

Minnesota East Central 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.....	17
Findings.....	17
Recent extent of forestlands.....	18
Observations.....	18
Structure of timberland.....	20
Observations.....	20
Riparian areas.....	25
Observations.....	25
Vascular plants and wildlife species.....	29
Observations.....	29
Social and Economic Conditions and Trends.....	35
Findings.....	35
Land Use and Ownership.....	36
Observations.....	36
Demographics.....	45
Observations.....	45
Employment.....	51
Observations.....	51
Economic Production.....	62
Observations.....	62
Recreation and Tourism.....	73
Observations.....	73

Appendix A. Metadata - General Information of Data	80
Appendix B. Summary of FIA Sampling and Estimation Procedures	83

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 East Central Landscape, 1977 and 1990 19

Table 4. Ratio of Forestland to Nonforestland for the East Central Landscape, 1977 and 1990 19

Table 5. 1977 FIA Acrea (acres) by Timberland Type & Stand Size Class for the East Central Landscape..... 23

Table 6. 1990 FIA Acrea (acres) by Timberland Type & Stand Size Class for the East Central Landscape..... 24

Table 7. Density of Waterways, by Ecological Subsection, in the East Central Landscape 27

Table 8. Wetlands by Ecological Subsection, in the East Central Landscape..... 28

Table 9. Richness of vascular plants in Owenby and Morley (1991) by MFRC Landscape 30

Table 10. Numbers of vascular plants in Owenby and Morely (1991) with recorded occurrence limited to a particular MFRC Landscape..... 31

Table 11. Richness of forest-associated mammals, amphibians and reptiles, and breeding birds in Minnesota 32

Table 12. Status of Minnesota’s forest-associated endangered, threatened and special concern vertebrate wildlife, 1984 33

Table 13. Status of Minnesota’s forest-associated endangered, threatened and special concern vertebrate wildlife, 1996 34

Table 14. Area of land by GAP ownership groups for the East Central Landscape 38

Table 15. Area of Ownership Classes for the East Central Landscape, 1977 and 1990 39

Table 16. Area of Ownership by Public and Private for the East Central Landscape, 1977 and 1990 40

Table 17. Area of land use classes for the East Central Landscape 43

Table 18. Population of Minnesota and Counties in the East Central Landscape 46

Table 19. Population Projections for Minnesota and counties in the East Central Landscape..... 47

Table 20. Population by age group for Minnesota and the East Central Landscape 48

Table 21. Persons with incomes below poverty level in the East Central Landscape 49

Table 22. Per capita personal income for Minnesota and the East Central Landscape and counties	50
Table 23. 1998 Distribution of Employees by Industry for the East Central Landscape	52
Table 24. 1998 Distribution of Weekly Wages by Industry for the East Central Landscape ..	53
Table 25. Total Wages by Industry for the East Central Landscape Landscape in 1998	58
Table 26. Unemployed for Minnesota and counties in the East Central Landscape 1999 ...	59
Table 27. Statewide summary of perecent of total income by source	60
Table 28. 1999 Property Tax Information by County in the East Central Landscape.....	63
Table 29. 1995 Property tax refunds per capita, by County in the East Central Landscape .	64
Table 30. 1994 Individual Income Tax Payments per Capita, by County in the East Central Landscape.....	65
Table 31. Sawmills, Paper Mills, ect. per County in the East Central Landscape.....	66
Table 32. Average Prices received for Pulpwood (\$'s per Cord) Sold by Public Land Agencies in Minnesota: 1990 and 1998	69
Table 33. Average Prices received for Sawtimber (\$'s per MBF) Sold by Public Land Agencies in Minnesota: 1990 and 1998	71
Table 34. Distribution of Hunting Licenses by Type for the Counties in the East Central Landscape	74
Table 35. 1996 Total Sales from Hotels, Motels, Resorts and Other Lodging Places per County in the East Central Landscape (In Thousands of Dollars)	75

List of Figures

Figure 1. Ecological subections in the East Central Landscape	9
Figure 2. Forest Change in the East Central Landscape, 1800's to 1990's	15
Figure 3. Acres of timberland by forest type groups for the East Central Landscape	21
Figure 4. Acres of timberland by stand-size for the East Central Landscape	22
Figure 5. Wetlands and Waterways in the East Central Landscape	26
Figure 6. Ownership in the East Central Landscape	37
Figure 7. Reserved Lands and Forests in the East Central Landscape	41
Figure 8. Land Use from Remotely Sensed data for the East Central Landscape.....	42
Figure 9. Distribution of nonindustrial private forestland (NIPF) acres statewide by ownership class size, 1990	44
Figure 10. Earnings by major industry for Minnesota, 1970-1995	54
Figure 11. Projected earnings by major industry for Minnesota, 1998-2045	55
Figure 12. Number of employees by major industry for Minnesota, 1970-1995	56
Figure 13. Projected employment by major industry for Minnesota, 1998-2045	57
Figure 14. The Minnesota Forest Products Industry	67
Figure 15. Trends in hardwood and soft wood harvesting statewide, 1980-1997	68
Figure 16. Average stumpage prices received by public agencies for sawtimber, 1987-1997	70
Figure 17. Average stumpage prices received by public agencies for pulpwood, 1987-1997	72
Figure 18. Economic impact of domestic travel, 1988-1995	76
Figure 19. Major Roads in the East Central Landscape.....	77
Figure 20. Road mileage statewide in Minnesota, 1989-1999	78
Figure 21. Trail mileage statewide in Minnesota, 1984-1996	79

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Introduction

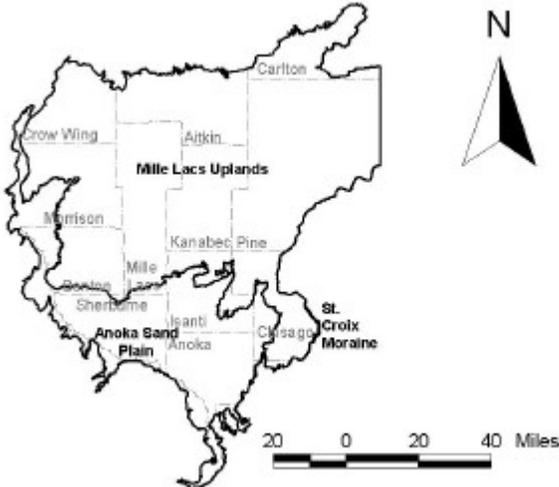
The process for conducting assessments of landscape conditions and trends for the East Central landscape of Minnesota (see Figure 1) is explained in the background section below. At the time of this writing, the following sections of the assessment are completed:

- 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 East Central landscape, which includes all of Benton, Chisago, Isanti, Kanabec, Mille Lacs, Morrison, Pine, Sherburne, and Wright 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 Subsections in the East Central Landscape



Legend

 Ecological Subsections

 County Boundaries

Source: DNR

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. 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: East Central Landscape Region" represents the first step in the general planning process for southeastern Minnesota. Resource managers from the Minnesota Forest Resources Council, Department of Natural Resources, United States Forest Service, and county land departments have analyzed the natural resources and ecological conditions and trends and prepared their findings. 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. Overall findings from the assessment are noted in this document's introduction; 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 Southeast 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

There is less forest than historically (Figure 2).

Comparison of Pre-settlement vegetation to today

Observations

Compared to pre-settlement not as much of the region is still forested (Figure 2).

There has been a noticeable decrease in bur oak (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:

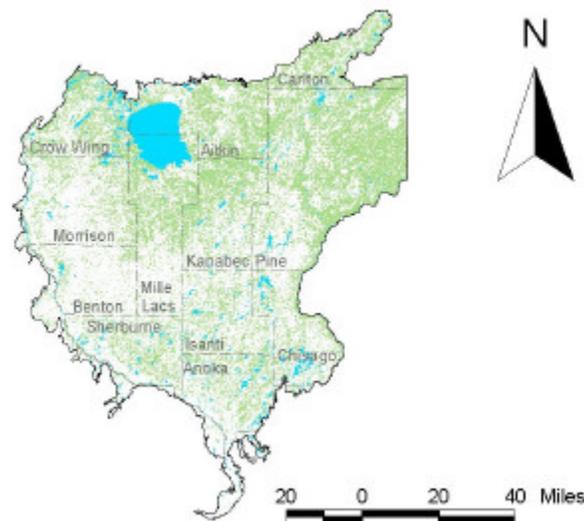
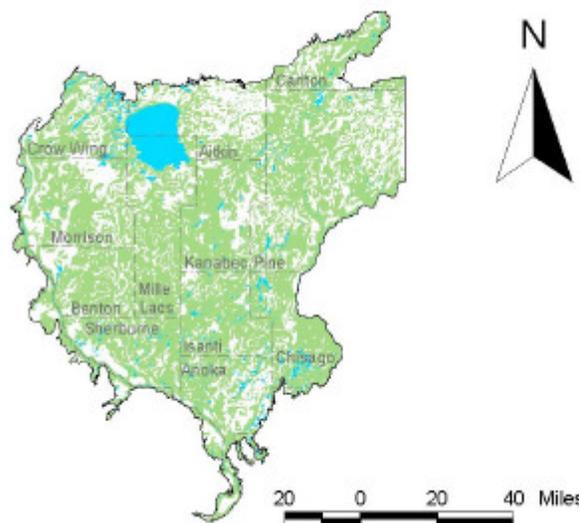
Source: Copyright 2000 MNDNR. Rare features data have been provided by the Natural Heritage and Nongame Research Program of the Section of Ecological Services, MNDNR and were current as of 7/31/2000. These data are not based on an exhaustive inventory of the state. The lack of data for any geographic 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 East Central 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>	8	23
Aspen-- <i>Populus tremuloides</i> , <i>P. grandidentata</i> , <i>P. balsamifera</i> (in lesser part)	23	3
Balm-of-Gilead-- <i>Populus balsamifera</i> (in greater part)	1	0
Beech-- <i>Fagus grandifolia</i> (unknown from Minn. possibly <i>Carpinus caroliniana</i>)	0	0
Birch-- <i>Betula papyrifera</i> , <i>B. cordifolia</i>	-1	25
Black Birch-- <i>Betula nigra</i> , <i>B. alleghaniensis</i> (in part ?)	0	1
Black Oak-- <i>Quercus nigra</i> , <i>Q. ellipsoidalis</i> (in part)	0	-49
Black Walnut-- <i>Juglans nigra</i>	0	21
Blue Beech-- <i>Carpinus caroliniana</i>	0	0
Box-Elder-- <i>Acer negundo</i>	1	406
Bur Oak-- <i>Quercus macrocarpa</i>	-23	-13
Butternut-- <i>Juglans cinerea</i>	0	18
Cherry-- <i>Prunus serotina</i> , <i>P. pennsylvanica</i>	2	95
Cottonwood-- <i>Populus deltoids</i>	0	141
Elm-- <i>Ulmus americana</i> , <i>U. rubra</i> , <i>U. thomasii</i>	1	14
Fir-- <i>Abies balsamea</i>	-1	0
Hackberry-- <i>Celtis occidentalis</i>	0	30
Hawthorn-- <i>Crataegus</i> spp.	0	0
Hickory-- <i>Carya cordiformis</i> , <i>C. ovata</i>	0	18
Illegible or Not Recorded--equivalent unknown	0	39
Ironwood-- <i>Ostrya virginiana</i>	-1	7
Jack Oak-- <i>Quercus ellipsoidalis</i>	5	-11
Jack Pine-- <i>Pinus banksiana</i>	0	0
Juniper or Red Cedar-- <i>Juniperus virginiana</i>	0	439
Linden or Basswood-- <i>Tilia Americana</i>	5	21
Maple-- <i>Acer rubrum</i> , <i>A. saccharum</i> , <i>A. saccharinum</i>	4	20
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>	-6	0
Plum--probably <i>Prunus Americana</i>	0	2
Red Elm-- <i>Ulmus rubra</i>	1	0
Red Oak -- <i>Quercus rubra</i> , <i>Q. ellipsoidalis</i> (in part or as hybrid)	4	30
Red, Norway, or Yellow Pine-- <i>Pinus resinosa</i>	6	21
Spruce-- <i>Picea mariana</i> , <i>P. glauca</i>	-2	0
Sugar Maple-- <i>Acer saccharum</i>	1	62
Tamarack-- <i>Larix laricina</i>	-26	0
Thorn--probably <i>Crataegus</i> spp.	0	0
White Cedar-- <i>Thuja occidentalis</i>	0	0
White Pine-- <i>Pinus strobes</i>	-5	26
Willow-- <i>Salix</i> spp.	0	56
Witch Hazel-- <i>Hamamelis virginiana</i>	0	0
Yellow Birch-- <i>Betula alleghaniensis</i>	-1	0



Source: Public Land Survey Bearing Tree Data, late 1800s, and 1990 US Forest Service Forest Inventory and Analysis. Summary produced by John C. Almendinger, MNDNR. 8/1997.

