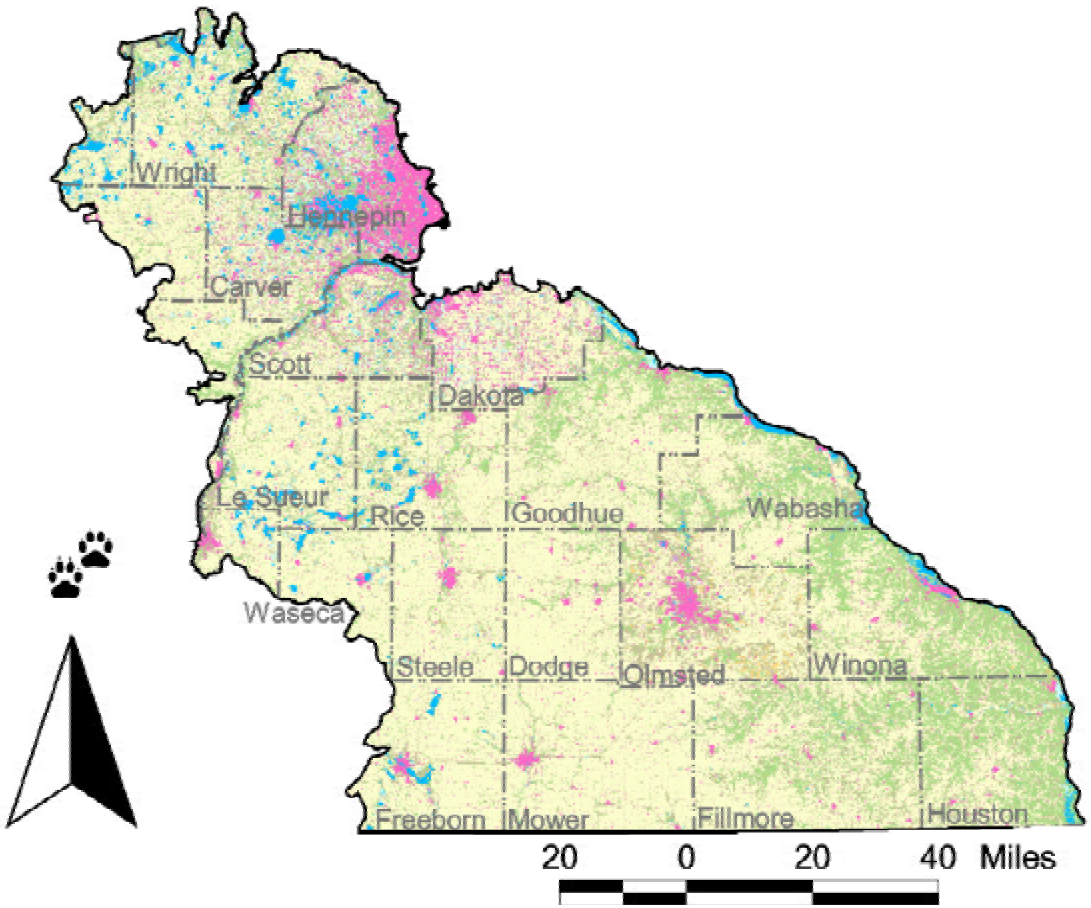


Figure 9. Land use from satellite data for the Southeast ecological landscape, 1990.



Legend

County Boundaries

Land Use and Cover

- Urban and Rural Development
- Cultivated Land
- Hay/Pasture/Grassland
- Brushland
- Forested
- Water
- Bog/Marsh/Fen
- Mining

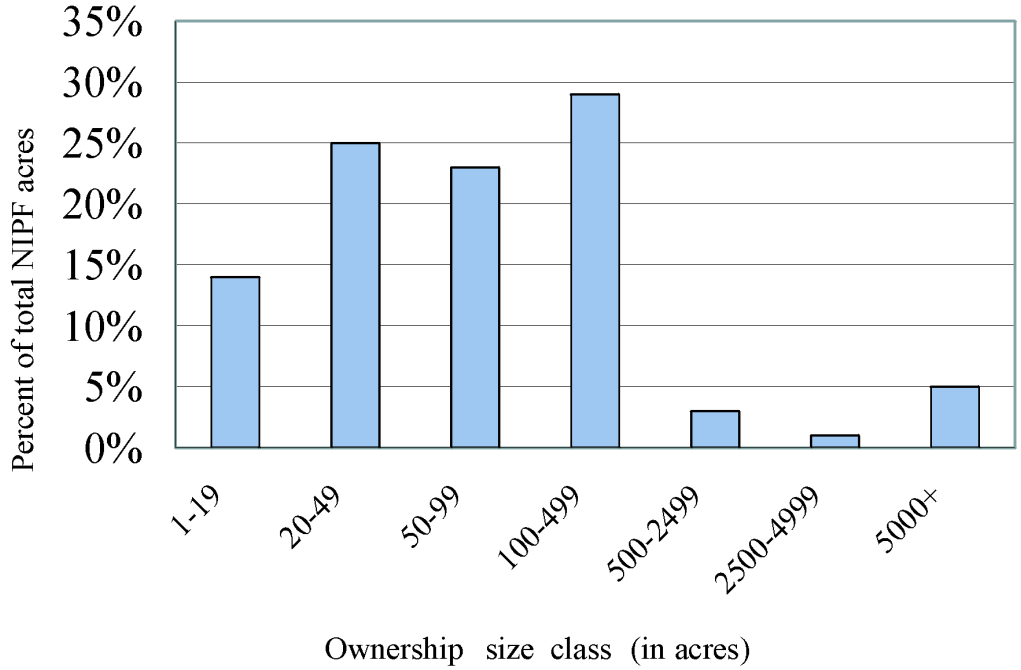
Note:
See metadata appendix for more information on the data.

Table 19. Area of land use classes (in acres) in the Southeast ecological landscape.

Land Use Classes	Acres	Percent of Southeast Landscape
Cultivated Land	4,073,799	61.0%
Forested	991,881	14.9%
Hay/Pasture/Grassland	791,328	11.8%
Urban/Rural/Development	451,104	6.8%
Water	201,901	3.0%
Bog/Marsh/Fen	133,793	2.0%
Brushland	27,880	0.4%
Mining	7,638	0.1%
Total Acres	6,679,325	100.0%

Source:
Remotely sensed data, 1988-1996.

Figure 10. Distribution of nonindustrial private forestland (NIPF) acres statewide by ownership class size, 1990.



Demographics

Observations

· From 1970 to 2025 the southeast region shows a current growth of 7% and a project growth of 6%. This is below the statewide current average of 8% and project average of 14%. The three counties with noticeably low increases and some decrease are Freeborn, Fillmore, and Mower. Three counties with high increases include Olmsted, Rice, and Le Sueur (Figure 17, and Tables 19, 20, and 21).

· Poverty in most counties is below the statewide average, except in Fillmore, Freeborn, and Winona counties. The lowest poverty rates are in Olmsted and Steele counties (Table 22).

