

Minnesota Northern Landscape

Current Conditions and Trends Assessment

Draft, March 2001

Minnesota
Forest
Resources
Council
Landscape Program

Minnesota Forest Resources Council
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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
Historical Conditions.....	12
Findings.....	12
Comparisons of pre-settlement vegetation to current vegetation.....	13
Observations.....	13
Natural Resources and Ecological Conditions and Trends.....	18
Findings.....	18
Recent extent of forestlands.....	19
Observations.....	19
Structure of timberland.....	21
Observations.....	21
Riparian areas.....	26
Observations.....	26
Vascular plants and wildlife species.....	30
Observations.....	30
Social and Economic Conditions and Trends.....	36
Findings.....	36
Land Use and Ownership.....	37
Observations.....	37
Demographics.....	45
Observations.....	45
Employment.....	58
Observations.....	58
Economic Production.....	71
Observations.....	71
Recreation and Tourism.....	79
Observations.....	79

Appendix A. Metadata - General Information of Data	92
Appendix B. Summary of FIA Sampling and Estimation Procedures	94

List of Tables

Table 1. Summary of Rare Natural Features, by Landscape and Feature Type..... 14

Table 2. Difference between Bearing Tree data and 1990 FIA data rounded to the nearest percent) 16

Table 3. Area (acres) of Land Use in the Northern Landscape, 1977 and 1990 20

Table 4. Ratio of Forestland to Nonforestland for the Northern Landscape, 1977 and 1990 20

Table 5. 1977 FIA Summary of Area (acres) by Timberland Type & Stand Size Class in the Northern Landscape 24

Table 6. 1990 FIA Acrea (acres) by Timberland Type & Stand Size Class in the Northern Landscape 25

Table 7. Density of Waterways, by Ecological Subsection, in the Northern Landscape 28

Table 8. Total acres of riparian areas, by ecological subsection, in the Northern Landscape (percent of total for each column in “()”) 29

Table 9. Richness of vascular plants in Owenby and Morley (1991) by MFRC Landscape 31

Table 10. Numbers of vascular plants in Owenby and Morley (1991) with recorded occurrence limited to a particular MFRC Landscape 32

Table 11. Richness of forest-associated mammals, amphibians and reptiles, and breeding birds in Minnesota 33

Table 12. Status of Minnesota’s forest-associated endangered, threatened and special concern vertebrate wildlife, 1984 34

Table 13. Status of Minnesota’s forest-associated endangered, threatened and special concern vertebrate wildlife, 1996 35

Table 14. Area of land by GAP ownership groups in the Northern Landscape 39

Table 15. Area of land by GAP ownership by public and private in the Northern Landscape 39

Table 16. Area of Ownership Classes in the Northern Landscape, 1977 and 1990 40

Table 17. Area of Ownership by Public and Private in the Northern Landscape, 1977 and 1990 40

Table 18. Area of land use classes for the Northern Landscape.....	43
Table 19. Population of Minnesota and counties in the Northern Landscape	47
Table 20. Population Projections for Minnesota and counties in the Northern Landscape	50
Table 21. Population projection by age group for Minnesota and the counties in the Northern Landscape	53
Table 22. Persons with incomes below poverty level in the counties in the Northern Landscape.....	54
Table 23. Per capita personal income for Minnesota and the counties in the Northern Landscape	56
Table 24. Statewide summary of percent of total income by source	59
Table 25. 1998 Distribution of Employees by Industry for the counties in the Northern Landscape.....	64
Table 26. Unemployed for Minnesota and counties in the Northern Landscape, 1999	66
Table 27. Total Wages by Industry for the counties in the Northern Landscape, 1998	68
Table 28. Distribution of Weekly Wages by Industry for the counties in the Northern Landscape, 1998	69
Table 29. Pulp, Paper and Board Plants, per County in the Northern Landscape	73
Table 30. Average Prices Received for Sawtimber (\$'s per MBF) sold by Public Land Agencies in Minnesota: 1990 and 1998	75
Table 31. Average Prices Received for Pulpwood (\$'s per Cord) sold by Public Land Agencies in Minnesota: 1990 and 1998	77
Table 32. Property Tax Information by County for the Northern Landscape, 1999	80
Table 33. Individual Income Tax Payments per Capita, by Counties in the Northern Landscape, 1995	83
Table 34. Property tax refunds per capita, by Counties in the Northern Landscape, 1995.....	84
Table 35. Total Sales from Hotels, Motels, Resorts and Other Lodging Places per Counties in the Northern Landscape, 1996 (In Thousands of Dollars)	86
Table 36. Distribution of Hunting Licenses by Type for the Counties in the Northern Landscape.....	88

List of Figures

- Figure 1. Ecological subsections in the Northern Landscape 9
- Figure 2. Forest Change in the Northern Landscape, 1800's to 1990's 15
- Figure 3. Change in Area (acres) of Timberland by Forest Type for the Northern Landscape, 1977, 1990 22
- Figure 4. Change in Area (acres) of Timberland by Size Class for the Northern Landscape, 1977, 1990 23
- Figure 5. Wetlands and Waterways in the Northern Landscape 27
- Figure 6. Ownership in the Northern Landscape 38
- Figure 7. Reserved Lands and Forests in the Northern Landscape 41
- Figure 8. Land Use from Remotely Sensed data for the Northern Landscape 42
- Figure 9. Distribution of nonindustrial private forestland (NIPF) acres statewide by ownership class size, 1990 44
- Figure 10. Relative Level of Population Change for Minnesota and Counties in the Northern Landscape from 1990 to 1998 48
- Figure 11. 1998 Population Density of Population Change for Minnesota and Counties in the Northern Landscape 49
- Figure 12. Population sizes for the counties in the Northern Landscape 51
- Figure 13. Percentage change in Population Projected for the counties in the Northern Landscape, 1995 to 2025. 52
- Figure 14. Percent population below poverty level in the counties in the Northern Landscape 55
- Figure 15. Per capita personal income for Minnesota and the counties in the Northern Landscape 57
- Figure 16. Earnings by major industry for Minnesota, 1970-1995 60
- Figure 17. Projected earnings by major industry for Minnesota, 1998-2045 61
- Figure 18. Number of employees by major industry for Minnesota, 1970-1995 62
- Figure 19. Projected employment by major industry for Minnesota, 1998-2045 63
- Figure 20. 1998 Employment by Sector for the counties in the Northern Landscape 65
- Figure 21. Unemployment Rates for the counties in the Northern Landscape 67
- Figure 22. Average Wages Earned for the counties in the Northern Landscape, 1998 70
- Figure 23. The Minnesota Forest Products Industry 77
- Figure 24. Trends in hardwood and soft wood harvesting statewide, 1980-1997 74
- Figure 25. Average stumpage prices received by public agencies for sawtimber, 1987-1997 76
- Figure 26. Average stumpage prices received by public agencies for pulpwood, 1987-1997 79
- Figure 27. Property Taxes Payable by County for the Northern Landscape, 1999 81
- Figure 28. 1999 Property tax (% of value) for the Northern Landscape 82
- Figure 29. Economic impact of domestic travel, 1988-1995 85
- Figure 30. Total Sales from Hotels, Motels, Resorts and Other Lodging Places per Counties in the Northern Landscape, 1996 (In Thousands of Dollars) 87
- Figure 31. Major Roads in the Northern Landscape 89
- Figure 32. Road mileage statewide in Minnesota, 1989-1999 90
- Figure 33. Trail mileage statewide in Minnesota, 1984-1996 91

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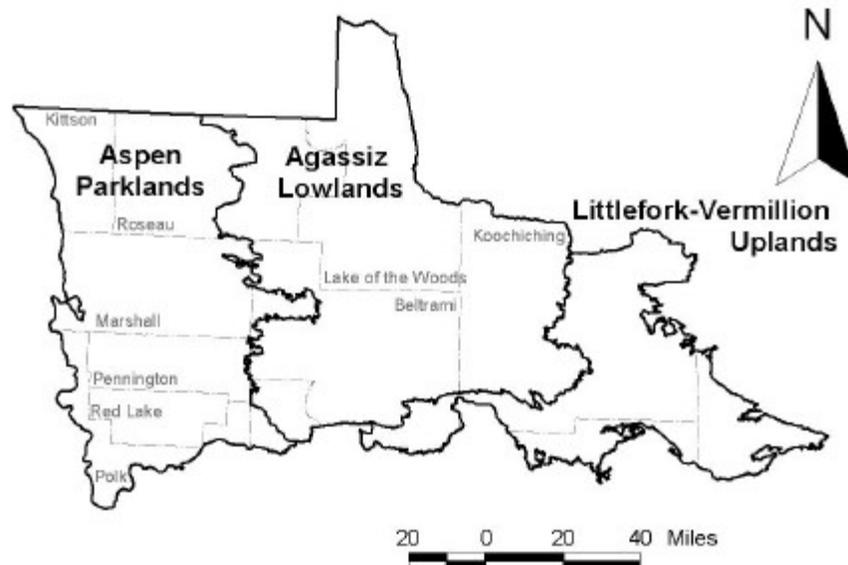
Introduction

The process for conducting assessments of landscape conditions and trends for the Northern 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 Northern landscape, which includes all of Kittson, Koochiching, Lake of the Woods, Marshall, Pennington, Red Lake, and Roseau counties and the upper half of Beltrami County. 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 subsections in the Northern 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.

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. Which is as follows:

- 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: Northern Landscape Region" represents the first step in the general planning process for Northern 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.

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

Findings: A general theme that emerges from a set of observations. Findings about specific topics are listed at the beginning of that section.

Issues: An area of concern based on the interpretation of the findings and people's values. Some issues regarding forest resources in southeastern Minnesota are listed in the introduction to this document.

Goals: A benchmark to strive towards in resolving the issues. Goals are not listed in this assessment; the Northern Regional Forest Resource 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.

Historical Conditions and Trends

Findings

Most areas that were forest still are (Figure 1). There has been some changes in forest types, noticeable a increase in aspen-balm-of-gilead and a decrease in tamarack (Table 2).

Comparison of Pre-settlement vegetation to day

Observations

Compared to pre-settlement much of the region is still forested (Figure 2).

There has been a noticeable decrease in tamarack, and increase in aspen and balm-of-gilead (Table 2).

Table 1. Summary of Rare Natural Features, by Landscape and Feature Type

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

Examples of feature types:

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

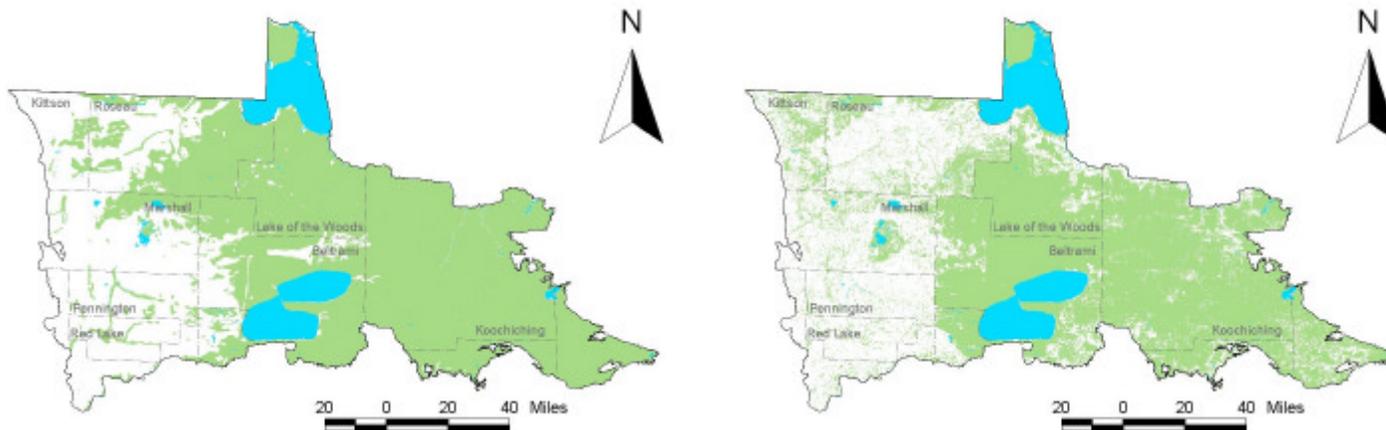
Source: Copyright 2000 MNDNR. Rare features data have been provided by the Natural Heritage and Nongame Research Program of the Section of Ecological Services, MNDNR and were current as of 7/31/2000. These data are not based on an exhaustive inventory of the state. The lack of data for any geographic 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.



Figure 2. Forest Change in the Northern Landscape, 1800's to 1990's

Area of forest cover 1800's^A

Area of forest cover 1990's^B



Legend

-  County Boundaries
-  Forested
-  Water

Source: ^AMarschner data based on public land survey records, 1930.
^BRemotely sensed data, 1988-1996.

Table 2. Difference between Bearing Tree data and 1990 FIA data (rounded to the nearest percent)

Name	Percent Difference	Proportional Difference
Alder-- <i>Alnus incana</i> , <i>A. viridis</i>	0	0
Ash-- <i>Fraxinus nigra</i> , <i>F. pennsylvanica</i> , <i>F. americana</i>	9	7
Aspen-- <i>Populus tremuloides</i> , <i>P. grandidentata</i> , <i>P. balsamifera</i> (in lesser part)	26	4
Balm-of-Gilead-- <i>Populus balsamifera</i> (in greater part)	15	17
Beech-- <i>Fagus grandifolia</i> (unknown from Minn. possibly <i>Carpinus caroliniana</i>)	0	0
Birch-- <i>Betula papyrifera</i> , <i>B. cordifolia</i>	0	0
Black Birch-- <i>Betula nigra</i> , <i>B. alleghaniensis</i> (in part ?)	0	0
Black Oak-- <i>Quercus nigra</i> , <i>Q. ellipsoidalis</i> (in part)	0	0
Black Walnut-- <i>Juglans nigra</i>	0	0
Blue Beech-- <i>Carpinus caroliniana</i>	0	0
Box-Elder-- <i>Acer negundo</i>	0	10
Bur Oak-- <i>Quercus macrocarpa</i>	1	15
Butternut-- <i>Juglans cinerea</i>	0	0
Cherry-- <i>Prunus serotina</i> , <i>P. pennsylvanica</i>	0	0
Cottonwood-- <i>Populus deltoids</i>	0	-2
Elm-- <i>Ulmus americana</i> , <i>U. rubra</i> , <i>U. thomasii</i>	2	3
Fir-- <i>Abies balsamea</i>	10	4
Hackberry-- <i>Celtis occidentalis</i>	0	0
Hawthorn-- <i>Crataegus</i> spp.	0	0
Hickory-- <i>Carya cordiformis</i> , <i>C. ovata</i>	0	0
Illegible or Not Recorded--equivalent unknown	0	0
Ironwood-- <i>Ostrya virginiana</i>	0	-1



Table 2. Difference between Bearing Tree data and 1990 FIA data (rounded to the nearest percent)

Name	Percent Difference	Proportional Difference
Jack Oak-- <i>Quercus ellipsoidalis</i>	0	-1
Jack Pine-- <i>Pinus banksiana</i>	-2	-1
Juniper or Red Cedar-- <i>Juniperus virginiana</i>	0	0
Linden or Basswood-- <i>Tilia Americana</i>	1	8
Maple-- <i>Acer rubrum</i> , <i>A. saccharum</i> , <i>A. saccharinum</i>	1	8
Mountain Ash-- <i>Sorbus decora</i> , <i>S. americana</i>	0	0
Oak-- <i>Quercus rubra</i> , <i>Q. macrocarpa</i> , <i>Q. ellipsoidalis</i> , <i>Q. velutina</i> , <i>Q. alba</i> , <i>Q. bicolor</i>	-1	0
Pine-- <i>Pinus strobus</i> , <i>P. resinosa</i> , <i>P. banksiana</i>	-1	0
Plum--probably <i>Prunus Americana</i>	0	0
Red Elm-- <i>Ulmus rubra</i>	0	0
Red Oak -- <i>Quercus rubra</i> , <i>Q. ellipsoidalis</i> (in part or as hybrid)	0	19
Red, Norway, or Yellow Pine-- <i>Pinus resinosa</i>	1	3
Spruce-- <i>Picea mariana</i> , <i>P. glauca</i>	-12	-3
Sugar Maple-- <i>Acer saccharum</i>	1	138
Tamarack-- <i>Larix laricina</i>	-58	-13
Thorn--probably <i>Crataegus</i> spp.	0	0
White Cedar-- <i>Thuja occidentalis</i>	11	4
White Pine-- <i>Pinus strobes</i>	-1	-5
Willow-- <i>Salix</i> spp.	-1	0
Witch Hazel-- <i>Hamamelis virginiana</i>	0	0
Yellow Birch-- <i>Betula alleghaniensis</i>	0	0



Natural Resources and Ecological Conditions and Trends

Findings

Forestland has decreased slightly, while timberland has increased (Tables 3, 4, 5, and 6, and Figures 3, and 4).