Natural Resources and Ecological Conditions and Trends

Findings

The region is mostly non-forested. Areas containing timberland have slightly increased (Recent Forest and Structure of Timberland Observations).

The area is mostly upland, with a higher density of intermittent streams versus perennial streams, and ditches (Riparian Observations).

Recent Extent of Forestland

Observation

This area has increased in forestland (Tables 3 and 4).

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

Land Use	1977		1990		Change	
	Acres	Percent	Acres	Percent	Acres	Percent
Forestland	1,483,000	32.3%	1,676,000	36.8%	193,000	4.5%
Nonforestland	3,102,000	67.7%	2,875,000	63.2%	-227,000	-4.5%
Total	4,585,000	100.0%	4,551,000	100.0%	-34,000	0.0%



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

1977	1990
2/5	3/5



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.

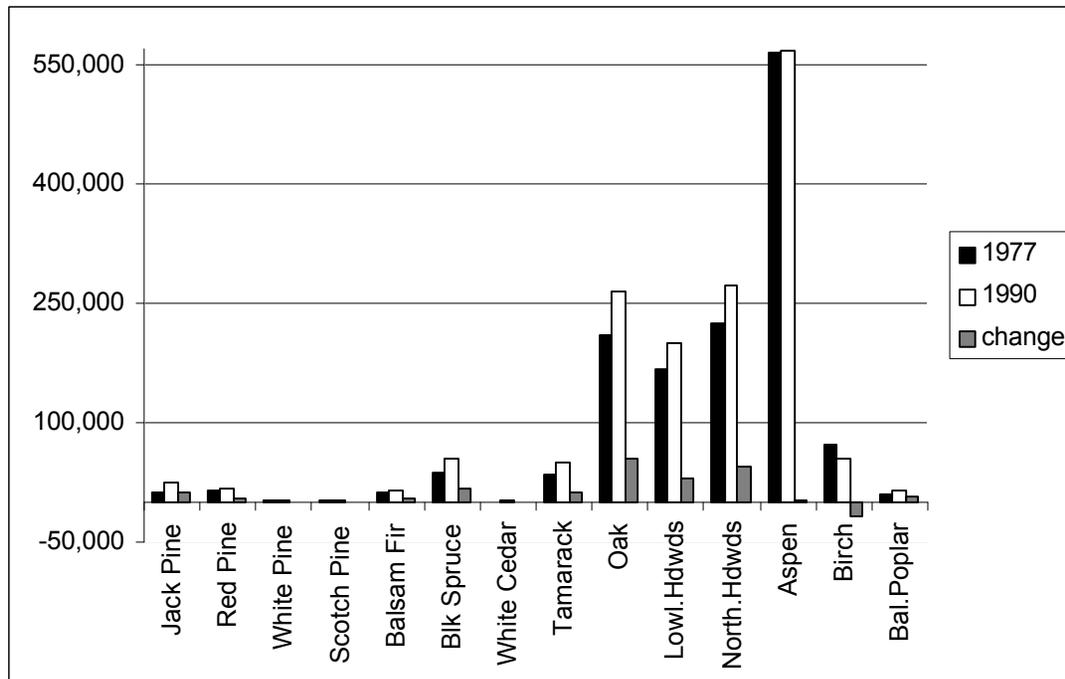
Structure of Timberland

Observations

All timberland types have increased since 1977 except birbh (Figure 3, Tables 5 and 6).

All size classes have increased since 1977 except poletimber (Figure 4, Tables 5 and 6).

Figure 3. Acres of timberland by forest type groups for the East Central landscape.



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.

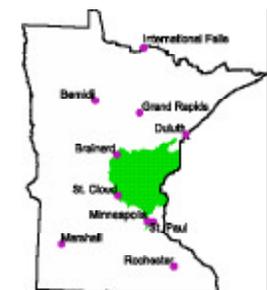
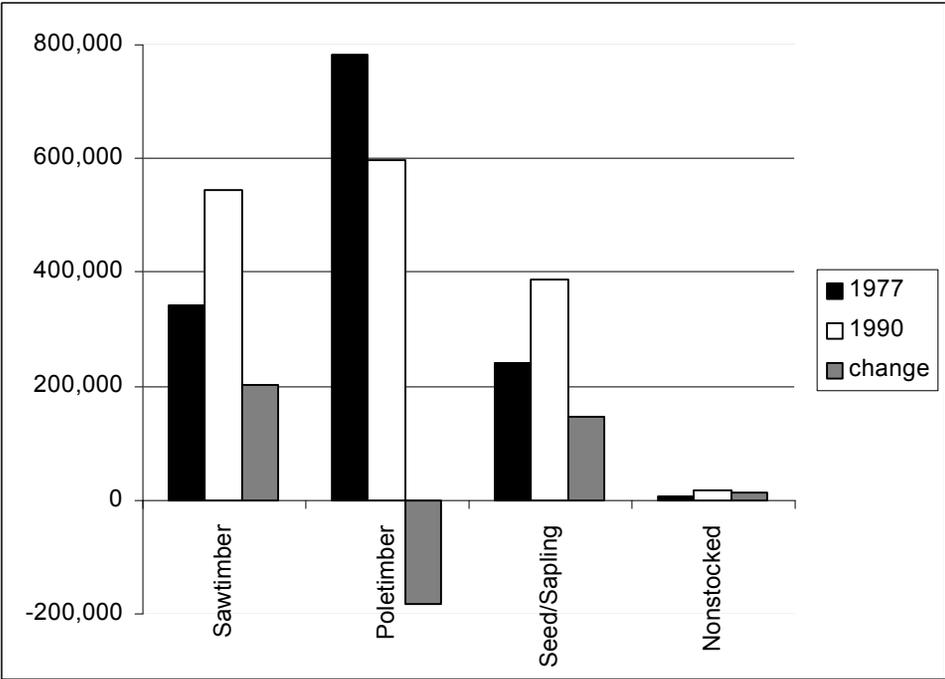


Figure 4. Acres of timberland by stand-size for the East Central landscape



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 Acrea (acres) by Timberland Type & Stand Size Class for the East Central Landscape

Forest Type	Size Class Sawtimber	Poletimber	Seed/ Sapling	Nonstocked	Total
Jack Pine	3,000	5,000	4,000	0	12,000
Red Pine	1,000	3,000	10,000	0	14,000
White Pine	3,000	0	0	0	3,000
Scotch Pine	0	2,000	0	0	2,000
Balsam Fir	1,000	9,000	2,000	0	12,000
Blk Spruce	0	12,000	27,000	0	38,000
White Cedar	1,000	0	0	0	1,000
Tamarack	6,000	16,000	12,000	2,000	36,000
Oak	87,000	111,000	11,000	0	209,000
Lowl.Hdwds	40,000	103,000	25,000	0	168,000
North.Hdwds	106,000	101,000	19,000	0	226,000
Aspen	82,000	359,000	121,000	3,000	565,000
Birch	9,000	58,000	6,000	0	73,000
Bal.Poplar	3,000	3,000	3,000	0	9,000
Total	343,000	781,000	240,000	5,000	1,368,000



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 Acres (acres) by Timberland Type & Stand Size Class for the East Central Landscape

Forest Type	Size Class Sawtimber	Poletimber	Seed/ Sapling	Nonstocked	Total
Jack Pine	5,000	3,000	8,000	9,000	24,000
Red Pine	6,000	9,000	3,000	0	18,000
White Pine	3,000	1,000	0	0	3,000
Scotch Pine	1,000	2,000	0	0	3,000
Balsam Fir	6,000	8,000	3,000	0	16,000
Blk Spruce	3,000	14,000	38,000	0	55,000
White Cedar	2,000	0	0	0	2,000
Tamarack	13,000	10,000	24,000	3,000	49,000
Oak	160,000	81,000	24,000	0	265,000
Lowl.Hdwds	42,000	96,000	59,000	1,000	199,000
North.Hdwds	124,000	93,000	54,000	1,000	272,000
Aspen	168,000	241,000	158,000	1,000	567,000
Birch	11,000	34,000	11,000	1,000	56,000
Bal.Poplar	4,000	7,000	5,000	0	16,000
Total	546,000	597,000	386,000	17,000	1,545,000



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.

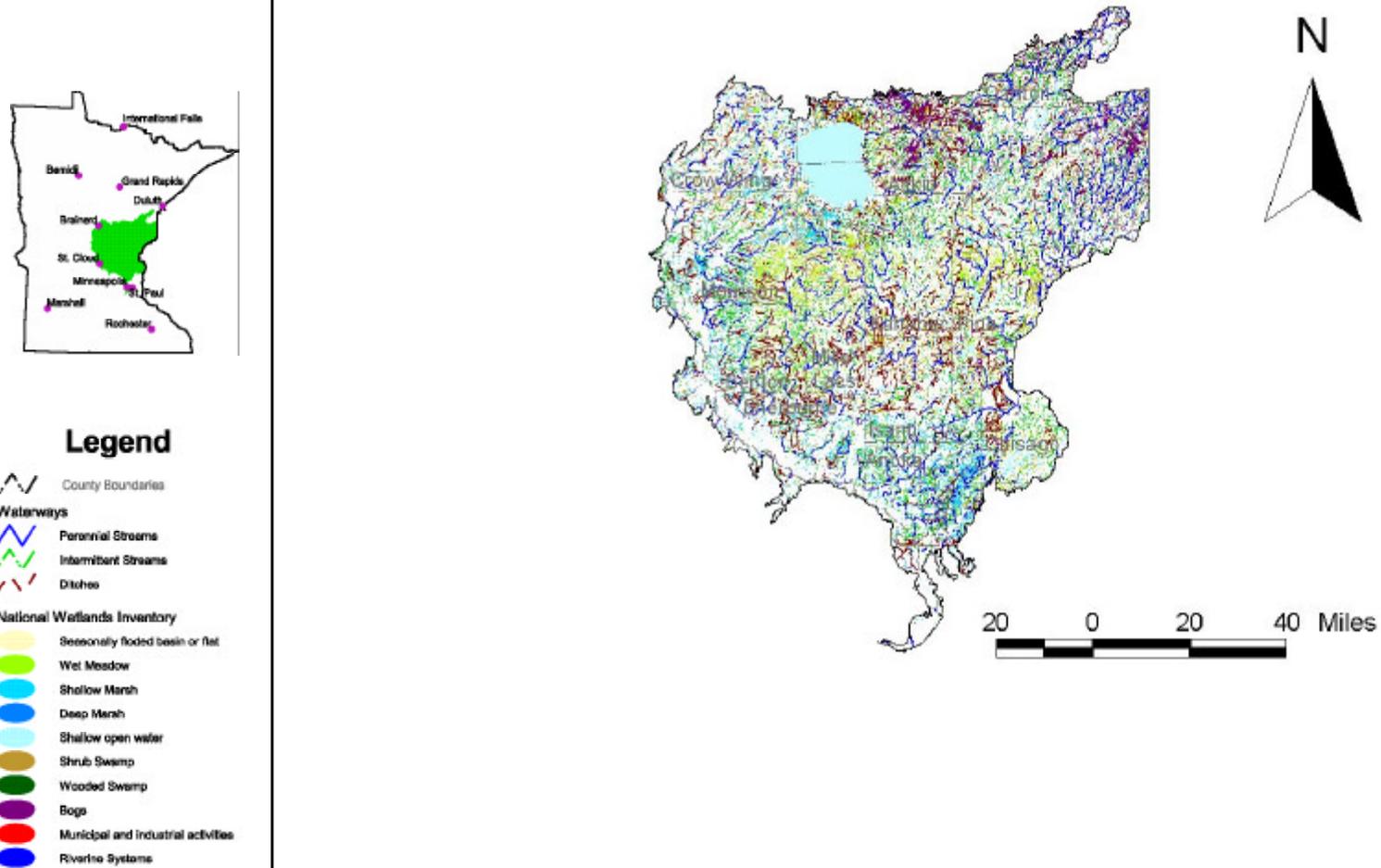
Riparian Areas

Observations

There is a noticeable high density of intermittent streams in the St. Croix Moraine subsection (Figure 5, and Table 7).