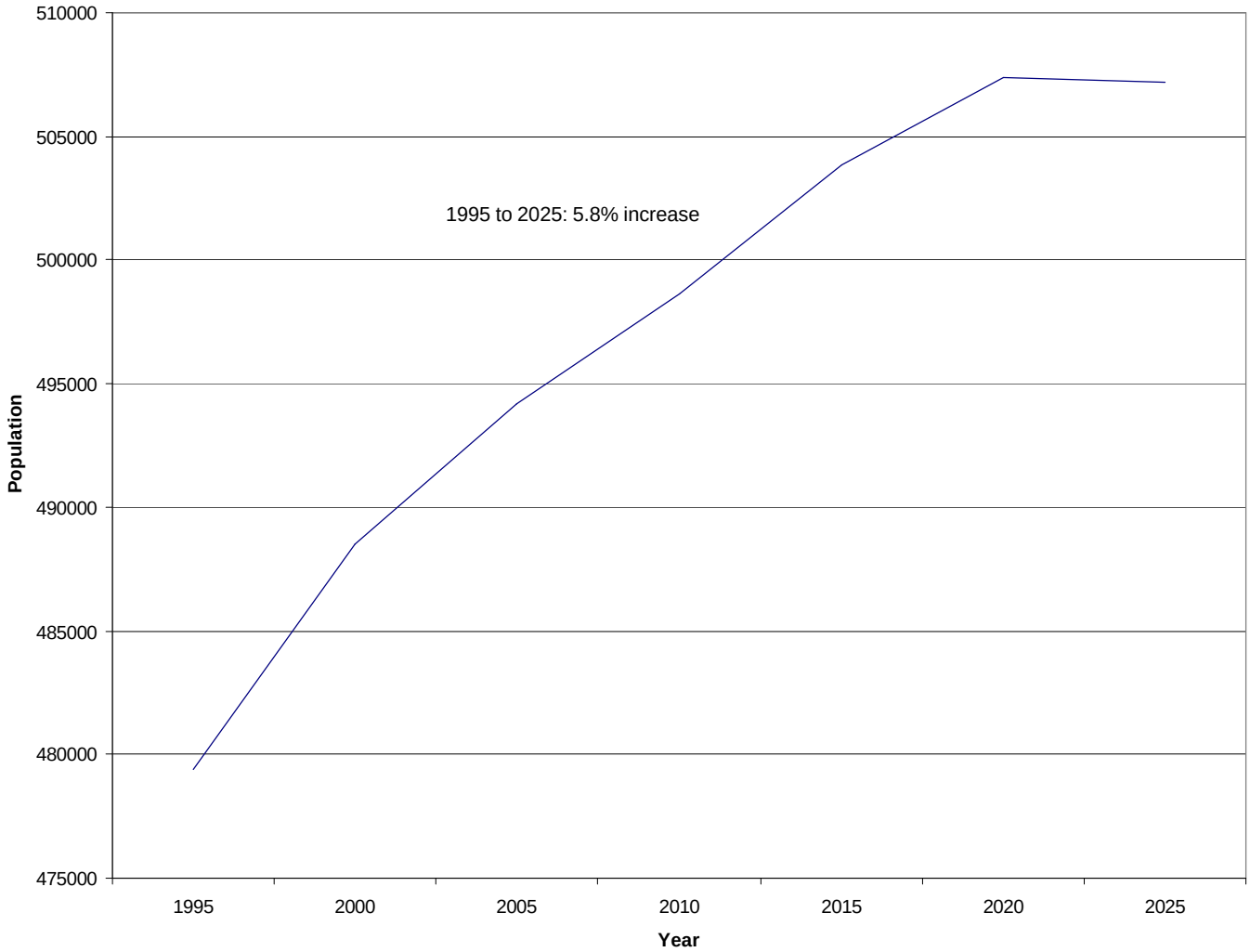
· Per capita income is above the statewide average in Mower, and Steele, and is comparatively low in Fillmore and Wabasha (Table 23).

Table 20. Population of Minnesota and counties in the Southeast landscape.

	1970	1980	1990	1980-1990 % Change	1997[A]	1990-1997 % Change
Minnesota	3,806,103	4,075,970	4,375,099	7.34	4,735,830	8.25
Southeast	1,482,308	1,527,369	1,668,314	9.23	1,781,340	6.77
Dodge	13,037	14,773	15,731	6.48	17,122	8.84
Fillmore	21,916	21,930	20,777	-5.26	20,969	0.92
Freeborn	38,064	36,329	33,060	-9.00	32,429	-1.91
Goodhue	34,804	38,749	40,690	5.01	42,987	5.65
Houston	17,556	18,382	18,497	0.63	19,330	4.50
Le Sueur	21,332	23,434	23,239	-0.83	24,939	7.32
Mower	44,919	40,390	37,385	-7.44	37,575	0.51
Olmsted	84,104	92,006	106,470	15.72	116,537	9.46
Rice	41,582	46,087	49,183	6.72	53,514	8.81
Steele	26,931	30,328	30,729	1.32	32,320	5.18
Wabasha	17,224	19,335	19,744	2.12	20,721	4.95
Waseca	16,663	18,448	18,079	-2.00	18,626	3.03
Winona	44,409	46,256	47,828	3.40	49,485	3.46

Source:
United States Census Bureau, 1990.
Note:
[A]Minnesota State Demographic Center.

Figure 11. Population projection for the Southeast landscape, 1995-2025.



Source:
Minnesota State Demographic Center

Note:
The 1995 data is a U.S. Census Bureau estimate that was used to creat the population projections through 2025.

Table 21. Population projections for Minnesota and the Southeast landscape, 1995-2025.

	1995[A]	2025	1995-2025 % Change
Minnesota	4,626,514	5,282,840	14.19
Southeast	479,407	507,190	5.8
Dodge	16,680	17,990	7.85
Fillmore	20,906	19,310	-7.63
Freeborn	32,759	28,170	-14.01
Goodhue	42,477	48,170	13.40
Houston	19,123	19,660	2.81
Le Sueur	24,371	28,880	18.50
Mower	37,628	35,130	-6.64
Olmsted	113,968	130,000	14.07
Rice	52,232	58,720	12.42
Steele	31,817	33,340	4.79
Wabasha	20,428	20,830	1.97
Waseca	18,031	16,930	-6.11
Winona	48,987	50,060	2.19

Source:
Minnesota State Demographic Center

Note:
The 1995 data is a U.S. Census Bureau estimate that was used to creat the population projections through 2025.

Table 22. Population projection by age group for Minnesota and the Southeast landscape, 1995-2025.

Source:
Minnesota State Demographic Center

Note:
The 1995 data is a U.S. Census Bureau estimate that was used to creat the population projections through 2025.

	Minnesota			Southeast Landscape		
Age Group	**1995 [A]**	**2025**	**1995-2025 % Change**	**1995[A]**	**2025**	**1995-2025 % Change**
0-24	1,678,036	1,506,390	-10.2	175,715	144,840	-17.6%
25-64	2,369,249	2,735,390	15.5	233,970	251,060	7.3%
65-85+	579,229	1,041,060	79.7	69,722	111,290	59.6%
Total	4,626,514	5,282,840	14.2	479,407	507,190	5.8%

Table 23. Persons with incomes below the poverty level, 1990.

	% of Population Below Poverty Level
Minnesota	10.2
Dodge	7.6
Fillmore	14.8
Freeborn	10.3
Goodhue	8.1
Houston	8.8
Le Sueur	8.8
Mower	10.0
Olmsted	6.9
Rice	8.7
Steele	6.7
Wabasha	8.4
Waseca	9.4
Winona	12.8

Source: United States Census Bureau, 1990.

Table 24. Per capita personal income (in dollars) for Minnesota and counties in the Southeast landscape, 1990-1996.

Source:
Minnesota State
Demographic Center

	1990	1995	1996	% Growth 1995-1996	% Growth 1990-1996
Minnesota	19,373	24,097	25,699	6.7	32.7
Dodge	16,352	19,316	20,760	7.5	27.0
Fillmore	15,378	17,221	19,101	10.9	24.2
Freeborn	15,678	18,466	20,047	8.6	27.9
Goodhue	17,332	21,842	23,486	7.5	35.5
Houston	16,317	19,462	21,030	8.1	28.9
Le Sueur	16,164	19,741	20,848	5.6	29.0
Mower	17,190	21,904	23,399	6.8	36.1
Olmsted	20,694	24,834	26,478	6.6	28.0
Rice	15,608	19,194	20,314	5.8	30.2
Steele	17,661	22,142	24,191	9.3	37.0
Wabasha	16,713	19,316	20,780	7.6	24.3
Waseca	16,042	19,222	20,847	8.5	30.0
Winona	15,905	19,883	21,108	6.2	32.7

Employment

Observations

· Employer by major industry for the southeast has seen a decrease in farm employment and sevices, while statewide only farm employment has decreased (Figures 18, and 19). Farming is expected to continue to decrease both statewide and in the southeast region (Figure 20 and Table 25)

· In general unemployment has declined in the U.S., Minnesota, and all of the counties in thesouthesat region. However, Dodge, Fillmore, and Le Sueur has averages above the state average while Olmsted has an average well below the state average (Table 26).