The landscape contains a high percentage of uplands, bogs, and swamps (Table 8).

Recent Extent of Forestland

Observations

In the last 30 years there has been a decrease in forestland (Tables 3 and 4).

Table 3. Area (acres) of Land Use in the Northern Landscape, 1977 and 1990

Land Use	1977		1990		Change	
	Acres	Percent	Acres	Percent	Acres	Percent
Forestland	4,927,000	53.4%	3,642,00	44.5%	-285,000	-8.8%
Nonforestland	4,308,000	46.6%	4,542,000	55.5%	234,000	8.8%
Total	9,235,00	100.0%	8,184,000	100.0%	-1,051,000	0.0%



Table 4. Ratio of Forestland to Nonforestland for the Northern Landscape, 1977 and 1990

1977	1990
6/5	4/5

Source: Chung M. Chen, MNDNR, summarizing 1990 and 1977 FIA detailed database from the USFS N.C. & Landscape Regions from MFRC 9/20/00. On the average one plot represents about 1.25 thousand acres.

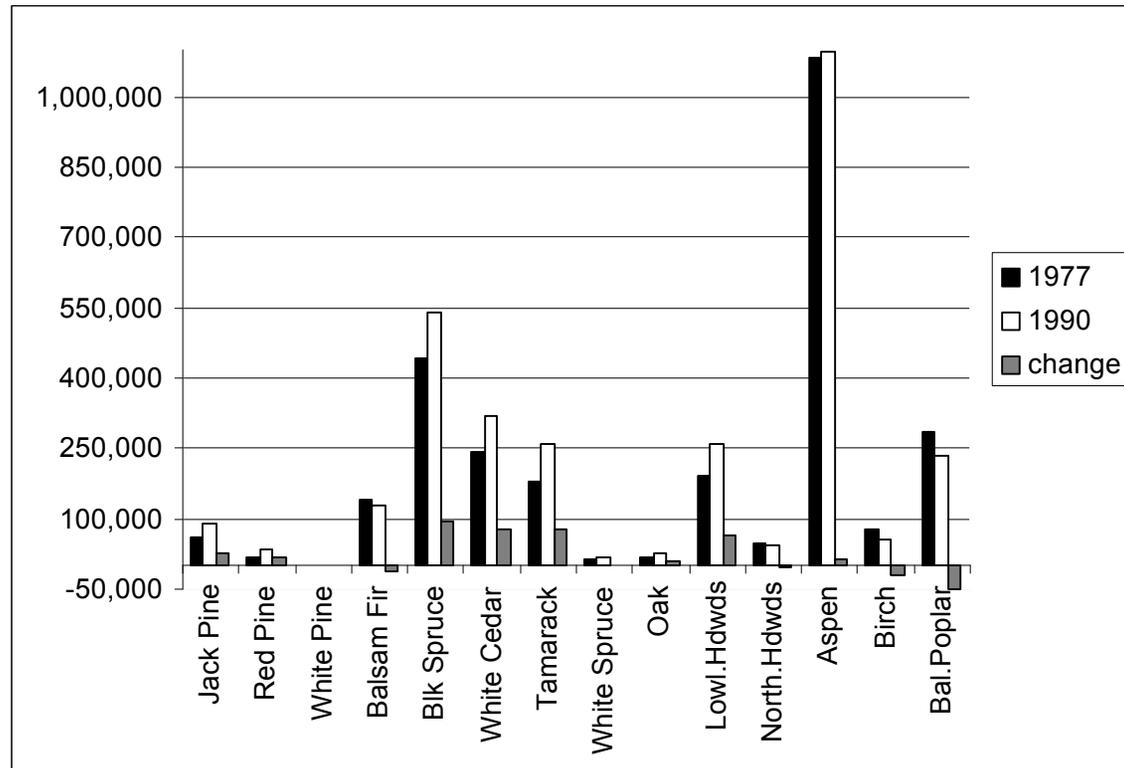
Structure of Timberland

Observations

Most timberland areas have increased since 1977 (Figure 3, Tables 5 and 6).

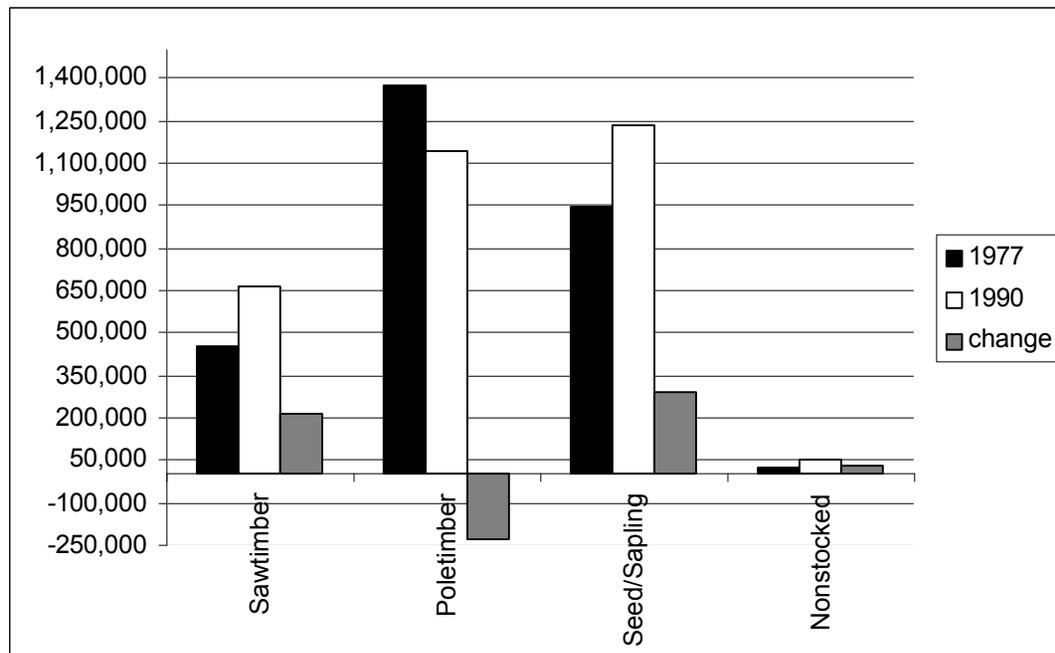
All size classes have increased since 1977 except pole timber (Figure 4).

Figure 3. Change in Area (acres) of Timberland by Forest Type for the Northern Landscape, 1977, 1990



Source: Chung M. Chen, MNDNR, summarizing 1990 and 1977 FIA detailed database from the USFS N.C. & Landscape Regions from MFRC 9/20/00. On the average one plot represents about 1.25 thousand acres.

Figure 4. Change in Area (acres) of Timberland by Size Class for the Northern Landscape, 1977, 1990



Source: Chung M. Chen, MNDNR, summarizing 1990 and 1977 FIA detailed database from the USFS N.C. & Landscape Regions from MFRC 9/20/00. On the average one plot represents about 1.25 thousand acres.

Table 5. 1977 FIA Summary of Area (acres) by Timberland Type & Stand Size Class in the Northern Landscape

Forest Type	Size Class				Total
	Sawtimber	Poletimber	Seed/Sapling	Nonstocked	
Jack Pine	26,000	18,000	14,000	4,000	62,000
Red Pine	10,000	6,000	2,000	0	18,000
White Pine	3,000	0	0	0	3,000
Balsam Fir	22,000	75,000	42,000	2,000	140,000
Blk Spruce	18,000	164,000	260,000	0	442,000
White Cedar	69,000	142,000	31,000	0	241,000
Tamarack	17,000	85,000	72,000	5,000	179,000
White Spruce	4,000	5,000	5,000	0	14,000
Oak	7,000	7,000	3,000	0	17,000
Lowl.Hdwds	49,000	104,000	39,000	0	192,000
North.Hdwds	29,000	17,000	1,000	0	48,000
Aspen	138,000	574,000	363,000	5,000	1,081,000
Birch	20,000	40,000	15,000	1,000	76,000
Bal.Poplar	44,000	136,000	99,000	8,000	287,000
Total	455,000	1,373,000	946,000	25,000	2,799,000



Source: Chung M. Chen, MNDNR, summarizing 1990 and 1977 FIA detailed database from the USFS N.C. & Landscape Regions from MFRC 9/20/00. On the average one plot represents about 1.25 thousand acres.

Table 6. 1990 FIA Acrea (acres) by Timberland Type & Stand Size Class in the Northern Landscape

Forest Type	Size Class				Total
	Sawtimber	Poletimber	Seed/Sapling	Nonstocked	
Jack Pine	32,000	17,000	15,000	25,000	88,000
Red Pine	17,000	6,000	10,000	0	34,000
White Pine	2,000	0	0	0	2,000
Balsam Fir	21,000	60,000	47,000	0	128,000
Blk Spruce	25,000	175,000	334,000	4,000	538,000
White Cedar	100,000	151,000	66,000	2,000	320,000
Tamarack	38,000	87,000	129,000	4,000	258,000
White Spruce	5,000	5,000	6,000	1,000	17,000
Oak	18,000	5,000	4,000	1,000	28,000
Lowl.Hdwds	58,000	108,000	90,000	3,000	258,000
North.Hdwds	32,000	7,000	6,000	0	45,000
Aspen	255,000	398,000	434,000	6,000	1,094,000
Birch	20,000	18,000	16,000	0	54,000
Bal.Poplar	43,000	107,000	79,000	8,000	236,000
Total	666,000	1,144,000	1,236,000	53,000	3,099,000

Source: Chung M. Chen, MNDNR, summarizing 1990 and 1977 FIA detailed database from the USFS N.C. & Landscape Regions from MFRC 9/20/00. On the average one plot represents about 1.25 thousand acres.



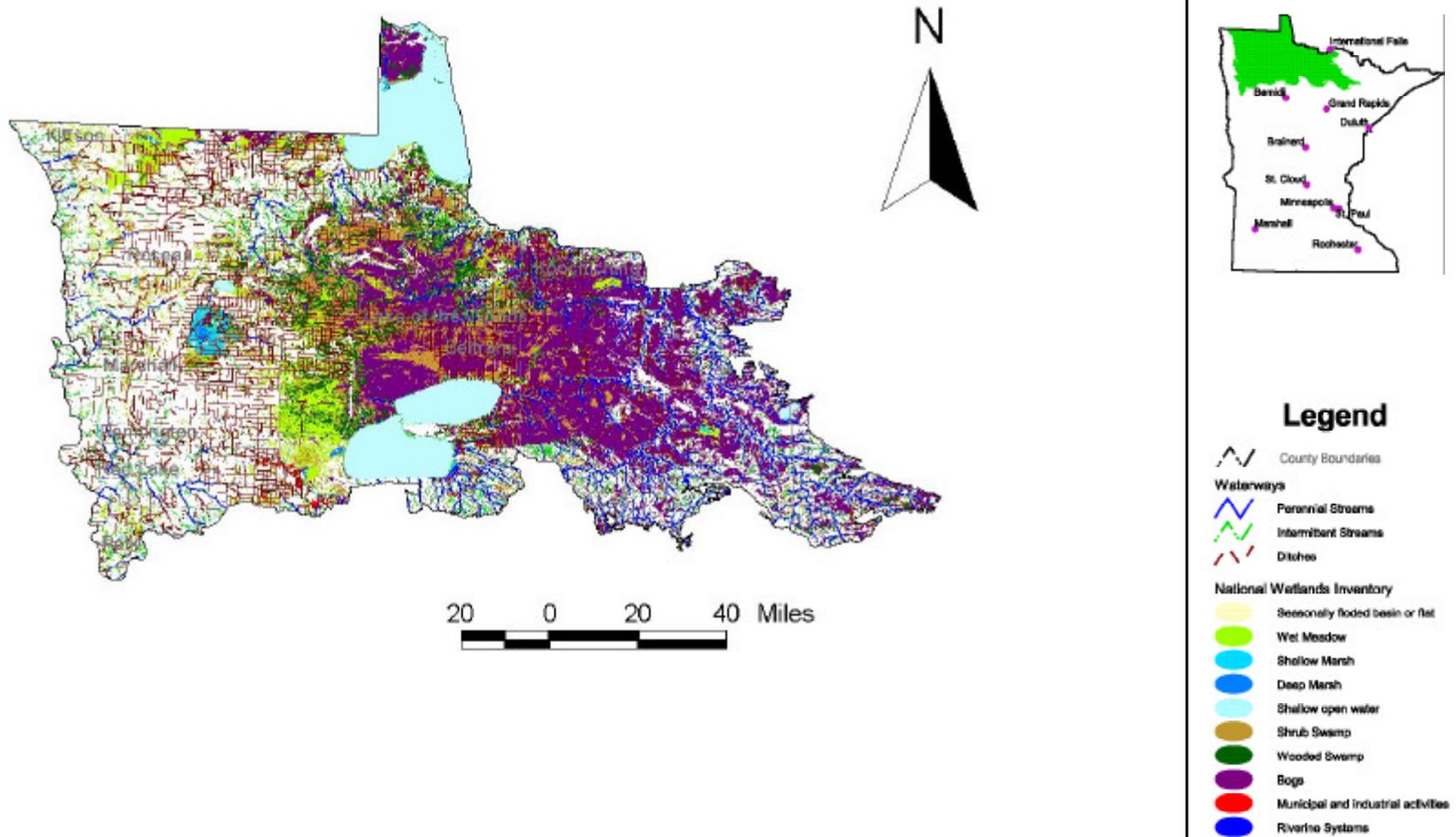
Riparian Areas

Observations

The Littlefork-Vermilion Uplands subsection has the highest density of streams (perennial and intermittent) while the Agassiz Lowlands subsection has the highest density of ditches (Figure 5, and Table 7).

About half the area is considered upland, and 30 percent is bogs and swamps (Table 8).

Figure 5. Wetlands and Waterways in the Northern Landscape



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

Table 7. Density of Waterways, by Ecological Subsection, in the Northern Landscape

Subsection	Perennial	Intermittent	Ditch
Littlefork-Vermilion Uplands	0.65	0.29	0.10
Agassiz Lowlands	0.16	0.15	0.41
Aspen Parklands	0.32	0.23	0.05



Source: MNDNR GIS data derived from 1980 USGS quadrangle maps.
 Note: Density equals miles of waterway divided by miles square of subsection.