A majority of the area is considered upland (Table 8).

Figure 5. Wetlands and Waterways in the East Central Landscape



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

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

Subsection	Perennial	Intermittent	Ditch
Mille Lacs Uplands	0.30	0.37	0.22
Anoka Sand Plain	0.34	0.41	0.28
St. Croix Moraine	0.19	0.75	0.00



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

Table 8. Wetlands by Ecological Subsection, in the East Central Landscape

Wetland Type (circ39)	Mille Lacs Uplands	Anoka Sand Plain	St. Croix Moraine
Seasonally flooded basin or flat	0.3%	0.8%	1.0%
Wet meadow	5.9%	2.1%	1.0%
Shallow marsh	4.1%	8.9%	0.3%
Deep marsh	0.1%	0.4%	0.6%
Shallow open water	5.9%	3.2%	5.0%
Shrub swamp	7.6%	4.0%	0.9%
Wooded swamps	3.4%	2.4%	1.9%
Bogs	4.5%	0.3%	0.0%
Municipal and industrial activities, water regime	0.0%	0.0%	0.0%
Riverine systems, system	0.6%	1.6%	10.7%
Uplands, system	67.6%	76.3%	78.6%
Area outside Minnesota, system	0.0%	0.0%	0.0%



Source: MNDNR GIS data derived from Aerial photography, 1979-1988.

Vascular Plants and Wildlife Species

Observations

Compared to other regions of the state there some 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 `0. 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	
<p>Mammals —</p> <p>Birds —</p> <p>Amphibians and reptiles 1. Five-lined skink</p>	<p>Mammals 1. Gray wolf</p> <p>Birds 1. Bald eagle 2. Loggerhead shrike</p> <p>Amphibians and reptiles 1. Wood turtle 2. Blanding's turtle</p>	<p>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</p> <p>Birds 1. Red-shouldered hawk 2. Osprey 3. Louisiana waterthrush</p>	<p>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</p>

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

We see a drastic change in population composition in Minnesota and the 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 14.9 percent in the west central region. Middle-aged people, representing the productive work force (ages 25-64) will increase in the population by 15.5% for the state, and increase roughly 10 percent in this region. Of most consequence, the state and region will see dramatic increases (79.7% and 55.9% 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 affect 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 18 illustrates this tremendous increase in which annual gross receipts grew from about 4 billion in 1988 to nearly 8 billion by 1995. (see Tourism Observations).

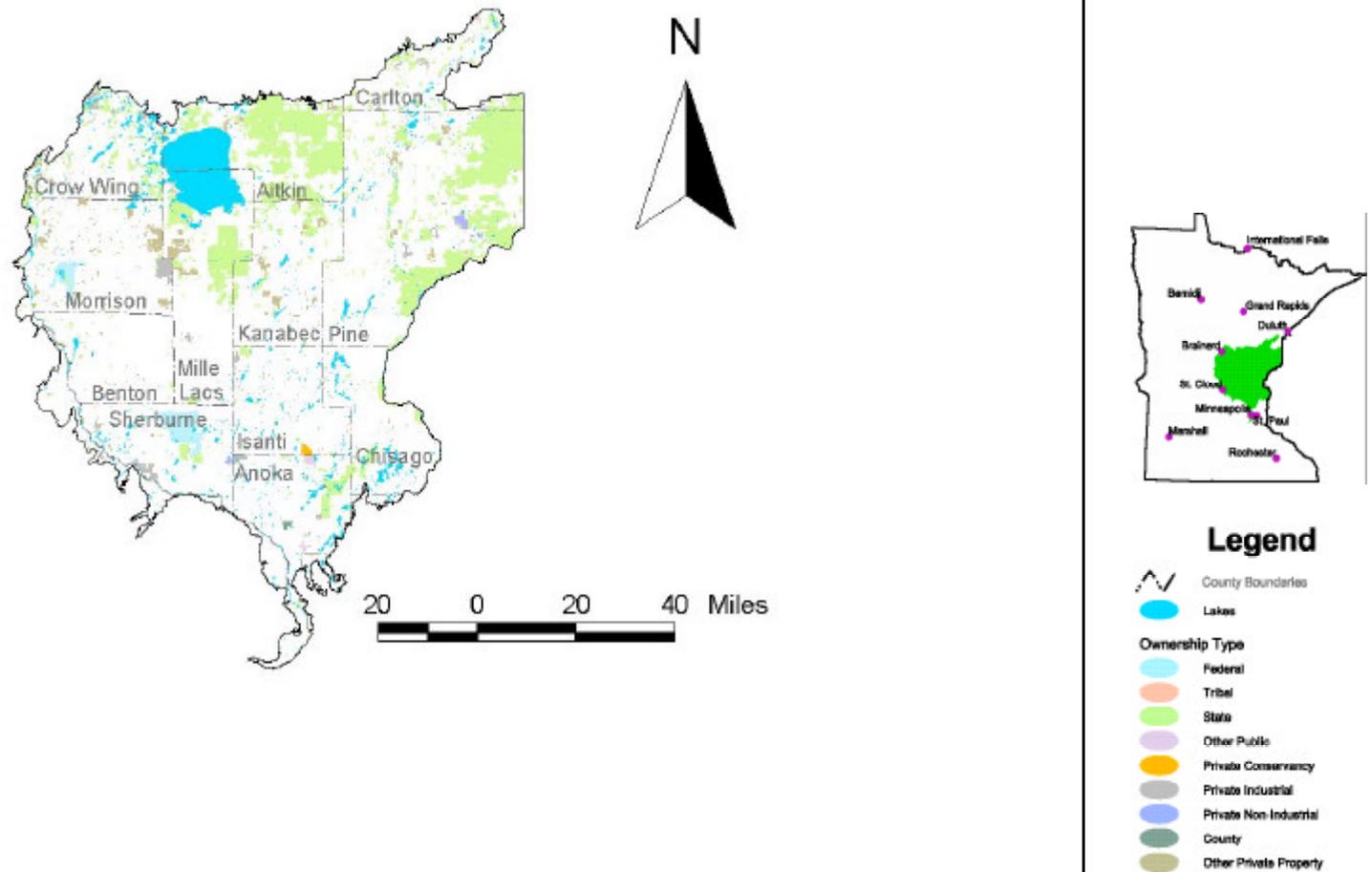
Land Use and Ownership

Observations

Most of the land is privately owned (Figure 6, and Tables 14, 15, and 16).

About 1/3 of the land is forested, more than 1/3 is agriculture/hay/pasture/grassland, and one sixth water/bog/marsh/fen (Figure 8 and Table 17).

Figure 6. Ownership in the East Central Landscape



Source: 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 East Central Landscape

GAP Ownership Name	Acres	Percent
County	1,747	0.04%
Federal	48,903	1.06%
Other private property	70,912	1.54%
Other Public	4,652	0.10%
Private Conservancy	2,647	0.06%
Private Industrial, more than 1000 acres owned within affected county	43,685	0.95%
Private Non-Industrial Business or Trust, more than 1000 acres owned within affected county	5,594	0.12%
State, including tax-forfeited lands under county stewardship	645,065	14.05%
Tribal	4,105	0.09%
Total classified	(827,309)	(18.02%)
Unknown (not classified)	3,764,800	81.98%
Total Land	4,592,110	100.00%



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

Table 15, Area of Ownership Classes for the East Central Landscape, 1977 and 1990

Ownership Class	1977		1990		Change	
	Acres	Percent	Acres	Percent	Acres	Percent
Bureau of Land Management	0	0.0%	0	0.0%	0	0.0%
County & Municipal	176,000	3.8%	168,000	3.7%	-8,000	-0.1%
Indian Lands	6,000	0.1%	7,000	0.2%	1,000	0.0%
Misc Federal	12,000	0.3%	26,000	0.6%	14,000	0.3%
National Forest	0	0.0%	0	0.0%	0	0.0%
Private	1,273,000	27.8%	1,290,000	28.3%	17,000	0.6%
State	289,000	6.3%	325,000	7.1%	36,000	0.8%
Unknown	2,830,000	61.7%	2,736,000	60.1%	-94,000	-1.6%
Total	4,586,000	100.0%	4,552,000	100.0%	-34,000	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.



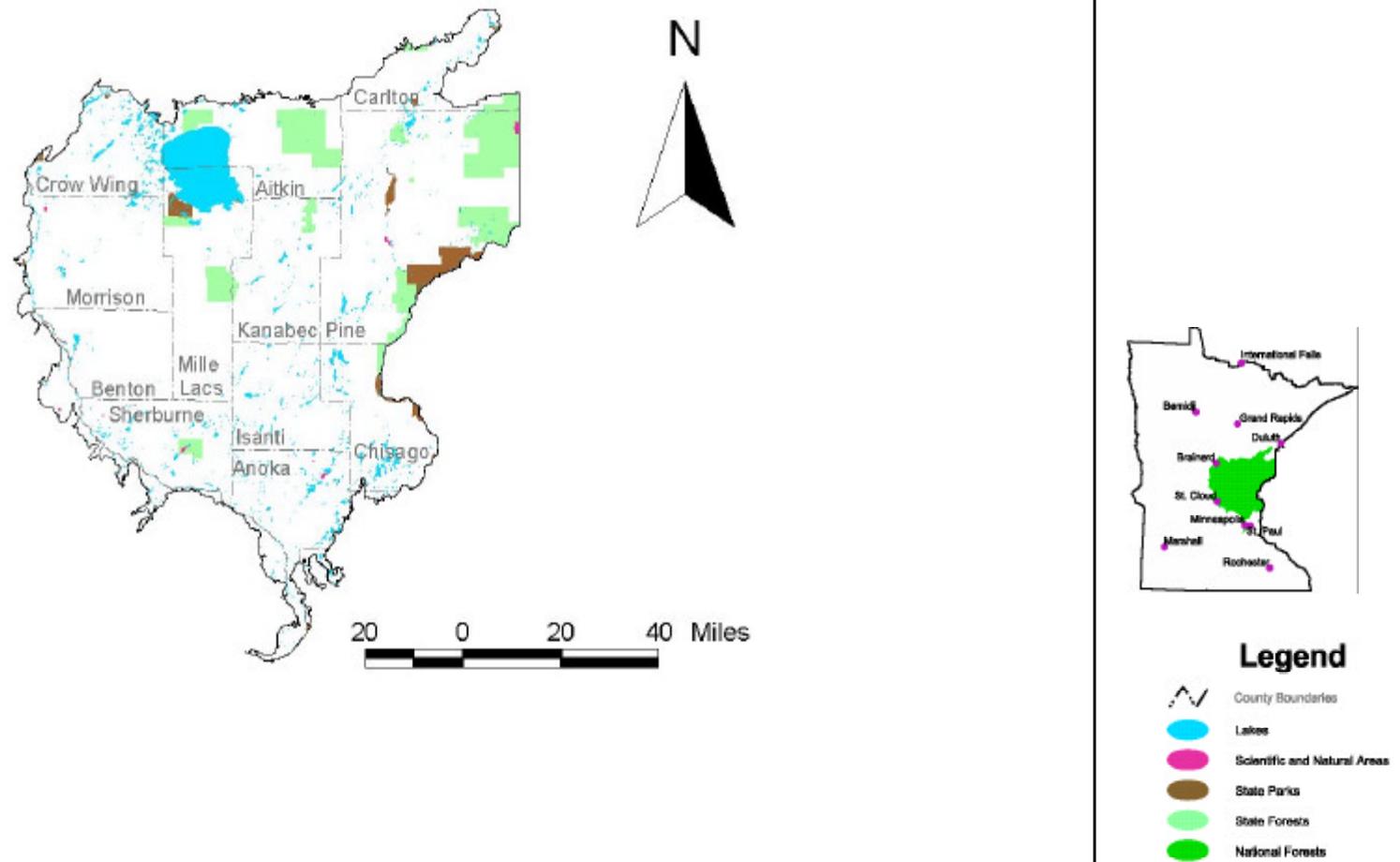
Table 16, Area of Ownership by Public and Private for the East Central Landscape, 1977 and 1990