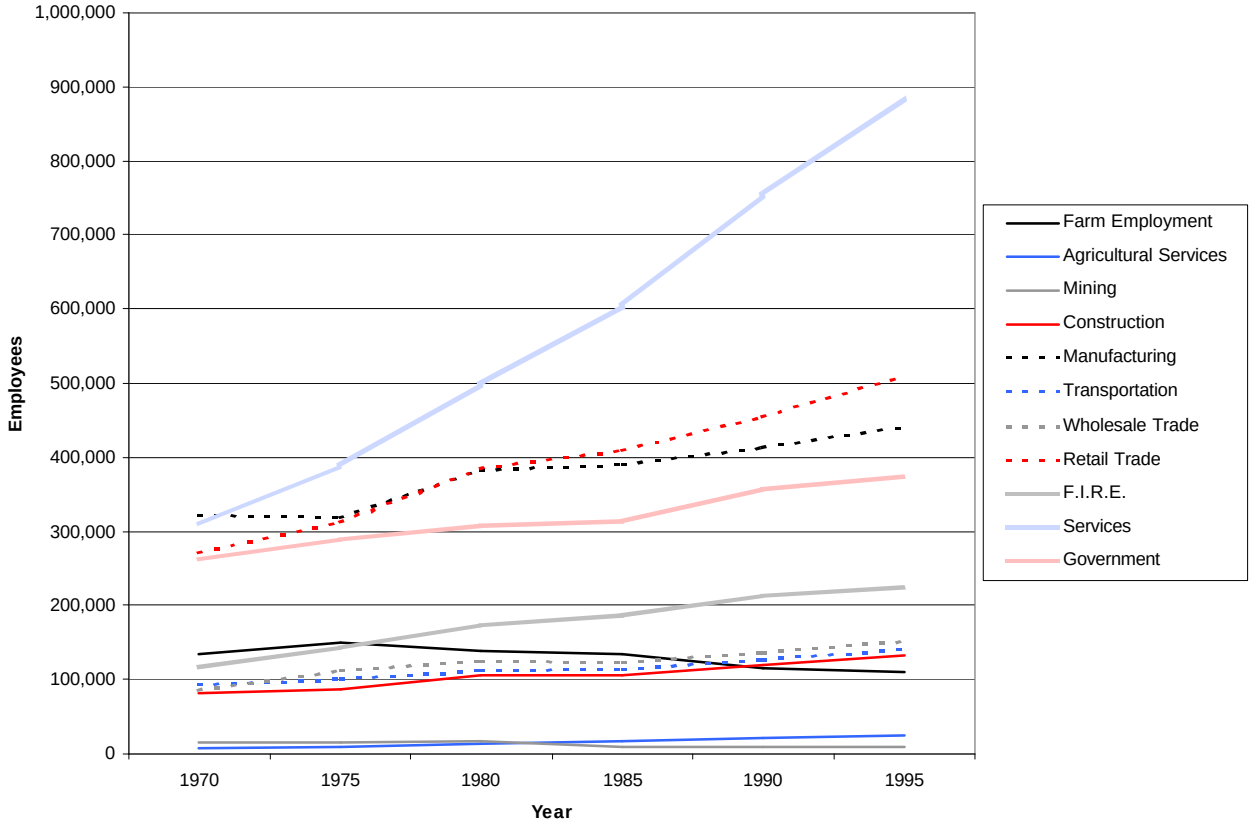
Employment data is defined as employment covered by social security and reported by place of work (as opposed to place of residence data used in the census). All employment and earnings data are reported for industries classified by Standard Industrial Classification (SIC) codes. The SIC codes are used in the Regional Economic Information System (REIS) to provide a detailed accounting of employment and earnings by industry at the county, state, and national level. Since only social security data is used, individual businesses opting out of the social security system (such as independent loggers) are not included. Also, transportation and agriculture industries tend to be undercounted because employees have their own retirement systems.

The REIS tends to emphasize manufacturing and heavy industry data rather than service industry data. Tourism is captured indirectly through codes for eating and drinking places, hotels and lodging places, and automobile dealers and service stations under the service industry category.

Data disclosure laws can be problematic when using county-level economic data. These laws prevent data from being released that would make it possible to identify a specific business within a geographic area. This results in incomplete or absent data for many industry categories. Because of the limitations of SIC codes and data availability, only major industry categories were included in this assessment. These industries include the following:

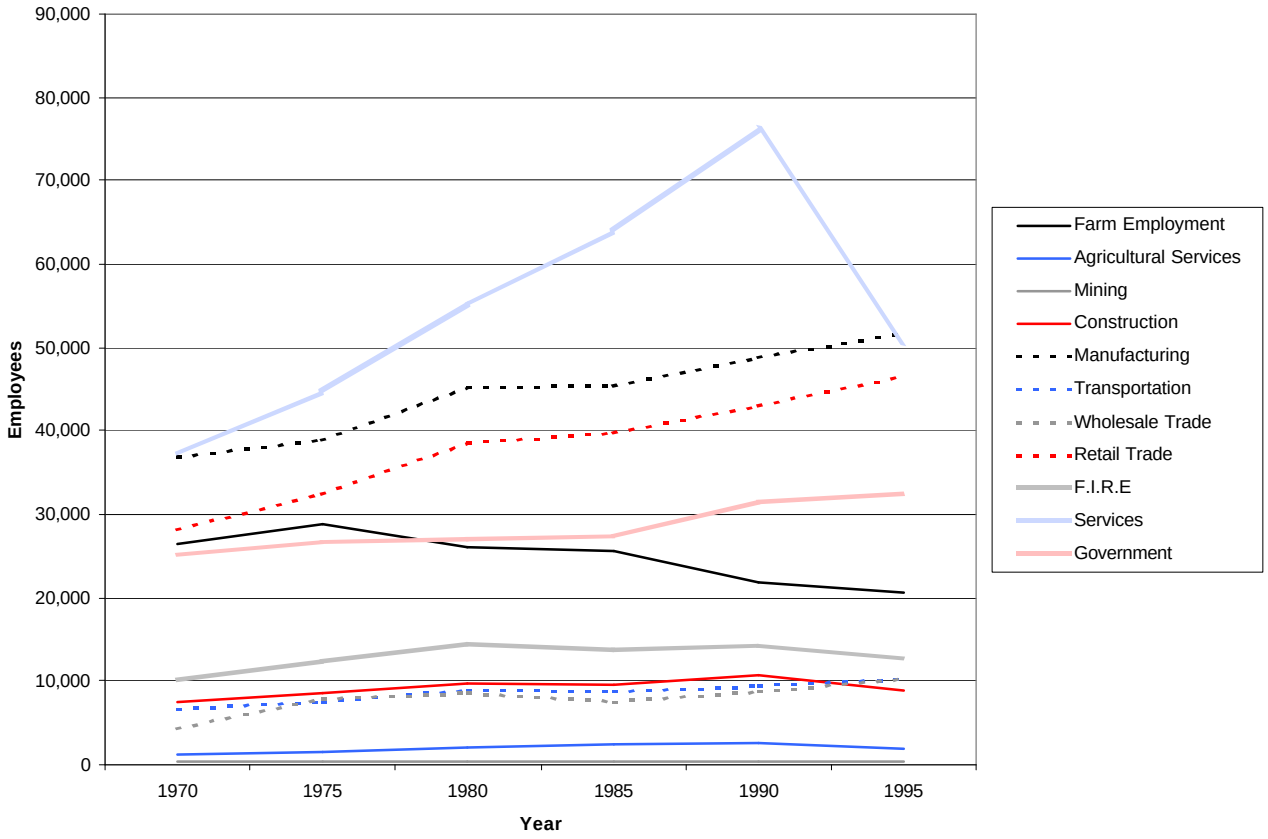
- Agricultural Services, Forestry, and Fishing
- Construction
- Farming
- Finance, Insurance, and Real Estate (F.I.R.E.)
- Government (state, local, military, and federal including USFS employees)
- Manufacturing (includes lumber and wood products; furniture and fixtures; and paper and allied products)
- Mining (includes metal, coal, oil and gas extraction; and nonmetallic minerals)
- Retail Trade
- Services (includes hotels and lodging places)
- Transportation and Public Utilities
- Wholesale Trade

Figure 12. Number of employees by major industry for Minnesota, 1970-1995.