Table 8. Total acres of riparian areas, by ecological subsection, in the Northern Landscape (percent of total for each column in “()”)

Wetland Type (circ39)	Agassiz Lowlands	Aspen Parklands	Littlefork-Vermilion Uplands	Total
Seasonally flooded basin or flat	7,310 (0.2%)	14,299 (0.5%)	7,774 (0.5%)	29,382 (0.4%)
Wet meadow	268,382 (7.3%)	229,170 (7.9%)	19,916 (1.2%)	517,468 (6.3%)
Shallow marsh	21,742 (0.6%)	65,243 (2.2%)	29,502 (1.8%)	116,488 (1.4%)
Deep marsh	8,741 (0.2%)	9,248 (0.3%)	4,080 (0.2%)	22,069 (0.3%)
Shallow open water	591,910 (16.2%)	15,534 (0.5%)	12,792 (0.8%)	620,236 (7.6%)
Shrub swamp	573,000 (15.7%)	138,029 (4.7%)	109,077 (6.6%)	820,105 (10.0%)
Wooded swamps	393,301 (10.8%)	74,874 (2.6%)	87,392 (5.3%)	555,568 (6.8%)
Bogs	1,187,333 (32.5%)	7,090 (0.2%)	492,242 (29.8%)	1,686,665 (20.5%)
Municipal and industrial activities, water regime	1,611 (0.0%)	11,913 (0.4%)	1,410 (0.1%)	14,933 (0.2%)
Riverine systems, system	14,379 (0.4%)	18,152 (0.6%)	13,123 (0.8%)	45,655 (0.6%)
Uplands, system	585,652 (16.0%)	2,322,633 (79.9%)	873,717 (52.9%)	3,782,003 (46.1%)
Area outside Minnesota, system	158 (0.0%)	0 (0.0%)	0 (0.0%)	158 (0.0%)
Total	3,653,520 (100.0%)	2,906,184 (100.0%)	1,651,025 (100.0%)	8,210,730 (100.0%)



Source: MNDNR GIS data derived from aerial photographs taken between 1979 and 1988.

Vascular Plants and Wildlife Species

Observations

Compared to other regions of the state there are few endangered and threatened vascular plants (Tables 9 and 10).

Table 9. Richness of vascular plants in Owenby and Morley (1991) by MFRC Landscape

MFRC Regional Landscapes	Number of species ^A	1996 State List of Endangered, Threatened, Special Concern Species ^B		
		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:

^AOwenby and Morley, 1991.

^BMinnesota Department of Natural Resources, 1996



Table 10. Numbers of vascular plants in Owenby and Morley (1991) with recorded occurrence limited to a particular MFRC Landscape

MFRC Regional Landscapes	Number of species ^A	1996 State List of Endangered, Threatened, Special Concern Species ^B		
		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:

^AOwenby and Morley, 1991.

^BMinnesota Department of Natural Resources, 1996.

Table 11. 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:

^AOwenby and Morley, 1991.

^BMinnesota Department of Natural Resources, 1996



Table 12. Status of Minnesota's forest-associated endangered, threatened, and special concern vertebrate wildlife, 1984

Endangered	Threatened	Special concern	
Mammals —	Mammals 1. Gray wolf	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	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
Birds —	Birds 1. Bald eagle 2. Loggerhead shrike	Birds 1. Red-shouldered hawk 2. Osprey 3. Louisiana waterthrush	
Amphibians and reptiles 1. Five-lined skink	Amphibians and reptiles 1. Wood turtle 2. Blanding's turtle		



Source: MNDNR

Table 13. Status of Minnesota's forest-associated endangered, threatened, and special concern vertebrate wildlife, 1996

Endangered	Threatened	Special concern	
Mammals —	Mammals 1. Eastern spotted skunk	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
Birds —	Birds 1. Loggerhead shrike		
Amphibians and reptiles 1. Northern cricket frog 2. Massasauga	Amphibians and reptiles 1. Wood turtle 2. Timber rattle snake 3. Blanding's turtle		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



Source: MNDNR

Social and Economic Conditions and Trends

Findings

Overall, the region is sparsely populated in relation to the rest of the state, which averaged over 60 people per square mile. As the population growth rate has been consistently slower in the northern region than the state average for the past several decades, this region should continue to be relatively sparse in population for years to come (see Demographics Observations).

We see a drastic change in population composition in Minnesota and the northern region for the years to come. The number of young people (up to 24 years old) is expected to decrease by 10.2% in Minnesota and by 18.8 percent in the northern region. Middle aged people, representing the productive work force (ages 25-64) will increase in the population by 15.5% for the state, but remain roughly the same for the eight county region. Of most consequence, the state and region will see dramatic increases (79.7% and 53.6% respectively) in the population of senior citizens (over the age of 65). This can be largely attributed to increases in life expectancy rates, but other explanations are possible. An attractive retirement environment and the maturing of the "baby-boom" generation are other possible reasons. This is a very important observation, as a drastic shift in population composition can significantly effect the needs (such as health care), values, and recreational activities of the community. Rapid expansion of the services sector of the economy is one likely result (see Demographics Observations).

Timber harvesting and the relative price of wood has increased greatly since the mid-1980's. An increase in

wood harvesting is a good indication of an overall growth in the forest and timber products sector. Several explanations exist for the significant increases in stumpage price that have occurred during the past decade. First and most important, is the observation that harvesting has increased significantly since 1980. Greater demand on a limited resource will always cause the price to rise. Inflation also causes price level rise, but this explains only a limited amount of the observed growth. Steady advancement in conservation management, environmental concern, and social responsibility may also contribute to price upsurge as the supply of timber has been tightened by inclinations to protect privately owned and public land. However, this theory is largely speculative (see Economic Production Observations).

Remarkable growth in the tourism industry has occurred in Minnesota since the late 1980's. Figure 29 illustrates this tremendous increase in which annual gross receipts grew from about 4 billion in 1988 to nearly 8 billion by 1995. Meanwhile, the tourism industry continues to grow. However, this is not true for northern Minnesota, where tourism has remained fairly stagnant over this time period. This can be largely attributed to the fact that hunting, fishing, camping and canoeing are the most prominent recreational tourism attractions of northern Minnesota. These activities will tend to stay at a stable level. Accounting for the majority of tourism increases statewide is the growing attractiveness of the Twin Cities and other areas in southern Minnesota. Based on these observations, tourism in the northern region should remain fairly stable in the future, but forests and wetlands must be preserved to maintain these levels (see Tourism Observations).

Land Use and Ownership

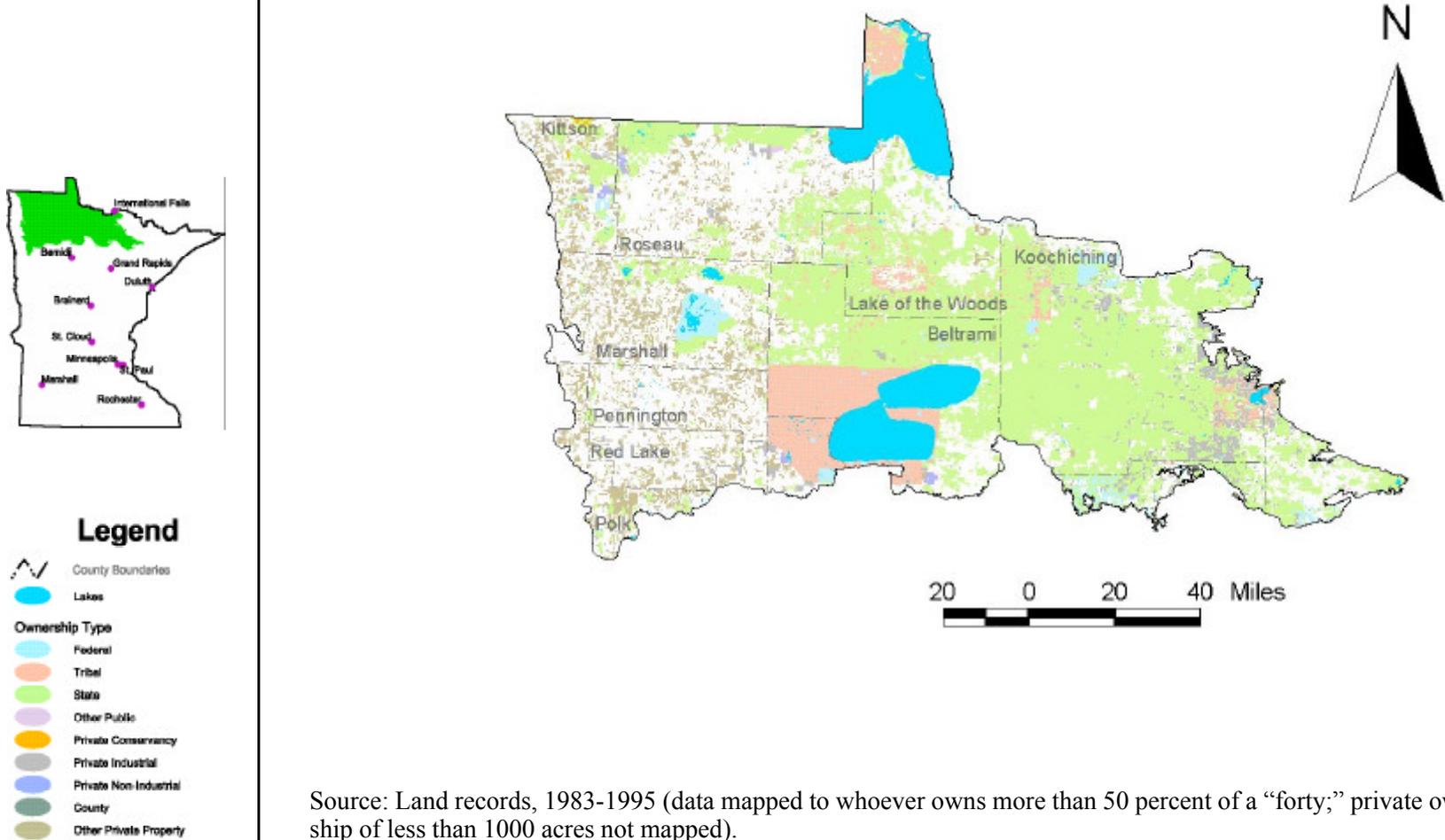
Observations

Most of the land is held privately (including tribal land), 60%, while 40% is public, mostly state land, 37% (Figure 6, and Tables 14 and 15).

Public land ownership has slightly gone down in the last 25 years (Tables 16 and 17).

About $\frac{1}{4}$ of the land is agriculture, one third forested, and one third water/bog/marsh/fen (Figure 8 and Table 18).

Figure 6. Ownership in the Northern 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).

Table 14. Area of land by GAP ownership groups for the Northern Landscape

GAP ownership groups	Acres	Percent
County	640	0.0%
Federal	193,536	2.4%
Other private property	639,728	7.8%
Other Public	3,325	0.0%
Private Conservancy	4,966	0.1%
Private Industrial, more than 1000 acres owned within affected county	246,289	3.0%
Private Non-Industrial Business or Trust, more than 1000 acres owned within affected county	18,281	0.2%
State, including tax-forfeited lands under county stewardship	3,037,758	37.0%
Tribal	533,168	6.5%
Unknown	3,533,037	43.0%
Total	8,210,730	100.0%

Table 15. Area of land by GAP ownership by public and private for the Northern Landscape

	Acres	Percent
Public	3,235,259	39.4%
Private (including all privates, tribal, and unknown)	4,975,471	60.6%
Sum	8,210,730	100.0%

Source: Land records, 1983-1995 (data mapped to whoever owns more than 50 percent of a “forty”).



Table 16. Area of Ownership Classes in the Northern Landscape, 1977 and 1990

Ownership Class	1977		1990		Change	
	Ares	Percent	Acres	Percent	Acres	Percent
Bureau of Land Mgmt	91,000	1.0%	29,000	0.4%	-62,000	-0.6%
County & Municipal	394,000	4.3%	404,000	4.9%	10,000	0.7%
Indian Lands	430,000	4.7%	416,000	5.1%	-14,000	0.4%
Misc Federal	44,000	0.5%	71,000	0.9%	27,000	0.4%
National Forest	887,000	9.6%	37,000	0.5%	-850,000	-9.2%
Private	1,138,000	12.3%	956,000	11.7%	-182,000	-0.6%
State	2,333,000	25.3%	1,940,000	23.7%	-393,000	-1.6%
Unknown	3,918,000	42.4%	4,333,000	52.9%	415,000	10.5%
Total	9,235,000	100.0%	8,186,000	100.0%	-1,049,000	0.0%

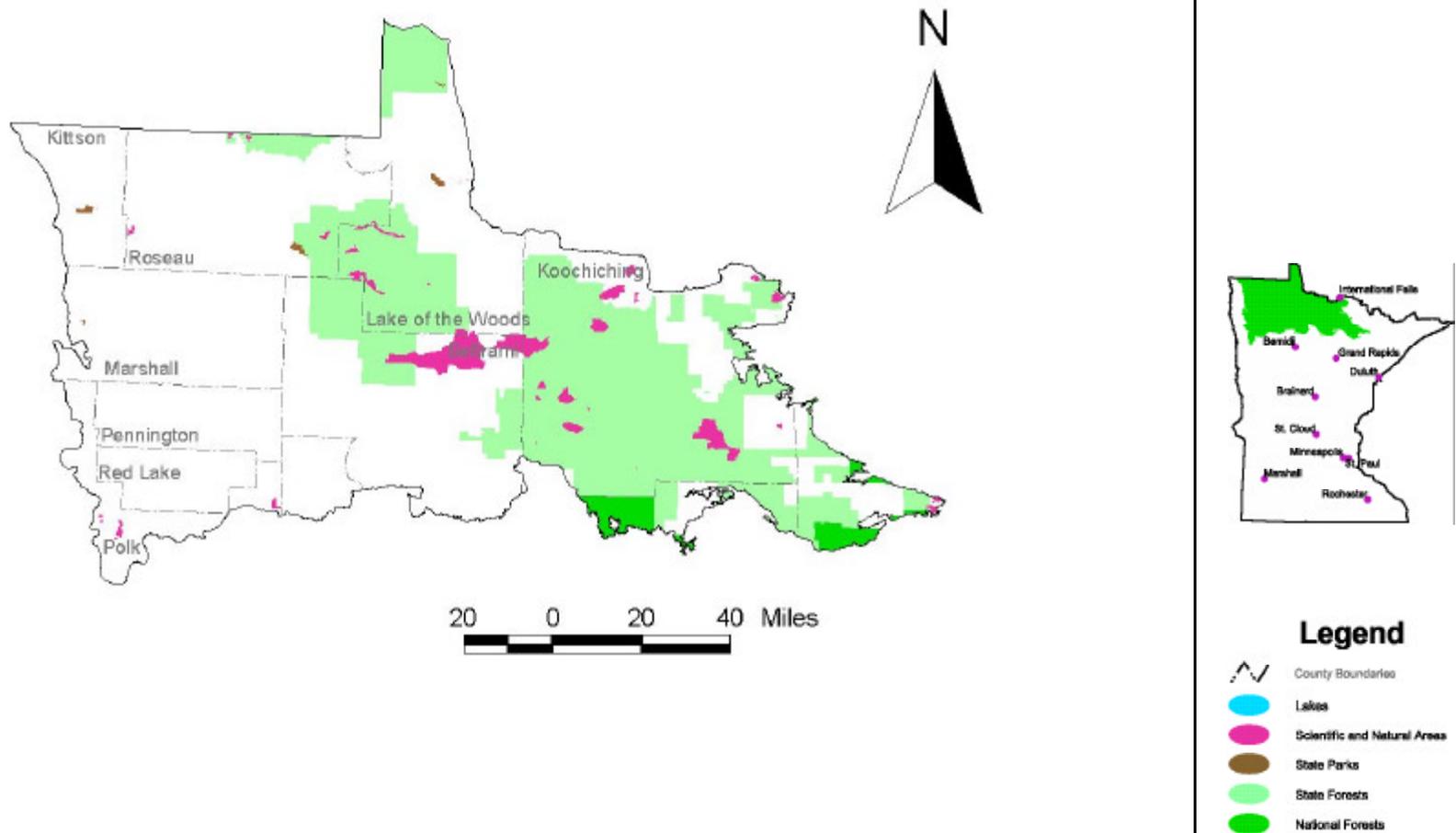


Table 17. Area of Ownership by Public and Private in the Northern Landscape, 1977 and 1990

Ownership	1977		1990		Change	
	Acres	Percent	Acres	Percent	Acres	Percent
Public	4,179,000	45.3%	2,897,000	35.4%	-1,282	-9.9%
Private	5,056,000	54.7%	5,289,000	64.6%	233	9.9%
Total	9,235,000	100.0%	8,186,000	100.0%	-1,049,000	0.0%