Ownership	1977		1990		Change	
	Acres	Percent	Acres	Percent	Acres	Percent
Public	483,000	10.5%	526,000	11.6%	43,000	1.0%
Private	4,103,000	89.5%	4,026,000	88.4%	-77,000	-1.0%
Total	4,586,000	100.0%	4,552,000	100.0%	-68,000	0.0%



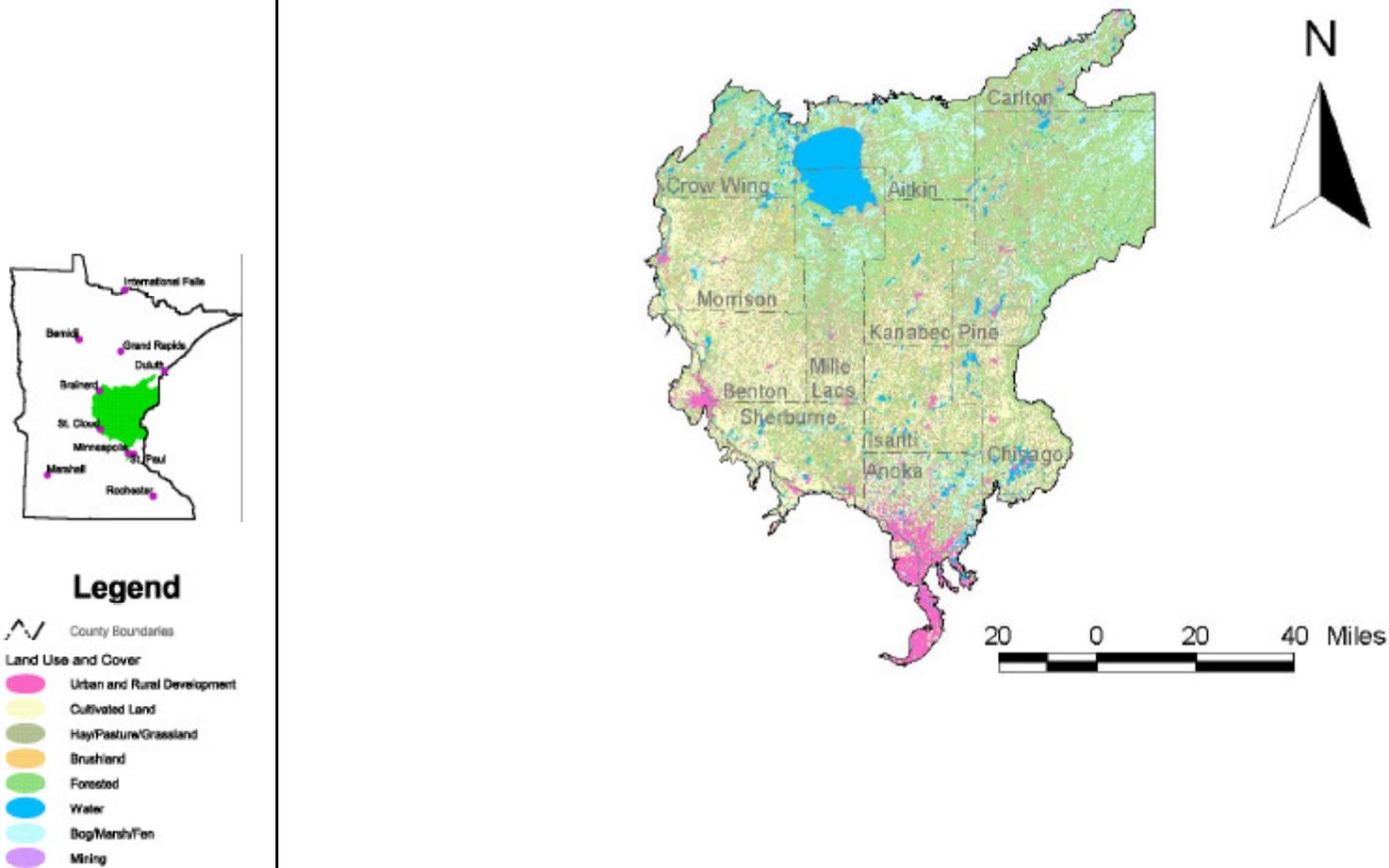
Source: Chung M. Chen, MNDNR, summarizing 1990 and 1977 FIA detailed database from the USFS N.C. & Landscape Regions from MFRC 9/20/00. On the average one plot represents about 1.25 thousand acres.

Figure 7. Reserved Lands and Forests in the East Central Landscape



Source: DNR

Figure 8. Land Use from Remotely Sensed data for the East Central Landscape



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

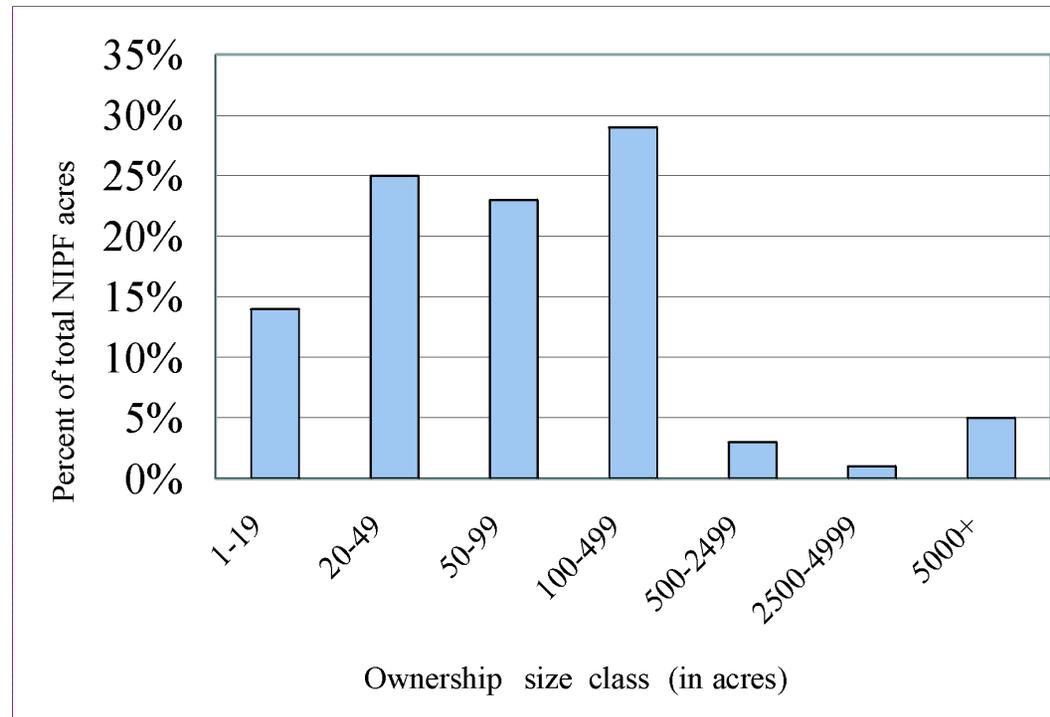
Table 17. Area of land use classes for the East Central Landscape

LULC	Acres	Percent
Urban-Rural Dev.	225,811	4.92%
Cultivated Land	867,793	18.90%
Hay/ Pasture/ Grassland	977,205	21.28%
Brushland	120,776	2.63%
Forested	1,601,773	34.88%
Water	261,125	5.69%
Bog/Marsh/ Fen	531,734	11.58%
Mining	5,895	0.13%
Total	4,592,110	100.00%



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 181,000 people live in the region (Table 18).

The region is moderately populated, with a population density just below the state average (Table 18).

Sherburne County is the most densely populated and Pine County is the least dense. Wright County has the greatest population, while Kanabec has the least population (Tables 18 and 19).

The populations of Chisago and Sherburne are increasing the most in this region (Tables 18, and 19).

Morrison County has had the lowest increase (Table 18).

The distribution and composition of the population is changing significantly. Specifically there is a high projected increase of individuals ages greater than 65 (Table 20).

The counties in the region have mixed levels of poverty in relation to the 8.7% state average (Table 21).

Kanabec County has the leading poverty rate in the region at 11.9%, and Sherburne the lowest at 5.7% (Table 21).

Personal income is lower in all counties than the state average (Table 22).

Wright has the highest per capita income and Pine has the lowest (Table 22).