Source:
Regional Economic Information System, Table CA25, Bureau of Economic Analysis.

Figure 13. Number of employees by major industry for the Southeast landscape, 1970-1995.



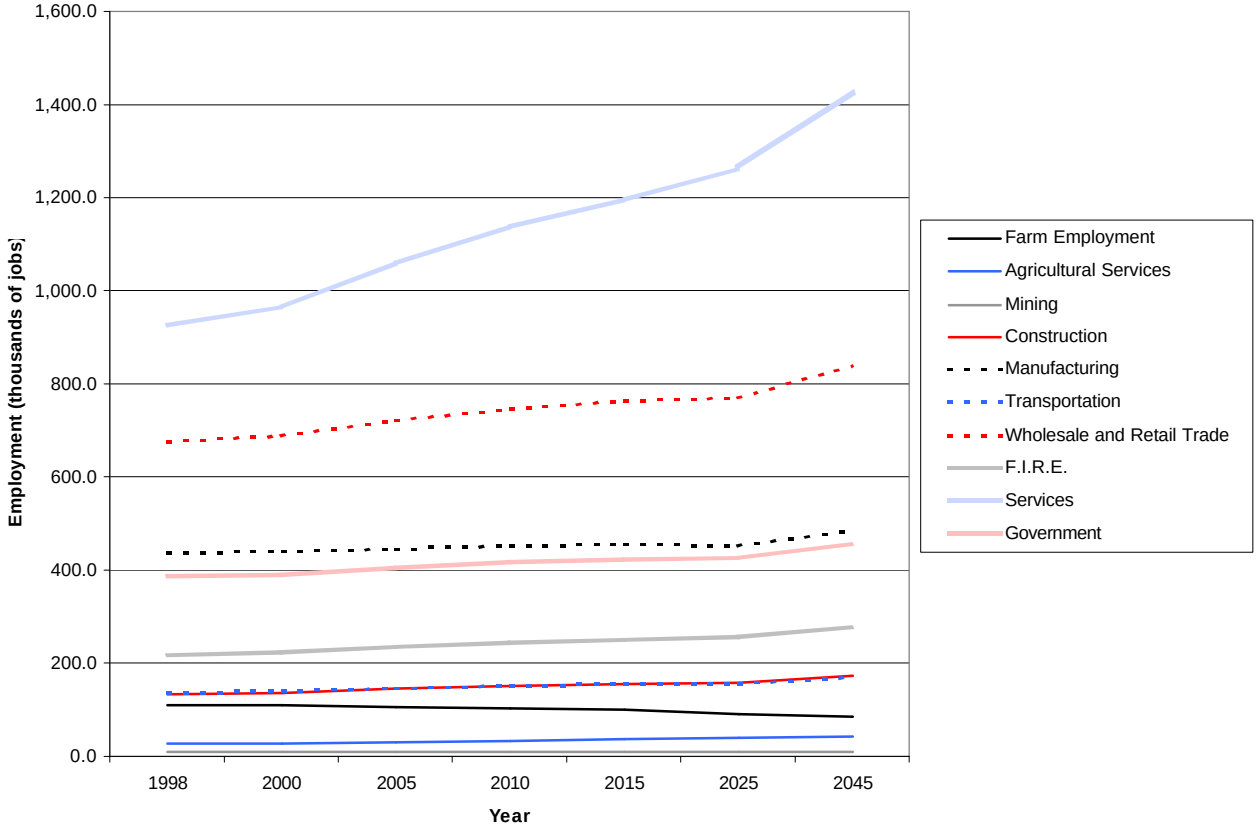
Source:
Regional Economic Information System, Table CA25, Bureau of Economic Analysis.

Table 25. Number of employees by major industry in the Southeast landscape, 1995.

Industry	Number of Employees	Percent of Total
Manufacturing	51,617	21.0%
Services	50,467	20.5%
Retail Trade	46,560	18.9%
Government	32,596	13.2%
Farm Employment	20,637	8.4%
F.I.R.E	12,715	5.2%
Wholesale Trade	10,303	4.2%
Transportation	10,248	4.2%
Construction	8,946	3.6%
Agricultural Services	1,882	0.8%
Mining	310	0.1%
Total	246,281	100.0%

Source:
Regional Economic Information System, Table CA25, Bureau of Economic Analysis.

Figure 14. Projected employment by major industry for Minnesota, 1998-2045.



Source:
Regional Economic Information System, Bureau of Economic Analysis

Table 26. Projected employment by major industry, 1994-2005: Southeast Projection Area [A]

Source:
Minnesota Department of Economic Security

[A] Minnesota Department of Economic Security (MDES) Southeast Projection Area includes the following counties: Dodge, Fillmore, Freeborn, Goodhue, Houston, Mower, Olmsted, Rice, Steele, Wabasha, and Winona.

Industry	1994 Estimated Employment	2005 Projected Employment	1994-2005 Percent Change	1994-2005 Numeric Change	Region's % of 1994 State Employment
Total - All Industries	222,920	256,390	15	33,470	9
Agriculture, Forestry, Fishing	11,620	10,980	-6	-640	14
Mining	230	210	-9	-20	3
Construction	6,710	7,510	12	800	8
Manufacturing	43,490	47,120	8	3,630	10
Transportation, Public Utilities	7,540	8,260	10	720	7
Wholesale Trade	8,490	9,030	6	540	6
Retail Trade	35,690	41,190	15	5,500	8
Finance, Insurance, Real Estate	6,950	7,120	2	170	5
Services	74,540	94,140	26	19,600	9
Government	13,350	14,530	9	1,180	8
Self-Employed/Unpaid Family	14,320	16,310	14	1,990	9

Table 27. Percent unemployed in Minnesota and counties in the Southeast landscape, 1990-1998.