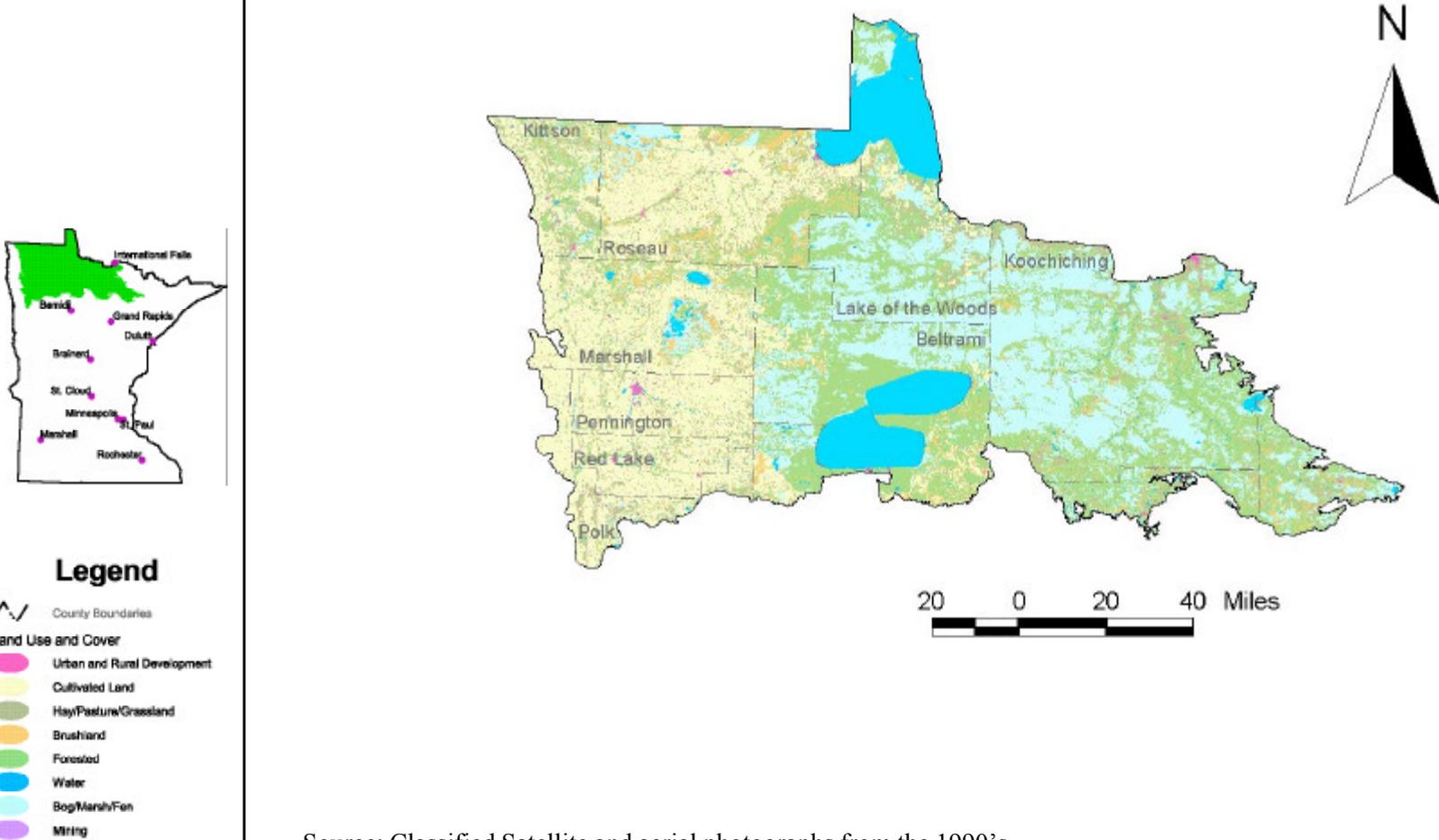
Source: Chung M. Chen, MNDNR, summarizing 1990 and 1977 FIA detailed database from the USFS N.C. & Landscape Regions from MFRC 9/20/00. On the average one plot represents about 1.25 thousand acres.

Figure 7. Reserved Lands and Forests in the Northern Landscape



Source: DNR

Figure 8. Land Use from Remotely Sensed data in the Northern Landscape



Source: Classified Satellite and aerial photographs from the 1990's.

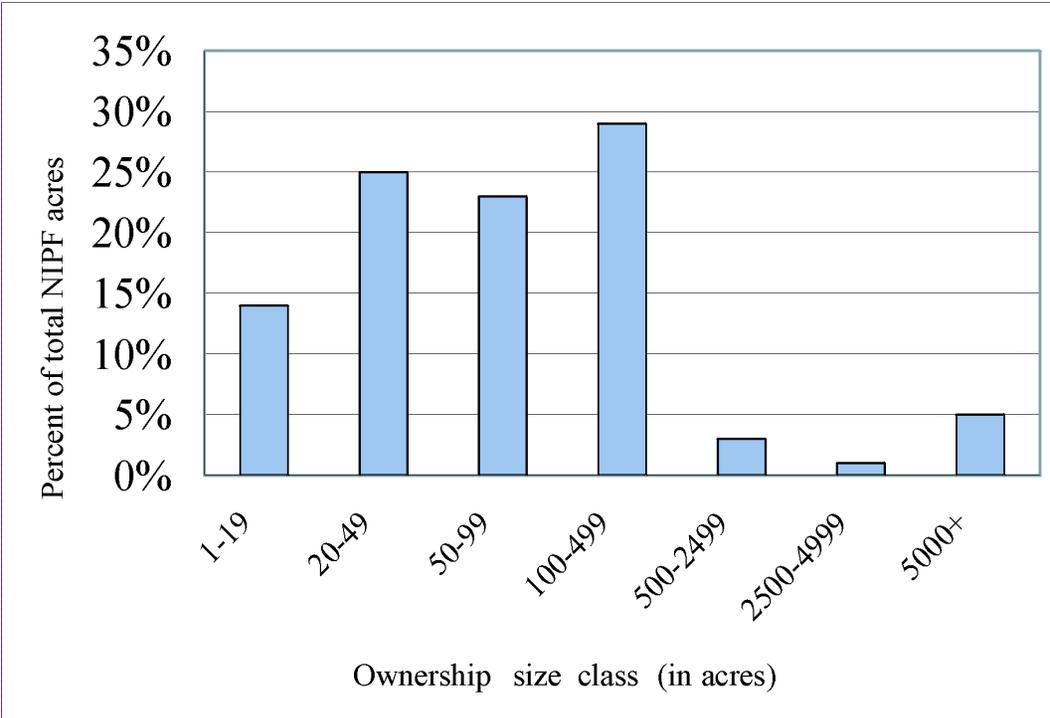
Table 18. Area of land use classes in the Northern Landscape

Land Use Classes	Acres	Percent
Urban-Rural Dev.	46,895	0.6%
Cultivated Land	2,105,656	25.6%
Hay/Pasture/Grassland	512,315	6.2%
Brushland	417,011	5.1%
Forested	2,440,661	29.7%
Water	656,031	8.0%
Bog/Marsh/Fen	2,031,595	24.7%
Mining	6,669	0.1%
Total	8,216,833	100.0%



Source: Classified Satellite and aerial photographs from the 1990's.

Figure 9. Distribution of nonindustrial private forestland (NIPF) acres statewide by ownership class size, 1990



Demographics

Observations

About 109,000 people live in the Northern Landscape Region (Table 19).

The region is sparsely populated, with a population density only one seventh of the state average (Table 19).

Pennington County is the most densely populated and Beltrami County has the greatest population (Table 19 and Figure 11).

The populations of Beltrami and Roseau are increasing (Table 20, Figure 13).

The populations of Koochiching, Marshall, Kittson, and Red Lake are declining (Table 20, Figure 13).

The distribution and composition of the population is changing significantly, but minimal net growth is occurring (Table 21).

Poverty and Income

Observations

The northern region has a relatively high level of poverty in relation to the 8.7% state average (Table 22, Figure 14).

Beltrami County has the leading poverty rate in the region at 18.6% (Table 22, Figure 14).

Personal income is significantly lower than the state average throughout the region (Table 23 and Figure 15).

Pennington has the highest per capita income and Red Lake County has the lowest (Table 23 and Figure 15).

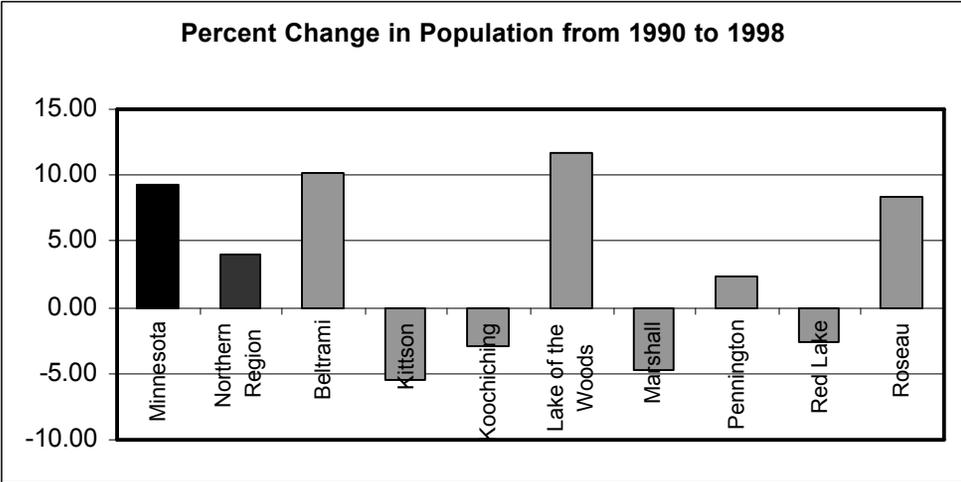
Table 19. Population of Minnesota and counties in the Northern Landscape

	1970	1980	1990	80-'90 % Change	1998	90-'98 % Change	1998 Pop. Density
Minnesota	3,806,103	4,075,970	4,375,099	7.34	4,782,745	9.32	60.07
Northern Region	97,627	105,319	104,376	-0.90	108,505	3.96	8.69
Beltrami	26,373	30,982	34,384	10.98	37,899	10.22	15.13
Kittson	6,853	6,672	5,767	-13.56	5,455	-5.41	4.97
Koochiching	17,131	17,571	16,299	-7.24	15,826	-2.90	5.10
Lake of the Woods	3,987	3,764	4,076	8.29	4,553	11.70	3.51
Marshall	13,060	13,027	10,993	-15.61	10,465	-4.80	5.90
Pennington	13,266	15,258	13,306	-12.79	13,617	2.34	22.08
Red Lake	5,388	5,471	4,525	-17.29	4,404	-2.67	10.19
Roseau	11,569	12,574	15,026	19.50	16,286	8.39	9.80



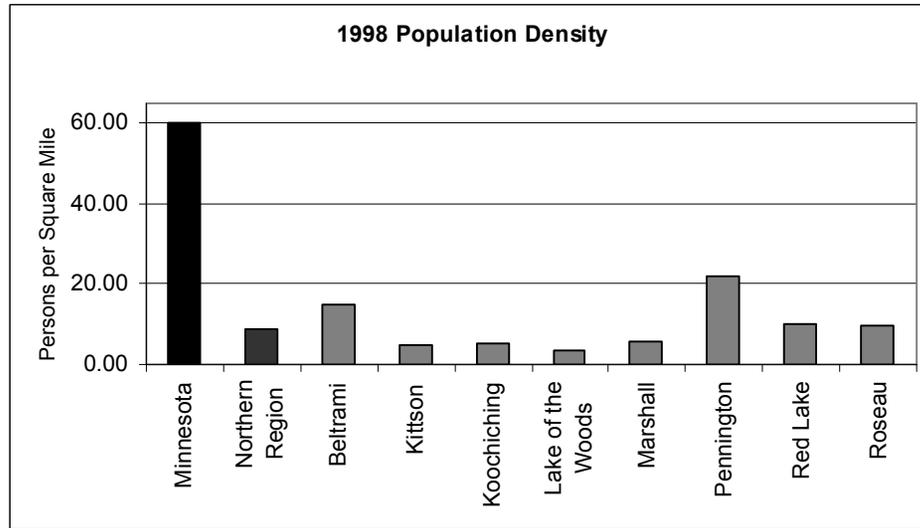
Source: Minnesota State Demographic Center and U.S. Census Bureau

Figure 10. Relative Level of Population Change for Minnesota and counties in the Northern Landscape from 1990 to 1998



Source: Minnesota State Demographic Center and U.S. Census Bureau

Figure 11. 1998 Population Density of Population Change for Minnesota and counties in the Northern Landscape



Source: Minnesota State Demographic Center and U.S. Census Bureau

Table 20. Population Projections for Minnesota and counties in the Northern Landscape

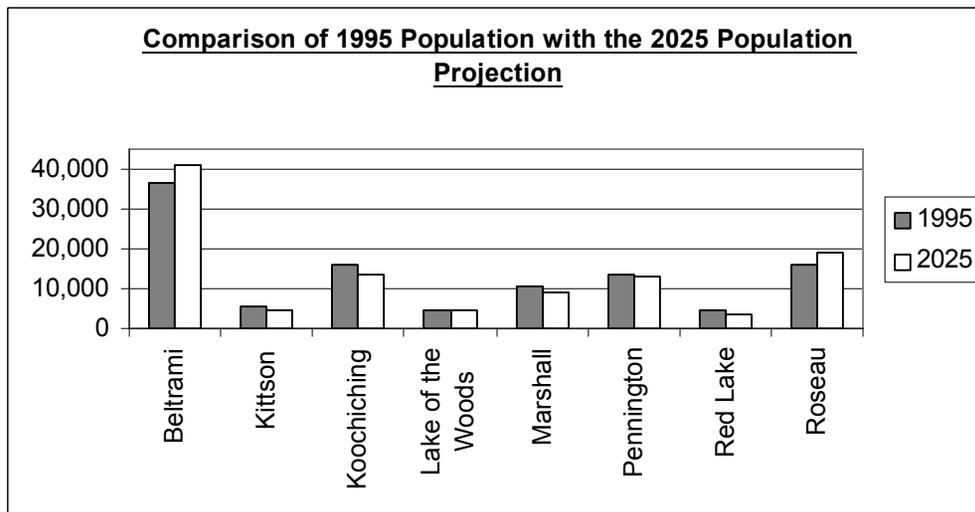
	1995	2025	1995-2025 % Change
Minnesota	4,626,514	5,282,840	14.19
Northern Region	106,984	108,570	1.48
Beltrami	36,508	41,050	12.44
Kittson	5,572	4,730	-15.11
Koochiching	15,911	13,580	-14.65
Lake of the Woods	4,363	4,490	2.91
Marshall	10,733	9,000	-16.15
Pennington	13,391	13,230	-1.20
Red Lake	4,481	3,670	-18.10
Roseau	16,025	18,820	17.44



Source: Minnesota State Demographic Center

Note: Although only Roseau and Beltrami are expected to grow significantly, they are over-represented in the regional average due to their large populations (accounting for over half the regional population), giving the northern region positive net growth.