Table 18. Population of Minnesota and Counties in the East Central 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
East Central Region	181,418	242,866	279,622	15.13	340,256	21.68	56.73
Benton	20,841	25,187	30,185	19.84	34,431	14.07	84.33
Chisago	17,492	25,717	30,521	18.68	40,237	31.83	96.33
Isanti	16,560	23,600	25,921	9.83	30,038	15.88	68.41
Kanabec	9,775	12,161	12,802	5.27	14,220	11.08	27.09
Mille Lacs	15,703	18,430	18,670	1.30	21,026	12.62	36.60
Morrison	26,949	29,311	29,604	1.00	31,496	6.39	28.01
Pine	16,821	19,871	21,264	7.01	23,937	12.57	16.96
Sherburne	18,344	29,908	41,945	40.25	59,945	42.91	137.30
Wright	38,933	58,681	68,710	17.09	84,926	23.60	128.52



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

Table 19. Population Projections for Minnesota and counties in the East Central Landscape

	1995	2025	1995-2025 % Change
Minnesota	4,626,514	5,282,840	14.19
East Central Region	313,483	444,990	41.95
Benton	33,362	48,650	45.82
Chisago	36,045	55,570	54.17
Isanti	28,664	34,310	19.70
Kanabec	13,473	15,880	17.87
Mille Lacs	19,807	23,710	19.71
Morrison	30,756	31,280	1.70
Pine	22,816	27,230	19.35
Sherburne	51,328	98,540	91.98
Wright	77,232	109,820	42.19

Source: Minnesota State Demographic Center



Table 20. Population projection by age group for Minnesota and the East Central Landscape

Age Group	Minnesota			East Central Region		
	1995	2025	1995-2025 %Change	1995	2025	1995-2025 %Change
0-24	1,678,036	1,506,309	-10.2	122,941	141,060	14.7
25-64	2,369,249	2,735,390	15.5	153,396	224,000	46.0
65+	579,229	1,041,060	79.7	37,146	80,140	115.7
Total	4,626,514	5,282,840	14.2	313,483	445,200	42.0



Source: Minnesota State Demographic Center

Table 21. Persons with incomes below poverty level in the East Central Region

	% Population Below Poverty Level in 1995
Minnesota	8.7
Benton	8.2
Chisago	6.0
Isanti	7.1
Kanabec	11.9
Mille Lacs	11.3
Morrison	13.2
Pine	13.2
Sherburne	5.5
Wright	5.7



Source: U.S. Census Bureau

Table 22. Per capita personal income for Minnesota and the East Central Landscape and counties

	1990	1997	% Growth '90-'97
Minnesota	19,348	26,243	35.60%
Benton	14,382	18,953	31.80%
Chisago	15,920	21,169	33.00%
Isanti	15,229	20,322	33.40%
Kanabec	13,244	16,432	24.10%
Mille Lacs	14,174	17,893	26.20%
Morrison	12,633	16,563	31.10%
Pine	12,011	16,495	37.30%
Sherburne	15,462	19,793	28.00%
Wright	16,321	23,202	42.20%



Source: Minnesota State Demographic Center

Employment

Observations

The services industry has experienced the highest growth rate over the past several decades and this trend is expected to continue (Figures 10, 11, 12, and 13).

The farming sector of Minnesota's economy is currently shrinking and should continue to contract (Figures 10, 11, 12, and 13).

The services, manufacturing, government and trade sectors are the dominant industries in the region (Table 23, and 25).

The trades and services sector generally pays low wages (Table 24).

There are about 179,000 people in the regional labor force (Table 26).

The East Central region unemployment is a little higher than the state and lower than the national averages at 3.3% of the labor force (Table 26).

Kanabec has a very high rate of unemployment (Table 26).

Workers in Sherburne and Wright generally earn the highest wages in the region (Tables 24, and 25).

Manufacturing, Trade (retail and wholesale), Services and Government are the leading industries in Minnesota (Table 27).

The timber industry accounts for 2.5% of statewide personal income (Table 27).

Table 23. 1998 Distribution of Employees by Industry for the East Central Landscape

	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
Benton	467	Na	Na	597	556	468	366	347	500
Chisago	464	393	420	747	573	526	282	450	503
Isanti	457	233	Na	514	576	578	259	441	554
Kanabec	439	Na	Na	714	514	493	323	345	492
Mille Lacs	392	Na	Na	541	446	396	224	377	497
Morrison	414	Na	Na	549	533	415	263	360	549
Pine	382	Na	Na	570	477	592	235	341	541
Sherburne	506	Na	Na	609	672	867	315	343	612
Wright	468	Na	Na	642	592	770	318	370	512



Source: Minnesota Department of Economic Security

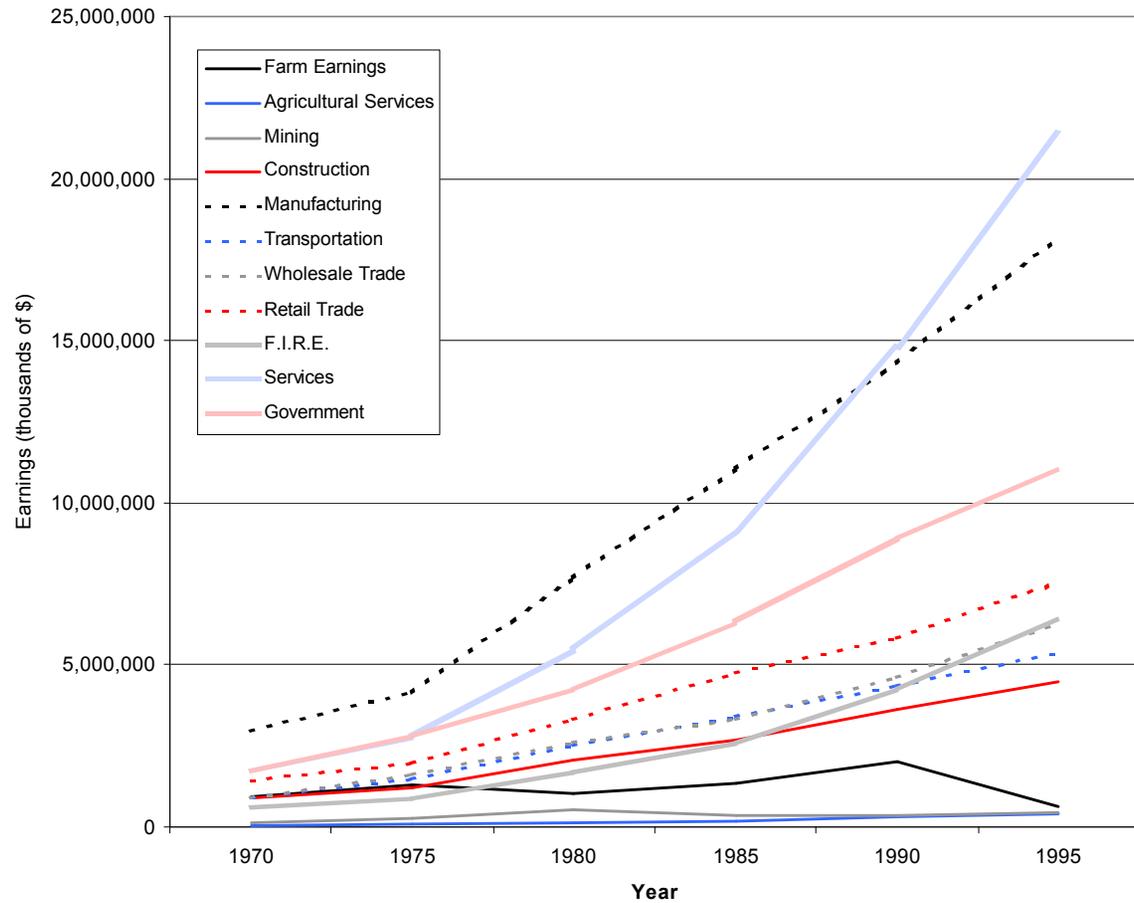
Table 24. 1998 Distribution of Weekly Wages by Industry for the East Central Landscape

	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
Benton	467	Na	Na	597	556	468	366	347	500
Chisago	464	393	420	747	573	526	282	450	503
Isanti	457	233	Na	514	576	578	259	441	554
Kanabec	439	Na	Na	714	514	493	323	345	492
Mille Lacs	392	Na	Na	541	446	396	224	377	497
Morrison	414	Na	Na	549	533	415	263	360	549
Pine	382	Na	Na	570	477	592	235	341	541
Sherburne	506	Na	Na	609	672	867	315	343	612
Wright	468	Na	Na	642	592	770	318	370	512

Source: Minnesota Department of Economic Security



Figure 10. Earnings by major industry for Minnesota, 1970-1995

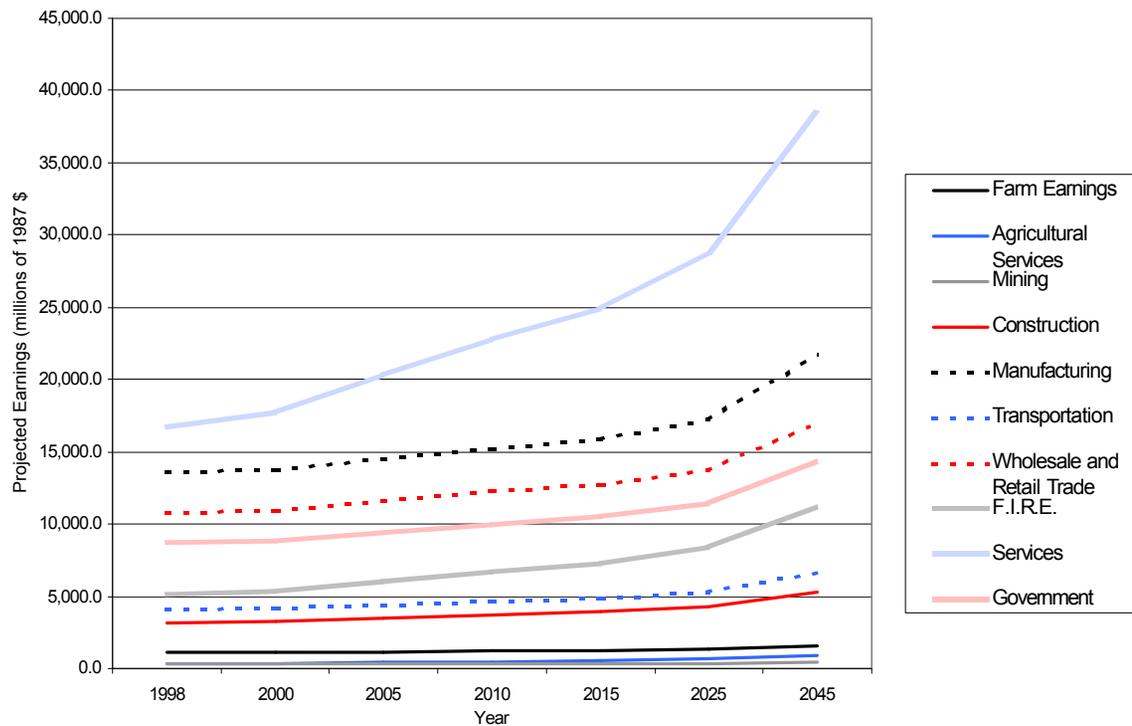


Source: Regional Economic Information System, Table CA05, Bureau of Economic Analysis