Region/ County	1990	1991	1992	1993	1994	1995	1996	1997	1998
U.S.	5.5	6.7	7.4	6.8	6.1	5.6	5.4	4.9	4.5
Minnesota	4.9	5.1	5.2	5.1	4.0	3.7	4.0	3.3	2.5
Dodge	5.4	6.1	6.0	6.6	5.8	5.4	5.7	4.3	3.2
Fillmore	4.7	5.4	5.6	6.0	5.0	4.6	5.2	3.8	3.0
Freeborn	11.7	5.8	4.4	5.7	6.7	4.7	4.5	3.5	2.4
Goodhue	3.7	4.0	4.0	4.6	4.1	3.7	4.3	3.2	2.5
Houston	3.6	4.2	4.0	4.8	3.0	3.5	3.9	3.0	2.6
Le Sueur	6.0	6.6	6.2	6.0	4.6	4.4	4.9	4.1	3.2
Mower	4.4	3.8	3.7	4.0	3.8	3.2	3.5	2.7	2.0
Olmsted	2.9	2.8	3.0	3.3	3.4	2.9	3.0	2.2	1.6
Rice	4.6	5.3	5.7	5.4	4.7	4.1	4.1	3.3	2.7
Steele	3.6	4.8	4.8	4.2	3.7	3.8	3.7	3.1	2.2
Wabasha	4.5	5.2	4.9	4.7	4.2	4.1	4.7	3.3	2.4
Waseca	3.9	4.7	5.1	5.9	4.2	3.6	4.3	3.1	2.7
Winona	5.8	5.9	5.1	4.9	3.6	3.7	3.9	3.2	2.2

Source:
Minnesota Department of Economic Security

Economic Production and Financial Data

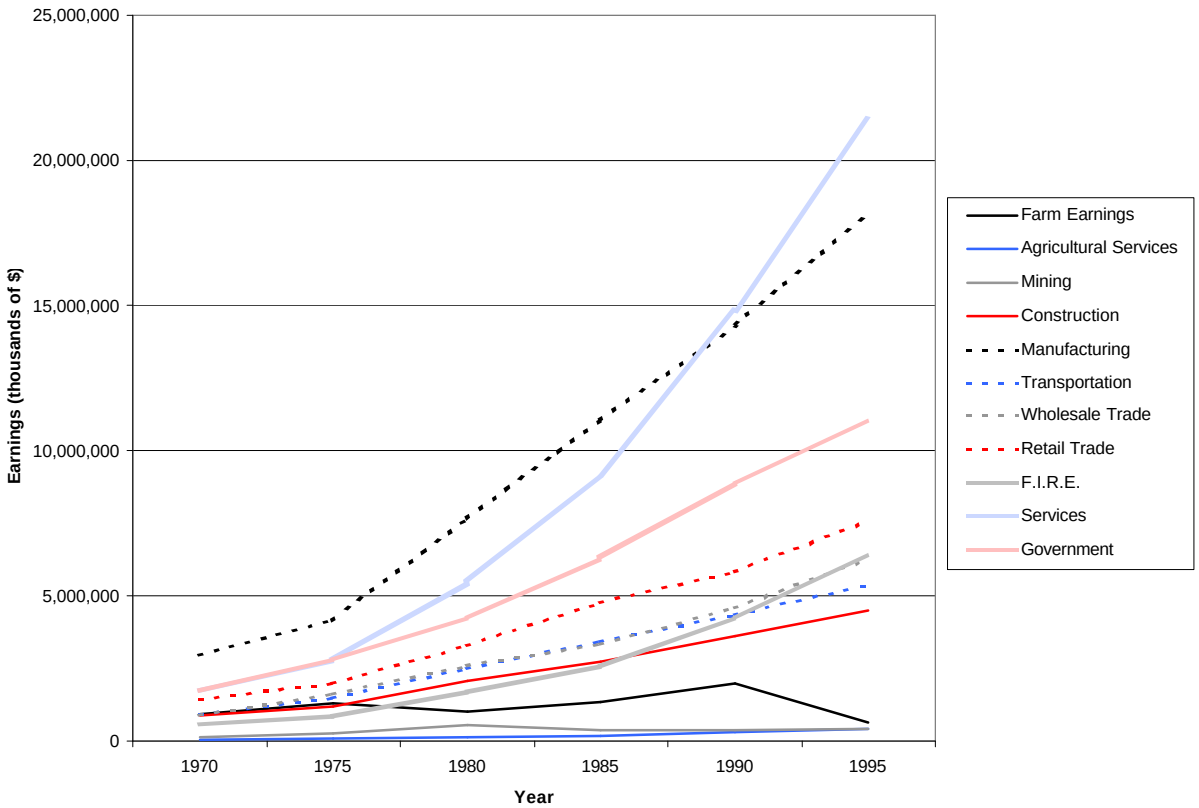
Observations

· Earning have risen in all areas except services and farming within the southeast region (Figure 22).

· The area with the most earnings is manufacturing, which accounts for one third of all earnings in the southeast region (Table 27).

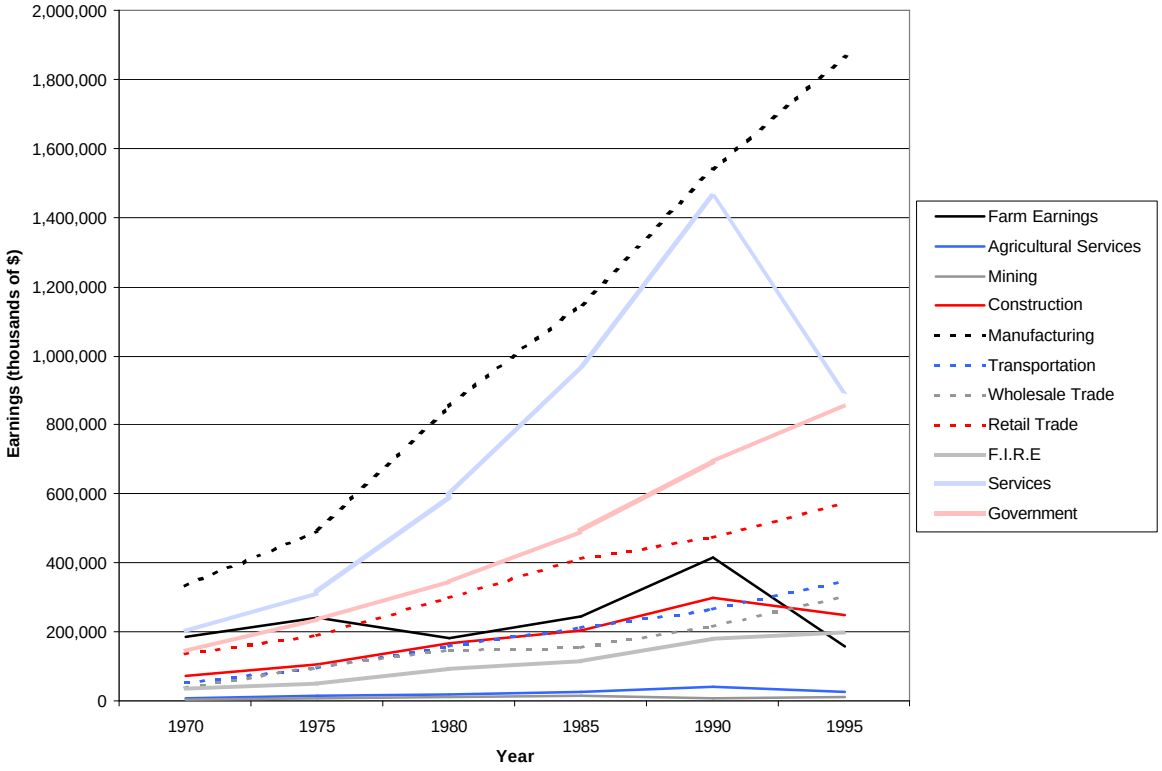
· Between 1993 and 1997 there has been a decrease of imported timber, and increase of exports (Table 28).