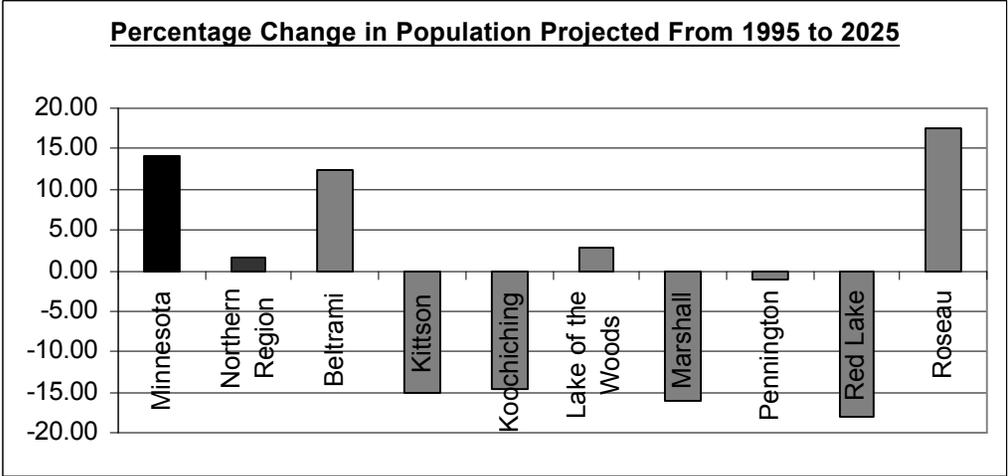
Figure 12. Population sizes for the counties in the Northern Landscape



Source: Minnesota State Demographic Center and U.S. Census Bureau



Figure 13. Percentage change in Population Projected for the counties in the Northern Landscape, 1995 to 2025



Source: Minnesota State Demographic Center and U.S. Census Bureau

Table 21. Population projection by age group for Minnesota and the counties in the Northern Landscape

Age Group	1995	Minnesota		1995	Northern Region	
		2025	1995-2025 % Change		2025	1995-2025 % Change
0-24	1,678,036	1,506,309	-10.2	4,0518	32,900	-18.8
25-64	2,369,249	2,735,390	15.5	50,388	50,680	0.6
65+	579,229	1,041,060	79.7	16,078	25,130	53.6
Total	4,626,514	5,282,840	14.2	106,984	108,710	1.6



Source: Minnesota State Demographic Center

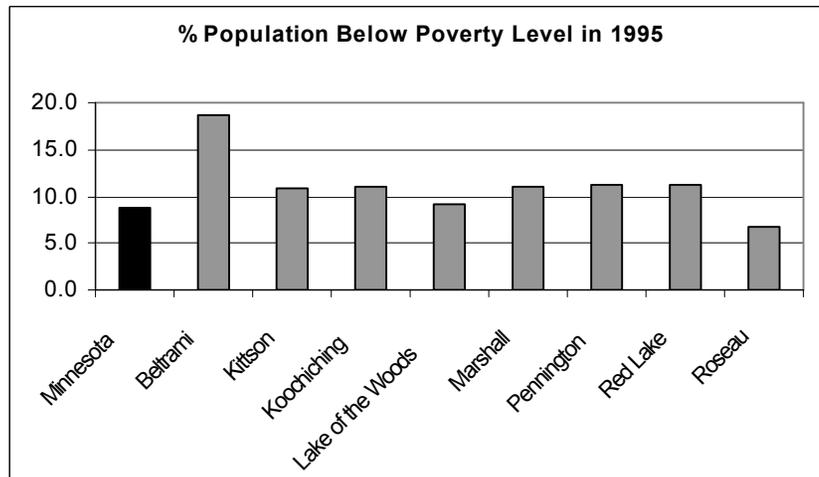
Table 22. Persons with incomes below poverty level in the counties in the Northern Landscape

	% Population Below Poverty Level in 1995
Minnesota	8.7
Beltrami	18.6
Kittson	10.9
Koochiching	11.1
Lake of the Woods	9.1
Marshall	11.1
Pennington	11.3
Red Lake	11.3
Roseau	6.8



Source: U.S. Census Bureau

Figure 14. Percent population below poverty level in the counties in the Northern Landscape



Source: U.S. Census Bureau



Table 23. Per capita personal income for Minnesota and the counties in the Northern Landscape

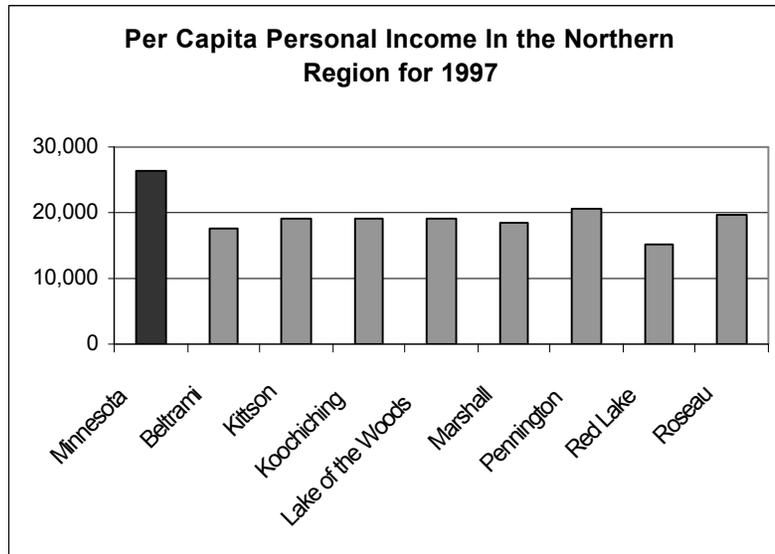
	1990	1997	% Growth '90-'97
Minnesota	19,348	26,243	35.60%
Beltrami	13,023	17,492	34.30%
Kittson	18,980	19,140	0.80%
Koochiching	14,265	18,988	33.10%
Lake of the Woods	15,187	18,995	25.10%
Marshall	14,492	18,414	27.10%
Pennington	15,204	20,560	35.20%
Red Lake	12,581	15,187	20.70%
Roseau	16,671	19,818	18.90%



Source: Minnesota State Demographic Center

Note: Because the northern region experienced a relatively high level of poverty, we would expect per capita income to be lower than the state average. This is confirmed by the data, as every county has income levels far below the state average of \$26,243 for 1997. Pennington County had the highest income (\$20,560) in the region, and the greatest level of income growth over the seven-year period.

Figure 15. Per capita personal income for Minnesota and the counties in the Northern Landscape



Note: No county experienced growth of per capita income as high as the state average, indicating that the region is becoming relatively poorer in relation to the rest of the state. However, this is probably misleading, as the cost of living in the region is not taken into consideration when comparing income with the rest of the state.



Employment

Observations

Manufacturing, Trade (retail and wholesale), Services and Government are the leading industries in Minnesota (Table 24).

The timber industry accounts for 2.5% of statewide personal income (Table 24).

The services industry has experienced the highest growth rate over the past several decades and this trend is expected to continue (Figures 16 and 17).

The farming sector of Minnesota's economy is currently shrinking and should continue to contract (Figures 16 and 17).

There are about 45,000 people in the regional labor force (Table 25)

The services, manufacturing, government and trade sectors are the dominant industries in the region. (similar to state-wide industrial distribution) (Table 25 and Figure 20)

Northern region unemployment is high in comparison to state and national averages at 5.3% of the labor force (Table 26 and Figure 21).

Marshall and Red Lake have very high rates of unemployment (Table 26 and Figure 21).

The services sector generally pays low wages (Table 28).

Workers in Koochiching County generally earn the highest weekly wages in the northern region (Table 28, and Figure 22).

In Red Lake and Kittson counties, workers earn low weekly wages (Table 28, and Figure 22).

Table 24. Statewide summary of percent of total income by source

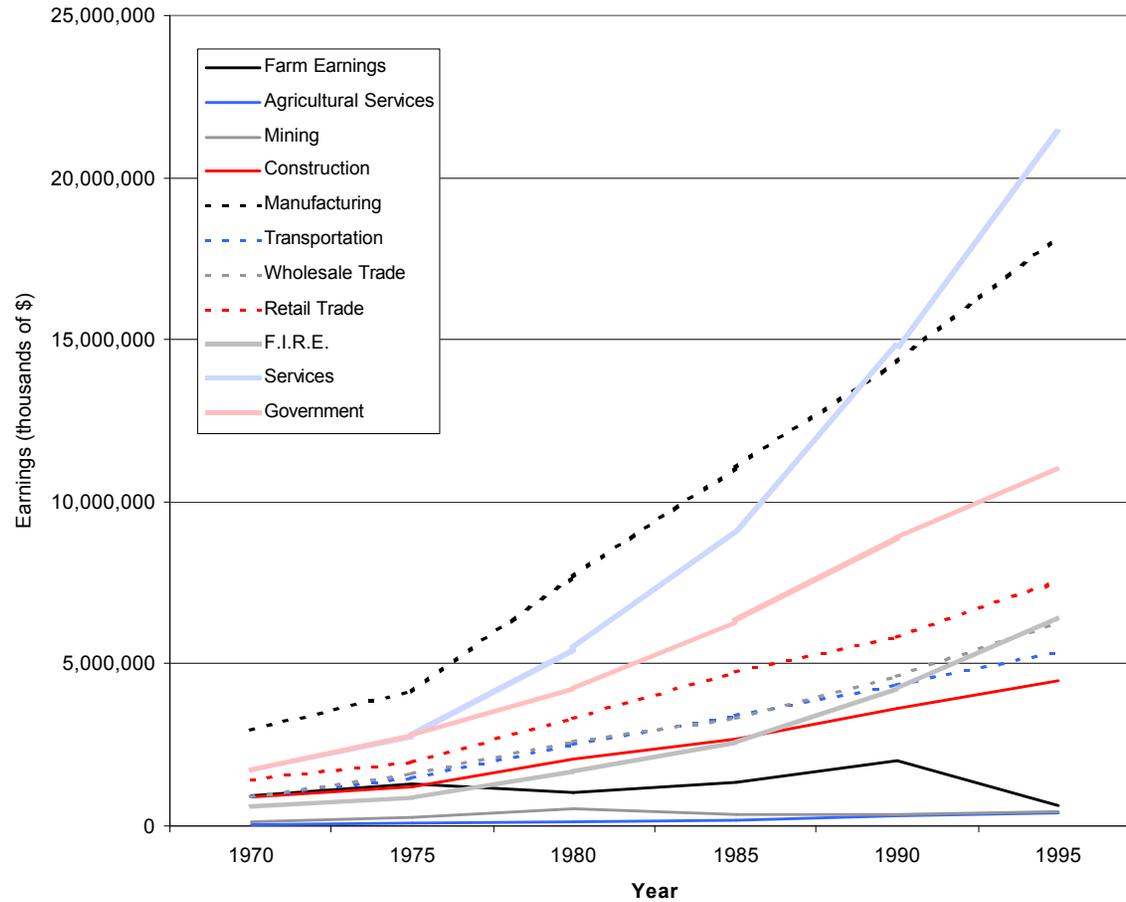
Source	Percent of Total Income
Farming and ag. services	1.7
Mining	0.4
Timber-related	2.5
Construction	4
Manufacturing (non-wood)	12.6
Transportation & public utilities	4.5
Wholesale trade	5.6
Retail trade	6.3
Finance, insurance, and real estate	5.8
Services	18.1
Government	9.2
Non-labor income ^a	30
Total	100.7

^aThis "non-labor income" includes dividends, interest and rent from investments, Social Security, pension from home equity gains, and other payments.

Source: U.S. Bureau of Economic Analysis, 1998



Figure 16. Earnings by major industry for Minnesota, 1970-1995

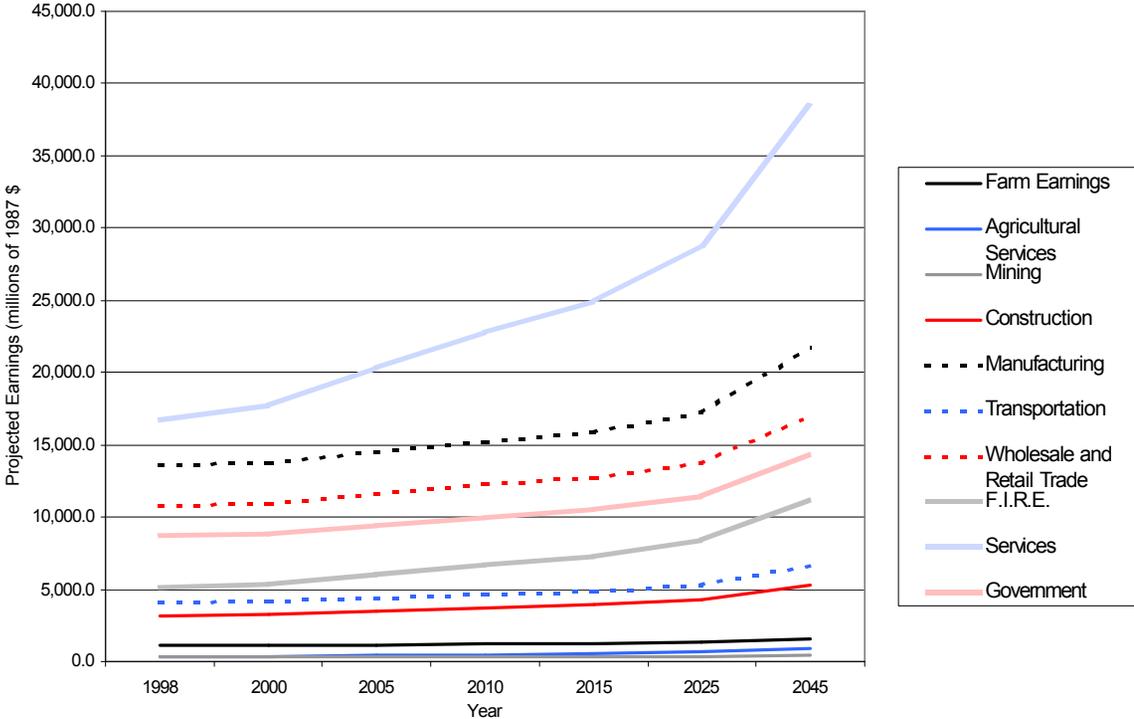


Source: Regional Economic Information System, Table CA05, Bureau of Economic Analysis

Note: As growth is shown monetarily rather than proportionally, these differences in growth are misleading. However, this diagram is useful in illustrating that farm earnings have decreased significantly since 1990.



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

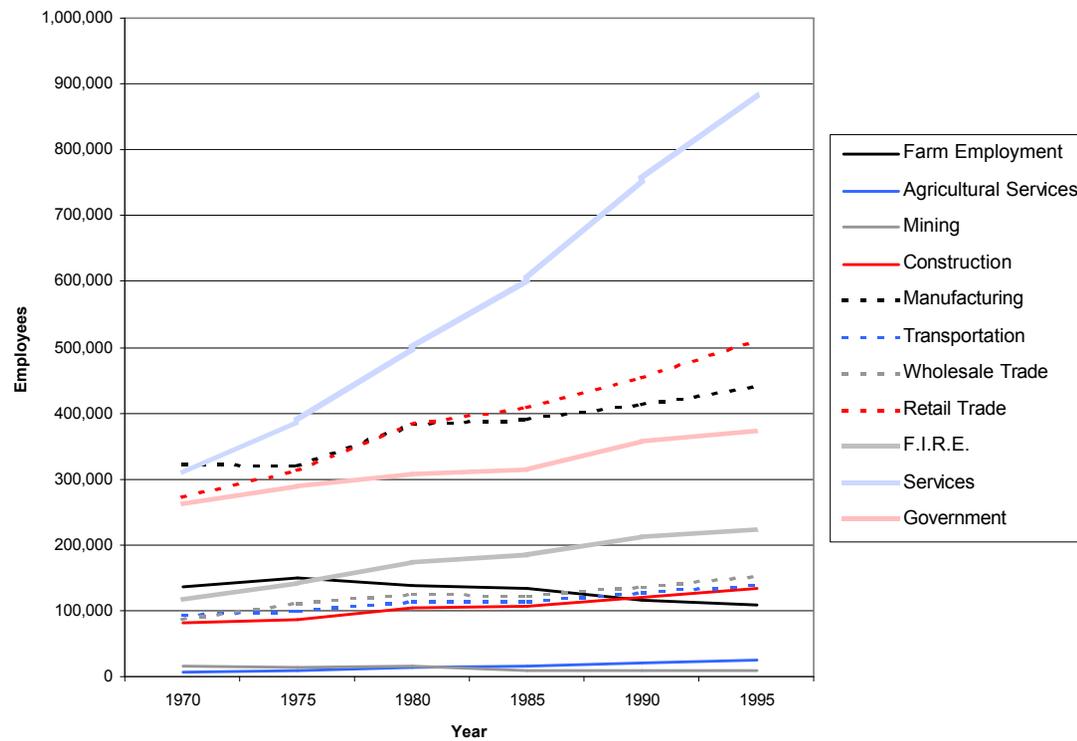


Source: Regional Economic Information System, Bureau of Economic Analysis

Note: It is difficult to distinguish real earnings growth from inflationary growth in this figure