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

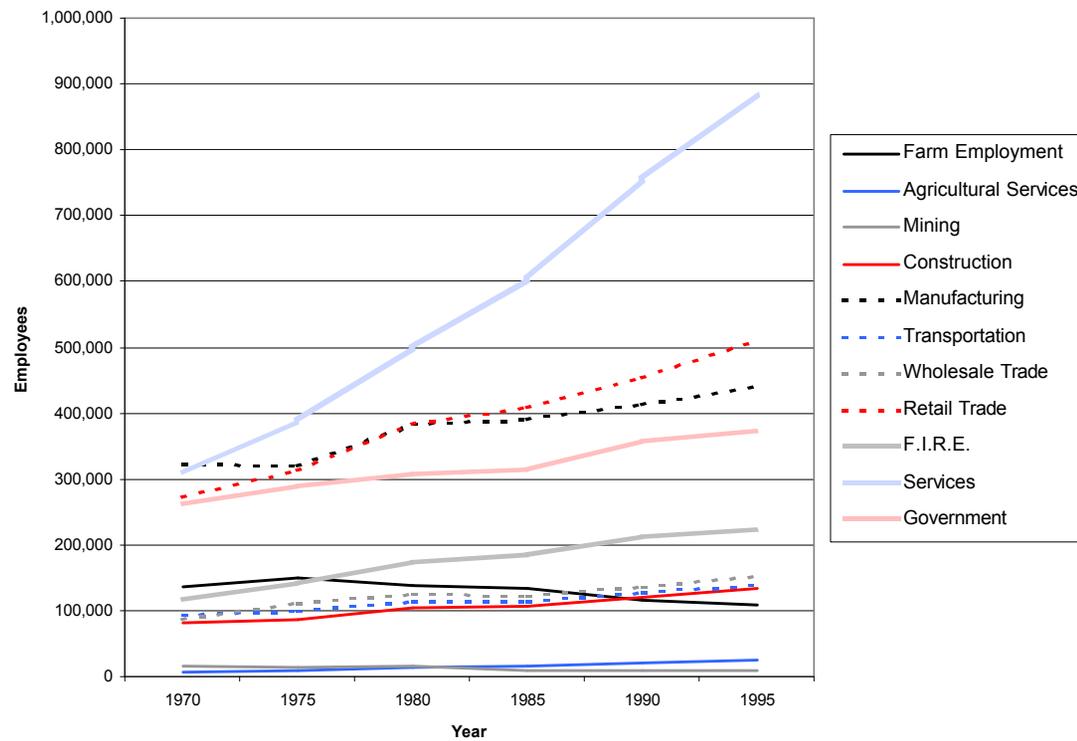


Source: Regional Economic Information System, Bureau of Economic Analysis

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



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

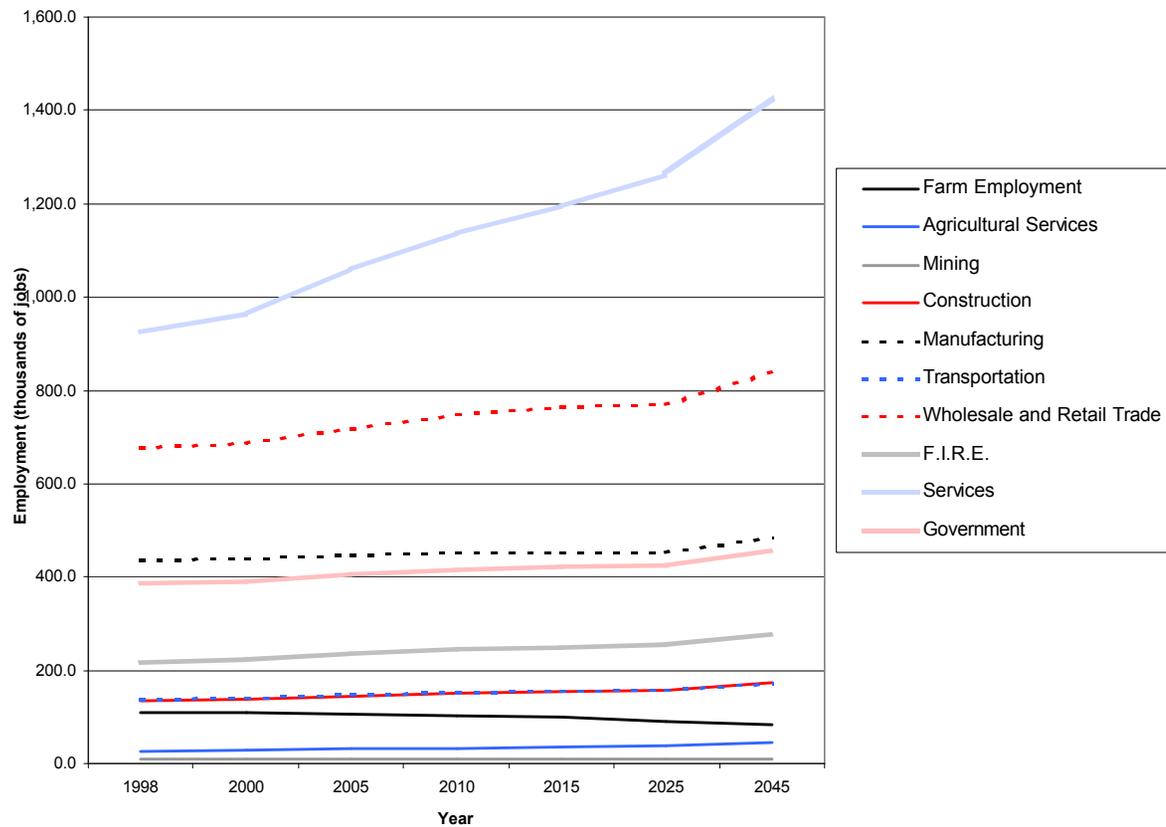


Source: Regional Economic Information System, Table CA25, Bureau of Economic Analysis

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



Figure 13. 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. Total Wages by Industry for the East Central Landscape in 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
East Central Region	2,509,969	3,363	240	204,048	568,782	180,044	425,140	483,581	511,754
Benton	318,087	na	na	32,314	101,719	9,685	69,668	41,005	34,410
Chisago	270,015	2105	240	27554	67024	5,827	38,674	68,076	51,879
Isanti	206,964	1258	0	10,949	48,448	10,213	25,527	54,101	49,885
Kanabec	90,933	na	na	11359	21288	1,025	20,182	10,188	22,433
Mille Lacs	178,765	na	na	8,247	38,613	4,741	21,304	59,900	34,977
Morrison	225,735	na	na	12,612	47,916	9,020	38,023	48,594	58,860
Pine	152,425	na	na	9,371	10,043	6,032	23,316	48,992	47,231
Sherburne	447,011	na	na	33,107	97,029	69,498	76,264	56,240	95,195
Wright	620,034	na	na	58,535	136,702	64,003	112,182	96,485	116,884



Source: Minnesota Department of Economic Security

Table 26. Unemployed for Minnesota and counties in the East Central Landscape 1999

	Labor Force	Employment	Unemployment	Unemployment Rate
US	139,368,000	133,488,000	5,880,000	4.20%
Minnesota	2,698,511	2,623,058	75,453	2.80%
East Central Region	178,587	172,672	5,915	3.30%
Benton	19,980	19,467	513	2.60%
Chisago	21,008	20,408	600	2.90%
Isanti	15,886	15,428	458	2.90%
Kanabec	6,393	5,985	408	6.40%
Mille Lacs	8,919	8,411	508	5.70%
Morrison	14,978	14,252	726	4.80%
Pine	11,099	10,425	674	6.10%
Sherburne	32,595	31,782	813	2.50%
Wright	47,729	46,514	1,215	2.50%

Source: Minnesota Department of Economic Security

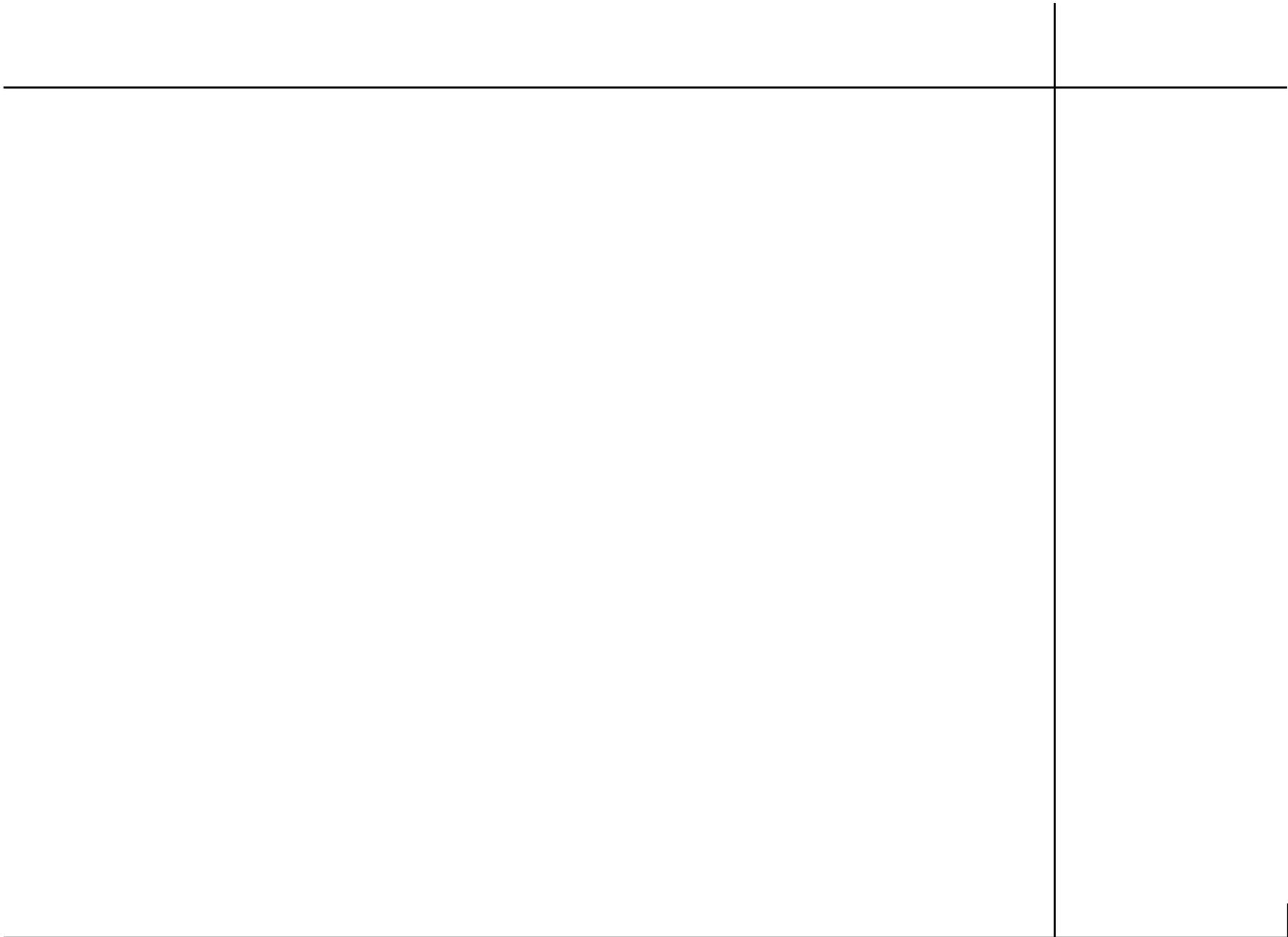


Table 27. Statewide summary of percent of total income by source

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





Economic Production

Observations

Overall, the range of property tax rates is very widespread (Table 28).

The region pays low income taxes compared to the state average (Table 30).

1999 Property taxes reached nearly \$256,000,000 in the region (Table 28).

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).

The volume of annual timber harvesting has increased greatly over the past twenty years (Figure 15).

The price of wood has risen dramatically throughout the past decade (Tables 32 and 33, and Figures 16 and 17).

The prices received for Aspen, Balsam and Balm wood have risen faster than other species (Tables 32 and 33).