Figure 15. Earnings by major industry for Minnesota, 1970-1995



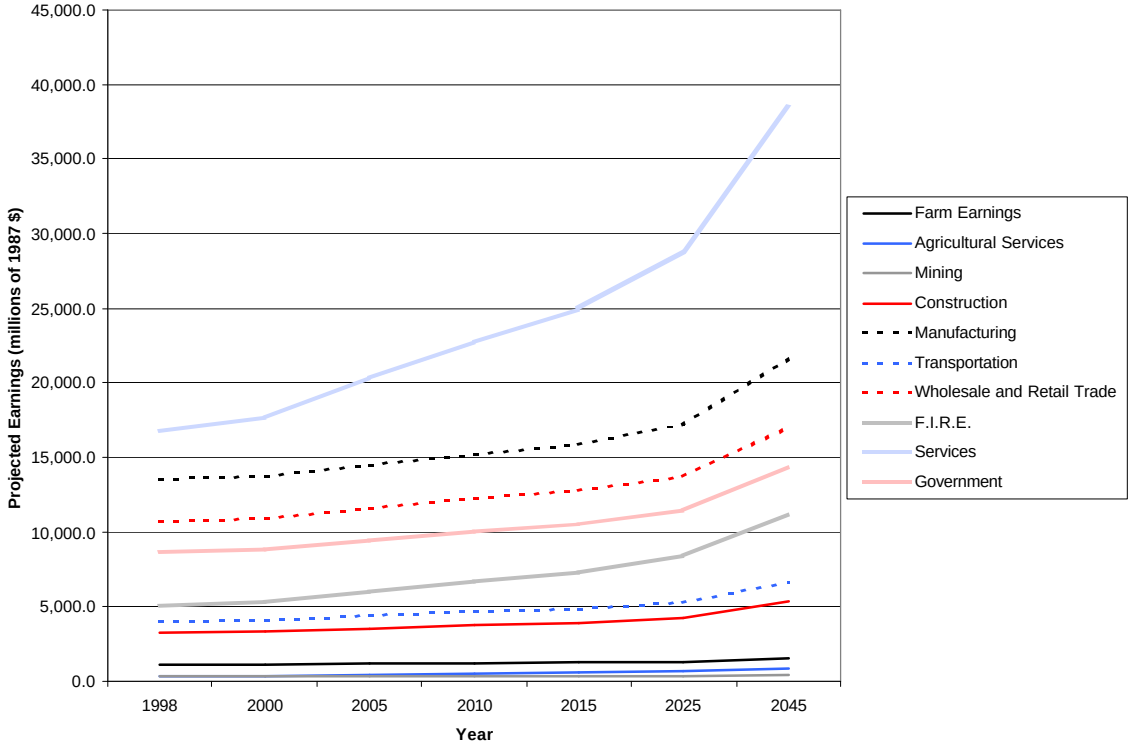
Source:
Regional Economic Information System, Table CA25, Bureau of Economic Analysis.

Figure 16. Earnings by major industry for the Southeast landscape, 1970-1995.



Source:
Regional Economic Information System, Table CA25, Bureau of Economic Analysis.

Figure 17. Projected earnings by major industry for Minnesota, 1998-2045.



Source:
Regional Economic Information System, Bureau of Economic Analysis.

Table 28. Earnings by major industry for the Southeast landscape, 1995.

Industry	Earnings (thousands of dollars)	Percent of Total Earnings
Manufacturing	1,869,434	34.0%
Services	896,865	16.3%
Government	860,082	15.7%
Retail Trade	571,773	10.4%
Transportation	349,640	6.4%
Wholesale Trade	303,797	5.5%
Construction	248,535	4.5%
F.I.R.E	199,657	3.6%
Farm Earnings	157,072	2.9%
Agricultural Services	27,159	0.5%
Mining	10,308	0.2%
Total	5,494,322	100.0%

Source:
Regional Economic Information System, Table CA25, Bureau of Economic Analysis.

Table 29. Minnesota pulpwood production, exports, and imports, 1993-1997[A].

Year	Total production	Exports	Imports[B]	Imports from Canada
1993	2,969	185	66	71
1994	3,029	216	72	114
1995	2,971	232	98	142
1996	3,065	390	73	136
1997[C]	2,980	326	46	102

Source:
United States Forest Service North Central Forest Experiment Station.

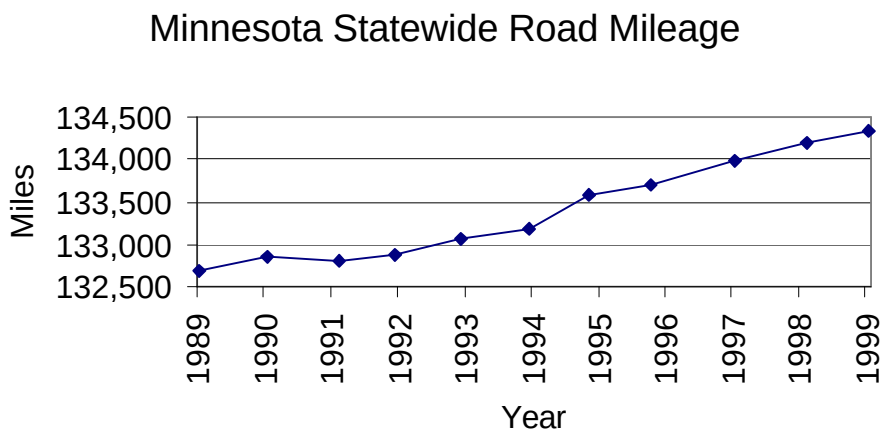
Note:
[A]Values are in thousands of cords, unpeeled and include mill residues used for pulp.
[B] Data include imports from Michigan and Wisconsin.
[C] 1997 data is preliminary and subject to revision.

Recreation and Tourism

Observations

· Both statewide road and trail mileages have increased over the last 10 years (Figures 24, 25 and 26).

Figure 18. Road mileage statewide in Minnesota, 1989-1999.



Source:
Minnesota Department of Transportation.

Note:
The following route systems are included in the mileage total: interstate trunk, U.S. trunk, Minnesota trunk, county state aid, municipal state aid, county, township, unorganized township, municipal streets, national forest development, Indian reservation, state forest, state park, military, national wildlife refuge, state game preserve, and airport roads.

Figure 19. Major roads in the Southeast ecological landscape.