Figure 18. Number of employees by major industry for Minnesota, 1970-1995

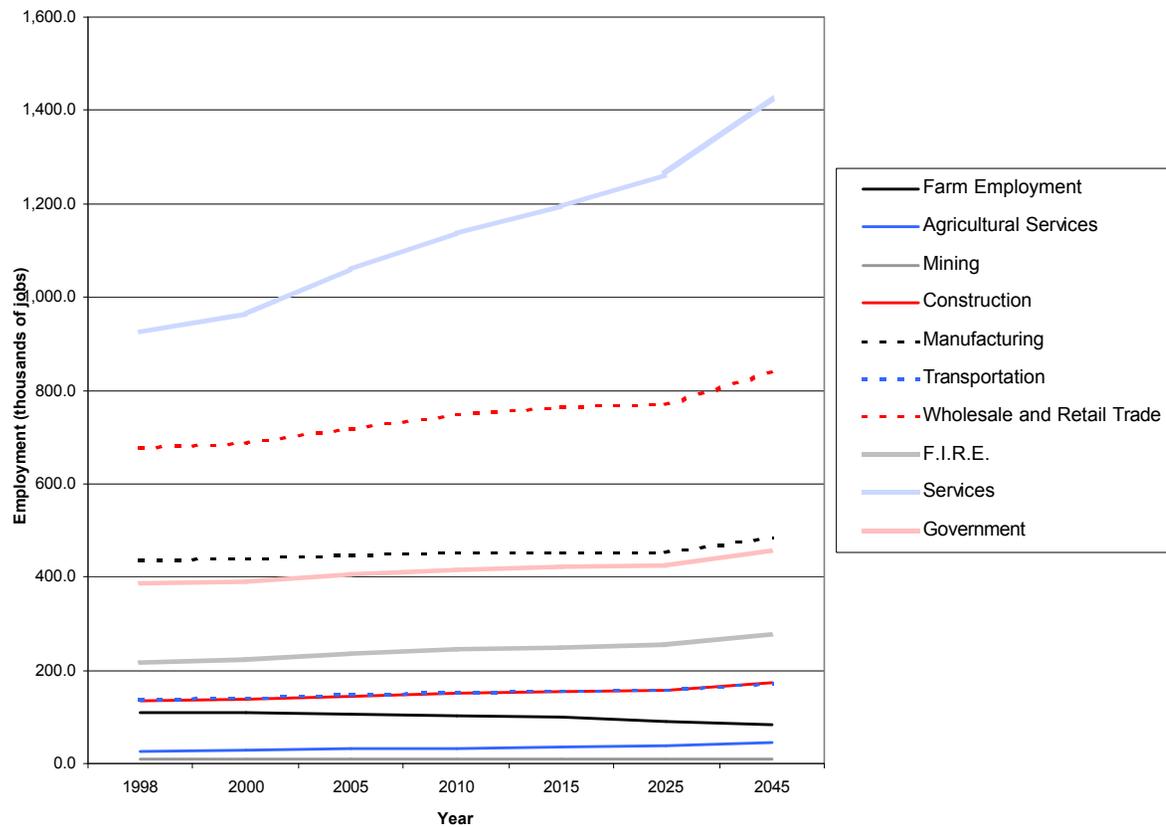


Source: Regional Economic Information System, Table CA25, Bureau of Economic Analysis

Note: As expected, Employment by industry closely mirrors Earnings by industry over the same time period.



Figure 19. Projected employment by major industry for Minnesota, 1998-2045



Source: Regional Economic Information System, Bureau of Economic Analysis

Note: Greater efficiency and tightened competition are possible explanations for relative farming declines in earnings and employment. It should be recognized that land use industries, such as mining, agriculture and farming, have intrinsic growth limitations due to land and resource availability and ownership.



Table 25. 1998 Distribution of Employees by Industry for the counties in the Northern Landscape

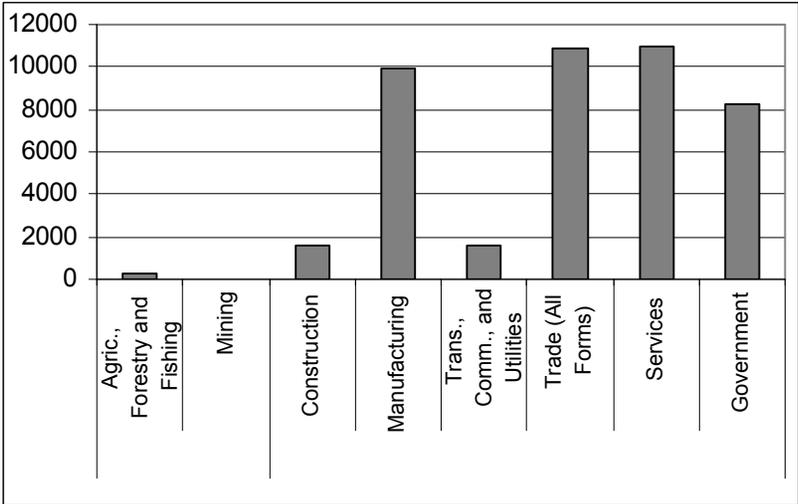
	Total Annual Wages per Industry (given in Thousands of Dollars).								
	All Industries	Agric., Forestry and Fishing	Mining	Construction	Manufacturing	Trans., Comm., and Utilities	Trade (All Forms)	Services	Government
Northern Region	45,217	265	15	1565	9975	1595	10906	11002	8279
Beltrami	15,912	56	0	939	1,077	719	4,280	4,895	3,473
Kittson	1,537	na	na	33	41	71	428	439	382
Koochiching	5,871	na	na	181	1,579	236	1,220	1,444	1,050
Lake of the Woods	1,519	na	0	47	na	54	323	498	309
Marshall	2,415	112	15	105	315	60	594	430	674
Pennington	7,826	41	0	112	1,874	232	2,553	1,647	1,194
Red Lake	1,167	na	na	59	141	88	262	238	294
Roseau	8,970	56	0	89	4,948	135	1,246	1,411	903



Source: Minnesota Department of Economic Security

Note: It is important to note that the agriculture, forestry and fishing sector as well as mining is unrecorded for many of the Counties and is therefore under-represented in the regional total.

Figure 20. 1998 Employment by Sector for the counties in the Northern Landscape



Source: Minnesota Department of Economic Security



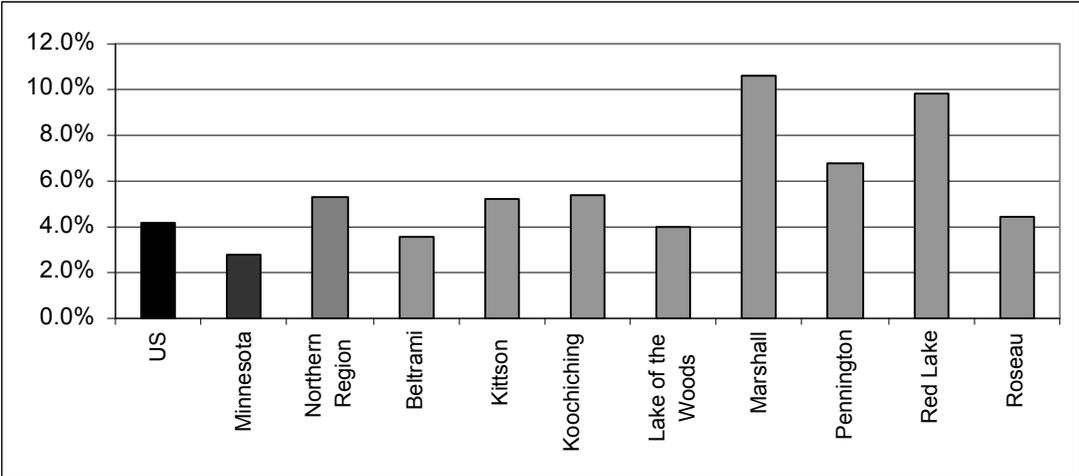
Table 26. Unemployed for Minnesota and counties in the Northern Landscape, 1999

	Labor Force	Employment	Unemployment	Unemployment Rate
US	139,368,000	133,488,000	5,880,000	4.2%
Minnesota	2,698,511	2,623,058	75,453	2.8%
Northern Region	52,976	50,167	2,809	5.3%
Beltrami	19,212	18,512	700	3.6%
Kittson	2,133	2,022	111	5.2%
Koochiching	5,870	5,555	315	5.4%
Lake of the Woods	2,435	2,337	98	4.0%
Marshall	4,216	3,770	446	10.6%
Pennington	8,240	7,678	562	6.8%
Red Lake	1,848	1,666	182	9.8%
Roseau	9,022	8,627	395	4.4%



Source: Minnesota Department of Economic Security

Figure 21. Unemployment Rates for the counties in the Northern Landscape



Source: Minnesota Department of Economic Security



Table 27. Total Wages by Industry for the counties in the Northern Landscape, 1998

Total Annual Wages per Industry (given in Thousands of Dollars).									
	All Industries	Agric., Forestry and Fishing	Mining	Construction	Manufacturing	Trans., Comm., and Utilities	Trade (All Forms)	Services	Government
Northern Region	1,054,112	5,219	496	47,861	289,815	49,351	168,601	212,053	238,213
Beltrami	362,467	1,087	na	31,492	25,102	23,584	60,076	100,740	109,012
Kittson	30,796	na	na	665	743	3,412	6,999	5,973	9,981
Koochiching	164,394	na	na	5,876	64,227	5,434	21,022	33,139	30,951
Lake of the Woods	31,788	na	na	856	na	1,602	3,663	6,877	8,329
Marshall	49,947	2,130	496	2,628	7,380	1,943	9,971	6,037	16,243
Pennington	174,916	646	na	3,396	47,381	5,914	48,618	31,731	32,801
Red Lake	22,776	na	na	1,222	2,814	3,051	3,382	4,081	6,683
Roseau	217,028	1,356	na	1,726	142,168	4,411	14,870	23,475	24,213



Source: Minnesota Department of Economic Security

Table 28. Distribution of Weekly Wages by Industry for the counties in the Northern Landscape, 1998

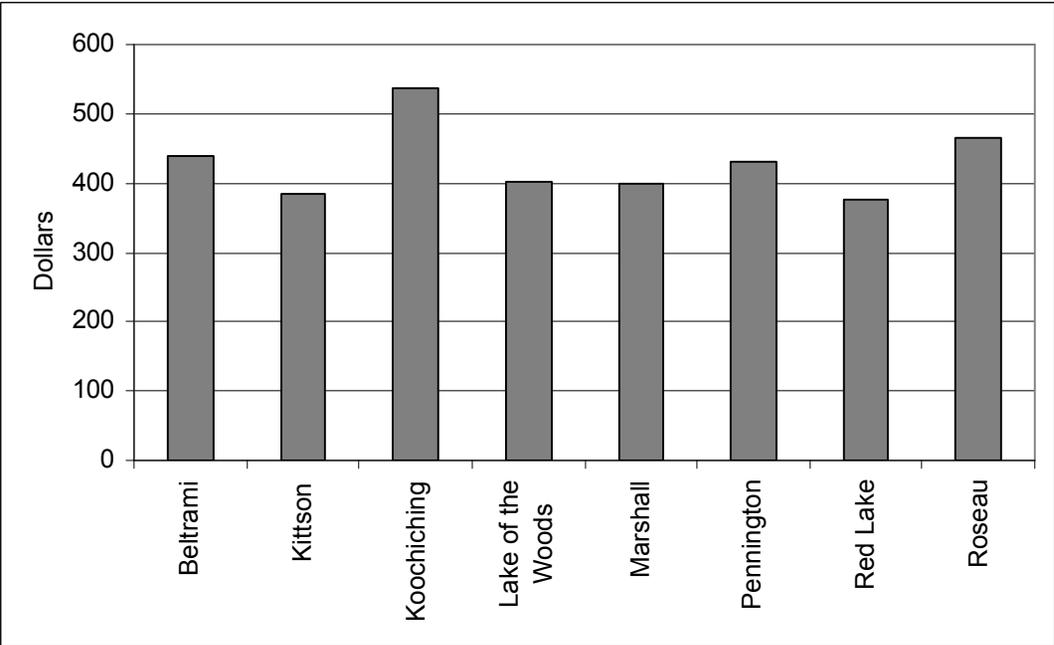
	Average Weekly Wages per Industry (given in dollars)								
	All Industries	Agric., Forestry and Fishing	Mining	Construction	Manufacturing	Trans., Comm., and Utilities	Trade (All Forms)	Services	Government
Beltrami	438	373	na	645	448	631	270	396	604
Kittson	385	na	na	387	349	924	315	262	502
Koochiching	538	na	na	624	782	443	331	441	567
Lake of the Woods	402	na	na	350	na	571	218	266	518
Marshall	398	366	636	481	451	623	323	270	463
Pennington	430	303	na	583	486	490	366	371	528
Red Lake	375	na	na	398	383	667	248	330	437
Roseau	465	465	na	373	552	628	230	320	516

Source: Minnesota Department of Economic Security

Note: displays variation of the average weekly wage across industrial sectors for the northern region. Many of these differences can be attributed to skill and training levels required, as well as the dominance of labor unions in certain sectors. This data is very difficult to interpret, but the transportation, communications and utilities sector, as well as construction, government and manufacturing industries all seem to pay relatively well while the service industry yields low wages, as this is generally unskilled labor.



Figure 22. Average Wages Earned for the counties in the Northern Landscape, 1998



Economic Production

Observations

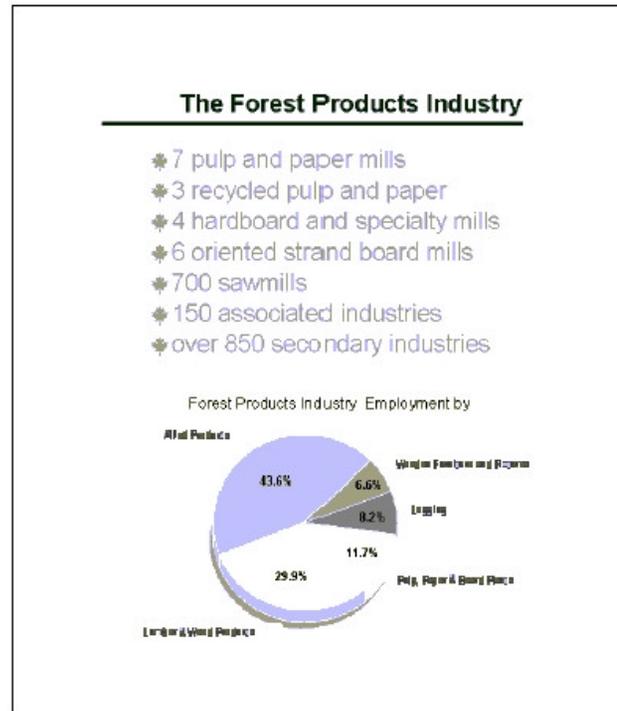
In the northern landscape region, the timber industry is largely skewed toward the eastern counties (Table 29).

The volume of annual timber harvesting has increased greatly over the past twenty years (Figure 24).

The price of wood has risen dramatically throughout the past decade (Tables 30 and 31, and Figures 25 and 26).

The prices received for Aspen, Balsam and Balm wood have risen faster than other species (Tables 30 and 31).

Figure 23. The Minnesota Forest Products Industry



Source: Minnesota Forest Industries.

Note: The forest and timber products industry accounts for 2.5% of statewide personal income and is thus a major component of Minnesota’s economy. Figure 3.1 summarizes the major businesses involved in this industry. Also included below is a pie chart, illustrating the proportion of total labor supplied by each division of the forestry products sector. Allied products (secondary businesses associated with the timber industry) supply the greatest amount of employment in forestry products with 43.6% of net employment. Lumber and wood products account for nearly 30% of employment. Logging, pulp and paper mills, and wooden furniture and fixtures comprise the remaining forest products and timber related jobs in Minnesota.