Table 28. 1999 Property Tax Information by County in the East Central Landscape

	Net Property Tax Payable by County	Average Tax Rate (% of Market Value)	Net Tax Credit by County
Minnesota	4,604,137,455	0.093	325,585,713
East Central Region	256,157,824	Na	21,883,899
Benton	23,214,429	0.068	1,661,028
Chisago	29,166,073	0.027	3,165,212
Isanti	19,552,784	0.016	2,121,393
Kanabec	7,480,382	0.018	705,597
Mille Lacs	14,095,602	0.044	1,111,515
Morrison	17,651,110	0.056	1,493,699
Pine	15,635,047	0.037	1,183,376
Sherburne	60,208,359	0.069	4,296,208
Wright	69,154,038	0.056	6,145,871

Source: Minnesota Department of Revenue



Table 29. 1995 Property tax refunds per capita, by County in the East Central Landscape

	Per Capita Property Tax Refunds
Minnesota	\$37
Benton	\$30-\$55
Chisago	\$30-\$55
Isanti	\$20-\$30
Kanabec	\$20-\$30
Mille Lacs	\$30-\$55
Morrison	\$30-\$55
Pine	\$20-\$30
Sherburne	\$12-\$20
Wright	\$20-\$30



Source: Department of Revenue
 *Counties are given a range rather than an accurate value for per capita, property tax refunds

Table 30. 1994 Individual Income Tax Payments per Capita, by County in the East Central Landscape

	Per Capita Income Tax
Minnesota	\$737
Benton	\$255-\$500
Chisago	\$500-\$700
Isanti	\$255-\$500
Kanabec	\$255-\$500
Mille Lacs	\$500-\$700
Morrison	\$255-\$500
Pine	\$255-\$500
Sherburne	\$500-\$700
Wright	\$500-\$700

Source: Department of Revenue

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



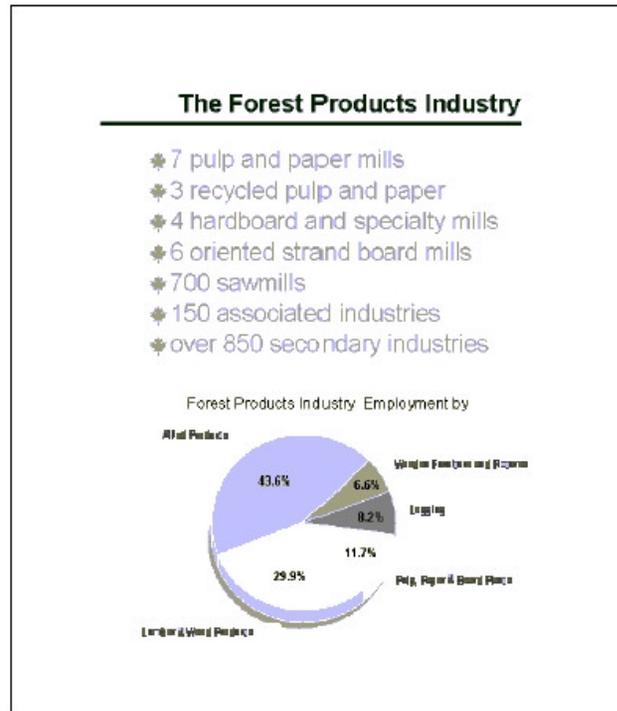
Table 31. Sawmills, Paper Mills, ect. per County in the East Central Landscape

	Number of Timber Mills
East Central Region	14
Benton	1
Chisago	1
Isanti	2
Kanabec	0
Mille Lacs	3
Morrison	2
Pine	4
Sherburne	1
Wright	0



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

Figure 14. 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.



Figure 15. Trends in hardwood and soft wood harvesting statewide, 1980-1997

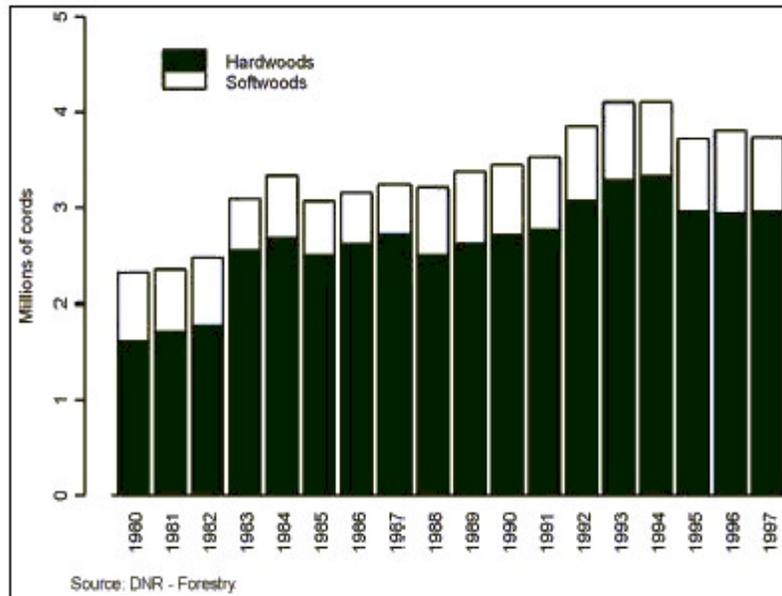


Table 32. Average Prices Received for Sawtimber (\$'s per MBF) sold by Public Land Agencies in Minnesota: 1990 and 1998

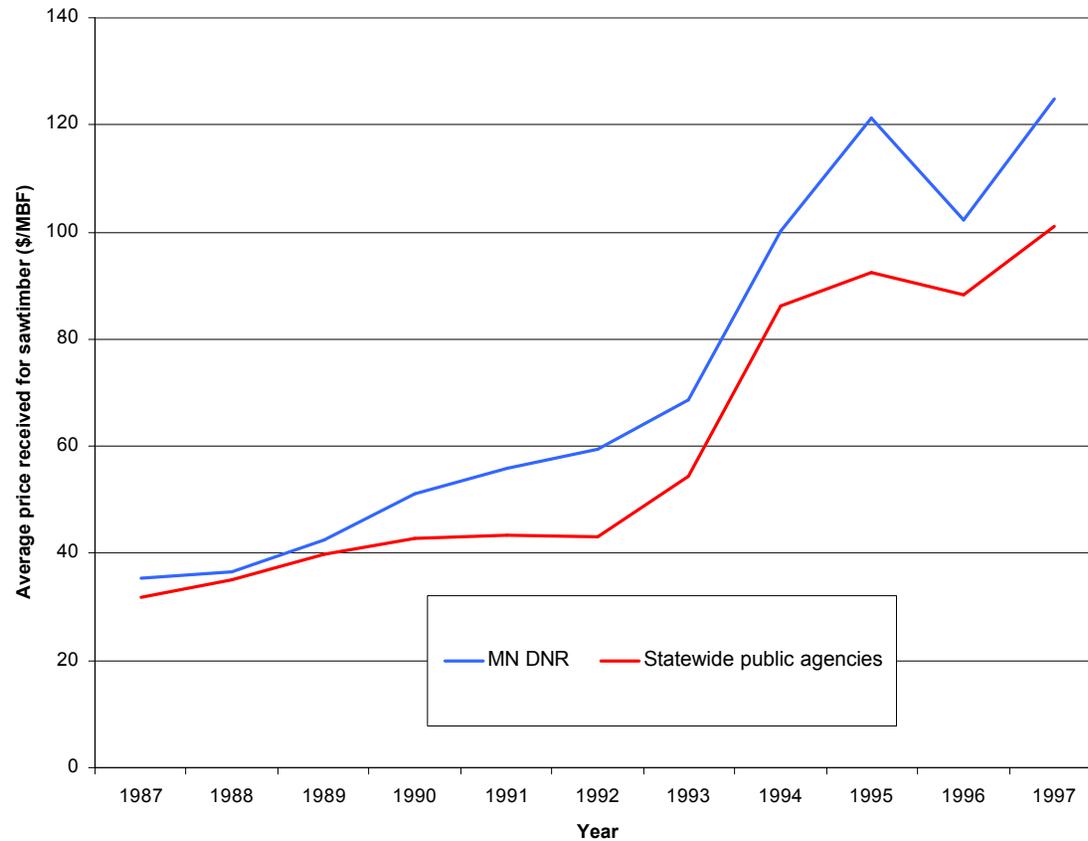
Species	1990	1998	% Increase in Price
Aspen	\$ 23.34	\$ 100.54	331%
Birch	\$ 20.87	\$ 39.78	91%
Ash	\$ 49.44	\$ 97.09	96%
Elm	\$ 38.77	\$ 53.31	38%
Oak	\$ 73.40	\$ 140.20	91%
Balsam	\$ 20.54	\$ 88.30	330%
W. Spruce	\$ 54.34	\$ 78.34	44%
Cedar	\$ 29.63	\$ 38.64	30%
J. Pine	\$ 62.83	\$ 121.84	94%
R & W. 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 16. 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.



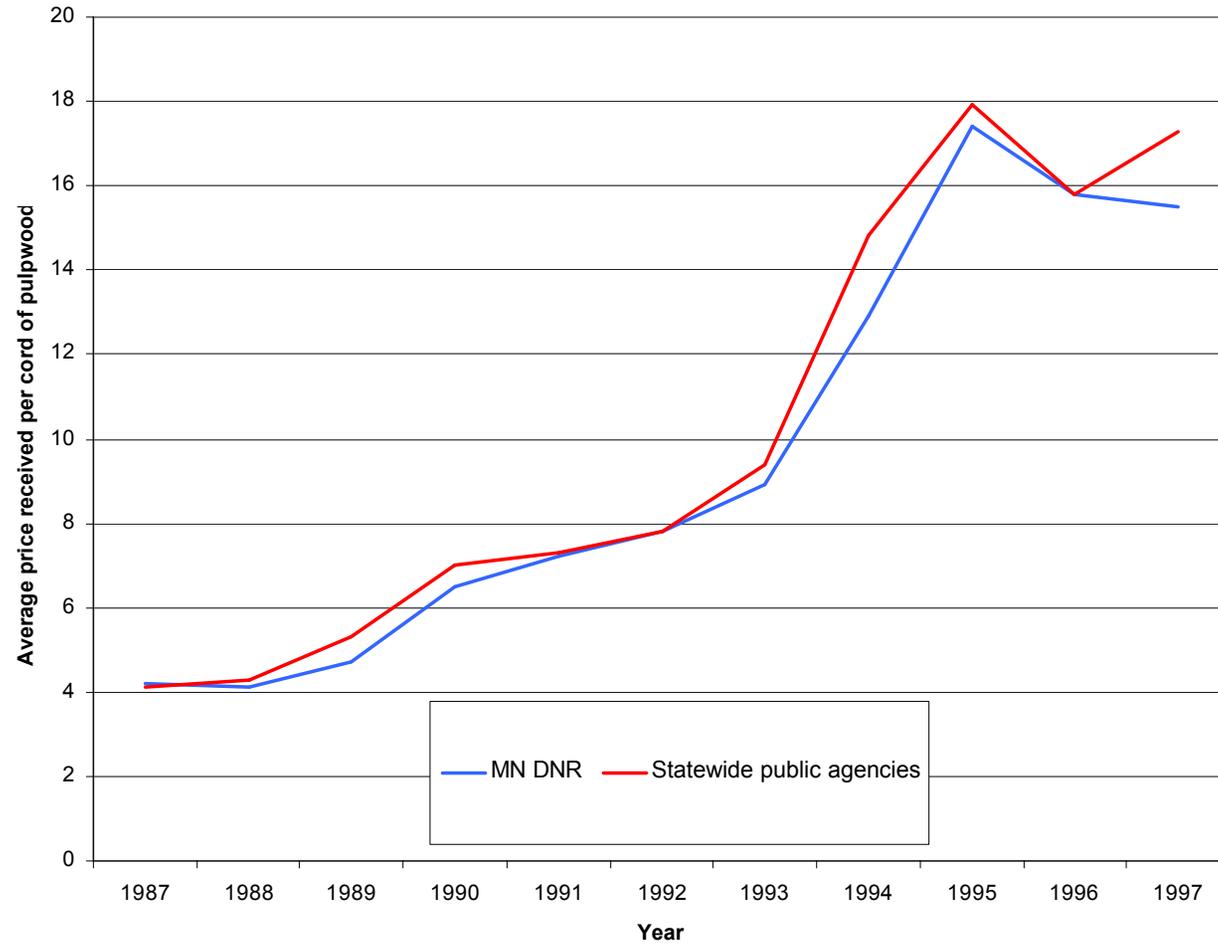
Table 33. Average Prices Received for Pulpwood (\$'s per Cord) sold by Public Land Agencies in Minnesota: 1990 and 1998

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



Source: DNR - Forestry

Recreation and Tourism

Observations

Tourism in Minnesota has grown substantially during the past decade (Figure 18).

Wright County has the greatest amount of hunting in the region (Table 34).

There is a large amount of major roads systems in this region (Figure 19).

Statewide roads and trails have been increasing for at least the last 10 years (Figures 20 and 21).