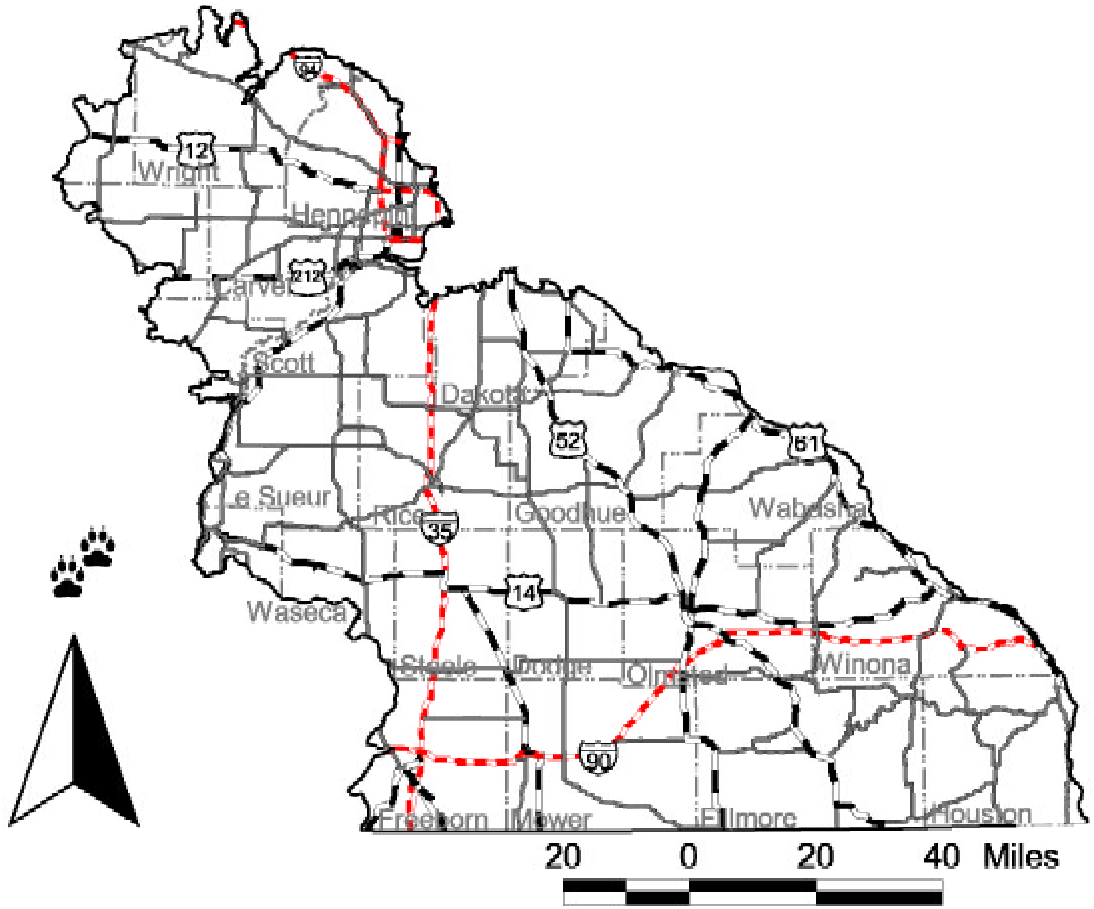
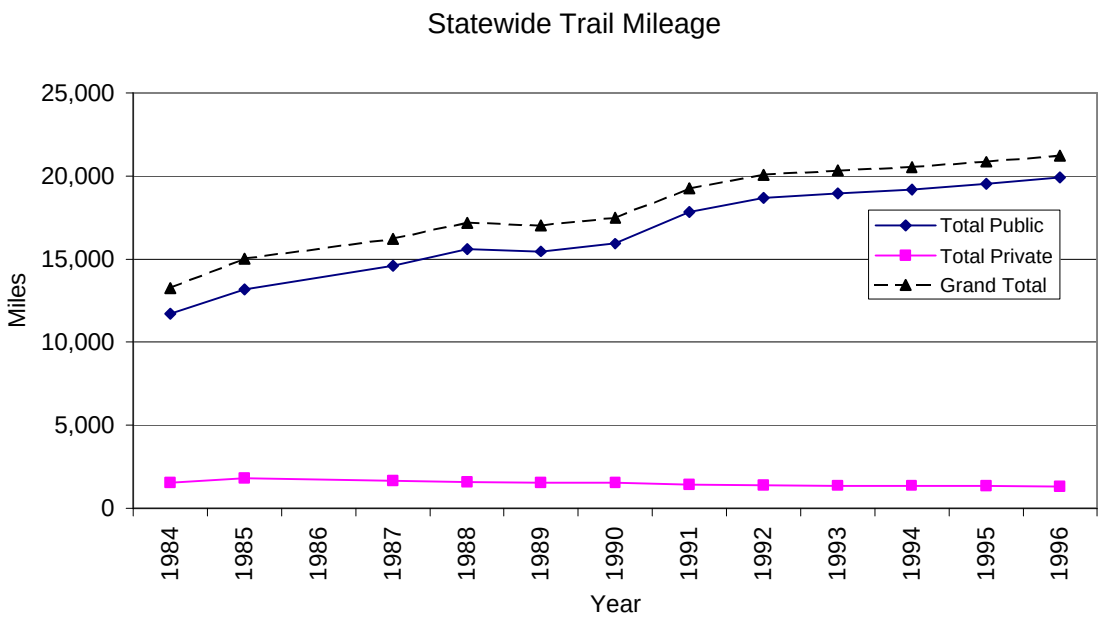


Figure 20. Trail mileage statewide in Minnesota, 1984-1996.



Source:
Minnesota Department of Natural Resources Division of Trails and Waterways.

Appendix A. Metadata: General information about data in the current conditions and trends assessment for the Southeast landscape.[A]

Data	Date(s)	Source	Size of Data Area	Spatial Resolution	Summary	Pros (+) / Cons (-)
Advanced Very High Radiometer Resolution AVHRR[B]	1990 to 1996 biweek	Satellite images	Earth	250 acres	AVHRR Satellites initially used for weather purposes, but found to useful in regional/global vegetation analysis.	+ High temporal resolution - Poor spatial resoltion
Breeding Birds	1999	J.C. Green	Minnesota, and North central Minnesota	none	Listing of birds in the state and northeast.	+ Complete species list for the state and North central MN - No abundance list
Cooperative Stand Assessment CSA[B]	1998	Aeriel photos and ground surveys	Minnesota, Stand Level, Public Forest Lands	1 to 3 acres	Public agencies responsible for forest management use this data as their main inventory source.	+ Detailed forest stand information - Only land managed by public agencies for forest magement represented
Demographic	1990 1995	U.S. Census Bureau	U.S., states, counties, cities, census tracts, and block groups	none	Survey of all individuals. Demographic data on population, income, housing, and employment by geographic region (place of residence).	+Complete universe of individuals + Fine level of geographic detail - Updated only every 10 years
Forest Inventory And Analysis FIA[B C] See Appendix B for more information.	1977 1990	Aerial photos and ground surveys	Minnesota, Plot Level	1225 acres represented per plot	A federally funded inventory of the state's forest resources: their type, extent, growth, mortality, and removals.	+ Detailed forest stand information + Represents public and private lands - Poor spatial resolution
GAP Stewardship[B]	1995	Land records	Minnesota	40 acres	Provides ownership and administration information for each PLS quarter-quarter section.	+ Provides ownership information for the entire state - Source data is mostly from 1983B85 - Poor spatial resolution

[A]Libraries and numerous Internet sites contain additional information on the above data sources.
[B]Detailed metadata can be found at the Interagency Information Cooperative's web site, www.iic.state.mn.us.
[C]The following Internet site contains information on the FIA program: srsfia.usfs.msstate.edu/tables.htm.

Appendix A. Metadata: General information about data in the current conditions and trends assessment for the Southeast landscape.[A]

Data	Date(s)	Source	Size of Data Area	Spatial Resolution	Summary	Pros (+) / Cons (-)
LandUse[B]	1969	air photos	Minnesota	40 acres	Shows land use in Minnesota broken into several different categories.	+ Historical representation - Poor spatial resolution
LandUse/Cover[B]	1990	Aerial photos and satellite images	Minnesota	1/4 acre	Shows land use in Minnesota broken into several different categories.	+ High spatial resolution - Different classifications used than in the 1969 land use data
Mammals, Amphibians, Reptiles	1995	J.R. Tester and J.C. Green	Minnesota, and North central Minnesota	none	Listing of mammals, amphibians, and reptiles in the state and North central.	+ Complete species list for the state and North central MN - No abundance data
Marschner Presettlement Vegetation[B]	1930	1847-1908 Public Land Survey (PLS)	Minnesota	100's acres	Maps out basic boundaries of forest stands using data from the PLS.	+ Historical representation + Good generalization - Very poor spatial resolution - General cover type classes
Minnesota Legislative reports (state lands)	1951 to 1970	DNR reports	Minnesota	none	Gives information on statutory acreages in different state land areas (parks and forests).	+ Good historical information - Is based on statutory boundaries
MN DNR Trails	1984 to 1996	DNR reports	Minnesota	none	Yearly summaries from 1984 to 1996 on the trail mileages in MN, including both private and public trails.	+ High temporal resolution + Distinctive trail classes - Only DNR tral mileages frequenty updated - Overlap in trail mileage counts for multi-use trails
National Resources Inventory[B]	1982 1987 1992	Aerial photos and ground surveys	U.S. nonfederal lands	1875 acres represented per plot	A statistically based sample of land use and natural resources conditions and trends on U.S. non-federal land.	+ Includes private land - Does not include federal lands - Main focus is on agricultural land

[A]Libraries and numerous Internet sites contain additional information on the above data sources.
[B]Detailed metadata can be found at the Interagency Information Cooperative's web site, www.iic.state.mn.us.
[C]The following Internet site contains information on the FIA program: srsfia.usfs.msstate.edu/tables.htm.