Table 29. Pulp, Paper and Board Plants, per County in the Northern Landscape

	Number of Plants
Northern Region	12
Beltrami	6 (1)
Kittson	0
Koochiching	7
Lake of the Woods	3
Marshall	0
Pennington	0
Red Lake	1
Roseau	0

Source: United States Forestry Service (North Central Research Station)

Note: This table indicates the relative importance of the forest and timber industry for each county in the northern region. Twelve plants are located in the region, the majority of which are found in Koochiching County (7 plants) and Lake of the Woods County (3 plants). This indicates that the forest and timber products industry is unbalanced in this region, with a larger degree of activity on the eastern side of the region.

Of the 6 plants located in Beltrami County, only 1 is located in the Northern Landscape.



Figure 24. Trends in hardwood and soft wood harvesting statewide, 1980-1997

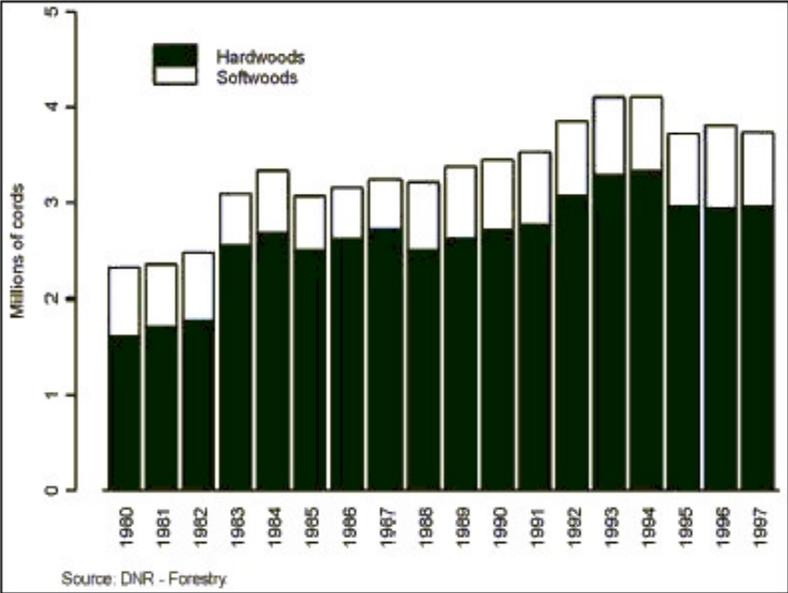


Table 30. Average Prices Received for Sawtimber (\$'s per MBF) sold by Public Land Agencies in Minnesota: 1990 and 1998

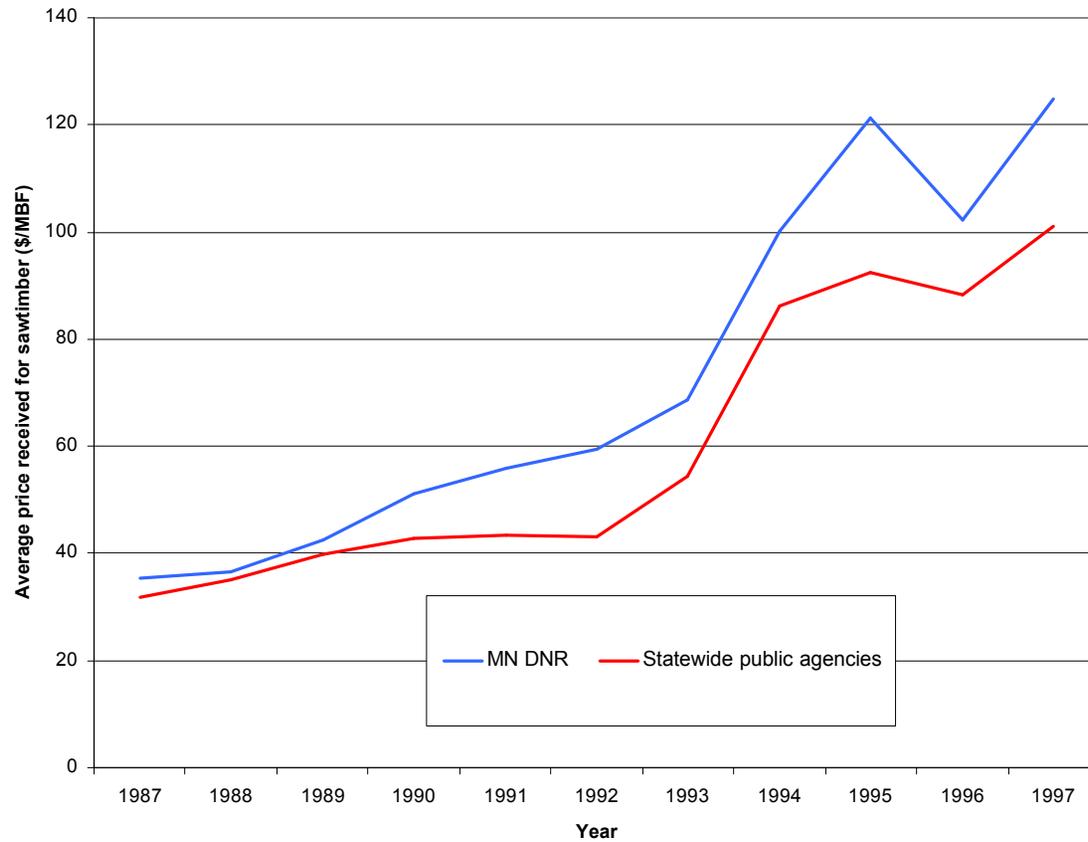
Species	1990	1998	% Increase in Price
Aspen	\$ 23.34	\$ 100.54	331%
Birch	\$ 20.87	\$ 39.78	91%
Ash	\$ 49.44	\$ 97.09	96%
Elm	\$ 38.77	\$ 53.31	38%
Oak	\$ 73.40	\$ 140.20	91%
Balsam	\$ 20.54	\$ 88.30	330%
W. Spruce	\$ 54.34	\$ 78.34	44%
Cedar	\$ 29.63	\$ 38.64	30%
J. Pine	\$ 62.83	\$ 121.84	94%
R & W. Pine	\$ 93.55	\$ 161.01	72%

Source: Department of Natural Resources (Forestry Division).

Note: This data is somewhat misleading, as it fails to account for changes in inflation. With an estimate of 3.5% annual inflation over this time period, the price level would be expected to increase by approximately 32%.



Figure 25. Average stumpage prices received by public agencies for sawtimber, 1987-1997



Source: DNR – Forestry

Note: Although this is statewide stumpage data, these findings apply directly to the northern region because only trivial price differences would be seen across the state.



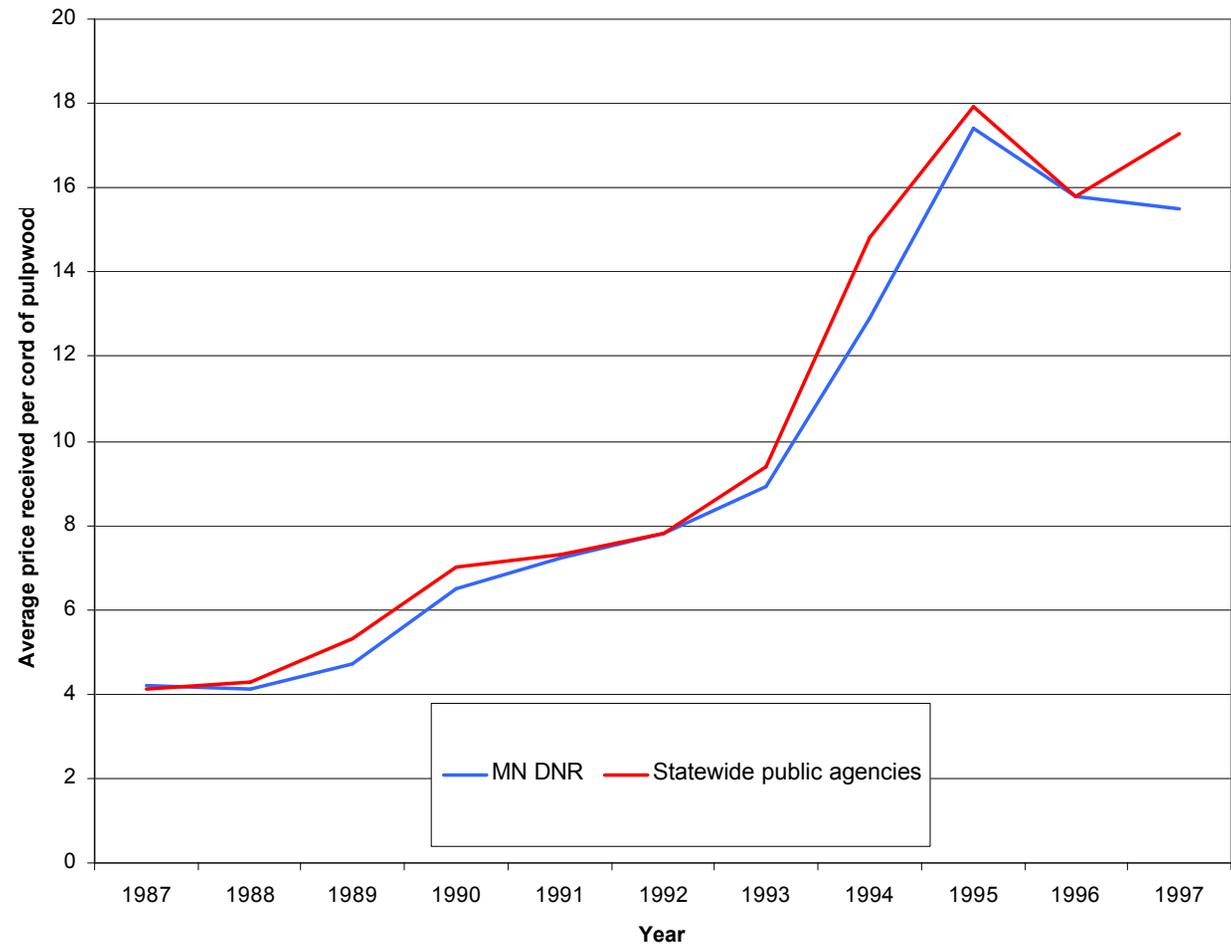
Table 31. Average Prices Received for Pulpwood (\$'s per Cord) sold by Public Land Agencies in Minnesota: 1990 and 1998

Species	1990	1998	% Increase in Price
Aspen	\$ 6.09	\$ 20.54	237%
Balm	\$ 3.35	\$ 16.95	406%
Birch	\$ 3.69	\$ 7.53	104%
Ash	\$ 3.82	\$ 5.51	44%
Oak	\$ 4.89	\$ 8.98	84%
Balsam	\$ 6.49	\$ 14.12	118%
W. Spruce	\$ 12.42	\$ 19.18	54%
B. Spruce	\$ 11.88	\$ 21.16	78%
Tamarack	\$ 4.61	\$ 7.29	58%
Cedar	\$ 9.76	\$ 7.31	-25%
J. Pine	\$ 11.34	\$ 24.72	118%
R & W. Pine	\$ 13.04	\$ 15.63	20%

Source: Department of Natural Resources (Forestry Division)



Figure 26. Average stumpage prices received by public agencies for pulpwood, 1987-1997



Source: DNR - Forestry

Tourism and Taxes

Observations

Overall, the range of property tax rates is very widespread and inconsistent in the northern region (Table 32, and Figures 27 and 28).

Overall, the region pays low income taxes. This should be expected, as per capita income is substantially lower in the northern region than the state average (Table 33).

1999 Property taxes reached nearly \$70,000,000 in the northern region (Table 32).

Pennington County had the highest per capita property tax in the northern region (Table 33).

Tourism in Minnesota has grown substantially during the past decade (Figure 29).

Tourism in the northern region is largely based upon camping, fishing and hunting (Table 36).

Roseau, Koochiching and Beltrami have the greatest amount of hunting in the region (Table 36).

There is not a large amount of major roads systems in this region (Figure 31).

Statewide roads and trails have been increasing for at least the last 10 years (Figures 32 and 33).

Table 32. Property Tax Information by County for the Northern Landscape, 1999

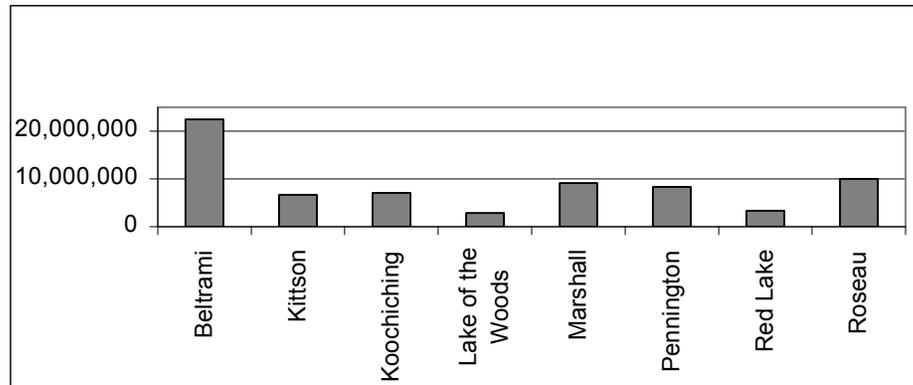
	Net Property Tax Payable by County	Average Tax Rate (% of Market Value)	Net Tax Credit
Minnesota	4,604,137,455	0.093	325,585,713
Northern Region	69,860,843	na	3,797,988
Beltrami	22,533,143	0.052	1,413,506
Kittson	6,788,532	0.261	136,352
Koochiching	7,046,972	0.059	584,437
Lake of the Woods	2,908,026	0.008	187,278
Marshall	9,047,331	0.070	275,219
Pennington	8,325,819	0.070	485,563
Red Lake	3,296,400	0.103	46,655
Roseau	9,914,620	0.134	668,978



Source: Minnesota Department of Revenue

Note: Beltrami County accounts for the largest portion of property taxes in the region, but this should be expected with its large population

Figure 27. Property Taxes Payable by County for the Northern Landscape, 1999



Note: Three things essentially determine property taxes payable (for a county): the number of people, the value of the land, and the average tax rate (as percent of market value).



Figure 28. 1999 Property tax (% of value) for the Northern Landscape

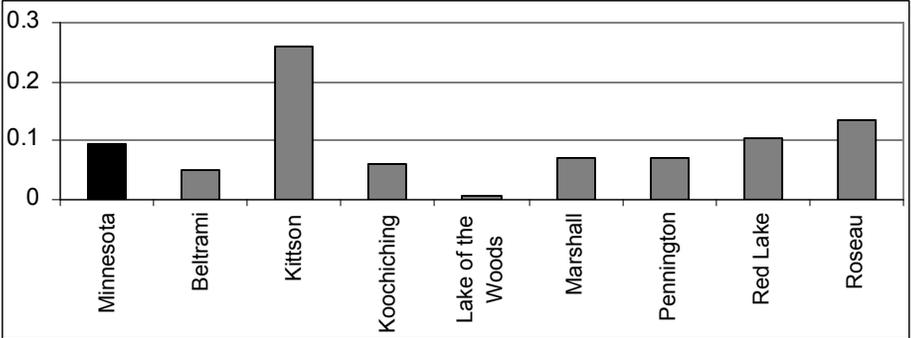


Table 33. Individual Income Tax Payments per Capita, by Counties in the Northern Landscape, 1995

	Per Capita Income Tax
Minnesota	\$737
Beltrami	\$255-\$500
Kittson	\$255-\$500
Koochiching	\$255-\$500
Lake of the Woods	\$255-\$500
Marshall	\$255-\$500
Pennington	\$700-\$1060
Red Lake	\$255-\$500
Roseau	\$500-\$700

Source: Department of Revenue

Notes: It should be noted that these figures include only state income taxes from 1994, but exclude federal income tax.