Table 34. Distribution of Hunting Licenses by Type for the Counties in the East Central 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
East Central Region	11,871	319	46,756	462	8,354	39	9,625	10,366	3,636
Benton	474	1	3,267	2	522	0	370	323	99
Chisago	1,645	66	5,190	149	1,184	19	1,033	1,393	404
Isanti	950	10	4,397	18	964	1	798	838	331
Kanabec	852	12	3,093	17	335	1	436	385	141
Mille Lacs	1,431	48	4,614	31	694	3	1,248	854	236
Morrison	1,071	19	6,843	42	1,175	2	1,386	1,159	376
Pine	1,740	116	6,016	146	772	8	990	718	227
Sherburne	1,484	8	5,780	29	1,008	1	1,076	1,364	445
Wright	2,224	39	7,556	28	1,700	4	2,288	3,332	1,377



Source: Department of Natural Resources

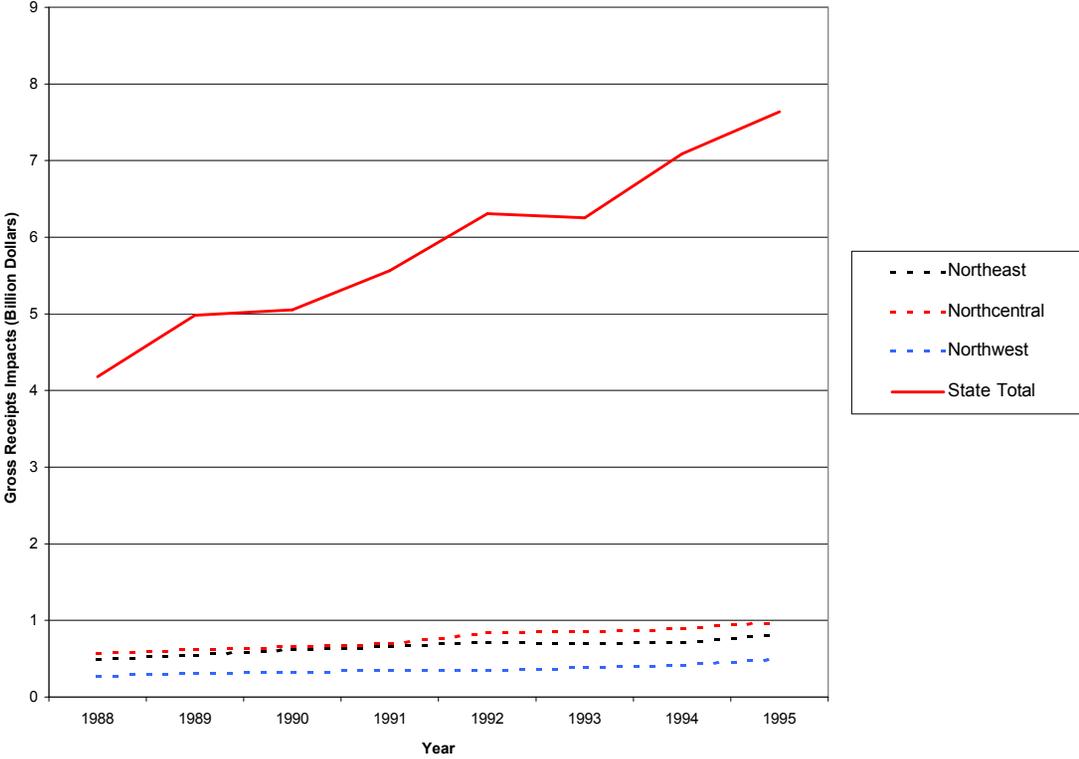
Table 35. 1996 Total Sales from Hotels, Motels, Resorts and Other Lodging Places per County in the East Central Region (In Thousands of Dollars)

	1996 Sales for All Lodging Places	% Change From 1995 to 1996
Minnesota	1,142,036	14.00%
East Central Region	26,179	NA
Benton	1,561	-4.60%
Chisago	1,527	18.50%
Isanti	744	4.20%
Kanabec	388	40.10%
Mille Lacs	8,404	19.90%
Morrison	2,051	1.30%
Pine	6,112	-6.00%
Sherburne	1,707	8.00%
Wright	5,246	140.00%



Source: Minnesota Department of Trade & Economic Development
 * This data can be used as a proxy for relative tourism levels.

Figure 18. Economic impact of domestic travel, 1988-1995

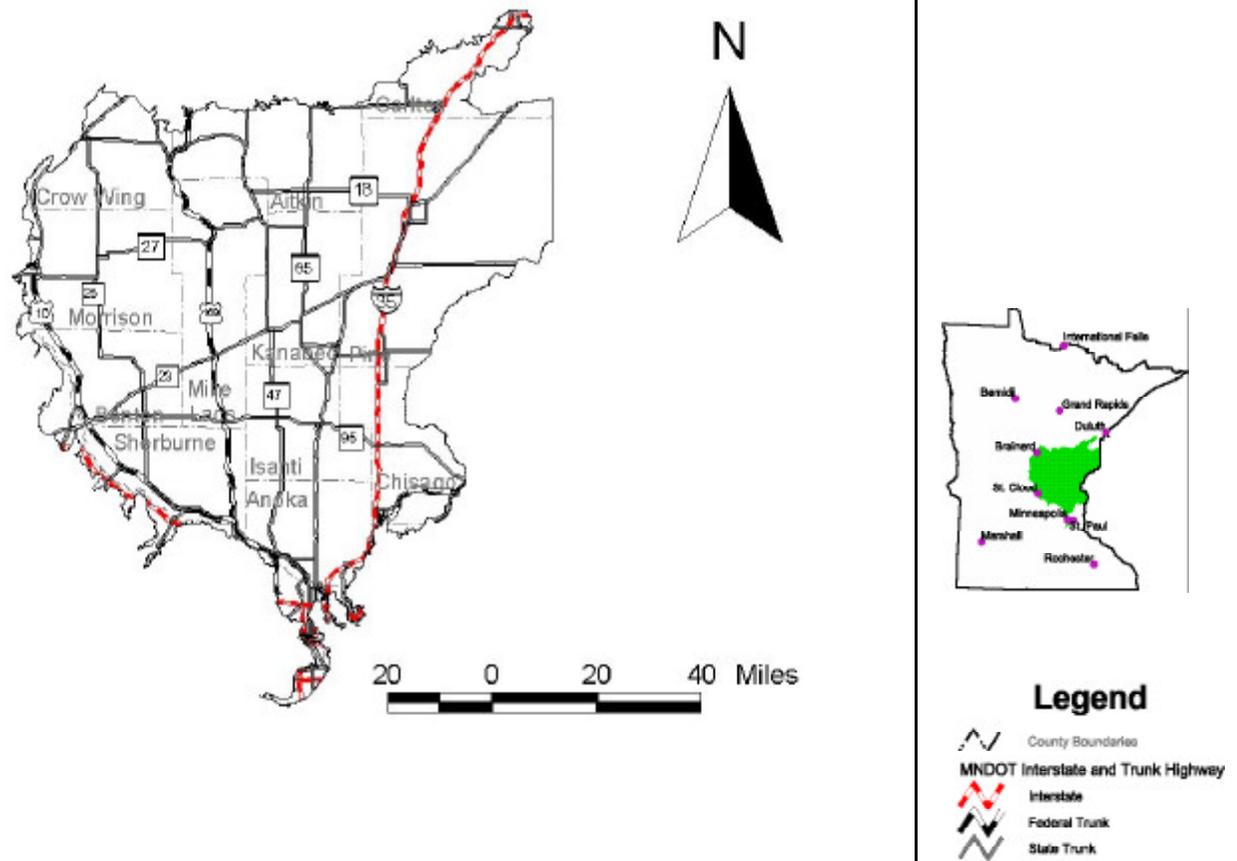


Source: MN Department of Trade and Economic Development, MN Office of Tourism

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, Mahnommen, Marshall, Norman, Otter Tail, Pennington, Polk, Pope, Red Lake, Stevens, Wadena, and Wilkin

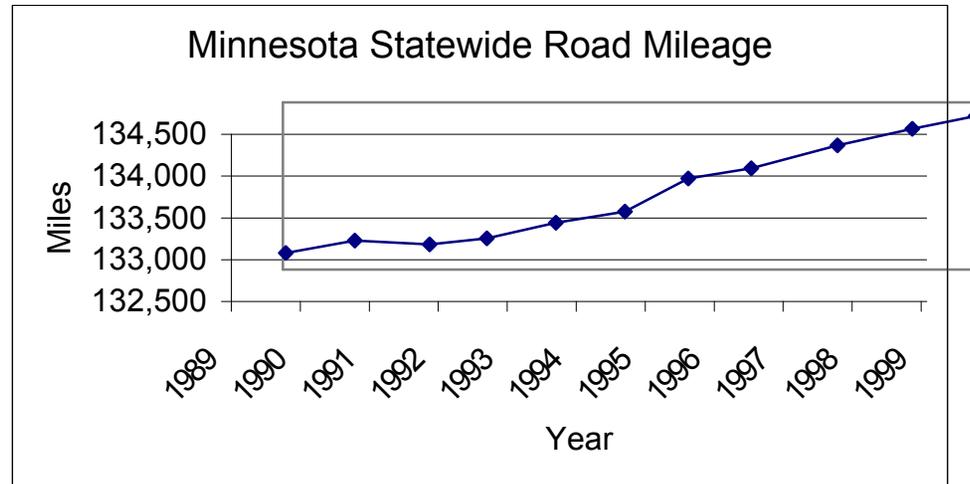


Figure 19. Major Roads in the East Central Landscape



Source: MN Department of Transportation

Figure 20. Road mileage statewide in Minnesota, 1989-1999

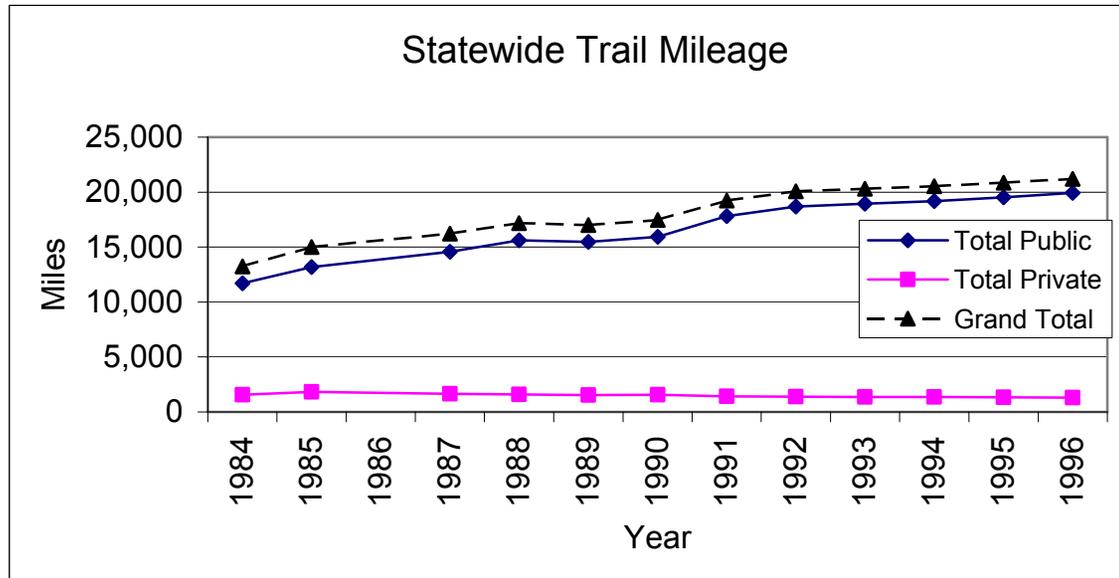


Source: Minnesota Department of Transportation.

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 21. 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 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

^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

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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.