Appendix A. Metadata: General information about data in the current conditions and trends assessment for the Southeast landscape.[A]

Data	Date(s)	Source	Size of Data Area	Spatial Resolution	Summary	Pros (+) / Cons (-)
Public Land Survey Bearing Tree Data[B]	1847 through 1908	Ground surveys	Minnesota	quarter section	A field survey conducted in the late 1800's and early 1900's to ascertain and dispose of lands in the Western Teritory.	+ Represents Minnesota before major European settlement and harvesting - Survey was completed over a long period of time
Silvicultural Practices	1996	MFRC	Minnesota	none	Type and event of silviculture and harvesting practices in the state.	+ Shows trends for 1991-96 - No spatial breakdown - Does not account for practices on non-industrial private forest (NIPF) lands
Vascular Plants	1991	Herbarium collections	Minnesota FRC Landscapes	none	Original locations of specimens in the U of MN herbarium	+ Complete species list for the state and the FRC landscapes. - Not a systematic inventory
Employment and Earnings	1969 to 1996	Bureau of Economic Analysis	States and counties	none	Employment and income estimates for over 3,100 U.S. counties, 330 metropolitan areas, and 172 BEA economic areas; gross state product estimates for 1977-94 and regional projections to 2045.	+ Detailed employment and earnings data for major industrial sectors at the county, state, and national level - Since only social security data are used, individual businesses opting out of the social security system are not included. - Data disclosure laws prevent data from being released that would make it possible to identify a specific business within a geographic area.

[A]Libraries and numerous Internet sites contain additional information on the above data sources.
[B]Detailed metadata can be found at the Interagency Information Cooperative's web site, www.iic.state.mn.us.
[C]The following Internet site contains information on the FIA program: srsfia.usfs.msstate.edu/tables.htm.

Appendix B. Summary of FIA Sampling and Estimation Procedures.

Chapter 2 from "The Eastwide Forest Inventory Data Base: Users Manual" (http://www.srsfia.usfs.msstate.edu/ewman.htm)

Users of the Eastwide Data Base need a basic understanding of FIA sampling and estimation procedures to understand the type of data available. Here, we present a general discussion of these procedures. Specific sampling methods differ among regions and even among States within a region. Publications cited in this manual give more detailed information about methods used by each region. If you need more information about sampling procedures for a specific State, contact the FIA project responsible for that State's inventory.

Each State inventory begins with the interpretation of an aerial-photo sample that classifies the land by various photo classes. The total area of a sample comes from outside sources (usually Bureau of Census reports). The photo classes used are based on land use (pasture, cropland, urban, etc.). For forested land, more detailed classes are sometimes defined based on criteria such as forest type, volume per acre, stand size, stand density, ownership, and stand age. Then, ground plots are measured to adjust the aerial photo sample for changes since the date of photography and misclassification and to obtain estimates that cannot be made from the aerial photography. The photo classification of these ground plots, together with the area estimates from the photo sample, is used to assign area expansion factors to all ground plots. These area expansion factors are used to expand values observed on the plot from a per acre basis to a population basis. An area expansion factor is basically the area (in acres) that the plot represents for estimation purposes. The sampling area, or level at which expansion factors are assigned, is different from State to State, as is the scheme used to assign photo-interpretation classes. For the details of how these expansion factors were assigned to the ground plots for a particular State, contact the appropriate FIA project.

FIA plots are designed to cover a 1-acre sample area; however, not all trees on the acre are measured. Various arrangements of fixed radius and variable radius (prism) sample points are used to select sample trees to be measured. Ground plots may be new plots that have never been measured, or remeasurement plots that were measured in the previous inventory. For all plots, several observations are recorded for each sample tree, including its diameter breast height (d.b.h.), species, and other measurements that enable us to predict the tree's volume, growth rate, and quality. These tree measurements form the basis of the data on the tree records in the EWDB.

Some of the data items in the EWDB come directly from field measurements; others are computed from tree measurements. Net cubic foot volume is a computed item.

Each FIA project uses some type of volume equation to compute this volume based on d.b.h. and other tree and stand attributes. Although equations differ from State to State, they were all designed to compute the same volume.

One important computed item is the tree expansion factor VOLFAC. This item expresses the number of trees per acre that each sampled tree represents in the current inventory. It is the inverse of the size of the plot the tree was sampled on. For example, if the plot design samples trees under 5 inches d.b.h. on a single one-one hundredth-acre fixed radius plot, this item would have the value 100 trees per acre for a tree less than 5 inches d.b.h. If trees 5 inches d.b.h. and larger are sampled with ten 37.5 BAF (English) prism points, as is common with FIA plots, the expansion factor would depend on the d.b.h. of the tree. Under such a sample, a 14.0-inch tree would have an expansion factor of 3.51 trees per acre, again the inverse of the plot size[1].

[1] The plot size of a 14.0-inch tree on a single 37.5 BAF (English) prism plot would be: (14.02 x pi)/(37.5 x 22 x 122) = 0.0285 acres. The plot size of this tree on a 10-point cluster would be 10 times this or 0.285 acres, producing an expansion factor of 3.51.

Two other computed expansion factors are in the data base: MORTFAC and REMVFAC. They are used to compute mortality and removals. The mortality factor (MORTFAC) expresses an estimate of how many trees per acre of annual mortality are represented by a given sample tree. This factor is the number of trees per acre of annual mortality that the sample tree represents. In sample designs that have remeasurement plots, this value is zero for a tree that did not die over the remeasurement period. For trees that did die, MORTFAC is a function of the tree expansion factor and the remeasurement period. Some State inventories also estimate mortality from new ground plots. In these cases, mortality is estimated from either a mortality prediction equation that predicts the probability that a tree will die over some time period, or from a field estimate of mortality based on the measurement of dead trees and an estimate of when they died.

The removals factor (REMVFAC) is computed and used like MORTFAC. REMVFAC is the number of trees per acre of annual removals that the sample tree represents. It is computed based on observations of trees cut on either new or remeasured plots, depending on the inventory design. None of the Eastern FIA projects use removals prediction equations to estimate removals.

The items in the plot record are either observations of a specific condition at the plot center or estimates of average conditions on the acre sampled by the plot. Ownership is an example of a specific condition recorded

at plot center, rather than averaged over the plot. If a plot area overlaps more than one owner, the ownership at plot center determines the recorded ownership class. Basal area is an example of an item averaged over the entire plot. If the plot falls in two stands with different basal areas, the value recorded in BACUR will represent their average basal area. In some State inventories, plots falling on more than one stand are shifted into one stand. EWDB users concerned about field procedures should check with the FIA project for more information.

We have tried to make the data in the EWDB as consistent as possible from one State to another. Therefore, although differences in field and estimation procedures do exist between States, the data in the EWDB for different States are compatible. The minor differences that do exist should have little or no impact on most uses of this data.

Accuracy Standards

Forest inventory plans are designed to meet sampling error standards for area, volume, growth, and removals provided in the Forest Service Handbook. These standards, along with other guidelines, are aimed at obtaining comprehensive and comparable information on timber resources for all parts of the country. In the East, FIA inventories are commonly designed to meet the specified sampling errors at the State level at the 67-percent confidence limit (one standard error). A 3-percent error per 1 million acres of timberland is the maximum allowable sampling error for area. A 5-percent error per 1 billion cubic feet of growing stock on timberland is the sampling error goal for volume, removals, and net annual growth.

Caution: FIA inventories are extensive inventories that provide reliable estimates for large sampling areas. As data are subdivided into smaller and smaller areas, such as a geographic unit or a county, the sampling errors increase and the reliability of the estimates decreases. For example, a State with 5 million acres of timberland would have a maximum allowable sampling error for area of 1.3 percent, a geographic unit within that State with 1 million acres of timberland would have a 3.0 percent maximum allowable sampling error, and a county within that State with 100 thousand acres would have a 9.5 percent maximum allowable sampling error at the 67-percent level.