Counties are given a range rather than an accurate value for per capita income tax payments



Table 34. Property tax refunds per capita, by Counties in the Northern Landscape, 1995

	Per Capita Property Tax Refunds
Minnesota	\$37
Beltrami	\$12-\$20
Kittson	\$12-\$20
Koochiching	\$12-\$20
Lake of the Woods	\$12-\$20
Marshall	\$12-\$20
Pennington	\$20-\$30
Red Lake	\$12-\$20
Roseau	\$12-\$20

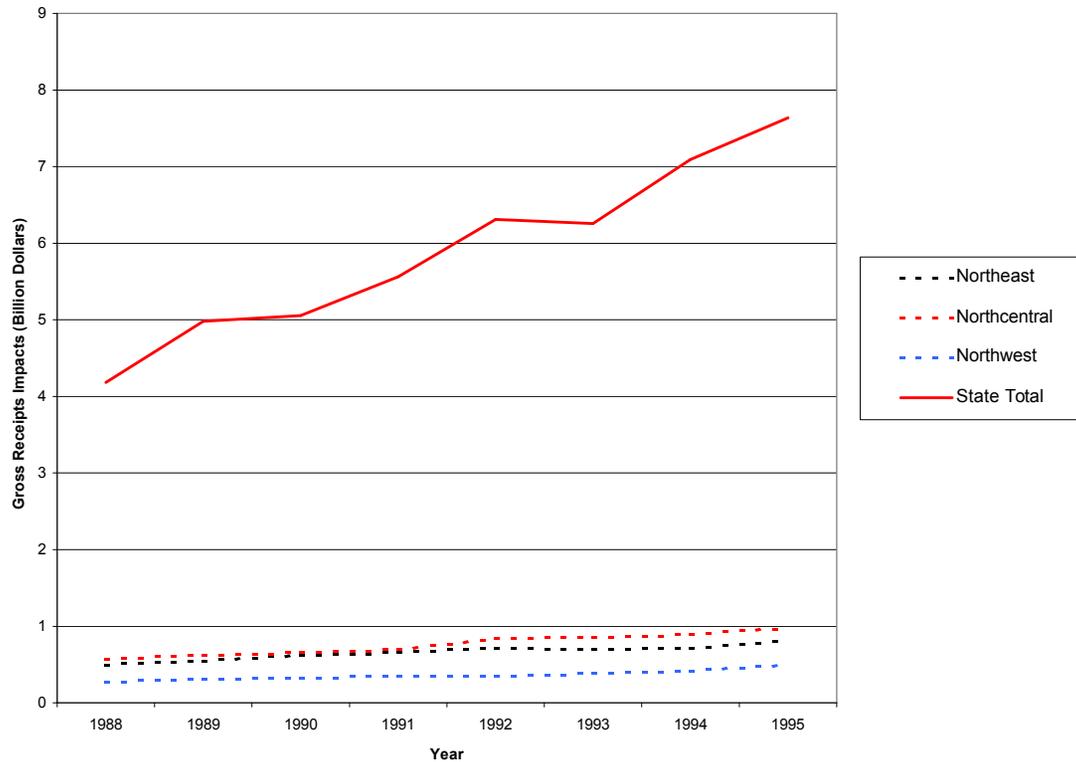


Source: Department of Revenue

Note: Property tax refunds per capita is essentially another index of relative tax levels. Those who pay the most taxes, generally receive the greatest tax rebate.

Counties are given a range rather than an accurate value for per capita, property tax refunds

Figure 29. Economic impact of domestic travel, 1988-1995



Source: MN Department of Trade and Economic Development, MN Office of Tourism

Notes: The MN Office of Tourism regions include the following counties:

Northeast: Aitkin, Carlton, Cook, Isanti, Itasca, Kanabec, Koochiching, Lake, Pine, and St. Louis.

Northcentral: Beltrami, Benton, Cass, Crow Wing, Hubbard, Lake of the Woods, Mille Lacs, Morrison, Roseau, Sherburne, Stearns, and Todd.

Northwest: Becker, Clay, Clearwater, Douglas, Grant, Kittson, Mahnomen, Marshall, Norman, Otter Tail, Pennington, Polk, Pope, Red Lake, Stevens, Wadena, and Wilkin



Table 35. Total Sales from Hotels, Motels, Resorts and Other Lodging Places per Counties in the Northern Landscape, 1996 (In Thousands of Dollars)

	1996 Sales for All Lodging Places	% Change From 1995 to 1996
Minnesota	1,142,036	14%
Northern Region	31,992	NA
Beltrami	9,793	16.20%
Kittson	206	NA
Koochiching	9,284	27.10%
Lake of the Woods	6,955	17.80%
Marshall	149	NA
Pennington	3,055	-1.10%
Red Lake	NA	NA
Roseau	2,550	121%

Source: Minnesota Department of Trade & Economic Development

Notes: Total sales from hotels, motels and other lodging places for 1996 is shown below. This can be used as a gauge for tourism. However, some problems arise from this analysis. As mentioned before, much of the tourism in this area is derived from camping activity, which is not accounted for here. The northern region as a whole had roughly \$32 million in revenue from lodging in 1996. Ultimately, we see that counties with the largest population and some semi-urban community have the greatest receipts from lodging. As this data, from the Minnesota Department of Trade and Economic Development, is fairly unreliable, substantial conclusions cannot be made from these observations. Chart 4.6.1 illustrates the receipts from lodging per county, showing a wide variation across counties.

This data can be used as a proxy for relative tourism levels.



Figure 30. Total Sales from Hotels, Motels, Resorts and Other Lodging Places per Counties in the Northern Landscape, 1996 (In Thousands of Dollars)

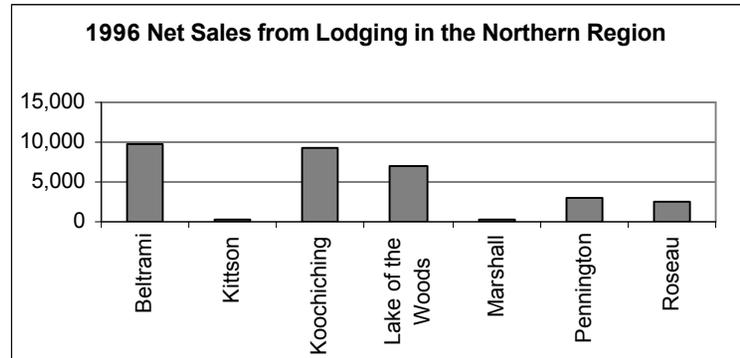


Table 36. Distribution of Hunting Licenses by Type for the Counties in the Northern Landscape

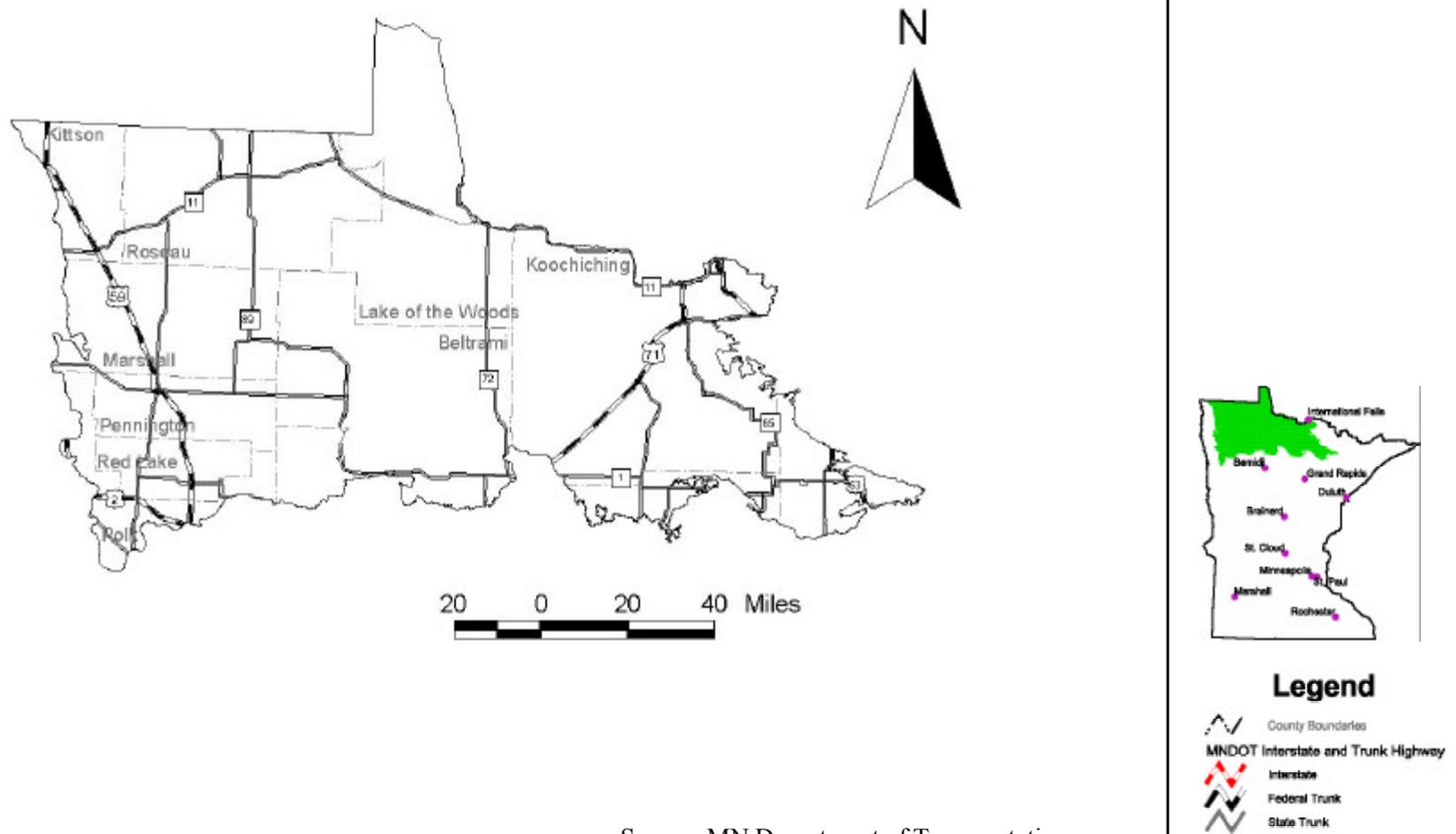
	Small Game		Deer Firearms		Deer Archery		Individual Sports	Waterfowl	Goose
	Resident	Nonresident	Resident	Nonresident	Resident	Nonresident	Resident	Stamp	Permit
Minnesota	120,419	7,158	379,974	8,882	64,141	1,037	101,060	126,822	38,800
Northern Region	5,927	418	22,477	469	2,741	34	5,887	3,840	621
Beltrami	2,114	154	6,992	122	853	10	1,978	1,421	273
Kittson	162	21	1,209	90	257	8	163	145	1
Woodruffing	1,561	91	3,489	55	141	0	1,036	355	37
Lake of the Woods	295	71	1,124	32	96	1	662	230	67
Marshall	237	12	1,575	57	212	5	160	241	9
Pennington	556	23	2,611	48	312	3	470	650	47
Red Lake	75	1	798	10	85	0	133	109	12
Roseau	927	45	4,729	55	785	7	1,285	689	175



Source: Department of Natural Resources

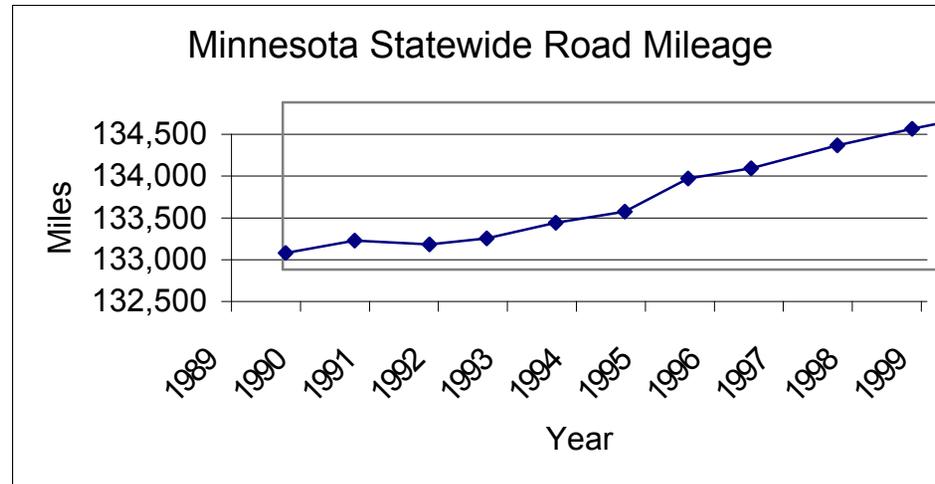
Note: Per capita hunting data is not available, and population size and land area can skew these values.

Figure 31. Major Roads in the Northern Landscape



Source: MN Department of Transportation

Figure 32. Road mileage statewide in Minnesota, 1989-1999

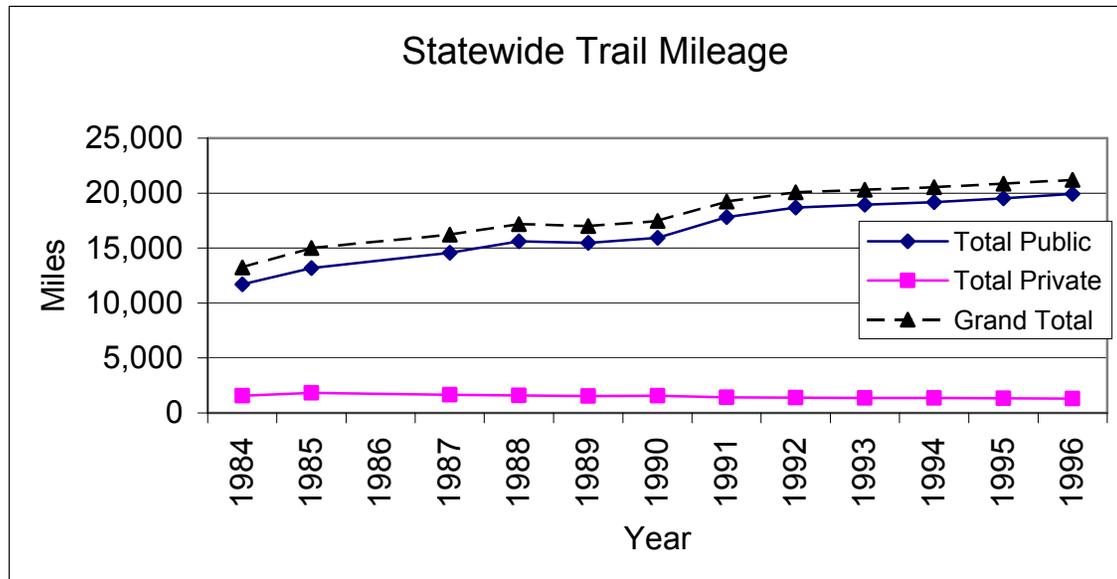


Source: Minnesota Department of Transportation.

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 33. 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 resolution
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	Aerial 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 management 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

^ALibraries and numerous Internet sites contain additional information on the above data sources.

^BDetailed metadata can be found at the Interagency Information Cooperative's web site, www.iic.state.mn.us.

^CThe 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 trail mileages frequently 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

^ALibraries and numerous Internet sites contain additional information on the above data sources.

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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 Territory.	+ 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.

^ALibraries and numerous Internet sites contain additional information on the above data sources.

^BDetailed metadata can be found at the Interagency Information Cooperative's web site, www.iic.state.mn.us.

^CThe 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.

Appendix B. Summary of FIA Sampling and Estimation Procedures.

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 size¹.

¹ The plot size of a 14.0-inch tree on a single 37.5 BAF (English) prism plot would be: $(14.02 \times \pi) / (37.5 \times 22 \times 122) = 0.0285$ 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 (REMFAC) is computed and used like MORTFAC. REMFAC 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

Appendix B. Summary of FIA Sampling and Estimation Procedures.

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.